ACTIVITY REPORT 2019

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.
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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.

We produce multi-disciplinary knowledge to facilitate and drive decision-making towards sustainable international development. 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.
Is our vision to steer climate change science towards the co-production of new knowledge together with stakeholders. We support policy development, generating basic knowledge, proposing and supporting the testing and demonstration of scalable solutions, and providing the basis for evaluating the impact and effectiveness of different policy measures.

During 2019, we have completed the second year of the BC3 2018-2021 strategy, and we have worked to take further the integration of the environmental (physical, ecological), socioeconomic and ethical dimensions of climate change, providing knowledge, tools and new methodologies to lead towards action in a collaborative manner and produce multi and transdisciplinary knowledge relevant to decisions on climate change issues and towards sustainable development at different levels.

The center’s activity has been articulated around our six general objectives, including:
- Several contributions to leading scientific interdisciplinary bodies, such as IPCC and IPBES: co-production of knowledge together with the supranational institutions, the European Commission, national, regional and local governments and UN agencies and bodies.
- BC3 aims to contribute to the creation of innovative approaches by integrating environmental, socioeconomic, and ethical dimensions of climate change to help decision makers.

And last but not least, our scientific production generated 132 publications during 2019: 95 peer-reviewed journal articles, 19 books and chapters and 15 publications, including technical reports in collaboration with leading international institutions. BC3 has also contributed to climate science by publishing 2 BC3 Policy Briefings and 1 BC3 Working Paper.
THE CENTRE

BC3-BASQUE CENTRE FOR CLIMATE CHANGE
Scientific Campus of the University of the Basque Country.
LEIOA, BIZKAIA
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.
Our partners

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

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 hypothesis 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.
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 years as independent scientific experts on the basis of their specific skills, abilities, experience and knowledge.

The regular annual meeting was held on the 5th of July 2019, where BC3 presented its scientific achievements during 2018 and its scientific objectives for 2019.

At the end of 2018 and early 2019, the composition of the Advisory members was reviewed. The final composition is as follows:

**ANNE LA ANGER-KRAVI**
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
### BC3 Team: Statistics

<table>
<thead>
<tr>
<th>BC3 Team</th>
<th>2018</th>
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<tbody>
<tr>
<td><strong>TOTAL BC3 TEAM</strong></td>
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</tr>
<tr>
<td>Management Assistant</td>
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**Gender distribution**

- **WOMEN**: 50 out of 58 (2018), 50 out of 66 (2019)
- **MEN**: 35 out of 58 (2018), 30 out of 66 (2019)

**Nationality distribution**

- **INTERNATIONAL**: 35 out of 58 (2018), 35 out of 66 (2019)
- **NATIONAL**: 30 out of 58 (2018), 30 out of 66 (2019)

*The BC3 staff (dated December 31, 2019)*
The European Commission awarded in 2015 BC3 with the HR EXCELLENCE IN RESEARCH in recognition to the commitment with the European Charter for Researchers and the Code of Conduct for the Recruitment of Researcher, 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. Improving BC3’s recruiting process, including guaranteeing gender equality at all the stages of the research career, has been one of the axes that guided the Human Resources management.
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
Terrestrial Ecosystems

UNAI ALVAREZ-RODRIGUEZ
Postdoctoral Researcher
Integrated Modelling of Coupled Human-natural Systems

JORGE CURIEL
BC3 Research Professor
Adaptation Lab

MARIÁN JOSÉ SANZ
Scientific Director
Terrestrial Ecosystems

ALINE CHIABAI
BC3 Research Professor
Terrestrial Ecosystems

INAKI ARDO
BC3 Research Professor
Terrestrial Ecosystems

IÑAKI ARTO
IkERBASqUE Research Professor
Low Carbon

STEFANO BALBI
Research Fellow
Integrated Modelling of Coupled Human-natural Systems

MARÍA JOSÉ SANZ
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Terrestrial Ecosystems

INMACULADA BATALLA
Postdoctoral Researcher
Terrestrial Ecosystems

AGUSTÍN DEL PRADO
BC3 Research Professor
Terrestrial Ecosystems

MARÍA JOSÉ SANZ
Scientific Director
Terrestrial Ecosystems

SERGIO FARIA
IkERBASqUE Research Professor
Climate Basis

STEFANO BALBI
Research Fellow
Integrated Modelling of Coupled Human-natural Systems

TARIK FISSAA
Technical Officer
Integrated Modelling of Coupled Human-natural Systems

NEREA BILBAO
Research Assistant
Climate Basis

MANUEL ENCINAS
PhD Student
Terrestrial Ecosystems

MARCELA BRUGNACH
IkERBASqUE Research Professor
Adaptation Lab

INUAI ARTO
IkERBASqUE Research Professor
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TARIK FISSAA
Technical Officer
Integrated Modelling of Coupled Human-natural Systems
BC3 TEAM: RESEARCHERS

OUR TEAM OF RESEARCHERS
BC3 TEAM: RESEARCHERS

OUR TEAM OF RESEARCHERS

MARC NEUMANN
IKERBASQUE RESEARCH PROFESSOR - RAMON y CAJAL FELLOW
Adaptation Lab

MARTA OLAZABAL
RESEARCH FELLOW
Adaptation Lab

MEHMET AKIF ORTAK
TECHNICAL ASSISTANT
Integrated Modeling of Coupled Human-natural Systems

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POSTDOCTORAL RESEARCHER
Terrestrial Ecosystems

GUILLERMO PARDO
POSTDOCTORAL RESEARCHER
Terrestrial Ecosystems

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IKERBASQUE RESEARCH PROFESSOR
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BC3 TEAM: RESEARCHERS

OUR TEAM OF RESEARCHERS

FERDINANDO VILLA
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TECHNICAL ASSISTANT
 Integrated Modelling of Coupled Human-natural Systems

YUWEI WU
TECHNICAL ASSISTANT
 Integrated Modelling of Coupled Human-natural Systems

NOELIA ZAFRA
POSTDOCTORAL RESEARCHER
 Terrestrial Ecosystems

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

BC3 TEAM: ADMINISTRATION

ADMINISTRATION TEAM

NEREA ORTIZ
OPERATION MANAGER

SUSANA PÉREZ
MANAGEMENT ASSISTANT

AINHOA AZKARATE
PROJECT MANAGER

SILVIA DE LUIS
PROJECT OFFICER

IRUNE VEGAS
PROJECT OFFICER

RAQUEL VEGA
PROJECT OFFICER

AINARA FERNANDEZ
COMMUNITY MANAGER
The attraction of external funding is one of the key indicators of excellence. 2019 has continued to be exceptional in terms of external resources attracted. The non-BERC* funding percentage has reached 74% in 2019.

* 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.
OUR 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.
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 requires 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.

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 ºC.
- 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.
- [Granular Flows] Mathematical Model of Polydisperse Granular Flow and Comminution that models the flow of polydisperse granular media, including the effects of abrasion and fragmentation.
- 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.

HIGHLIGHTED PUBLICATIONS

- Sánchez Goñi M.F.; Ferretti P.; Polanco-Martínez J.M.; Rodríguez T.; Alonso-García M.; Rodriguez-Tovar F.J.; Dorador J.; Desprat S. 2019. Pronounced northward shift of the westerlies during MIS 17 leading to the strong 100-kyr ice age cycles. EARTH AND PLANETARY SCIENCE LETTERS. 511. 117. DOI (10.1016/j.epsl.2019.01.032).
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 society and energy secure, 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 has a multidisciplinary approach to assessing mitigation policies through the use of integrated assessment tools (ranging from Economy-Energy-Environment models, Real Option/Financial models, microeconomic models and Global Integrated Assessment models) to analyze the implications of energy transitions, taking into account not only the technological, economic and financial dimensions, but also other relevant social and environmental aspects. In this context the BC3 has contributed with the use of methods such as behavioral economics, to analyze the role of energy efficiency and the policies that can work to incentivize it. We have applied several research methods, such as field experiments in retailers (Under H2020 CONSEED Project), as well as questionnaires or mapping techniques (H2020 ENABLE Project), both with consumers and policy experts. The combination of quantitative and qualitative techniques to analyze behavior adds a very rich dimension to the economic analysis that traditionally has been characterized by primarily using quantitative methods with little effort to comprehend the role of attitudes and behavior.

**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, including co-benefits. During last year we have been working together with stakeholders and policy makers from different institutions. In particular, we have collaborated with the following institutions: 1) DG Trade and the Joint Research Centre of the European Commission, 2) Ministry for the Ecological Transition of the Spanish Government, 3) Basque Government, 4) the private company IBERDROLA and 5) the consortium of National Banks.

**Explore the synergies between low carbon policies and Sustainable Development Goals**

The activity in 2019 has been to build on earlier work undertaken with CDKN entitled “The impact of climate change on the achievement of the post-2015 sustainable development goals”. Work on estimating the gap for a number of SDG indicators is taking place in 2019.
OBJECTIVE 2

Support decision making in the transition to a low carbon society

- **HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS**
  - H2020 PARIS REINFORCE, delivering on the Paris Agreement.
  - H2020 ENABLE, Enabling the Energy Union through understanding the drivers of individual and collective energy choices in Europe.
  - EU-TIVA, Contract with the Directorate Growth and Innovation of the Joint Research Centre (JRC) of the European Commission.

- **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 is currently being used on the economic assessment of the Spanish Strategy of De-carbonization 2050.
  - 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 officer of the European Commissions (DG JRC, DG TRADE, DG EUROSTAT). The tool is currently being upgraded to include more databases, GHG emissions and footprint indicators

- **HIGHLIGHTED PUBLICATIONS**
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 strongly related to improve and further develop 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 on how ecosystems affected by ancient agricultural or mining uses recover over long periods of time in areas of Spain and Greenland (REBECOM project) to understand their recovery and how they are affected by past climate changes. This knowledge could inform innovative environmental policies and strategies for land conservation and restoration.

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

During 2019, activities focused on:

A) Understanding the patterns of the increasingly observed climate change induced forest die-off and its consequences for ecosystem functioning and services in several types of European forests. With two main aspects addressed: the effects of climate change over soils, as a large C and nutrient reservoir, and as a mayor provider of ecosystem functions; and the impact of historical management on current vulnerability to climate of forests. Studies are done in the Spanish Oak forest (IBERYCA Project), European forest (in collaboration with the University of Transylvania on the vulnerability of key tree species suffering mortality events after extreme summer droughts). Our published results show how climate-change induced changes in plant health are accelerating climate change effects over key soil metabolic pathways, especially related to the nitrogen cycling.

