



ACTIVITY

REPORT

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bc³

BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

Sustainability, that's it!



bc³

bc³

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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02

DIRECTOR'S VIEW

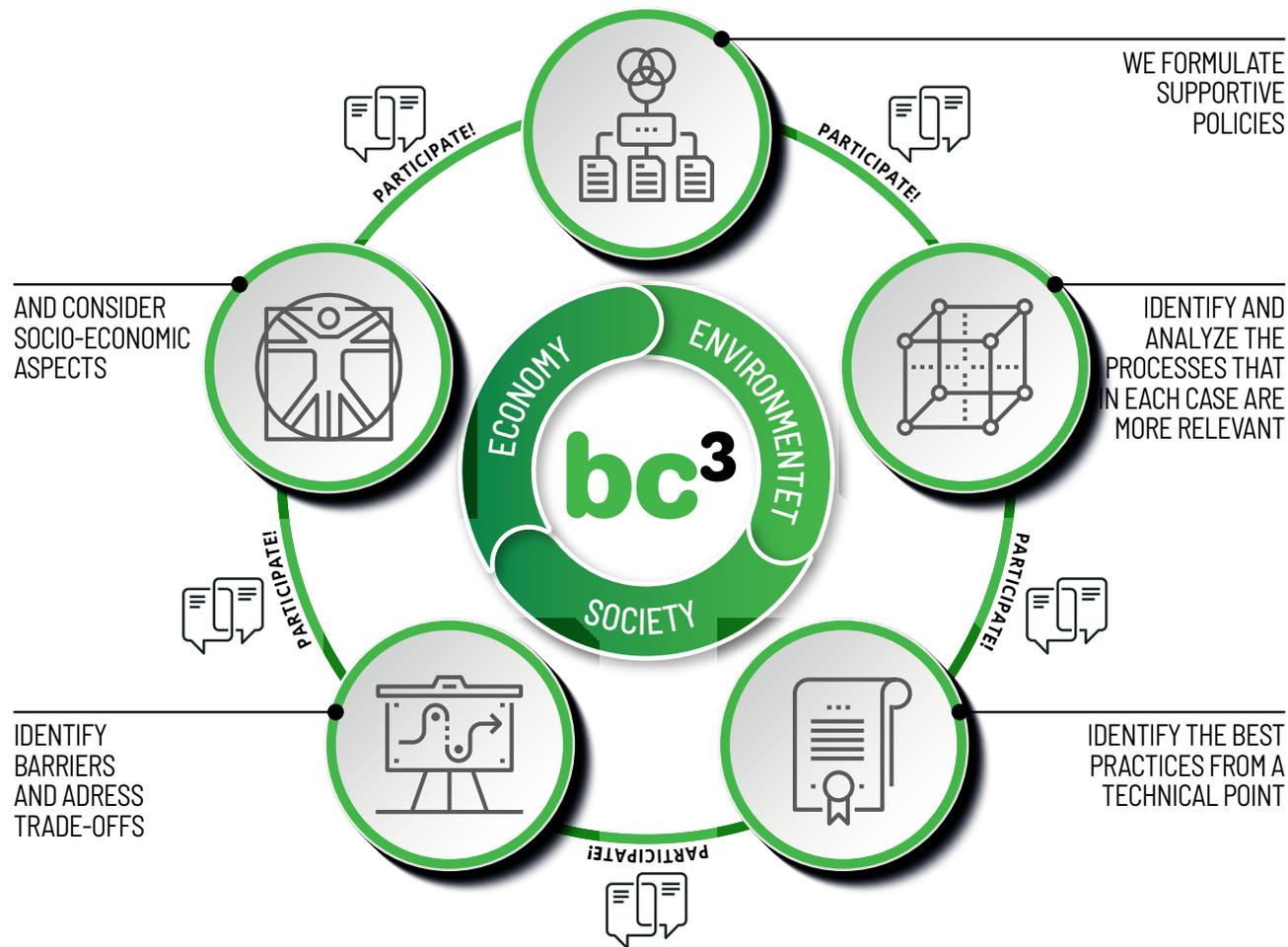


DIRECTOR'S VIEW

María José Sanz
SCIENTIFIC DIRECTOR

Since its inception in 2008, BC3 has achieved excellence in research on core aspects of climate change, from physical to ecological and socio-economic aspects.

Being our present vision: "Solid, visionary and transdisciplinary (i.e., interdisciplinary and participatory, known as "transdisciplinary") guidance to steer climate change science towards the co-production of new knowledge together with stakeholders to support policy development" on the Paris Agreement post era. BC3 aims to contribute to the creation of innovative approaches by integrating environmental, socioeconomic, and ethical dimensions of climate change to help decision makers. Including generating basic knowledge and proposing and supporting the testing and demonstration of scalable solutions, and providing the basis for evaluating the impact and effectiveness of different policy measures.



2018 has been a decisive year for BC3. In 2018 we have started a new strategic cycle (2018-2021), in the context of the celebration of our tenth anniversary (BC3 ten years) and we received the María de Maeztu Unit of Excellence accreditation.

For BC3 new strategy cycle 2018-2021 we seek to:

- 1) Integrate the environmental, (physical, ecological), socioeconomic and ethical dimensions of climate change.
- 2) Provide knowledge, tools, new methodologies to lead towards action in a collaborative manner
- 3) Produce multi and trans-disciplinary knowledge relevant to decisions on Climate Change issues and towards sustainable development at different levels.

To this end, we have aligned the center's activity with the new six overall objectives, including: several contributions to leading scientific interdisciplinary bodies such as IPCC and IPBES; co-production of knowledge together with the European Commission, National, Regional and Local Governments and UN Agencies and bodies.

We have also expanded the scientific infrastructure of the centre, a new IzotzaLab low-temperature laboratory is being built for testing and analyzing the physics and chemistry of Ice cores and instrument prototypes.

And last but not least our scientific production generated **130** publications during 2018: **88** peer-reviewed journal articles, **23** books and chapters, **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 **2** BC3 Working Papers.

BC3 aims to contribute to the creation of innovative approaches by integrating environmental, socioeconomic, and ethical dimensions of climate change to help decision makers

03

2018 AT A GLANCE

**130**

PUBLICATIONS

>60%OF INDEXED
PUBLICATIONS IN D1**>85%**OF INDEXED
PUBLICATIONS IN Q1**>2500**CITATIONS
RECEIVED IN 2018

2018 AT A GLANCE

Ten 2018 Milestones

1. Ten years of Excellence in Research. BC3 received the María de Maeztu Unit of Excellence (July 2018 – June 2022) accreditation in 2018.
2. BC3 set up a new four-year Strategic plan that provides a framework for the co-production of multidisciplinary science articulated in 6 objectives aligned with SDG.
3. Contributed to inter-disciplinary science at the highest level. Center with the highest representation in IPCC and IPBES in 2018 at the state level.
4. Leadership in attracting international projects as a sign of excellence in Research. 17 international active projects (13 H2020 projects). 70% Non BERC Funds.
5. More than 50 models and tools developed to provide solutions to complex problems. On the path of trans-disciplinarity.
6. Supporting climate policy from science: Key contributions to UNFCCC, the European Commission, Ministry of Ecological Transition and Basque Ombudsman.
7. New BC3 scientific infrastructures: IzotzaLab.
8. Training conducted: 48 post-graduate students being supervised during 2018.
9. Consolidation of BC3 Science Education programme: Strengthening our contribution to a societal change.
10. Science with Impact: Jean Claude Juncker referred to BC3 Research.

04

TEN

YEARS



TEN YEARS

During 2018 we celebrated our 10th anniversary. An opportunity to recognize the work done by all the people who have been part of the center, as well of its extensive community: academic institutions, partners and different stakeholders with whom we have had the opportunity to work.

Among other initiatives, we launched a website about the **history of the centre** and the **10th anniversary yearbook**, which include an overview of all the activities we have carried out in the past.

This anniversary website consists of a series of interviews with current and previous members, academic highlights and outreach activities. It sheds a light on our achievements, eventful years, successful projects and the people who have made, and who continue to make, BC3 what it is today.