B) We are also working on developing early markers of tree vulnerability to drought, since our results are showing that leaves in Mediterranean trees are experiencing early physiological stress and early malfunctions of the phorosynxtem II preceding defoliation. We aim to develop tools for early detection of stress.
Development of new generation mechanistic models of soil biogeochemical cycling. In the KEYLINK model, we integrated this approach and its importance for soil organic matter (SOM) stabilization and hydrology, with the existing concepts on SOM pools, and elements from food-web models, i.e., those from direct trophic interactions among soil organisms.

Disentangling the response mechanisms of the vegetation to increasing climatic stress and its impact on vegetation water use efficiency. Studies 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. We implemented a field experiment to test for alternative water mechanisms in tall trees under water stress set up in collaboration with INRA-Bordeaux (France) and the Swedish Agricultural University (SLU), and we also completed a study addressing a novel methodological approach to test for leaf internal diffusion limitations of CO2 uptake in vascular plants.

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 regional scales. These models are useful to explore scenarios (e.g. feeding management) that can both adapt to climate change (e.g. reducing 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. New methods and emission factors on livestock and soil N2O have been developed in the recently published methodological Report 2019, Refinement of the 2006 Guidelines for GHG inventories of the IPCC. BC3 also contributed to the zootechnical documents on N and P balances for cattle in Spain which is the basis for National inventories in GHG and NH3 emissions.

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.
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 related governance options. In this context, important contributions were made to different assessments of IPBES.

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

Efforts are concentrated in the multilateral activities and efforts to improve the understanding of the mitigation potential of the Land Use Sector in the global, regional and national context. In 2019, focus was placed on the completion of the Final Draft of the Methodological Report 2019 Refinement of the 2006 Guidelines for GHG inventories of the IPCC, and the preparations for the adoption Plenary in May 2019. In addition, efforts were made to work on improving the modelled global estimates of the expected contributions of the land use sector to the Paris Agreement goals to be considered in the IPCC SR on Land and Climate Change, in cooperation with IIASA and Climate Strategies.
OBJECTIVE 3
Understanding and managing terrestrial systems for sustainability

- HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS
  - H2020 ISAGE. Innovation for Sustainable Sheep and Goat Production in Europe.
  - EQUIVAL. Nurturing a shift towards equitable valuation of nature in the Anthropocene.
  - REVALUE. Relational values in urban environments: A transdisciplinary approach.
  - ESPERA. Social Equity in Payments for Environmental Services (PES): A Socio-Ecological Perspective.
  - REBECOM. Estimating recovery time of temperate forests after historic anthropogenic disturbances along a gradient of complexity.
  - EKLIPSE. (Knowledge & Learning Mechanism on Biodiversity & Ecosystem services).
  - IBERYCA. The role of plant-microbiota interactions in the resilience and collapse of Mediterranean forest of holm-oaks.
  - MANURE. Management of dejections in productive systems of milk cattle from the Cantabrian coast. From exploitation to the territory: efficiency of the nutrient loops on environmental impact, resilience and sustainability at different levels of the agri-food system.
  - SIMSRR. 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.

- HIGHLIGHTED MODELS AND TOOLS
  - SIMSDAIRY (Optibarn version). Modelling framework that has been re-developed in order to simulate the effect of heat stress and climate change
  - SIMSNIC. Model to investigate the effects of closed nutrient loops on environmental impact, resilience and sustainability at different levels of the agri-food system.
  - SIMSSR. Whole farm model to study small ruminant’s production systems sustainability in Europe.

- HIGHLIGHTED PUBLICATIONS

- OTHER HIGHLIGHTS
  - During 2019 BC3 started co-leading the new network Rednueva (Network for updating emission values in Spanish agriculture).
We conduct research to facilitate decisions for successful and effective adaptation to climate change and its impacts. Based on scientific proof, 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.
The focus of the ongoing research is on adaptation economics, adaptation policy analysis, climatic risk assessment, adaptation tracking and climate resilience in health, water, land use, coastal, urban, infrastructures and agriculture, focusing on impacts of heatwaves, flooding, droughts, sea level rise.

During 2019 the Adaptation Lab research line has contributed to enhance the understanding with respect to adaptation policies and their assessment. This has been achieved through the work of two research groups, one devoted to the specific topic of health issues and a second broader research group that focuses on adaptation policies at city and at regional level. 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 as well as the exposure and vulnerability of social, environmental and economic systems to these impacts.

During 2019 most of this activity has been taking place within the COACCH H2020 project along two main topics. Firstly, BC3 is developing methods for improving the understanding of public risk aversion including behavioural factors when addressing flood risk. Secondly, BC3 is developing a framework for geospatial heatwave risk mapping for Europe taking into account the three dimensions of hazard, exposure and vulnerability and their evolution in time. This work explores the use of different indices for each of the dimensions and includes the assessment of humid heatwaves.

Within this activity BC3 has been involved in various dissemination and practice-related engagements. At ECCA 2019 a session addressing new developments in risk governance was convened. Collaboration has been initiated with the Basque Cooperation Agency in topics related to coastal risks, vulnerability and risk governance. Further collaborations have been initiated with various national, regional and local agencies including the Spanish Climate Change Office, the Catalan Climate Change Office and the cities of Barcelona and Glasgow.

**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.

This activity has been further developing methodologies for the economic assessment of health and social benefits that urban green spaces provide. A cost-benefit analysis framework where stakeholders and the public are involved in the design process was developed and tested for the case-studies of Getxo (Spain) and Malvik (Norway). The framework and tool developed are deemed to be of interest for decision makers and local administrations. The methodology developed in the OASIS and INHERIT H2020 projects can provide a useful tool to support action for heat warning system in a context of climate change.
Support decision making for successful and effective adaptation

BC3 was involved in various high level policy activities including with the Canadian Government (Costs and Benefits of Climate Impacts and Adaptation in Canada), UNEP (Adaptation Gap Report Process in 2019, Ways forward for assessing adaptation gaps and tracking progress towards bridging them’), ICAT (Initiative for Climate Action Transparency), Oxford Martin School (Planetary Health Economic Council report) and the UN Statistical Office (including climate impacts the national accounts).

BC3 contributed to the report “Climate Change Adaptation in a Multi-Level Governance Context: A Perspective from Subnational Governments” that was presented in an official side-event co-organised by Regions4, BC3 and MCII on 9 December at COP25, Madrid. Likewise, BC3 contributed to the activities of the Joint Research Laboratory on Environmental Antibiotic Resistance.

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) and for supporting decision making under deep uncertainty. A global urban adaptation tracking study on 136 coastal cities around the world started to identify and document adaptation policies, evaluate their credibility and assess if and how these initiatives will effectively address future coastal risks. This work aims to track and document the progress towards adaptation in urban areas both in Spain and in metropolitan areas and regions across the globe.

The activity has engaged with public and private stakeholders across Spanish municipalities and global coastal megacities and is currently supporting RegionsAdapt (an initiative of Regions4 https://www.regions4.org/) in the use of our Adaptation Policy Checklist (APC) tool. Part of the work has been published in one of the Cities IPCC Special issue on Climate Finance. As a result of BC3’s participation in INCCCCT, a new International Platform for adaptation metrics is being created and BC3 is part of the Steering Committee. In addition, within this activity a special issue on knowledge co-production and transdisciplinarity in the journal WATER was completed.
Support decision making for successful and effective adaptation

Understanding the implications of uncertainty

BC3 develops quantitative and qualitative approaches to deal with uncertainty and variability in climate change adaptation. BC3 has continued testing the adequacy of methods from financial mathematics to estimate damages from extreme (low probability-high impact) events. Applications in 2019 have included the assessment of coastal- and of heatwave risks. Another study assessed levee-heightening strategies for river flood protection, including economic valuation and optimisation under stationary and non-stationary climate signals. The understanding of uncertainty also includes practice-oriented studies. In 2019, the team developed a resilience-screening tool for wastewater utilities, which was developed with practitioner engagement in Belfast (Northern Ireland Water) and validated in Murcia (ALICE-RISE H2020).

The team is co-editing a scientific and technical report for the International Water Association (IWA). The associated DOUT Task Group brings together over 30 leaders of the wastewater sector from both practice and academia to explore new applications in 2019 have included the assessment of coastal- and of heatwave risks. Another study assessed levee-heightening strategies for river flood protection, including economic valuation and optimisation under stationary and non-stationary climate signals. The understanding of uncertainty also includes practice-oriented studies. In 2019, the team developed a resilience-screening tool for wastewater utilities, which was developed with practitioner engagement in Belfast (Northern Ireland Water) and validated in Murcia (ALICE-RISE H2020).

The team is co-editing a scientific and technical report for the International Water Association (IWA). The associated DOUT Task Group brings together over 30 leaders of the wastewater sector from both practice and academia to explore new ways on how to address uncertainty. Collaborations were initiated with researchers at UPV-EHU and UOC on improving the understanding of dynamics in the evolution of urban infrastructure systems.

**HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS**

- **H2020 INHERIT**, Inter-sectoral Health Environment Research for Innovations.
- **H2020 COACCH**, Co-designing the Assessment of Climate Change costs.
- **H2020 MSCA RISE ALICE**, Accelerate Innovation in urban wastewater management for climate change.
- **CLIC**, Can we measure the effectiveness of public investments in urban climate resilience?
- **PROCESA**, Evaluation of the Progress of the Spanish Cities towards Adaptation.
- **Joint Research Laboratory** on Environmental Antibiotic Resistance.

**OTHER HIGHLIGHTS**

- BC3 co-leads the International Network of Climate Change Centres of Excellence and Think-Tanks for Capacity Building (INCCET 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**

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.
BC3 has a strong focus on methodological innovations in the field of informatics for sustainability and ARIES (Artificial Intelligence for Ecosystem Services) platform, is the flagship project. The philosophy behind ARIES is not to make one model, but a platform for interoperable data and models. 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 (AI) 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.

The currently available contents of the ARIES network include:

- More than 100 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 full set of GIS algorithms to use within modelling workflows to implement complex spatial models. In addition, we are working to integrate well-known hydrological models, forest growth models and agricultural models (including process-based descriptions of livestock and rangelands). We have also started 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**
  - INTERREG ALICE Towards a better management of Atlantic Landscapes: developing tools to better characterise biodiversity and eCosystem eServices (Interreg Atlantic Area).
  - H2020 MSCA Global Individual Fellowship, SABER CULTURAL.
  - CARDINAL project (Fundación BBVA).
  - OBServ (Belmont Forum & Biodiversa).
  - JRS Pollination project.
  - TRANSIT (MCIN).

- **HIGHLIGHTED MODELS AND TOOLS**
  - k.LAB
  - k.EXPLORER.
  - k.Modeller, k.LAB hub and k.LAB node.

- **HIGHLIGHTED PUBLICATIONS**
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

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. 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 decision. 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 reality for the first time. During the past decade, we have envisioned and built the ARIES (Artificial Intelligence for Ecosystem Services) platform, a technology that integrates network-available data and model components through semantics and machine reasoning. Its underlying software (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. We developed 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.
Highlyinitiative projects and projects:

- **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. This project has been approved by the European Union within the Integrated Projects Area for mitigation and adaptation to climate change. The project is led by the Department of Environment, Territorial Planning and Housing of the Basque Country, through its Public Society of Environmental Management, Ihobe. The project consortium is formed by 23 institutions and entities from across the Basque Country.

- A collaboration with the World Bank PROFOR, FAO and the central American, Ecuador and Colombia Ministries of Environment in assessing the inclusion of the AFOLU sector in their INDC/NDC, sharing their knowledge and experiences carried out through a workshop in Panama in early 2019. BC3 assisted in the understanding of the recently adopted Katowice Package by the UNFCCC in 2018, and supporting the analysis of the NDCs.

- A collaboration with Elika: Since 2019 BC3 is collaborating with the Basque Government (Elika) within the action plan to decrease food waste in the Basque Country. A new working group involving the government and academia has been formed to propose new solutions and research projects with the aim to improve the efficiency of the agro-food system in the Basque Region.

- A collaboration with the City of Vitoria-Gasteiz: The governance of urban green space and urban biodiversity in general as a strategy towards climate mitigation and adaptation requires understanding the perceptions and preferences of different stakeholders, including urban planners, policy makers and urban citizens themselves, towards nature. This requires understanding the multiple and often conflicting values of urban biodiversity beyond a utilitarian/instrumental perspective, and how these are articulated by such stakeholders. This knowledge can help urban planners design policies and plans that foster positive human-nature relations in the context of nature based solutions. The new project REVALUE (2019-2022) provides a transdisciplinary interdisciplinarity: ecology, economics, social sciences) and participatory approaches in the city of Vitoria-Gasteiz. The Council of Vitoria-Gasteiz is an active stakeholder and partner of the project.

- Small Sherpa Project (SSP): By the end of 2018 and the first months of 2019, BC3 organized and executed its first expedition to the K2 in the Karakoran (Pakistan), in collaboration with the mountaineering team led by Alex Txikon, to study the effects of climate change on that mountain and its surrounding glaciers. Such expedition, realized during the high winter in one of the most inhospitable places in the world and under conflict risk (Kashmir), was a formidable logistics challenge for BC3. The collected data and samples are now being analysed in BC3 and at a partner laboratory (NIPR) in Japan. A second expedition is now under planning.
RECOGNITION OF EXCELLENCE IN RESEARCH

Severo Ochoa/María de Maeztu Statuette handing over ceremony was held on the 9th of September 2019 in Madrid. María José Sanz received it from the Spanish Minister of Science, Innovation and Universities, Mr. Pedro Duque. This recognition is received by BC3, in acknowledgement of the quality and level of excellence in the research BC3 conducts and the proposed 2018-2021 Strategy Plan.

AWARDED PUBLICATION: AON FOUNDATION DISASTER OBSERVATORY

In November 2019, the AON Foundation Disaster Observatory tribunal selected one of the BC3 publications, “How are cities planning to respond to climate change? Assessment of local climate plans from 885 cities in the EU-28”, as winner of the first edition of the “José Mª Sarriregi” award for catastrophe management research.
During 2019, BC3 has put its scientific production within the best scholarly and the most influential leading publishers. 132 publications were published.

**BC3 PUBLICATIONS**

- **95** peer-reviewed articles
- **19** books and chapters
- **18** other relevant publications
BC3 has maintained the high number of articles produced and indexed in SCOPUS, along with their quality and impact. 85.06% Q1 and publications 66.67% D1.

Accordingly, the number of citations have increased, during 2019 over 3300 citations were received by BC3 publications.
**JOURNAL ARTICLES**


- **Martínez-Juarez P., Chabai A., Suárez C., Quiroga S.** 2018. Insights on urban and periurban adaptation strategies based on stakeholders' perceptions on hard and soft responses to climate change. **Sustainability (switzerland).** 10, (3) DOI (10.3390/su10030640-019-00328-1).


Calvo Buendia, Eduardo (Peru), Guendehou, Sabin (Benin), Limmeechokchai, Bundit (Thailand), Papatti, Riitta (Finland), Rojas, Yasna (Chile), Sturgiss, Rob (Australia), Tanabe, Kyoto (Japan), Wirth, Tom (USA) Romano, Daniela (Italy), Witi, Jongikhaya (South Africa), Garg, Amit (India), Weitz, Melissa M. (USA), Cai, Bo (China), Ottinger, Deborah A. (USA), Dong, Hongmin (China), MacDonald, James Douglas (Canada), Ogle, Stephen Michael (USA), Rocha, Marcelo Theoto (Brazil), Sanz Sanchez, María José (Spain), Bartram, Deborah M. (USA), Towprayoon, Sirintornthep (Thailand). 2019. Overview chapter. In: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse gas Inventories, Calvo Buendia, E., Tanabe, K., Kranjc, A., Baasansuren, J., Fukuda, M., Ngarize S., Osako, A., Pyrozhenko, Y., Shermanau, P. and Federici, S. (eds). Published: IPCC, Switzerland. https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/0_Overview/19R_V0_01_Overview.pdf


BOOK CHAPTERS

OTHER PUBLICATIONS


BC3 PUBLICATIONS


BC3 WORKING PAPER

- [WP 2019-01] Revisión sistemática de los efectos del paso a un ordeño al día en pequeños rumiantes. Elena Galán del Castillo
During 2019, BC3 strengthened its engagement with Key Panels and Institutions at international level, which is regarded as a proxy for assessing the visibility of BC3 members and scientific production in the most authoritative and inter-disciplinary scientific body dealing with climate change.

BC3 is contributing to most of the Sixth Assessment Cycle Key Reports that was mandated after the Paris Agreement.
IPCC

Intergovernmental Panel on Climate Change

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, S.H. Faria, Lead Author (Chapter 1) and Contributing Author (Chapter 10); Working Group II, Marta Olazabal Contributing author (Chapter 6). Special Report: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (María José Sanz, Coordinating Leading Author (AFOLU Volume), Agustín del Prado, Leading Author (Chapter 9 of the AFOLU volume). Special Report on Land and Climate Change. María José Sanz, Review Editor (Chapter 1) that was published in 2019.

Likewise, during 2019, María José Sanz was requested to participate in an internal IPCC review of the 6AR Volume II (Impacts of climate change), chapter 13 (Mediterranean Region) and is 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 largest representation at IPBES at Spanish Level (4 BC3 scientists).

Authorships: IPBES Global Assessment, (Unai Pascual, Leading author (Chapter 1) and Ignacio Palomo Author Fellow; IPBES Values Assessment, Unai Pascual Co-chair, Ignacio Palomo, Lead Author (Chapter 3), Bosco Lliso, Author-Fellow and Noelia Zafra-Calvo, Contributing Author (Chapter 5).

IPBES Values Assessment: Second Author Meeting (SAM) was hosted by BC3 in Vitoria –Gasteiz (October 21-25, 2019).
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:

- **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.

- **INCCETT 4CB**
  - BC3 was one of the co-founders of the International Network of Climate Change Centres of Excellence and Think-Tanks for Capacity Building, to boost coherence and improve coordination between major global centres of excellence and think tanks.

- **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 on it.

- **REDNUEVA**
  - BC3 co-founded in 2019 the Network for updating emission values in Spanish agriculture (Rednueva) to analyse the state of the greenhouse gas (GHG) emission factors in the Spanish agricultural sector and propose measures to improve them in the future.

- **OTHER HIGHLIGHTED NETWORKS**
  - RED ECOSOIL
  - GIGAKU TechnoPark Network
  - Manure management network
  - SHAIO
  - Hispanic-American Input-Output Society
  - Research Network on Energy Workforce Transitions (ReNEWT).
MEANS OF RESEARCH
The collaboration scheme and internationalization of BC3 is based on its continued active contribution to International Research Projects. This has happened mainly by an increase 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 the BC3’s international reputation and leadership.

In 2019, 33% of the total funding came from international projects.
**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 Brasilia (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 Eguino  
Iñaki Arto  
María 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 Nº 820846

**URL ADDRESS**  
https://paris-reinforce.eu/

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.
**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)  
- Universita di Pisa  
- Medunarodni Centar za Odrzivi Razvoj Energetike  
- Voda I Okolisa  
- Österreichische 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  
- Bureau European 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 Egino  
- Marc Neumann

**ACKNOWLEDGEMENT**

This project has received funding from the European Union Horizon 2020 Research and Innovations programme under Grant Agreement Nº 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.
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: 674,259 €
PARTNERS:
- Aristotle University of Thessaloniki (Coordinator)
- Kentro Genetikis Beltiosis Zoon Neas Mesimvrias
- LEVER S.A. Development Consultants
- Agricultural Cooperative of Pieria Sheep and Goat Farmers
- Agricultural Livestock Cooperative of Western Greece
- Luke - National Resource Institute Finland
- ProAgricultural Cooperative of Western Greece
- Agricultural Livestock Cooperative of Western Greece
- L’Institut de l’Elevage
- Capgenes
- Comite National Brebis Laitiere
- European Federation of Animal Science
- Universita Politecnica delle Marche
- Istituto per la Certificazione Etica ed Ambientale
- Mediterranean Agronomic Institute of Zaragoza / International Centre for Advanced Mediterranean Agronomic Institute
- Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria
- Agencia Estatal Consejo Superior de Investigaciones Cientificas
- BC3-Klima
- Carnes Oviarrogon SCL
- CaBRANDALUCIA Federacion Andaluza de Asociaciones de Ganado Caprino de Raza Pura
- ASSAFE (ES)
- ARDIE-KIN S.L.
- Asociacion Nacional de Criadores de Ovino Selecto de Raza Lacaune
- Nigde University
- Ataturk University
- Pan Hayvancilik Gida Sanayi Tic LTD
- Red Rock Agricultural Pastoral
- Tarim Limited Sirketi
- Gaziantep Ill Damizlik Koyun Keci Yetistiricileri Birligi
- 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

Dr. Agustín del Prado
Guillermo Pardo

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 research and innovations programme under grant agreement Nº 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) re-design 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.
**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 Tras-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**

- Dr. Ferdinando Villa (PI)
- Dr. Stefano Balbi
- Dr. Javier Martínez
- Dr. 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

**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.

**URL ADDRESS**

http://project-alice.com/
**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 la Energía (EVE)
- Fundación Cambio Climático de Gipuzkoa (NATURKIMA)
- 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 Egino
Ainhoa Azkarate
Marc Neumann
Silvia de Luis
Iñaki Arto
Estibaliz Sanz
Ester Galende
Maria Ruiz de Gopegui
Alejandro Rodriguez Zurita

**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/
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 €

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

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

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.