As a final activity to the Anniversary celebrations, we held a meeting in Bilbao with young and old people, in order to facilitate conversation and common views over the main challenges and opportunities that Climate Change brings to us. "Building Our Future - Lego Serious Play" offered play and a participative methodology to put a spotlight on society's understanding of Climate Change, in the constant effort to generate spaces for shared work.



05

THE CENTRE



BC3-BASQUE CENTRE
FOR CLIMATE CHANGE

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



PRESENTATION OF THE CENTRE

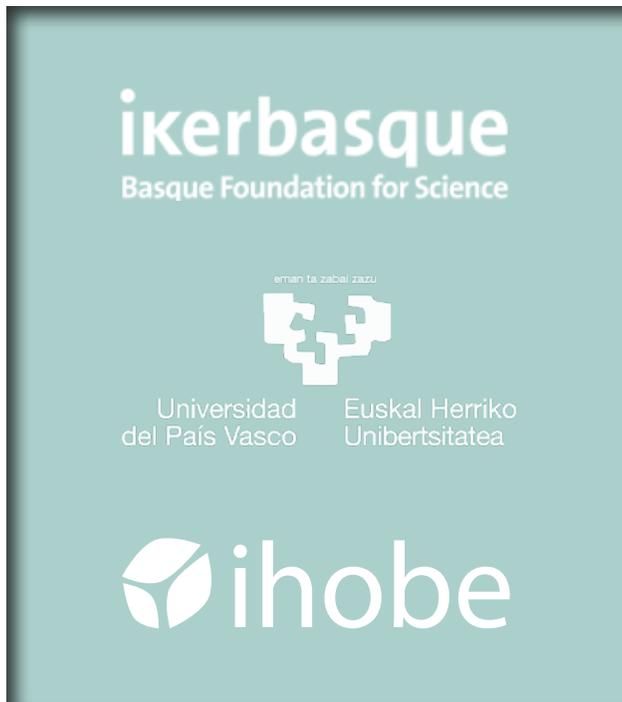
We are an excellence based research centre that contributes to the scientific knowledge of the causes and consequences of climate change. We produce multi-disciplinary knowledge to facilitate and drive decision-making toward sustainable international development. We are an interdisciplinary team led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

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

PARTNERS, MISSION AND VISION

Our partners

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



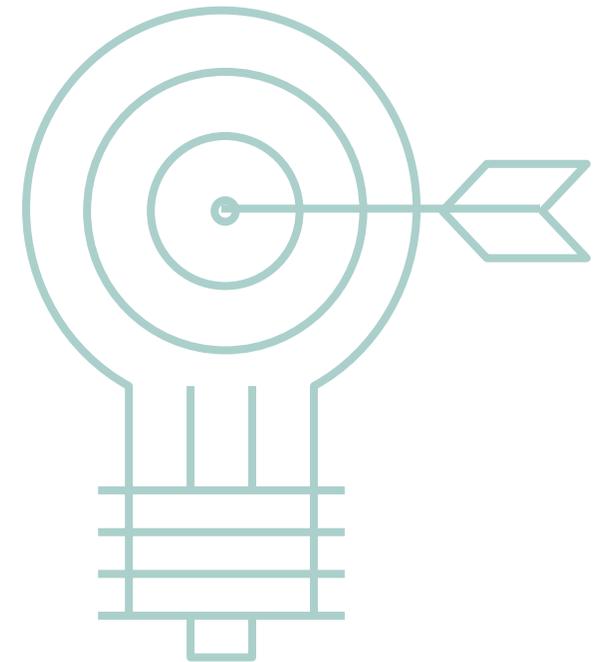
Mission

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.



Promoted by:



INTERNATIONAL SCIENTIFIC ADVISORY COMMITTEE

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

The regular annual meeting was held on the 1st of June 2018, where BC3 presented its scientific achievements during 2017 and its scientific objectives for 2018.

ISAC is composed of the following members:

IÑIGO LOSADA

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

NEIL ADGER

Professor of Human Geography at the University of Exeter (UK)

PETE SMITH

Professor of Soils & Global Change at the University of Aberdeen (UK)

VALENTINA BOSETTI

Professor of Economics at Bocconi University (Italy)

REINHARD MECHLER

Deputy Program Director of "Risk, Policy, Vulnerability" at IIASA - International Institute for Applied Systems Analysis (Austria)

TERESA RIBERA

Director of IDDRI-Institute for Sustainable Development and Internat. Relations (France).



IÑIGO LOSADA



NEIL ADGER



PETE SMITH



VALENTINA BOSETTI



REINHARD MECHLER



TERESA RIBERA

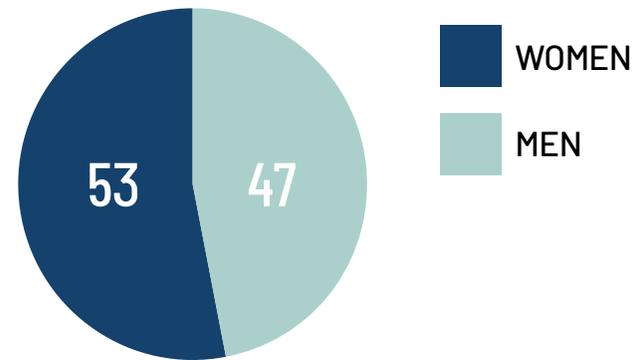
BC3 TEAM: Statistics

BC3 Team

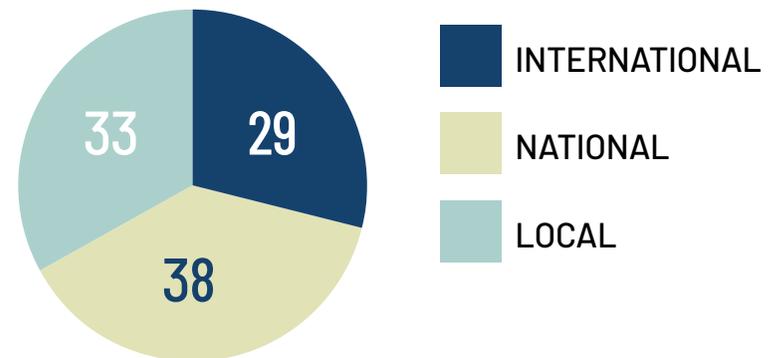
TOTAL BC3 TEAM		58
SCIENTIFIC DIRECTOR		1
RESEARCHERS		51
Research Professors		11
Research Fellows		5
Post Doc Researchers		17
PhD Students		18
ADMINISTRATION TEAM		6
Operation Manager		1
Project Manager Outreach		1
Project Officer		3
Management Assistant		1

The BC3 staff (dated December 31, 2018)

Gender distribution



Nationality distribution



BC3 TEAM: HR Excellence in Research

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.



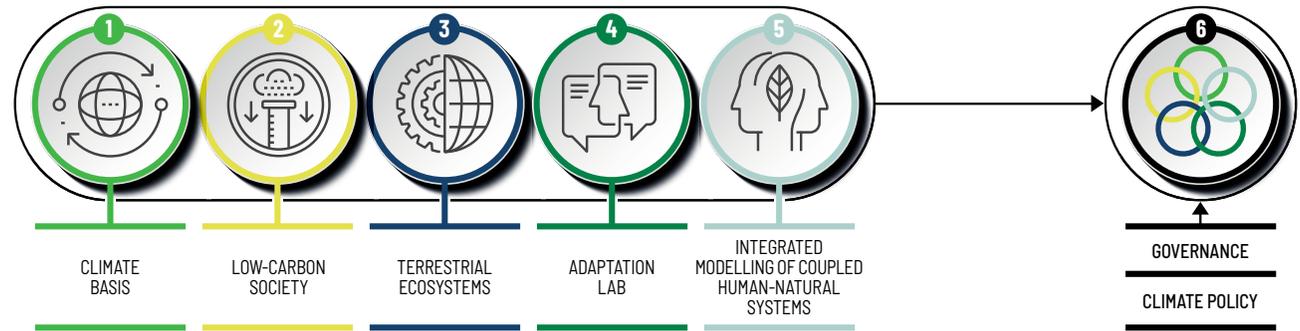
HR EXCELLENCE IN RESEARCH

BC3 TEAM: RESEARCHERS

BC3 RESEARCH LINES

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

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



OUR TEAM OF RESEARCHERS



MARÍA JOSÉ SANZ
SCIENTIFIC DIRECTOR



AMAIA ALBIZUA
GV-EJ POSTDOCTORAL RESEARCHER
4 Adaptation Lab



ALINE CHIABAI
RESEARCH PROFESSOR
4 Adaptation Lab



MARÍA ALMAGRO
POSTDOCTORAL RESEARCHER
3 Terrestrial Ecosystems



JORGE CURIEL
IKERBASQUE RESEARCH PROFESSOR
3 Terrestrial Ecosystems



UNAI ALVAREZ-RODRIGUEZ
GV-EJ POSTDOCTORAL RESEARCHER
5 Integrated Modelling of Coupled Human-natural Systems



AGUSTÍN DEL PRADO
RESEARCH PROFESSOR
3 Terrestrial Ecosystems



IÑAKI ARTO
RESEARCH PROFESSOR
2 Low Carbon



SERGIO FARIA
IKERBASQUE RESEARCH PROFESSOR - RAMON Y CAJAL FELLOW
1 Climate Basis



STEFANO BALBI
RESEARCH FELLOW
5 Integrated Modelling of Coupled Human-natural Systems



SEBASTIEN FOUDI
RESEARCH FELLOW
4 Adaptation Lab



INMACULADA BATALLA
POSTDOCTORAL RESEARCHER
3 Terrestrial Ecosystems



ELENA GALÁN
POSTDOCTORAL RESEARCHER
3 Terrestrial Ecosystems

BC3 TEAM: RESEARCHERS

OUR TEAM OF RESEARCHERS



IBON GALARRAGA
RESEARCH PROFESSOR
4 Adaptation Lab



JOAQUIN GARCÍA
POSTDOCTORAL RESEARCHER
2 Low Carbon



DANIEL GARCÍA
BC3 RESEARCHER
3 Terrestrial Ecosystems



SILVESTRE GARCÍA DE JALÓN
POSTDOCTORAL RESEARCHER
4 Adaptation Lab



TERESA GIMENO
IKERBASQUE RESEARCH FELLOW
3 Terrestrial Ecosystems



MIKEL GONZÁLEZ
RESEARCH PROFESSOR
2 Low Carbon



SEBASTIEN HUCLIN
ASSOCIATE RESEARCH FELLOW
2 Low Carbon



ASMA JEBARI
JUNIOR RESEARCHER - PHD STUDENT
3 Terrestrial Ecosystems



SIMONE LANGHANS
RESEARCH FELLOW
5 Integrated Modelling of Coupled Human-natural Systems



BOSCO LLISO
JUNIOR RESEARCHER - PHD STUDENT
3 Terrestrial Ecosystems



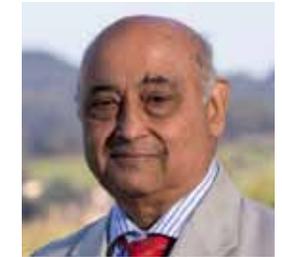
ELENA LÓPEZ
JUNIOR RESEARCHER - PHD STUDENT
2 Low Carbon



AINHOA MAGRACH
POSTDOCTORAL RESEARCHER
5 Integrated Modelling of Coupled Human-natural Systems



AMBIKA MARKANDAY
JUNIOR RESEARCHER - PHD STUDENT
4 Adaptation Lab



ANIL MARKANDYA
FORMER SCIENTIFIC DIRECTOR/
DISTINGUISHED IKERBASQUE PROFESSOR
4 Adaptation Lab



ALBA MÁRQUEZ TORRES
RESEARCH ASSISTANT
5 Integrated Modelling of Coupled Human-natural Systems



DAVID MORENO
IKERBASQUE RESEARCH FELLOW
3 Terrestrial Ecosystems



MARC NEUMANN
IKERBASQUE RESEARCH PROFESSOR - RAMON Y CAJAL FELLOW
4 Adaptation Lab



MARTA OLAZABAL
RESEARCH FELLOW
4 Adaptation Lab



IGNACIO PALOMO
POSTDOCTORAL RESEARCHER
3 Terrestrial Ecosystems



GUILLERMO PARDO
POSTDOCTORAL RESEARCHER
3 Terrestrial Ecosystems



UNAI PASCUAL
IKERBASQUE RESEARCH PROFESSOR
3 Terrestrial Ecosystems

BC3 TEAM: RESEARCHERS

OUR TEAM OF RESEARCHERS



JOSUÉ POLANCO
BC3 RESEARCHER
1 Climate Basis



ASUN RODRÍGUEZ
JUNIOR RESEARCHER - PHD
STUDENT
3 Terrestrial Ecosystems



ALEJANDRO RODRÍGUEZ
RESEARCH ASSISTANT
2 Low Carbon



IRATXE RUBIO
RESEARCH ASSISTANT
4 Adaptation Lab



MARÍA RUIZ DE GOPEGUI
RESEARCH ASSISTANT
4 Adaptation Lab



ITSASO RUIZ
JUNIOR RESEARCHER - PHD
STUDENT
1 Climate Basis



ELISA SAINZ DE MURIETA
GV-EJ POSTDOCTORAL
RESEARCHER
4 Adaptation Lab



JON SAMPEDRO
JUNIOR RESEARCHER - PHD
STUDENT
2 Low Carbon



ESTÍBALIZ SANZ
RESEARCH ASSISTANT
4 Adaptation Lab



ALESSANDRO SILVESTRI
JUNIOR RESEARCHER - PHD
STUDENT
2 Low Carbon



MAREK SMID
POSTDOCTORAL RESEARCHER
4 Adaptation Lab



MARI MAR SOLÁ
JUNIOR RESEARCHER - PHD
STUDENT
2 Low Carbon



ALEV SORMAN
POSTDOCTORAL RESEARCHER
2 Low Carbon



ALINA TEPES
BC3 RESEARCHER
4 Adaptation Lab



MIREIA VALLE
GV-EJ POSTDOCTORAL
RESEARCHER
3 Terrestrial Ecosystems



DIRK-JAN VAN DE VEN
JUNIOR RESEARCHER - PHD
STUDENT
2 Low Carbon



FERDINANDO VILLA
IKERBASQUE RESEARCH
PROFESSOR
5 Integrated Modelling of Coupled
Human-natural Systems