URL ADDRESS

https://clic.bc3research.org
RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)

**PROCESA**

**NAME OF THE PROJECT:** Evaluación del PROgreso de las Ciudades Españolas hacia la Adaptación (Evaluation of the Progress of Spanish Cities towards Adaptation)

**FUNDING AGENCY:** Fundacion Biodiversidad

**CALL:** FBIODIV_ADAPTACION_2017

**TIME FRAME:** 2018-07-01 - 2019-06-30

**FUNDING:** 42,836.90 €

**OBJECTIVE 4:** Support decision making for successful and effective adaptation

**KEY BC3 RESEARCHERS INVOLVED**

- Elisa Sainz de Murieta
- Ibon Gañaraga
- María Jose Sanz
- Estibaliz Sanz

**ACKNOWLEDGEMENT**

With the support of the Biodiversity Foundation, of the Spanish Ministry for Ecological Transition

**URL ADDRESS**

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

**PROJECT DESCRIPTION**

The objective of the PROCESA project (Evaluation of the Progress of Spanish Cities towards Adaptation), which has the support of the Biodiversity Foundation, of the Spanish Ministry for Ecological Transition, is precisely to analyze progress in adaptation to climate change in the main Spanish cities, through the evaluation of their adaptation plans and policies.

PROCESA, through a methodology initially tested in 4 pioneering cities in terms of adaptation (Durban, Copenhagen, Quito and Vancouver), allowed an innovative evaluation of the main adaptation policies at the state level. In addition, PROCESA allowed analyzing the degree of alignment of the adaptation policies analyzed with climate risks. This methodology provided a fundamental tool to guide cities when starting, reviewing and improving their adaptation plans.

In the framework of this project, a knowledge transfer event was organized that served as a meeting point between planners, managers and scientists. The results of the project were shared and opportunities and successful experiences that can serve as inspiration and motivation for action were also explored.
RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)

OBSERV

NAME OF THE PROJECT: Open Library of Pollinator Biodiversity and Ecosystem Services Scenarios (OBSERV)
FUNDING AGENCY: MICINN (MINECO) - Ministerio de Ciencia e Innovacion
FUNDING PROGRAM: ERA-NET CALL: MINECO-ERANet BiodiVERsA BIS
FUNDING: 125.302,20 €
PARTNERS:
Dr. Ignasi Bartomeus, Estación Biológica de Doñana (EBD-CSIC)
Dr. David Kleijn (Wageningen University)
Dr. Rachael Winfree, Rutgers University
Dr. Lucas A. Garibaldi (Instituto de Investigaciones en Recursos Naturales, Agroecología y Desarrollo Rural (IRNAD-UNRN))
BC3, Basque Centre for Climate Change

LINK WITH BC3’s OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED
Ferdinando Villa
Unai Pascual
Ainhoa Magrach
Stefano Balbi
Angel Gimenez

PROJECT DESCRIPTION

Biodiversity is now recognized as pivotal in maintaining ecosystem functions and providing ecosystem services with positive impacts for human well-being. Paradoxically, biodiversity is also being lost at unprecedented rates due to rapid human-induced environmental changes. Scenarios predicting the future of biodiversity and its associated services are a powerful tool to inform conservation planning but several barriers have impeded their widespread and productive use so far. A key limitation is that there is little guidance and no formal cost-benefit analysis on the use of different modeling approaches. Rather than aiming at finding one model that can be applied universally, we need tools that allow us to select the right models for each situation while taking into account model complexity and data requirements. Here we propose to use the open source environment k.LAB to develop a user-friendly open library of modeled scenarios in collaboration with stakeholders. We will focus on pollinators and the pollination service they provide given their key contributions to biodiversity maintenance and food security and their threatened status globally. Our approach will take into account different dimensions of biodiversity by capturing the responses of plant-pollinator interactions, scaling up pollinator responses to the community level and testing the transferability of umbrella species responses. Models will be validated against empirical data using baseline data collected by our group and by other researchers, as well as re-sampling of representative locations. By using a participatory approach with relevant stakeholders from four different countries we will assess the real utility of the developed models and biodiversity scenarios for the end users, including performance across scales and proper communication of uncertainty. The best models will be used to map pollination services under different environmental scenarios ranging from global trends extracted from IPCC and land use cover predictions to local potential implementations of better management practices.
**NAME OF THE PROJECT:** Evaluating the functional role of the hummingbird hawkmoth, *Macroglossum stellatarum* along its migratory pathway: implications for ecosystem functioning

**FUNDING AGENCY:** MICINN (MINECO) - Ministerio de Ciencia e Innovación

**FUNDING PROGRAM:** Programa de Investigación Fundamental No Orientada

**CALL:** Proyectos de I+D de Generación de Conocimiento Convocatoria 2018

**TIME FRAME:** 2019-01-01 - 2022-12-31

**FUNDING:** 111,320 €

**PARTNERS:**
- Dr. Ignasi Bartomeus, Estación Biológica de Doñana (EBD-CSIC)
- Dr. David Kleijn (Wageningen University)
- Dr. Rachael Winfree, Rutgers University
- Dr. Lucas A. Garibaldi (Instituto de Investigaciones en Recursos Naturales, Agroecología y Desarrollo Rural (IRNAD-UNRN))
- BC3, Basque Centre for Climate Change

**LINK WITH BC3’S OBJECTIVES**

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

**KEY BC3 RESEARCHERS INVOLVED**

Ainhoa Magrach
Paula Dominguez
Clara Parejo
Maddi Artamendi

**ACKNOWLEDGEMENT**

Project financed by MINECO, file number: PGC2018-098498-A-I00

**PROJECT DESCRIPTION**

Predicting how species, communities and ecosystems will respond to global environmental change remains a key scientific challenge. Much progress has been done in understanding how species interact and assemble into complex networks. However, the dynamic nature of these species assemblages and the role of biodiversity in shaping them remain poorly understood. To fill these gaps, we will survey plant-pollinator interactions along the migratory pathway of the hummingbird hawkmoth, *Macroglossum stellatarum*, which coincides with a pollinator diversity gradient, to address three main questions:

1. How does pollinator species diversity within the community and the migratory behaviour of a species affect its functional role? We will evaluate how *M. stellatarum’s* functional role changes throughout its migratory pathway: from Spain where migratory and resident populations co-exist, to Switzerland where all individuals annually migrate in late May, and the consequences this has for plant reproductive success.

2. How does pollinator functional diversity affect ecosystem function? We will focus on the relationship between community dynamics and the spatial network of pollination events generated by different pollinator species, including *M. stellatarum* along its migratory pathway, and test the effects for population persistence and potential longer-term evolutionary responses.

3. How will climate change affect *M. stellatarum’s* migratory behaviour and what will the consequences be for ecosystem functioning? We will evaluate how climate change might affect the migratory behaviour of *M. stellatarum*, and the consequences this might have for other pollinator species it co-exists with. We will develop models based on the knowledge generated in previous objectives to predict how communities will re-assemble and use them together with process-based models to forecast effects on ecosystem function.

By connecting empirical data with complex theoretical models, TRANSIT will represent a fundamental step to improve our ability to predict the outcome of ecosystem disturbances and their impact on community structure and function, while focusing on multiple levels of biodiversity: from species, interactions and communities to functions.
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.
**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 €

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**OBSTACLE 3. Understanding and managing terrestrial systems for sustainability**

**KEY BC3 RESEARCHERS INVOLVED**

- Teresa Gimeno
- David Moreno
- Jorge Curiel
- Javier Porras

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**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.
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. In 2019, BC3 obtained a grant for the acquisition of a specific microscope.

A UNIQUE APPROACH TO LOW-TEMPERATURE RESEARCH
BC3 continued strengthening and expanding its national and international relationships with many leading research institutions worldwide during 2019.

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

OVER 300 ACTIVE COLLABORATORS DURING 2019
TRAINING, DISSEMINATION AND CAPACITY BUILDING
During 2019 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 UPV / EHU as a key collaborator.

### Training Activities Conducted

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD Students Supervised</td>
<td>32</td>
</tr>
<tr>
<td>Master Students Supervised</td>
<td>10</td>
</tr>
<tr>
<td>Courses Given in Post-Graduate and Advanced Courses</td>
<td>13</td>
</tr>
<tr>
<td>BC3 Courses Organized</td>
<td>4</td>
</tr>
<tr>
<td>Researchers Participated in PHD &amp; Master Tribunal Defense Juries</td>
<td>7</td>
</tr>
<tr>
<td>Students from Multiple Disciplines Participated in the BC3 Training Activities</td>
<td>10</td>
</tr>
</tbody>
</table>
## Supervised PhD Students

<table>
<thead>
<tr>
<th>STUDENT NAME</th>
<th>SUPERVISOR/S AT BC3</th>
<th>UNIVERSITY</th>
<th>THESIS TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altor Andonegi</td>
<td>Agustín del Prado</td>
<td>University of the Basque Country</td>
<td>Análisis y evaluación integral de sistemas de pastoreo de ovejas lecheras: propuesta de escenarios y herramientas de gestión</td>
</tr>
<tr>
<td>Alba Návarri Torres</td>
<td>Ferdinando Villa and Stefano Babili</td>
<td>University of Lleida</td>
<td>Spatial-temporal characterization of forest ecosystem services in a context of climate change through semantic integration.</td>
</tr>
<tr>
<td>Alberto González García</td>
<td>Ignacio Palomo</td>
<td>Universidad Autónoma de Madrid</td>
<td>Planificación socio-ecológica del territorio en Madrid</td>
</tr>
<tr>
<td>Alessandro Silvestri</td>
<td>Sebastien Foudi</td>
<td>University of the Basque Country</td>
<td>The transition towards low carbon mobility: key factors and socio-economic impacts.</td>
</tr>
<tr>
<td>Ambika Markanday</td>
<td>Ibon Galarraga</td>
<td>University of the Basque Country</td>
<td>Economic and behavioural effects of uncertainties underlying adaptation decision-making in cities</td>
</tr>
<tr>
<td>Asma Jebari</td>
<td>Agustín del Prado</td>
<td>Universitat de Lleida</td>
<td>Quantificación Del Secuestro De Carbono En La Ganadería Ligada A Los Pastos Del País Vasco</td>
</tr>
<tr>
<td>Asun Rodríguez</td>
<td>David Moreno</td>
<td>University of the Basque Country</td>
<td>Recuperación de la estabilidad de las redes de interacción en bosques templados tras impactos causados por la minería desde la edad media</td>
</tr>
<tr>
<td>Bosco Lliso</td>
<td>Unai Pascual</td>
<td>University of Osnabrueck</td>
<td>Social Equity and Payments for Ecosystem Services: From Macro to Micro</td>
</tr>
<tr>
<td>Daniel García Angulo</td>
<td>Jorge Curiel</td>
<td>Universidad Autónoma de Madrid</td>
<td>Effect of the holm-oak die-off on the taxonomy and functioning of soil microbial communities</td>
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<tr>
<td>Dirk Jon Van de Ven</td>
<td>Mikel Gonzalez and Itxaki Arta</td>
<td>University of the Basque Country</td>
<td>Synergies and trade-offs of climate change mitigation policies: an integrative assessment approach</td>
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<tr>
<td>Elena Lopez</td>
<td>Ibon Galarraga</td>
<td>University of the Basque Country</td>
<td>Pathways to a decarbonised building sector: understanding energy decision in heating and cooling</td>
</tr>
<tr>
<td>Ekaat Iagziire Estibantz</td>
<td>Sergio H. Faria</td>
<td>University of the Basque Country</td>
<td>Evolution of glaciers and glacial lakes in response to climate change in the Cordillera Darwin Icefield, Tierra del Fuego, southernmost South America</td>
</tr>
<tr>
<td>Estibailz Sainz</td>
<td>Aline Chiabai</td>
<td>Universidad internacional de Cataluña (UIC)</td>
<td>Mainstreaming of climate change adaptation in urban planning</td>
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<tr>
<td>Fengzhi He</td>
<td>Simone Langhams</td>
<td>Free University Berlin</td>
<td>Diversity and risk patterns of freshwater megafauna: a global perspective</td>
</tr>
<tr>
<td>Freddy Eliseo Michel Portugal</td>
<td>Sergio H. Faria</td>
<td>University of the Basque Country</td>
<td>Territorialidad, resiliencia tradicional/ancestral y cambio climático: pueblos y nacionalidades indígenas de la Amazonia ecuatoriana del Cantón Mera de la Provincia de Pastaza 2016-2018</td>
</tr>
<tr>
<td>Gonzalo Morcillo</td>
<td>Sergio H. Faria</td>
<td>University of the Basque Country</td>
<td>Statistical analysis of climate and paleoclimate records</td>
</tr>
</tbody>
</table>
## TRAINING ACTIVITIES CONDUCTED

### Supervised Master Students

<table>
<thead>
<tr>
<th>STUDENT NAME</th>
<th>SUPERVISOR/S AT BC3</th>
<th>UNIVERSITY</th>
<th>THESIS TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alessia Farina</td>
<td>Ferdinando and Stefano Balbi</td>
<td>CUTGANA, University of Catania</td>
<td>Assessing and mapping ecosystem services. A case study based on ARES</td>
</tr>
<tr>
<td>Amaia Alberdi</td>
<td>Guillermo Pardo</td>
<td>University of the Basque Country</td>
<td>Comparación de diferentes tipos de explotaciones de ovino Latxo mediante el Análisis de Ciclo de Vida</td>
</tr>
<tr>
<td>Borja Aramburu</td>
<td>Jorge Curiel</td>
<td>University of the Basque Country</td>
<td>The role of Soil Biodiversity on plant defense against Phytophtora Cinammoni</td>
</tr>
<tr>
<td>Giulia Gadani</td>
<td>Ibon Galarraga</td>
<td>University of Ferrara</td>
<td>Non-state climate policies: the case of sub-national governments</td>
</tr>
<tr>
<td>Gonzalo Arechavaleta</td>
<td>Elisa Sainz de Murrieta</td>
<td>University of the Basque Country</td>
<td>An explanatory report on the last UNFCCC Conference of the Parties summit developed in Katowice and a review of 7 years of climate summits</td>
</tr>
<tr>
<td>Julia Cambronero</td>
<td>Marta Olazabal</td>
<td>University of Copenhagen</td>
<td>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)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT NAME</th>
<th>SUPERVISOR/S AT BC3</th>
<th>UNIVERSITY</th>
<th>THESIS TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mehmet Akif Ortak</td>
<td>Ferdinando and Stefano Balbi</td>
<td>Istanbul Technical University, Geomatic</td>
<td>Web process services for sustainability</td>
</tr>
<tr>
<td>Mikel Rueda</td>
<td>Iñaki Arto</td>
<td>University of the Basque Country</td>
<td>An estimation of Armington elasticities at the EU-28 level</td>
</tr>
<tr>
<td>Pablo Rhodes Pérez</td>
<td>David Moreno</td>
<td>Universidad de Alcalá de Henares</td>
<td>Estudio de las comunidades de hongos micorrícos en un hayedo (fagus sylvatica) afectado por minería metólica a cielo abierto</td>
</tr>
<tr>
<td>Victor Alfonso Rivera Meza</td>
<td>Ainhoa Magrach</td>
<td>Universidad Veracruzana</td>
<td>Influencia de la urbanización en interacciones mutualistas del bosque mesófilo de montaña Xalapa, Veracruz.</td>
</tr>
</tbody>
</table>
Among our training activity drivers, we may also find the classes offered by our researchers’ body in post-graduate and advanced courses in different universities during the year.

<table>
<thead>
<tr>
<th>TYPE OF COURSE</th>
<th>NAME OF THE COURSE</th>
<th>MAIN ORGANIZER</th>
<th>BC3 RESEARCHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD Course</td>
<td>Class on integrated modelling for PhD Programme on Climate Change</td>
<td>Ca Foscari</td>
<td>Stefano Balbi</td>
</tr>
<tr>
<td>PhD Course</td>
<td>Lecture on Climate Finance on Sustainable Development Finance Course</td>
<td>University of Bath</td>
<td>Anil Markandya</td>
</tr>
<tr>
<td>Master Course</td>
<td>Master in International Development (MID), Co-organized by UNSSC and IE University</td>
<td>IE University</td>
<td>Maria José Sanz</td>
</tr>
<tr>
<td>Master Course</td>
<td>Modélisation du fonctionnement des peuplements végétaux</td>
<td>Université de Bordeaux</td>
<td>Teresa Gimeno Chocarro</td>
</tr>
<tr>
<td>Master Course</td>
<td>Urban Water Management and Governance</td>
<td>University of Twente</td>
<td>Marcela Brugnach</td>
</tr>
<tr>
<td>Master Course</td>
<td>Master Class: “Cambio climático y su influencia en la salud de la población”</td>
<td>Universidad Internacional de Valencia (UIV)</td>
<td>María José Sanz Sánchez</td>
</tr>
<tr>
<td>Master course</td>
<td>“Socioeconomic Aspects of Climate Change” in Master MER+</td>
<td>University of the Basque Country, UPV-EHU</td>
<td>Iñaki Arto</td>
</tr>
<tr>
<td>Master Course</td>
<td>Environment and Fisheries/Aquaculture Interactions</td>
<td>University of the Basque Country, Plentziako Itsas Estazioa (PIE)</td>
<td>Iratxe Rubio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE OF COURSE</th>
<th>NAME OF THE COURSE</th>
<th>MAIN ORGANIZER</th>
<th>BC3 RESEARCHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Course</td>
<td>Microbiology</td>
<td>University of the Basque Country</td>
<td>Raquel Esteban</td>
</tr>
<tr>
<td>Advanced Course</td>
<td>ARIES training in Catania University</td>
<td>BC3</td>
<td>Stefano Balbi, Ferdinando Villa</td>
</tr>
<tr>
<td>Advanced course</td>
<td>Summer school on migration in computational social science</td>
<td>BIGSSS, Jacobs University Bremen</td>
<td>Stefano Balbi</td>
</tr>
<tr>
<td>Advanced course</td>
<td>Trade-SCAN: a Trade Supply Chain Analysis tool for computer dummies</td>
<td>International School of Input-Output Analysis (ISIOA), International Input-Output Association (IIOA)</td>
<td>Iñaki Arto</td>
</tr>
<tr>
<td>Advanced course</td>
<td>Livestock and climate change: assessment of emissions, mitigation options and adaptation strategies</td>
<td>CIHEAM</td>
<td>Agustín del Prado</td>
</tr>
</tbody>
</table>
TRAINING ACTIVITIES CONDUCTED

Courses Organized by BC3

SPRING UNIVERSITY ON ECOSYSTEM SERVICES MODELING
20th - 24th of May, 2019 (Bilbao)

Director of the School:
Dr. Ferdinando Villa (BC3)
http://springuniversity.bc3research.org

This initiative was launched in 2013 and consists on an annual two-week intensive advanced course, which enables simple use of complex models through artificial intelligence. The course is meant to build a new generation of scientists and policy analysts, capable of using coupled human-environmental models in research, and policy, to address and solve complex sustainability problems. The training plan covers the theory and practice of collaborative, integrated modelling on networked repositories, applied to concrete ecological and social issues of interest of the participants and of the larger community built around the ARIES project. The 2019 Spring University’s was also intended as an update on the latest developments in the k.LAB modeling software, including key updates to make model coding and reuse more user friendly, targeted for both new participants and those from previous years. The 2019 edition was held in collaboration with the ALICE Project co-funded by the EU INTERREG Atlantic Area Programme.

10th EDITION OF THE BC3-UPV/EHU SUMMER SCHOOL:
Transformation, Adaptation and Mitigation for a 1.5 degree Global Warming
8th - 10th of July, 2019 (Bilbao)

Directors of the School:
Ibon Galarraga (BC3), and Dr. Alberto Ansuategi (UPV/EHU)
http://summerschool.bc3research.org/

The annual Summer School on Climate Change was launched in 2010 with the collaboration of the University of the Basque Country. The objective of this 3-day 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 and has closely followed the international negotiations on climate change. In the 10th edition, the debate was spurred by the landmark report by the UN Intergovernmental Panel on Climate Change (IPCC), released on October 2018, stating that urgent action has to be taken in the next twelve years for global warming to be kept to a maximum of 1.5°C, in order to avoid catastrophic environmental and economic consequences.
TRAINING ACTIVITIES CONDUCTED

Courses Co-organized by BC3

TRAINING SCHOOL ON MEASURING GREENHOUSE GASES
28TH-29TH OF MARCH 2019 (LUGO)

BC3 is part of a new Spanish network for updating emission values in Spanish agriculture (REDNUEVA network https://www.rednueva.es/). In 2019, BC3 co-coordinated with the collaboration of COST-action LiveAge (http://cost-livage.eu/) a training school on measuring greenhouse gases in agricultural systems in Lugo (Spain) during 28-29 March 2019 (University of Santiago de Compostela). The aim of this training school was to offer comprehensive decision making criteria to identify the best measurement techniques in different research scenarios and practical demonstration of the use of a range of measurement techniques.