NOELIA ZAFRA
POSTDOCTORAL RESEARCHER
3 Terrestrial Ecosystems

BC3 TEAM: ADMINISTRATION

ADMINISTRATION TEAM



NEREA ORTIZ
OPERATION MANAGER



SUSANA PÉREZ
MANAGEMENT ASSISTANT



AINHOA AZKARATE
OUTREACH MANAGER



SILVIA DE LUIS
PROJECT OFFICER



IRUNE VEGAS
PROJECT OFFICER

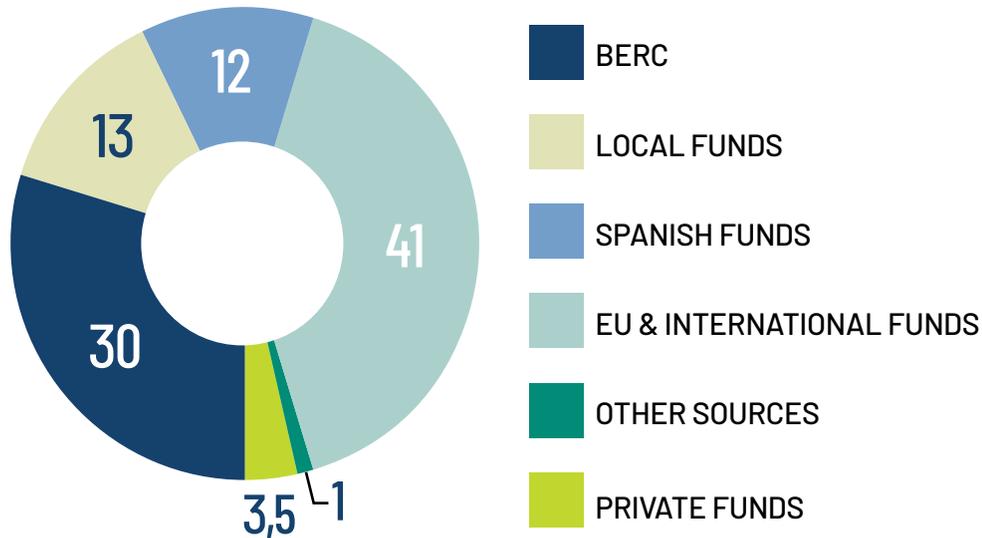


RAQUEL VEGA
PROJECT OFFICER

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

FUNDING

Distribution of BC3 Funds



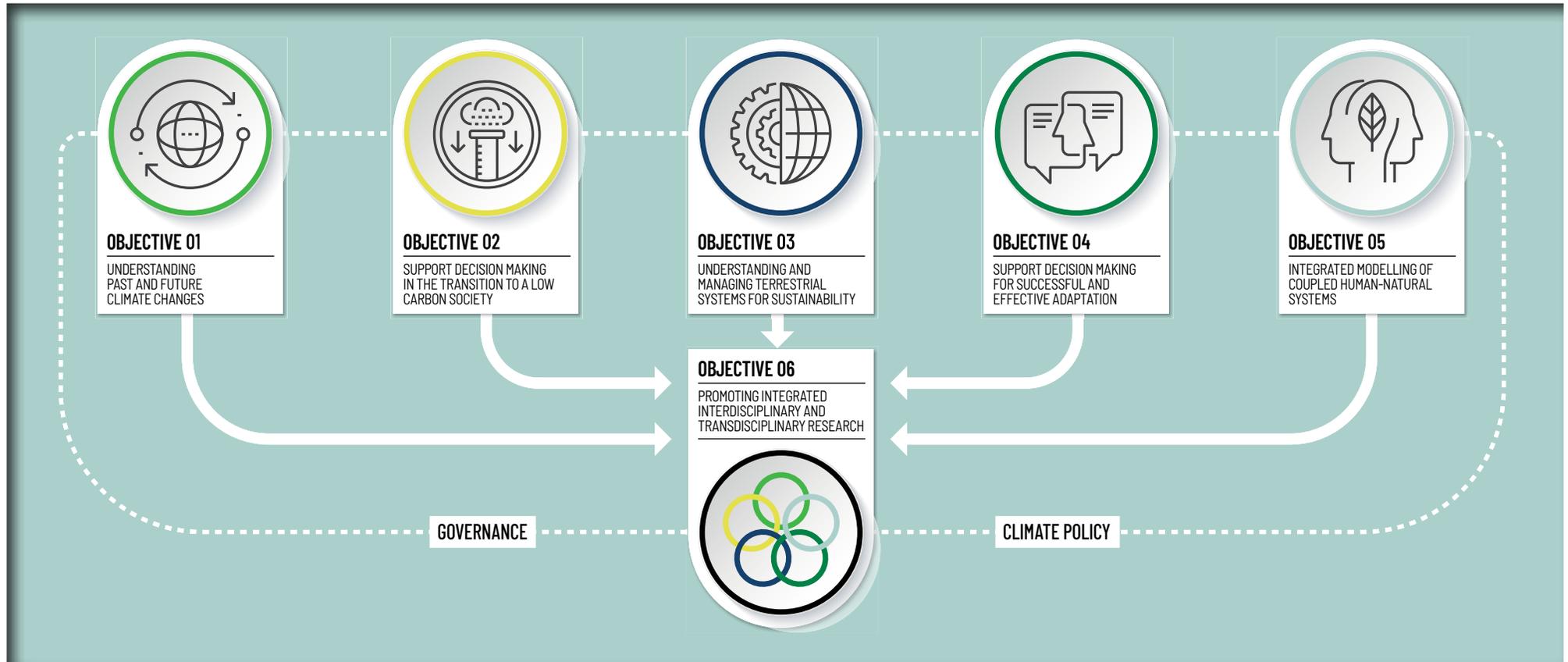
The attraction of external funding is one of the key indicators of excellence, as it represents the capacity of a challenging economic situation.

2018 has been exceptional in terms of external resources attracted. The non-BERC funding percentage has reached the 70% in 2018.

SELF-FINANCING
PERCENTAGE OF
70%

06

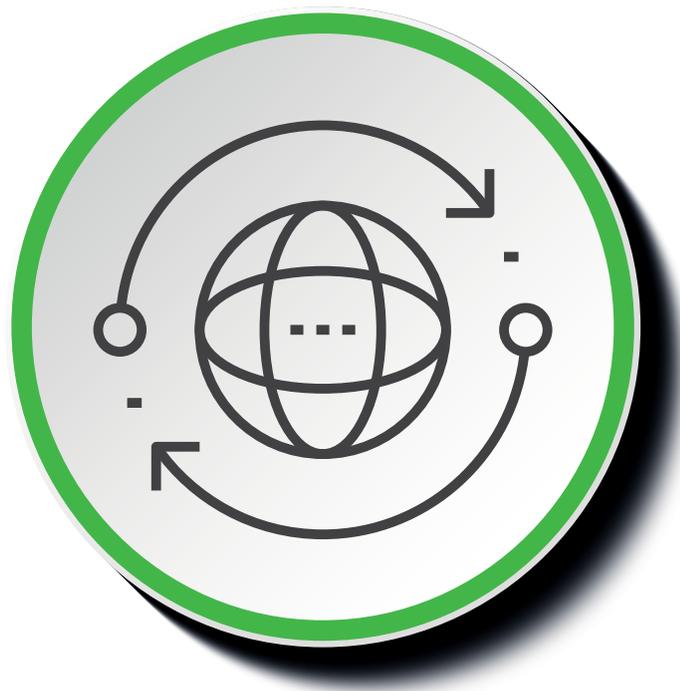
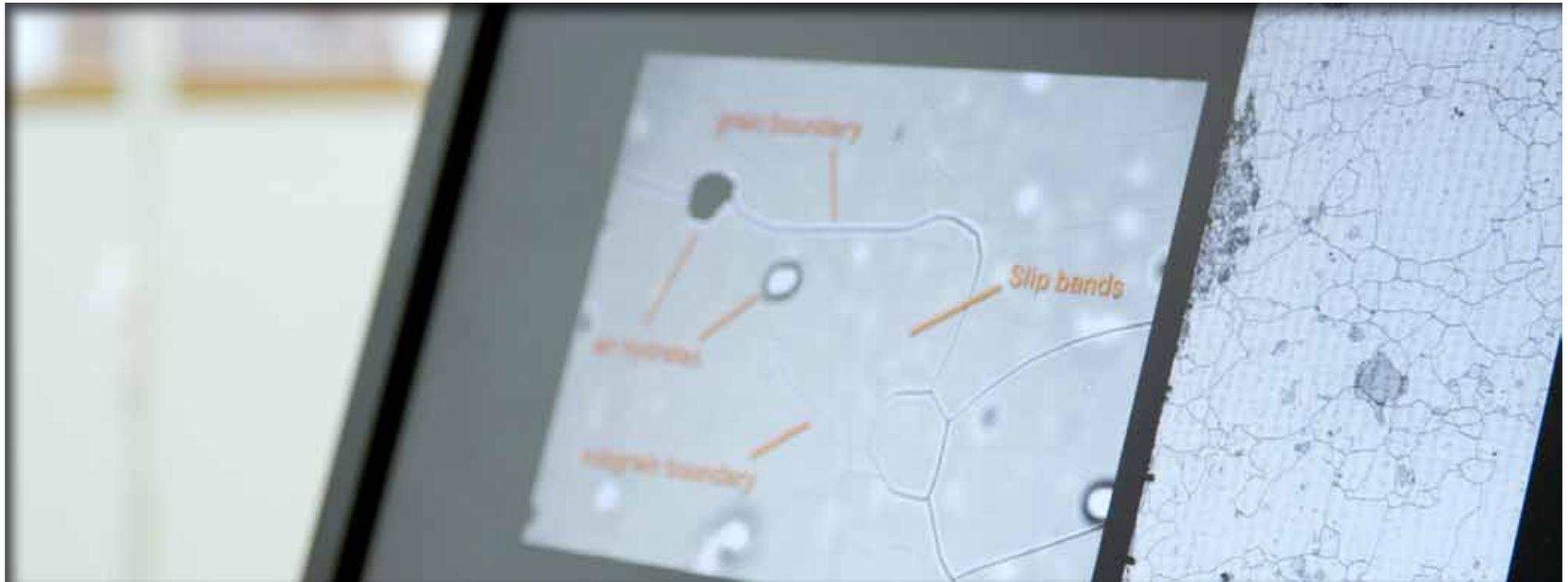
OUR OBJECTIVES



OBJECTIVES

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





OBJECTIVE 1

Understanding past and future climate changes

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

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

OBJECTIVE 1

Understanding past and futures climate changes



On the basis that responsible scientific support for policymaking and co-generation of far-reaching scientific knowledge require a clear understanding of the physical basis of climate change. This is approached from BC3 by two main activities, the development of methodological innovations in complex dynamical systems modelling and statistical analysis to contribute to the analysis and interpretation of climate records and understand better the dynamics of the cryosphere. On the theoretical side, in 2018 new theories of climate proxy formation and evolution (proxy modelling) using thermodynamic and statistical physics approaches were developed. New mathematical tools for time-series and climate-risk analysis, including resampling and wavelet analysis, taking into account timescale errors were also developed. An agreement with the University of the Basque Country (UPV/EHU) to develop new experimental tools and methods for investigating ice using Raman spectroscopy was signed.

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".
- BALELUR.

LEAD OR COLEAD NETWORKS

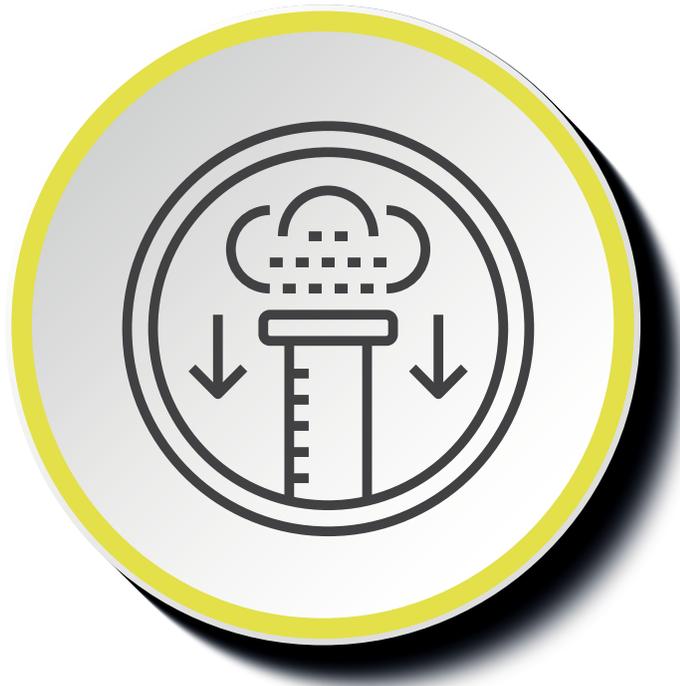
- TGU-GIGAKU. Gigaku Education Programme for Innovative Global Engineers.
- NUT's (Nagaoka University of Technology).

MODELS AND TOOLS

- Mathematical Model of Iceberg Dynamics.
- Mathematical Model of Poly disperse Granular Flow and Comminution.
- Physical Model of Slip-Band Formation and Distribution in Polar Ice.
- Physical Model of Strain-Induced Anisotropy in the North East Greenland Ice Stream (NEGIS).
- Physical Model of Visual Stratigraphy Formation in Polar Ice.
- BINCOR (v. 0.2.0). Computational package in R to estimate the correlation between two unevenly spaced climate time series.

HIGHLIGHTED PUBLICATIONS

- Faria, S.H., Kipfstuhl, S., Lambrecht, a.. 2018. The EPICA-DML Deep Ice Core. A Visual Record. Berlin. Springer, Berlin. (The line-scan images collected in this book represent the most accurate optical record of Antarctic ice cores ever presented, providing an invaluable resource for glaciologists and climate modellers, as well as a fascinating compilation of ice core images for Antarctica).
- Faria, S.H. 2018. Slip-band distributions and microstructural fading memory beneath the firn-ice transition of polar ice sheets. Mechanics Research Communications. 94. 95-101.



OBJECTIVE 2

Support decision making in the transition to a low carbon society

We research to produce knowledge that can be useful for decision-making in the transition to a Low Carbon Society. To be able to design, communicate, implement and assess actions towards a low carbon 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 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 including 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 2018 we have been working together with stakeholders and policy makers from different institutions.

Explore the synergies between low carbon policies and Sustainable Development Goals

The activity in 2018 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”. BC3 contributed to a major World Bank study on the impacts of climate change on living standards in South Asia. The impacts on incomes of the poor and on poverty were found to be significant, the more so when low carbon policies are not pursued. Related work on the impacts of climate change on agriculture and growth through its impacts on water scarcity and changes in the distribution of water were also carried out for South Asia and published in a review of the SDG linked developed of that sub-continent. BC3 researchers are currently looking at climate change and the SDGs through the lens of natural capital.

OBJECTIVE 2

Support decision making in the transition to a low carbon society



RESEARCH PROJECTS AND CONTRACTS

- H2020 TRANSRISK, Transitions pathways and risk analysis for climate change mitigation and adaptation strategies.
- H2020 CONSEED, CONsumer Energy Efficiency Decision Making.
- H2020 ENABLE, Enabling the Energy Union through understanding the drivers of individual and collective energy choices in Europe.
- TALES, Tools and analyses of value chains, income and employment. Contract with The Directorate Growth and Innovation of the Joint Research Centre (JRC) of the European Commission (EC).
- EU-TiVA. Contract with the Directorate Growth and Innovation of the Joint Research Centre (JRC) of the European Commission.
- CLIMAECON.
- IDAE Contract - Technical assistance in energy planning Project. Ministry for the Ecological Transition of the Spanish Government (MITECO) (Basque Ombudsman) contract to assess the basic pillars of a sustainable energy transition in the Basque Country.
- IBERDROLA Contract, to assess the economic and social implications of alternative schemes to finance the renewables in Spain.
- FUNDACION BBK Contract. Collaboration Agreement between UPV/EHU, BBK Foundation and BC3 within the framework of the Low Carbon Program.
- UNEP Agreement to design and test a methodology for assessing countries' Natural capital needs to meet the Sustainable Development Goals (SDGs).

MODELS AND TOOLS DEVELOPED

- DENIO Model: Dynamic Econometric National Input-Output model for Spain.

- DERIO Model: Dynamic Econometric Regional Input-Output model for the Basque Country.
- GCAM-Solarland (v1.0). Module that attributes land requirements to solar energy within GCAM.
- GCAM-TM5-FASST(V.1.0). R script that adjusts GCAM output in order to set into TM5-FASST air quality model.
- GCAM-Waste (V.1.0). Module that measures waste flows from households in the European Union.
- 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.

LEAD OR CO-LEAD NETWORKS

- SHAI0, Hispanic-American Input-Output Society.
- Spanish Association for the Energy Economics (AEEE).

HIGHLIGHTED PUBLICATIONS

- Markandya, A., Sampedro, J, Smith, A Markandya, J Sampedro, SJ Smith, Van Dingenen, R., Pizarro-Irizar, C. Arto, I, Gonzalez-Eguino (2018) Health co-benefits from air pollution and mitigation costs of the Paris Agreement: a modelling study, *The Lancet Planetary Health* 2 (3), 126-133.
- Van de Ven, DJ., González-Eguino, M., Arto, I. (2018) The potential of behavioural change for climate change mitigation: a case study for the European Union, *Mitigation and Adaptation Strategies for Global Change*, 23, 6, 853-886.
- Doukas, H., Nikas, A., González-Eguino, M., Arto, I., Anger-Kraav, A. 2018. From Integrated to Integrative: Delivering on the Paris Agreement. *Sustainability*. 10. (7) 2299.



OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability

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

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

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



BC3 explores different aspects that are relevant for socially efficient allocation of land resources, in terms of their long-term conservation of ecosystems as well as for their ongoing utilization. Effective land use decisions require process understanding and consideration of the interplay of social, economic and environmental effects on land, while promoting integrative, climate-smart agriculture and ecosystem management. The activities undertaken by BC3 are 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. Extensive analytical and field work was done during 2018.