UPV/EHU SUMMER SCHOOL:
Resistencia a antibióticos en el medio ambiente: origen de un escenario apocalíptico.
Antibiotic resistance in the environment: origin of an apocalyptic scenario.
18TH-19TH OF JULY 2019 (PLENTZIA)

Directors of the School:
Dr. Itziar Alkorta (UPV-EHU)

Maria José Sanz contributed to the organization of the course that was jointly organized by the UPV-EHU in the framework of the collaboration set up in 2019 around the Joint Research Lab on Environmental Antibiotic Resistance (JRL) initiative, where BC3 participates jointly with UPV-EHU and Neiker.
DISSEMINATION AND CAPACITY BUILDING

- 139 Contributions in National and International Scientific Meetings
- 25 Seminars Organized
- 31 Climate Change Events Organized
- 40 Guest Researchers Hosted
Dissemination in Scientific Meetings

Participation in national and international congresses, conferences or summits. BC3 research body disseminated in 2019 the main research findings, methodologies and best practices in key international and national climate change scientific meetings and forums.

Highlights

<table>
<thead>
<tr>
<th>EVENT NAME</th>
<th>HOSTING INSTITUTION</th>
<th>TOWN</th>
<th>DATE</th>
<th>CONTRIBUTION TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Expert Meeting on the Revision of the SEEA EEA</td>
<td>World Bank</td>
<td>New York</td>
<td>2019/01/01</td>
<td>Progress on Valuation Concepts and Accounting Treatments</td>
</tr>
<tr>
<td>Experiences and perspectives from activities related to forestry and other land uses in the context of NDCs (Regional Workshop)</td>
<td>WB-PROFOR and FAO</td>
<td>Panama</td>
<td>2019/01/29</td>
<td>GHG inventories as a bases for NDC reporting under the Paris Agreement</td>
</tr>
<tr>
<td>SIBECEL, Meeting of the Iberian Ecological Society</td>
<td>Asociación Española de Ecología Terrestre</td>
<td>Barcelona</td>
<td>2019/02/04</td>
<td>Impact of interaction network structure on community-level plant reproductive success</td>
</tr>
<tr>
<td>Climate Change Week Euskadi: Change the Change Side Event - Climate change and Health</td>
<td>Change the Change (IHOBE)</td>
<td>Bilbao</td>
<td>2019/03/01</td>
<td>Climate Change and Antibiotic Resistance</td>
</tr>
<tr>
<td>European Geosciences Union (EGU) General Assembly</td>
<td>European Geosciences Union (EGU)</td>
<td>Vienna</td>
<td>2019/04/07</td>
<td>How does drought-related mortality affect conifer species? The role of historical management practices on the current response of trees to climate</td>
</tr>
<tr>
<td>General Assembly European Geosciences Union</td>
<td>European Geosciences Union</td>
<td>Vienna</td>
<td>2019/04/07</td>
<td>Whole-tree mesophyll conductance does not respond to elevated temperature</td>
</tr>
<tr>
<td>Global Forest Observation Initiative Plenary</td>
<td>Global Forest Observation Initiative (GFOI)</td>
<td>Maputo</td>
<td>2019/04/08</td>
<td>Plenary Keynote Speech</td>
</tr>
<tr>
<td>Seminar talks University of Oldenburg</td>
<td>University of Oldenburg</td>
<td>Oldenburg</td>
<td>2019/05/20</td>
<td>The economic impact of Spanish National Energy and Climate Plan 2020 - 2030</td>
</tr>
<tr>
<td>Building a climate-resilient Europe task force. From gaps identification to action. How to improve the EU climate resilience framework?</td>
<td>European Policy Centre EPC</td>
<td>Brussels</td>
<td>2019/05/28</td>
<td>How to improve cost-benefit analysis of climate adaptation policies?</td>
</tr>
</tbody>
</table>
## Dissemination in Scientific Meetings

<table>
<thead>
<tr>
<th>EVENT NAME</th>
<th>HOSTING INSTITUTION</th>
<th>TOWN</th>
<th>DATE</th>
<th>CONTRIBUTION TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Meeting of the European Association of Environmental and Resource Economics</td>
<td>European Environmental Agency</td>
<td>Manchester, England</td>
<td>2019/06/26</td>
<td>Natural Capital and the SDGs</td>
</tr>
<tr>
<td>27th International Input-Output Association Conference</td>
<td>University of Strathclyde</td>
<td>Glasgow</td>
<td>2019/06/30</td>
<td>Bridge matrices for feeding macroeconomic models with consumption survey profiles for the EU-28 countries</td>
</tr>
<tr>
<td>Invited plenary talk at the 2019 Lake resilience symposium, Hamilton, New Zealand</td>
<td>University of Waikato</td>
<td>Hamilton</td>
<td>2019/08/29</td>
<td>Multi-criteria decisions to manage lakes and freshwater</td>
</tr>
<tr>
<td>Microstructures and Ice Dynamics Workshop 2019</td>
<td>Nagaoka University of Technology (NUT)</td>
<td>Myoko</td>
<td>2019/09/18</td>
<td>Sustainable Development Goals (SDGs) and Their Relevance for Ice Core Research</td>
</tr>
<tr>
<td>Delivering the Blueprint for a Green Economy, 30 Years On</td>
<td>OECD &amp; Cambridge Conservation Initiative</td>
<td>Cambridge</td>
<td>2019/09/19</td>
<td>The role of relational values in agri-environmental programs</td>
</tr>
<tr>
<td>The ESP 10th world conference</td>
<td>University of Hannover</td>
<td>Hannover</td>
<td>2019/10/21</td>
<td>Philosophy of globally customizable ARIES models</td>
</tr>
<tr>
<td>Global Landscape Forum New York 2018: Restore the Earth</td>
<td>UN General Assembly</td>
<td>New York</td>
<td>2019/12/28</td>
<td>No contribution</td>
</tr>
</tbody>
</table>
BC3 Seminar Programme

BC3 aims to contribute to climate change knowledge and dissemination through a series of lectures led by recognized academics in the field and by the contribution of its own researchers in third party seminars programmes. In 2019 we organized 25 interdisciplinary lectures, focused on key theoretical and methodological issues related to climate change. Some of these seminars were jointly organized with the University of the Basque Country.

<table>
<thead>
<tr>
<th>SEMINAR TITLE</th>
<th>DATE</th>
<th>LECTURER</th>
<th>INSTITUTION OF THE LECTURER</th>
<th>POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenting Marcela Brugnach’s research</td>
<td>2019/01/21</td>
<td>Marcela Brugnach</td>
<td>Leuphana University Lüneburg</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>FCM follow-up Seminar</td>
<td>2019/01/22</td>
<td>Marta Olazabal</td>
<td>BC3</td>
<td>Researcher Fellow</td>
</tr>
<tr>
<td>Heat waves and impacts in the urban systems</td>
<td>2019/02/20</td>
<td>Marek Smid</td>
<td>BC3</td>
<td>Postdoctoral Researcher</td>
</tr>
<tr>
<td>How do trees “handwrite” and manage to communicate with us?</td>
<td>2019/03/06</td>
<td>Ana M. Heres</td>
<td>BC3</td>
<td></td>
</tr>
<tr>
<td>1 Synergies and trade-offs of climate change mitigation pathways: an integrative assessment approach. 2 Risks, costs and co-benefits associated to different low carbon transition pathways</td>
<td>2019/03/27</td>
<td>Dirk Van der Ven Jon Sampedro</td>
<td>BC3 - UPV/EHU</td>
<td>Junior researcher</td>
</tr>
<tr>
<td>Integrated Assessment Modeling of climate mitigation co-benefits and adverse side effects</td>
<td>2019/03/27</td>
<td>Dirk Van der Ven Jon Sampedro</td>
<td>BC3</td>
<td>Junior Researcher - PhD Student</td>
</tr>
<tr>
<td>Changing cities in a changing climate</td>
<td>2019/04/11</td>
<td>Vanessa Castañn Broto</td>
<td>Urban Institute, University of Sheffield</td>
<td>Professor</td>
</tr>
<tr>
<td>Evolución del paisaje en nuestros bosques</td>
<td>2019/05/22</td>
<td>Jakoba Errekondo</td>
<td>Bizibaratzea</td>
<td>Agrónomo y paisajista</td>
</tr>
<tr>
<td>Essential Resources, Social Dilemmas and the Evolution of Cooperation: Paths Towards a Just and Sustainable Future</td>
<td>2019/05/29</td>
<td>Joshua Farley</td>
<td>University of Vermont</td>
<td>Research Professor</td>
</tr>
<tr>
<td>Leverage Points for the sustainable management of nature’s contributions to people</td>
<td>2019/06/30</td>
<td>Barta Martin-Lopez</td>
<td>Leuphana University Lüneburg</td>
<td>Junior Professor</td>
</tr>
<tr>
<td>Ecosystem Services, Climate Change, and the Environmentalists’ Paradox</td>
<td>2019/05/31</td>
<td>Sharachchandra Lele</td>
<td>Ashoka Trust for Research in Ecology and the Environment</td>
<td>Doctor</td>
</tr>
<tr>
<td>Designing Equitable Payments for Ecosystem Services (PES) for Indigenous Communities: a Deliberative Choice Experiment</td>
<td>2019/06/19</td>
<td>Bosco Lliso</td>
<td>BC3</td>
<td>Junior Researcher - PhD Student</td>
</tr>
<tr>
<td>An Integrated approach for the estimation of agricultural drought costs</td>
<td>2019/08/04</td>
<td>David Garcia León</td>
<td>Ca’ Foscari University of Venice</td>
<td>Postdoctoral Researcher</td>
</tr>
<tr>
<td>The power of impact framing and experience for determining acceptable levels of climate change risk: A lab experiment</td>
<td>2019/08/11</td>
<td>Ambika Markanday</td>
<td>BC3</td>
<td>Junior Researcher - PhD Student</td>
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</table>
### DISSEMINATION AND CAPACITY BUILDING Conducted

#### Seminars

<table>
<thead>
<tr>
<th>Seminar</th>
<th>Date</th>
<th>Lecturer</th>
<th>Institution of the Lecturer</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenges of EU Agriculture facing Climate Change: Economic Impacts, Adaptation and Mitigation Strategies</td>
<td>2019/09/13</td>
<td>Ignacio Pérez</td>
<td>Joint Research Centre, European Commission</td>
<td>Team Leader</td>
</tr>
<tr>
<td>Sustainable urban futures in Africa: Ensuring an effective institutional governance of urban climate change responses (Adaptation and Mitigation)</td>
<td>2019/09/25</td>
<td>Ama Kissiwah Boateng</td>
<td>National University of Public Service in Budapest</td>
<td>PhD Student</td>
</tr>
<tr>
<td>Fitting the heterogeneous needs of resource users: The Case Study of Hybrid Institution of Spiny Lobster Fisheries Co-management in Wagu, Mie Japan</td>
<td>2019/10/10</td>
<td>Hiroe Ishihara</td>
<td>Graduate School of Agriculture and Life Sciences</td>
<td>Assistant professor</td>
</tr>
<tr>
<td>Which fossil fuel prices promote innovation in electricity generation? Evidence before and after the shale gas revolution</td>
<td>2019/10/16</td>
<td>Itziar Lazkano</td>
<td>University of Wisconsin-Milwaukee</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>RUMANTES Y CAMBIO CLIMÁTICO ¿Ángeles o demonios?</td>
<td>2019/10/28</td>
<td>Pablo Manzano</td>
<td>BC3 researchers</td>
<td></td>
</tr>
<tr>
<td>BC3 Seminar: Can co-creation of (students of) the arts and sciences enhance public climate-consciousness?</td>
<td>2019/11/12</td>
<td>Jacqueline Heerema</td>
<td>Satellietgroep Foundation</td>
<td>Founding director, artist-curator</td>
</tr>
<tr>
<td>Introducing the H2020 PARIS REINFORCE Project</td>
<td>2019/11/13</td>
<td>Jorge Moreno, Esther Galinde, Dirk-Jan Van de Ven, Álregui Sorman and Mikel González-Eguino</td>
<td>BC3 researchers</td>
<td></td>
</tr>
<tr>
<td>European forest ecosystem dynamics mapped from space</td>
<td>2019/11/19</td>
<td>Cornelius Senf</td>
<td>University of Natural Resources and Life Sciences (BOKU)</td>
<td>Senior Post-doctoral Researcher</td>
</tr>
<tr>
<td>The impact of empirical data analysis on public health intervention: dengue fever, a case study</td>
<td>2019/11/25</td>
<td>Maíra Aguiar</td>
<td>UniTN - University of Trento and BCAM - Basque Center for Applied Mathematics</td>
<td></td>
</tr>
<tr>
<td>“Pueblos y Nacionalidades Indígenas” of the Ecuadorian Amazon, Shuar, Achuar, Zápara and Quichuas</td>
<td>2019/12/12</td>
<td>Freddy Eliseo, Michel Portugal</td>
<td>Universidad Central del Ecuador</td>
<td>Researcher</td>
</tr>
<tr>
<td>BC3 Seminar of Craig Bishop</td>
<td>2019/12/16</td>
<td>Craig R Bishop</td>
<td>University of Melbourne</td>
<td>Professor</td>
</tr>
</tbody>
</table>
During 2019 we organized with this objective a series of different dissemination activities, such as workshops, directed to nurture ongoing research, support decision-making processes and enhance the engagement of key players (stakeholders) by establishing a dialogue with them.

**SOME HIGHLIGHTS**

**WORKSHOP GREEN GROWTH IN BISCAY**

24th OF FEBRUARY 2019, (BIZKAIA ARETOA) BILBAO

Organized jointly with BC3, Fundación BBk and the University of the Basque Country, the report “Green Growth in Biscay” was presented. The event counted among others with the participation of the Director of the Grantham Research Institute on Climate and the Environment (London School of Economics), Sam Fankhauser, who gave the keynote speech “Green growth and the new industrial revolution”.

**IPBES VALUES ASSESSMENT: SECOND AUTHOR MEETING (SAM)**

21-25 OCTOBER 2019, VITORIA-GASTEIZ

BC3 hosted the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services’s (IPBES) panel of experts, which held its second meeting of authors in Vitoria-Gasteiz between October 21 and 27, 2019. Basque Centre for Climate Change (BC3) and the Department of the Environment, Territorial Planning and Housing of the Basque Government made possible to bring this meeting to the Álava capital, which was supported by the Vitoria-Gasteiz City Council and the Provincial Council Foral of Álava.

The best international specialists in biodiversity and ecosystems met in Vitoria-Gasteiz to address the multiple values and benefits offered by nature, its ecosystems and its biological diversity. This is the panel of experts from IPBES, the Intergovernmental Scientific-Regulatory Platform on Biological Diversity and Ecosystem Services, an independent intergovernmental body sponsored by the United Nations that seeks to establish bridges between science and the formulation of public policies.

The main objective of the meeting was to continue advancing in the Evaluation on Values of IPBES, that is, to synthesize the knowledge on the diversity of values related to nature according to the different visions, approaches and knowledge systems, as well as to recognize the benefits that provide for human well-being. The Values Assessment is aligned with the ultimate goal of IPBES: to provide essential information for environmental policy and action throughout the planet.

BC3 researcher, Unai Pascual, promoted the event as one of the main authors of the report on the global assessment of biological diversity, the most complete and rigorous scientific research on ecosystems carried out to date, which came to light in May 2019. This report caused a stir in the international community, as it warned that a million animal and plant species were at risk of extinction at an unprecedented rate as a result of human activity.
BC3 Visiting and Guest Programme

Visitors: Some Highlights

<table>
<thead>
<tr>
<th>NAME</th>
<th>VISIT MONTH</th>
<th>INSTITUTION</th>
<th>POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanesa Castán Broto</td>
<td>April</td>
<td>Urban Institute, University of Sheffield, United Kingdom</td>
<td>Research Professor</td>
</tr>
<tr>
<td>Berta Martin-Lopez</td>
<td>May</td>
<td>Leuphana University Lüneburg, Germany</td>
<td>Junior Professor</td>
</tr>
<tr>
<td>Joshua Farley</td>
<td>May</td>
<td>University of Vermont, United States</td>
<td>Research Professor</td>
</tr>
<tr>
<td>Sharachchandra Lele</td>
<td>May</td>
<td>Ashoka Trust for Research in Ecology and the Environment, India</td>
<td>Doctor</td>
</tr>
<tr>
<td>Morimasa Takata</td>
<td>November</td>
<td>Nagasaki University of Technology, Japan</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Cornelius Senf</td>
<td>November</td>
<td>Institute for Silviculture, University of Natural Resources and Life Sciences (BOKU) Vienna, Austria</td>
<td>Senior postdoctoral researcher</td>
</tr>
</tbody>
</table>

The dissemination of BC3 main results and findings, were done also through the exchange of knowledge with relevant researchers that participated in the 2019 BC3 Visiting and Guest Programme.

Through these programmes international experts are attracted each year to BC3. During their stay, the experts collaborate with BC3 researchers adding to the abilities, experience and knowledge of the centre’s specific areas of research. The main outcome of these visits is the establishment of cooperation with the researchers at BC3, in terms of preparation of joint publications and project proposals. Dissemination activities are also carried out with these visitors. Our Visiting Programme may be considered therefore an additional source for talent attraction, as well as a chance to join international research initiatives.

**40** Guest Researchers Hosted

**60%** International Visitors

**15** Countries Connected through the Programme
In 2019 BC3 continued conducting, through the collaboration agreement with the ADDI platform (public repository of publications of the University of the Basque Country) a delegated archive of the BC3 publications in a public repository that is interconnected with OPENAIRE in a way that optimizes the visibility of the BC3 production.
KNOWLEDGE CO-PRODUCTION AND TRANSFER
A key aspect of BC3 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.
Climate change is nowadays at the top of political agendas and it is a fundamental part of BC3’s work to contribute to the design of related policies, as well as to facilitate, through science, their application in a regulatory framework, consistent with the SDG.

During 2019, 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.

Because 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.

BC3 during 2019 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.
Contributions to key actors in 2019: Highlights

UNFCCC
United Nations Framework Convention on Climate Change

Recognized by the United Nations Framework Convention on Climate Change (UNFCCC) as a Non-Governmental Organization, during 2019, BC3 has reinforced its collaboration with UNFCCC (United Nations Framework Convention on Climate Change). The conducted actions in 2019 were:

2. BC3 Side Event in (COP 25/CMP 15/CMA 2) "Climate Change Adaptation in a Multi-Level Governance Context" organized jointly with Regions4 and Munich Climate Insurance Initiative (MCII), Blue Zone.
3. BC3 Side Event in (COP 25/CMP 15/CMA 2) "The role of ruminants on climate change mitigation: the good and the bad; held in the Blue Zone, Spanish Pavilion.
4. BC3 keynotes at (COP 25/CMP 15/CMA 2) "Financing climate action. The responsibility of the regions and the private sector" and "The macro case for climate-related investment: some figures for Spain".

BC3 had an active role in COP25. Organized 2 official Side Events and participated in over 10 events.

UNFCCC (COP25), BC3 Side Event
THE ROLE OF RUMINANTS ON CLIMATE CHANGE MITIGATION: THE GOOD AND THE BAD
5th of December 2019, Blue Zone, Spanish Pavilion

The objective of the event panel was to discuss about the role of ruminant's livestock systems on delivering low-carbon pathways, taking into account the different world contexts. This panel brought together and discussed different new scientific/technical information to enhance the societal understanding of the real challenges and opportunities that grass-fed livestock systems (ruminants) have in the face of climate change mitigation. Participants had the opportunity to also gather new evidence that updates current GHG estimates for ruminants (based on IPCC methodologies), explored new GHG reference baselines and the link of different emissions pathways with future global warming, while discussed on how society perceives the issue of livestock contribution to climate change through the eyes of an environmental journalist. One of the aims was to clarify the technical and general public misconceptions on the contribution of the livestock systems to climate change, that often are seen in absolute terms, rather than relative simplying scientific messages to the society.
Contributions to key actors in 2019: Highlights

**SUPRA-NATIONAL INSTITUTIONS**

**European Commission**

The 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 was 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. As a result of this collaboration, the BC3 and the JRC-EC have co-produced a number of key outputs including new databases methodologies, software toolkits, and policy reports.