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

During 2018, 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 major 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).
- B)** Predicting the potential effects of climate over natural systems and the ecosystem services, the example of warming manipulations (open top chambers in "Páramos", a collaboration with the Universidad de Los Andes) in its effect on high altitude tropical ecosystems (first experimental manipulation experiment ever installed in Tropical high elevation ecosystems).
- C)** Developing of new generation mechanistic models of soil biogeochemical cycling. In the KEY-LINK model, we integrated all this new knowledge 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. Some obtained results: **(1)** an important effect of predation on the complete C cycle with repercussions on

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



the hydrology as soil engineers are predated, and on SOM turnover when predation on fungivore and bacterivore populations are reduced. **(2)** the main driver of SOM turnover was, as expected, the microbial biomass.

However, microbial biomass is strongly regulated by the presence/absence of soil fauna.

D) 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; and a glasshouse experiment, in collaboration with colleagues from INRA-Bordeaux (France) where we assessed the drought sensitivity of an iconic European temperature deciduous tree (beech). And a trial field experiment to test for alternative water mechanisms in tall trees under water stress set up in collaboration with Swedish Agricultural University (SLU).

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. Contributions for new methods and emission factors on livestock and soil N₂O made the Final Draft of the 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 (Ministry of Agriculture, Food and Fisheries) 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 livestock systems, bioenergy and composting.

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



Modelling social-ecological dynamics of agrobiodiversity

Focus on understanding how institutions, including markets and policies, can co-evolve to support sustainable agrobiodiversity under climate change, we analyze both its and 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

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, since volume 4 was coordinated by M. J. Sanz. In addition, efforts were made to compare bottom up and top down estimates of land use (in particular forest) emissions and removals and proposals to reconcile the estimates in the context of the efforts towards the next Global Stock Take of the progress of the Paris Agreement Goal. At the international level support was given to the following: review and assessment process for REDD+ under the UNFCCC; Global Forest Observation Initiative (GFOI); FAO efforts on analysis of the needs for a transformational change in the land use sector and the Korinivia work program on Agriculture; EFDB of IPCC Task Force on GHG inventories; Green Climate Fund call for proposals on REDD+ assessment of proposals; BioCarbon Fund Initiative for Sustainable Forest Landscapes; two policy briefs on land use role (BC3, WRI). In addition, at national and local level, we participated in the Advisory Board of the National Adaptation Plan revision process and soil climate change adaptation and mitigation in the Basque Country background document.

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.
- REBECOM, Estimating recovery time of temperate forests after historic antropogenic disturbances along a gradient of complexity.
- IBERYCA, The role of plant-microbiota interactions in the resilience and collapse of Mediterranean forest of holm-oaks.
- ESPERA, Social Equity in Payments for Environmental Services: A Socio-Ecological Perspective.
- MANURE, Ejection management in systems. Cantabrian Cornice milk cattle. From exploitation to territory: efficiency of nutrient use, gas mitigation and Greenhouse and carbon footprint reduction.
- GHG reduction operating group. Supra-autonomic Operative Group (Ministry of Agriculture and Fisheries, Food and Environment).
- DEFRA_DIETARY N USE.
- EQUIVAL, Nurturing a Shift towards EQUitable Valuation of Nature in the Anthropocene.
- SEES, The role of Social Equity in the Governance of Nature: A Social-Ecological approach.

■ LEAD OR CO-LEAD NETWORKS

- ECOSOIL, Soil biodiversity as an essential resource for the functioning of terrestrial ecosystems and the sustainable use of natural resources.
- REMEDIA. Scientific Network on GHG mitigation from the agroforestry sector (agriculture, livestock and forestry) in Spain.

■ HIGHLIGHTED MODELS AND TOOLS

- KEYLINK Model. A new mechanistic model that, as far as we know, constitutes the best effort ever made to model the role of soil biodiversity on soil biogeochemical and hydrological cycling, being able to simulate well known process and improve our predictions on key aspects and services.
- RothC - GIS v1. Model that facilitates the use of RothC (model for simulating SOC dynamics).
- RothC - pastures. Modification of RothC model in order to account for grazing pressure and carbon quality of both excreta returns.
- 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.
- SIMSWASTE. Model to investigate the effects of closed nutrient loops on environmental impact, resilience and sustainability at different levels of the agri-food system.
- REDD+ funds distribution. Assess how the distribution of REDD+ funds impacts deforestation and biodiversity.

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



HIGHLIGHTED PUBLICATIONS

- Fernández, M.J, Curiel Yuste, J., Rubio, A, Kitzler, B. and Ortiz, C. 2018. Changes in litter chemistry associated with global change-driven forest succession resulted in time-decoupled responses of soil carbon and nitrogen cycles. *Soil Biology and Biochemistry* 120.
- Jebari A., del Prado A., Pardo G., Rodríguez Martín J.A., álvaro-Fuentes J. 2018. Modeling Regional Effects of Climate Change on Soil Organic Carbon in Spain. *Journal of Environmental Quality*. 47. (4) 644-653.
- Galán E., Llonch P., Villagrà A., Levit H., Pinto S., Del Prado A. 2018. A systematic review of non-productivity-related animal-based indicators of heat stress resilience in dairy cattle. *PLoS One*. 13. (11) e0206520.
- Díaz,S., U. Pascual, M. Stenseke,B. Martín-López,R.T. Watson,Z. Molnár,R. Hill,K.M.A. Chan,I.A. Baste,K.A. Brauman,S. Polasky,A. Church,M. Lonsdale,A. Larigauderie,P.W. Leadley,A.P.E. Van Oudenhoven,F. Van Der Plaats,M. Schröter,S. Lavorel,Y. Aumeeruddy-Th.2018. Assessing nature's contributions to people. *Science*. 359. (6373) 270-272.
- Wunder, S., Brouwer, R., Engel, S., Ezzine de Blas, D., Muradian, R., Pascual, U., Pinto, R. 2018. From principles to practice in paying for nature's services. *Nature Sustainability* 1(3): 145-150.



OBJECTIVE 4

Support decision making for successful and effective adaptation

We conduct research to facilitate decisions for successful and effective adaptation to climate change and its impacts. Based on scientific 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.

OBJECTIVE 4

Support decision making for successful and effective adaptation



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 2018 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

On developing 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. The achievements have been related to understanding the role of uncertainty in decision making within risk contexts. Within the project COACCH, BC3 is developing a framework to enhance communication and understanding of risks, with the aim of bridging the gap between the technical risk management perspective and the public risk aversion debate. This framework is expected to be useful for stress-testing resilience and defining risk appetite. The ongoing work includes other economic analysis techniques such as lab experiments to be able to comprehend behavioural factors in the risk perception area.

Designing and assessing adaptation policies, instruments and solutions

Exploring how to address effects of different adaptation options within policy appraisal, with strong focus on mainstreaming adaptation into development planning more widely and linking to Sustainable Development Goals (SDGs) in developing countries and sustainable development indicators in developed ones. Special emphasis on health impacts with the development of an epidemiological model to assess synergetic effects of high temperatures and ozone on health at the local and urban scale for the Basque Country, a conceptual framework under DPSEEA to support the operationalization of quantitative assessment of health benefits from green spaces.

Measuring adaptation progress and understanding adaptation dynamics

Focus 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. A second study assessed in detail the adaptation plans of Spanish cities. A Memorandum of

OBJECTIVE 4

Support decision making for successful and effective adaptation



Understanding with the Grantham Research Institute on Climate Change and the Environment (LSE) was signed, to collaborate in developing and carrying out specific research on climate change adaptation and policy.

Understanding the implications of uncertainty

Development and application of approaches to deal with uncertainty and variability in climate change adaptation. Development and use of stochastic modelling approaches to estimate damages from extreme events focusing on tail (low probability-high impact) events (a stochastic diffusion models for heatwaves analysis over time was developed). Real options analysis applied to energy and infrastructure systems. Application of structured sensitivity analysis (such as global sensitivity analysis) for climate impact and adaptation modelling. Resilience assessments of urban infrastructure in view of multiple interacting threats in project ALICE-RISE.

OBJECTIVE 4

Support decision making for successful and effective adaptation



HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

- H2020 RESIN, Climate Resilient Cities and Infrastructure.
- H2020 INHERIT, INter-sectoral Health Environment Research for InnovaTions.
- H2020 COACCH, CO-designing the Assessment of Climate CHange costs.
- CLIC, Can we measure the effectiveness of public investments in urban climate resilience?.
- PROCESA, Evaluation of the Progress of the Spanish Cities towards Adaptation.
- OASIS, KLIMATEK, IHOBE.
- Joint Research Laboratory on Environmental Antibiotic Resistance.

LEAD OR CO-LEAD NETWORKS

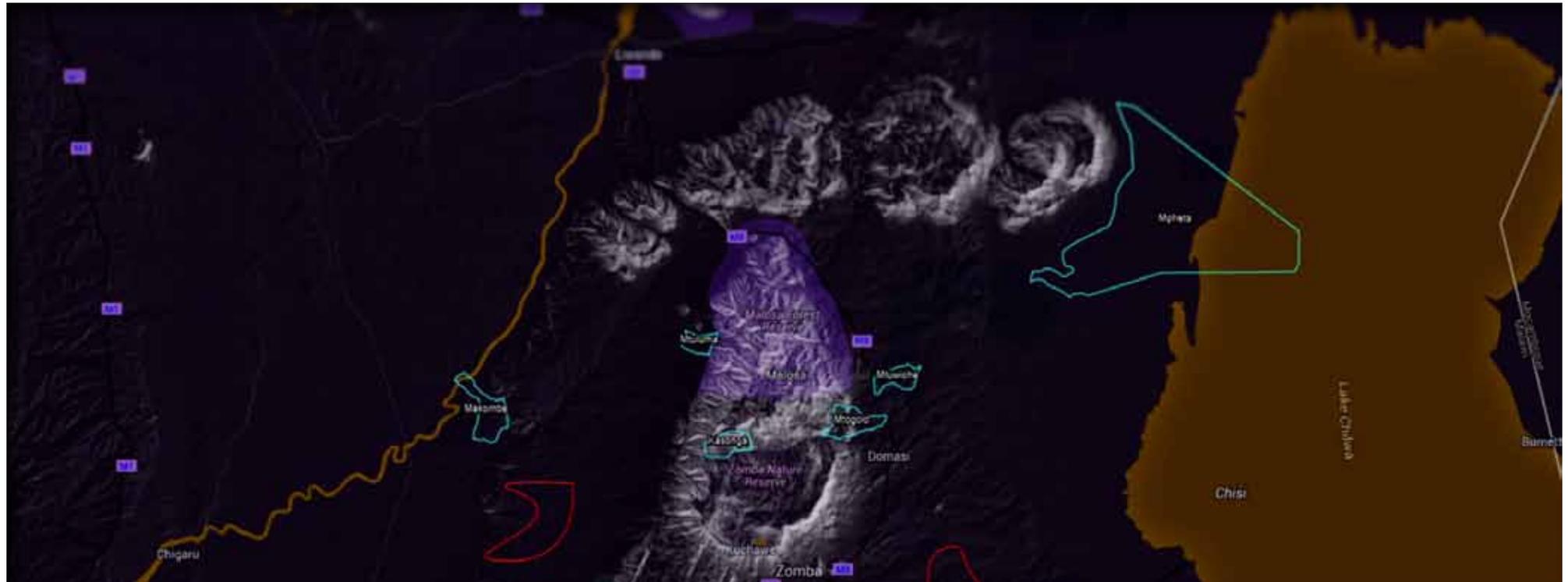
- International Network of Climate Change Centres of Excellence and Think-Tanks for Capacity Building (INCCETT 4CB).
- Urban Resilience Research Network.

HIGHLIGHTED MODELS AND TOOLS

- Stochastic modelling for extreme events.
- Model to assess heatwaves attributable mortality.
- An adaptation tracking tool was developed and it has been proposed to Regions Adapt initiative, a global network to inspire and support regional governments to take concrete action.
- Adaptation Policy Checklist.
- Fuzzy Cognitive Maps applied to assess resilience in wastewater management.
- eDPSEEA-based framework for green areas.
- Tool to model health benefits from exposure to green areas.

HIGHLIGHTED PUBLICATIONS

- Chiabai, A., Quiroga Gomez, S., Martinez-Suarez, P., Higgins, S., Taylor, T. (2018). The nexus between climate change, ecosystem services and human health: Towards a conceptual framework. *Science of Total Environment* 635, 1191-1204.
- Chiabai, A., Spadaro, J.V., Neumann, M.B. (2018). Valuing deaths or years of life lost? An economic assessment of the mortality benefits of an early heat warning system. *Mitigation and Adaptation Strategies for Global Change* 23, 1159 - 1176.
- Olazabal, M., Chiabai, A., Foudi, S., Neumann, M.B., 2018. Emergence of new knowledge for climate change adaptation. *Environmental Science & Policy* 83, 46 - 53.
- Galarraga, I., Sainz de Murieta, E., Markandya, A., Abadie, L. 2018. Addendum to 'Understanding risks in the light of uncertainty: low-probability, high-impact coastal events in cities. *Environmental Research Letters* 13 029401.



OBJECTIVE 5

Integrated modelling of coupled human-natural systems

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

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

OBJECTIVE 5

Integrated modelling of coupled human-natural systems



BC3 has a strong focus on methodological innovations in the field of informatics for sustainability, with a focus on certain activities such as:

Scaled complexity in biophysical and social modelling

The technology underlying ARIES can choose and assemble the most appropriate data and model components according to scale, detail, and availability of data. In data-poor contexts, the system adopts Bayesian belief network models that approximate the likely outcomes of physical processes through causal paths and correlations learned from data in comparable contexts. When data is available, the system adopts spatially explicit dynamic models of different processes. This scaled complexity approach allows best response and explicit communication of uncertainty in diverse contexts.

Bridging disciplines

From biophysical to social through agriculture and food security. In order to link data and models produced by other communities (such as agricultural, hydrological, pedological and geological) ARIES uses an approach driven by ontologies that reuses endorsed vocabularies and terminologies from recognized institutions and allows artifacts (such as data) of diverse provenance to be used jointly within integrated models. Negotiate effective translation of terminologies and continued interoperability is a crucial prerequisite to developing any effective trans-disciplinary project.

Bridging scales

From process detail and agent behavior to economic and policy instruments. Focusing on both, the biophysical mechanisms of ecosystem service provision, the socioeconomic drivers of their change and their implications for human well-being, requires integrating scales from local, through regional decision-making, to the country-level accounting of natural capital, which ultimately impacts the global economic system. Case studies often cut across wide scale spans in space and time. Such activities have prompted the development of scale-aware methods and automatic scaling of models, with explicit account of the resulting uncertainties. Techniques such as Multiple Criteria Analysis have also been integrated into ARIES to provide rapid and easily communicable analysis and visualization of stakeholder priorities and potential conflicts over alternative goals at different scales. These instruments allow the investigation of scaling trade-offs, such as those between short-term increase in provisioning services, and the long-term loss of regulating ones (e.g. flood risk).

OBJECTIVE 5

Integrated modelling of coupled human-natural systems



Instrumenting decision makers

Reconciling the need for simplicity and intuitiveness with that for accuracy, specificity and dynamic resolution is a challenge. By adapting models to diverse social, economic, and policy contexts without overly complicating their application by decision makers, the highly specialized practice of modelling is open to non-specialists, reduces its costs and potentially expands its role in decision making. These models can be used by decision makers to target economic incentives, while minimizing the information costs of identifying trade-offs between efficient and equitable targeting of ES providers.

ARIES PROJECT

The above activities are contributing to the ARIES (Artificial Intelligence for Ecosystem Services) project (<http://aries.integratedmodelling.org>), a highly recognized, pioneering example of an e-science collaboratory where independent actors can develop and share interoperable data and models. ARIES is the most well-known application of the *semantically integrated modeling technology* designed and developed at BC3, and made available through the k.LAB software, whose scope extends far beyond the current applications. The BC3 team, along with many international partners, has focused on the modelling of ecosystem services to provide a view of coupled human-natural systems that has been widely recognized in science, management and governance. It integrates a large set of models that continues to be increased.