As a proxy of the relevance of the science produced in BC3 and in regard to the Policy oriented results and the impact obtained at European scale, highlight that EASAC (European Academic Science Advisory Council) cited in 2019 the BC3 work in the EASAC policy report 38 June 2019, a report that was mentioned in the in an issue of *Nature*:

“This is beginning to happen. For example, a recent modelling study (Markandya et al, 2018) demonstrated that health co-benefits from mitigating air pollution (as assessed by the value of a statistical life) substantially outweigh the policy cost of achieving the target in all scenarios examined. That is, the mitigation efforts can be justified economically by considering the value of multiple benefits including health co-benefits; although this was a global study, the findings were expected to be substantial for the EU.”

In the same vein, President Ursula von der Leyen, included in her Work Programme (2019) presented for the European Commission, a mention to the pocketbook produced by BC3 in 2018.

“We believe in trade because it works - it accounts for over a third of the EU’s GDP and supports over 36 million jobs.”
Contributions to key actors in 2019: 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) Experimental Ecosystem Accounting in few strategic partner countries to the European Union (EU), developing a toolbox that is aligned with SEEA classifications and concepts to be applied for modeling ES and automatized the production of accounting tables from model outputs.

World Bank

BC3 has also collaborated with the World Bank in a number of research activities. One example of this collaboration is the assessment of the potential impact of an increase in the excise duty on diesel for vehicles on the price levels in Slovakia. The aim is to estimate the policy implications and impacts of an increase in the price of diesel for vehicles on the price levels of other goods in Slovakia. Also BC3 provide support to the World Bank and contributing to the ISLFL Evaluation Oversight Committee, on the inception Report.
Contributions to key actors in 2019: Highlights

**NATIONAL, REGIONAL AND LOCAL GOVERNMENTS**

During 2019, BC3 has 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 have 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**

During the years 2018 and 2019, the 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. The BC3 used the in-house developed DENIO model and the FASST model to elaborate the economic impact assessment of the Spanish 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.

The results of the macroeconomic impact assessment elaborated by BC3 have been quoted by key policymakers, including the President of Spain, Pedro Sánchez. Furthermore, the Directorate General of Energy of the European Commission has also highlighted that:

> “the Spanish [...] macroeconomic impact assessment represents a good practice other Member States could get inspiration from.”

The BC3 is also collaborating with the Directorate General of Architecture, Housing and Land of the Ministry of Development on the on the assessment of the economic impact of the long-term strategy for energy efficient refurbishment in dwellings in Spain.
Contributions to key actors in 2019: Highlights

**Regional Governments: Highlights**

**BASQUE GOVERNMENT**
In June 2019, the Basque Government introduced the draft Law on Climate Change of the Basque Country. This Law constitutes one of the cornerstones of the long-term Climate Strategy Change of the Basque Country (KLIMA 2050). It establishes, among others, the objectives for climate change adaptation and mitigation, including targets for greenhouse gas emissions reduction, deployment of renewables and improvement of energy efficiency. BC3 has offered scientific advice to the Basque Government for the development of the financial report accompanying the Law.

BC3 is one of the partners in URBAN KLIMA 2050, the largest climate action project in the Basque Country for the coming years.

BC3 contributed on the process of formulating the Urban Agenda of Euskadi with Consejo Asesor de la Agenda Urbana de Euskadi – Bultzatu 2050 (Basque Government, Department of Environment, Territorial Planning and Housing (Territorial Planning, Urbanism and Urban Regeneration). Participated in the creation of a Research Laboratory in Environmental Antibiotic Resistance that will allow monitoring and controlling the incidence of bacteria on human and animal health. Participated in a Hearing at the Basque Parliament to evaluate the findings of the IPBES Global Assessment, where BC3 had an active contribution and transfer the knowledge produced to the Basque Decision Makers. Lectured on Climate Change (opening lecture) at the IVAP-IHOBE (Basque institute of public administrations) in a course targeted at public servants of the Basque Government. Participated in the group of experts of a new social climate change platform led by KIC in Mondragon University.
Contributions to key actors in 2019: Highlights

Other Regional Governments: Highlights

BC3 has supported the regional governments providing decision making support BC3 tools (Regions Adapt). Provided recommendations for policymakers that could guide the development and implementation on climate change adaptation and disaster risk financing as a multi-level governance challenge, highlighting good practices and experiences from different levels of government. BC3 has contributed to produce the report “Climate Change Adaptation in a Multi-Level Governance Context: A Perspective from Subnational Governments”.

ARIES was used for Natural Capital Accounting national report and its discussion in Parliament during 2019 (Based on the Italian Report on Natural Capital 2018).

BC3 shared its k.LAB technology for Marine Ecosystem Service-based Mapping and Decision-making Support System in South Korea (Seoul).

BC3 met with representatives of the Otago Regional Council (ORC) to present the MCDA-approach to freshwater management and discuss future application of the method to Otago and the collaboration with the ORC during the development phase.

LOCAL GOVERNMENTS: HIGHLIGHTS

BC3 participated in the Klima DSS 2050: Climate change Plan, led by the City Hall of San Sebastian, where María José Sanz acted as Member of the Advisory board. The aim was to develop a local climate change strategy that allows citizens to connect with this great challenge and face it collectively, taking advantage of the opportunity to also solve other urban, environmental and social conflicts.

BC3 team has developed a participatory CBA (with local administration in Fadura - Getxo) to analyse the social desirability of the intervention of Thinking Fadura in Getxo, including the consideration of intangible social benefits.
Contributions to other Socio-Economic actors in 2019: Highlights

OTHER SOCIO-ECONOMIC ACTORS

Other line of collaboration has been developed through engagement with socio-economic agents such as sector companies and institutions.

IBERDROLA
Collaboration with Iberdrola: During 2019 we finished a technical report for Iberdrola, a multinational electric utility company based in Bilbao, to assess the economic and social implications of alternative schemes to finance the renewables in Spain. The report will be presented in January 2020 in Bilbao.

BBK Foundation
Collaboration with BBK Foundation: Collaboration Agreement between UPV/EHU, BBK Foundation and BC3 within the framework of the Low Carbon Program. On the 24th of February 2019, BC3 presented the report “Green Growth in Biscay”.

Foundations
Other relevant contributions were conducted with Axa Foundation grant, Leonardo grant from BBVA Foundation, among others.
Activities, Supporting Information and Tools Produced

Science-Policy Interface

<table>
<thead>
<tr>
<th>Activity</th>
<th>Count</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-level policy oriented meetings held</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>BC3 policy briefings relevant science-based solution-oriented own document series produced</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Training and capacity building courses targeted at policy making</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Capacity building events organized</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>BC3 promoted networks to support policy making process</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
In BC3, we contribute to activate society to face climate change and sustainable development challenges. We offer greater and better knowledge regarding climate change’s causes and consequences, and we connect 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

FOR SOCIETY
BC3 enhanced its communication with citizens through the implementation of different science-communication and outreach activities, contributing to the awareness of society to address what has been considered by the European Commission as one of the of the greatest European social challenges.

The activities carried out in 2019 were:

**Training Caravan Programme**

With the aim of optimizing the alignment between the BC3 research process and its results with the values, needs and expectations of society, and in particular that of the high school students, BC3 launched the Training Caravan initiative (researchers in classrooms) in 2010, aimed at students (aged between 17-18 years) of the Basque Country. A selection of BC3 researchers present yearly the science of climate change in classrooms and explain the path of the research career. As part of the Corporate Responsibility of BC3 during 2019 we have continued working in the Training Caravan program jointly with the Basque Government. Through this initiative BC3 researchers provide scientific evidence (using to do so study cases and scientific results) that encourage reflection, to shed scientific rigor on some “misinterpretations” and “equivocal messages” that have been translated about this science.

Web: [https://trainingcaravan.bc3research.org](https://trainingcaravan.bc3research.org)  
Twitter: #trainingcaravan

**Ingurugela programme**

Knowledge Transfer and Science Education to Basque Country High School faculty: Through a close collaboration with Ingurugela in the framework of Agenda21, a selection of BC3 senior researchers have developed training activities for faculty and technical staff from different CAV local governments on climate change for its subsequent implementation in the classrooms and municipal bodies. In 2019, BC3 developed climate change knowledge transfer activity to high school faculty and stakeholders connected through Agenda21 Crosscutting programme.

Other activities were targeted at senior audiences such as experience classrooms (seniors) or the Lego Activity, bringing together senior people and pupils “Building Our Future – Lego Serious Play” held on the 23rd of January at Bizkaia Aretoa (Bilbao).
Mass and Social Media

Providing information and developing innovative ways to connect climate change science with society will help make science more attractive to citizens and open up new research co-production.

This activity jointly with the dissemination activity conducted by the centre has enabled BC3 to increase climate change visibility within society. BC3 is regularly consulted by different media as an expert adviser on climate change. In this regard, BC3 had significant presence in national and international communication media. Its final objective is therefore to bridge science with policy-making and bring together other socio-economic actors and society as a whole, and it is aligned with our Strategic Goal of promoting the transition towards Trans-disciplinary Science.

As a result of active press and social media management, 392 interviews and media appearances were made during the year 2019. Permanent collaborations with certain media programmes: targeted at both experts and the general public, were conducted to raise awareness by highlighting the most relevant issues on climate change.
SET OF INDICATORS (BERC INDICATORS)
SET OF INDICATORS

BERC Indicators

**PUBLICATIONS (Production)**
- Total number of publications published in the given year: 132
- Number of articles published in the given year: 95
- Number of Books and Chapters published in the given year: 19
- Other publications published in the given year: 15
- BC3 Policy Briefings published in the given year: 2
- BC3 Working papers published in the given year: 1

**PUBLICATIONS (Impact Factor)**
- % of Indexed articles in Quartile 1: 85.06%
- % of Indexed articles in Decile 1: 66.67%
- H index: 44

**TRAINING**
- PhD - Supervised students: 32
- Master - Supervised students: 10
- BC3 courses organized: 4

**KNOWLEDGE TRANSFER**
- Dissemination in Scientific events: 139
- Number of BC3 seminars: 25
- Number of Dissemination events organized: 37

**OUTREACH AND SOCIAL MEDIA**
- Interviews in TV: 18
- Interviews in press/magazines: 227
- Interviews in radio: 58
- Interviews in digital media: 89
- Website traffic: 164,573 visits

**FUNDING**
- Total budget: 4,319,263€
- % of Funding (non BERC): 74%

**PEOPLE**
- Total BC3 Team: 66
- Number of researchers: 59
- Number of administration staff: 7
- Number of guest researchers: 40

INDEXED JOURNAL ARTICLES 2014-2019
BY QUARTILE DISTRIBUTION (%)
Sustainability, that’s it!