OBJECTIVE 5

Integrated modelling of coupled human-natural systems



■ HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

- H2020 AQUACROSS - Knowledge, Assessment, and Management for AQUatic Biodiversity and Ecosystem Services across EU policies.
- INTERREG ALICE Towards a better management of Atlantic Landscapes: developing tools to better characterise biodiversity and ecosystem services (Interreg Atlantic Area).
- H2020 MSCA Global Individual Fellowship, SABER CULTURAL.
- CARDINAL project.
- Contract with ITALIAN INSTITUTE FOR ENVIRONMENTAL PROTECTION AND RESEARCH (ISPRA).

■ LEAD OR CO-LEAD NETWORKS

- ARIES Network.
- k.LAB Japan Network.
- Integrated Modelling (IM) partnership.

■ HIGHLIGHTED MODELS AND TOOLS

- k.EXPLORER.
- k.Modeller, k.LAB engine, k.LAB hub and k.LAB node.
- Integrated Modelling Worldview (ontology collection) outdoor recreation, pollination, flood regulation, sediment regulation and carbon storage.

■ HIGHLIGHTED PUBLICATIONS

- Willcock, S., J. Martínez-López, D. Hooftman, K. Bagstad, S. Balbi, A. Marzo, C. Prato, S. Sciandrello, G. Signorello, B. Voigt, F. Villa, J. Bullock, I. Athanasiadis. 2018. Machine learning for ecosystem services. *Ecosystem Services*. doi:10.1016/j.ecoser.2018.04.004.
- Campbell, M., Edwards, W., Magrath, A., Alamgir, M., Porolak, G., Mohandass, D., Laurance, W.F. 2018. Edge disturbance drives liana abundance increase and alteration of liana-host tree interactions in tropical forest fragments. *Ecology and Evolution*. DOI (DOI: 10.1002/ece3.3959).
- Kolosz B.W., Athanasiadis I.N., Cadisch G., Dawson T.P., Giupponi C., Honzák M., Martínez-López J., Marvuglia A., Mojtahed V., Ogutu K.B.Z., Van Delden H., Villa F., Balbi S. 2018. Conceptual advancement of socio-ecological modelling of ecosystem services for re-evaluating Brown-field land. *Ecosystem Services*. 33. 29-39. DOI (10.1016/j.ecoser.2018.08.003).
- Buchanan, G. M., Beresford, A. E., Hebblewhite, M., Escobedo, F. J., De Klerk, H. M., Donald, P. F., Escribano, P., Koh, L. P., Martínez-López, J., Pettorelli, N., Skidmore, A. K., Szantoi, Z., Tabor, K., Wegmann, M., Wich, S. 2018. Free satellite data key to conservation. *Science*. 361. (6398) 139-140. DOI (10.1126/science.aau2650).



OBJECTIVE 6

Promoting integrated interdisciplinary and transdisciplinary research

We promote integrated interdisciplinary and transdisciplinary research.

Because only with an interdisciplinary approach is it possible to generate knowledge that addresses the climate challenges that we are facing. Excellent, cross-cutting knowledge, based on and with the cooperation of all kinds of stakeholders, to even further support 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. This is at the core of its vision, and therefore includes the promotion of progressive integration of research efforts from different research lines towards more than one of the proposed objectives 1-5. In that regard some steps were taken in 2018 including:

Strategic Integrative Projects (SIPs)

Only a few decisions made by businesses, or even by the public sector benefit today from the rich environmental data that now exists. This gap—between existing data and models and the lack of applications within real-world decision-making processes— is not just a lost opportunity, but can also result in unintended consequences for people and nature alike, ranging from over-drafting freshwater resources, to further fragmenting ecological systems which can make them less resilient, among many other potential impacts such as climate change. In response, we are proposing the rollout of a far easier to use approach than any that currently exists in order to enable wider use by both scientists and non-scientists. **The Integrated Modelling (IM) Partnership** is designing and building a fully integrated toolset for data-driven decision making, including four key advances:

A common set of terms (semantics) for interoperable and coherent description of informational artifacts;

OPEN DATA:

To ensure findable, accessible, interoperable and reusable (FAIR) stewardship for data of diverse domains.

OPEN MODELS:

To ensure transparent application of the FAIR principles across automated and unsupervised modeling and processing workflows.

SOFTWARE INFRASTRUCTURE:

For immediate and complete actionability of the paradigm, at non-technical to expert user levels.

It builds upon our experiences over the past decade in building and implementing the Artificial Intelligence for Ecosystem Services (ARIES) platform. During 2018, progress was made on polished web and IDE interfaces after the reinforcement of the team with computer programmers.

OBJECTIVE 6

Promoting integrated interdisciplinary and transdisciplinary research



BALELUR SSP

Effects and Sensitization of Climate Change on Baltoro Glacier and the Karakorum Mountain Range.

This is a Small Sherpa Projects (SSPs). BC3 started its collaboration in 2018 with the Alex Txikon's WinterTopAppeal Expedition to scale the K2 summit. The project spearheaded by BC3 is a collaborative project covering several objectives and is promoted as small integrative project that seeks to take advantage of the publicity from the expedition to underscore the problem of global warming through a series of pioneering initiatives, such as the use of solar panels and windmills to transmit the message that even an expedition must be sensitive to the problems of climate change. On its end, the multidisciplinary BALELUR project will facilitate ascertaining the effects of climate change on the region and raising awareness about them by working towards two objectives.

- 1) Determine the recent climate changes occurring in the glaciers and the higher peaks of Karakoram, including an estimate of the human ("anthropogenic") contribution to such changes. Track the presence of black carbon and other aerosols transported to the region from afar, as well as estimate recent precipitation history through water isotopes.
- 2) Evaluate the effectiveness of various climate change communication strategies used on social media platforms.

For the purpose, a BC3 researcher travelled together with Alex Txikon's team to conduct the field-work, geophysical measurements and snow and soil sample collection at different heights.

DECCMA Project

DEltas, vulnerability and Climate Change; Migration as an Adaptation

It takes a systemic and multi-scale analytical perspective to understand gendered vulnerability and adaptation in deltas under a changing climate by analysing four contrasting populous delta systems in South Asia and Africa where there is significant potential for migration. The dual research aims were: assess migration as an adaptation in deltaic environments with a changing climate, and deliver policy support to create the conditions for sustainable gender-sensitive adaptation. BC3 was Lead work package focused on the analysis of the economic impacts of climate change in deltaic environments and to evaluate different adaptation portfolios.

In DECCMA we adapted some of the tools that we usually use to assess mitigation in Objective 2 (such as using input-output techniques and Computable General Equilibrium models), to support decision making for successful and effective adaptation (Objective 4) and therefore constitutes one step towards Objective 6. Knowledge produced: Analysis of economic impacts of climate change in deltaic areas. Better understanding of the economic dimension of adaptation and migration in delta areas.

Internal collaboration on identification and analyses of the main drivers of climate change awareness and opinion, that constitutes an approach to bridge knowledge through the interaction of

OBJECTIVE 6

Promoting integrated interdisciplinary and transdisciplinary research



researchers and stakeholders to assess the Climate Change perception of Society. Resulted in the development of a conceptual model.

And in addition, knowledge transfer of several aspects of climate change addressed under the different objectives and by different research lines, while using participatory methodologies was tested through a project oriented to the **Integration of the Cross-Cutting Issue Climate Change in the Public Administration Training Plan**. This project was conducted jointly with the Environment Department of the Basque Country and IHOBE to assess the awareness and the needs for training on Climate Change aspects of the Tourism and Commerce Department of the Basque Government Technical staff on Climate Change issues as one of the activities deployed in the **Klima 2050 Strategy** in the specific actions proposed in **Goal 9: Responsible, exemplary Public Administration and reference in climate change**. And it is expected to be replicated in other departments in the near future.

HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

- DECCMA Project (DEltas, vulnerability and Climate Change; Migration as an Adaptation).

HIGHLIGHTED MODELS AND TOOLS

- Delta-CGE Computable General Equilibrium model for deltas.
- Conceptual Model of Climate Change Awareness and Opinion.

HIGHLIGHTED PUBLICATIONS

- Cazcarro, I., Arto, I., Hazra, S., Bhattacharya, R.N., Osei-Wusu Adjei, P., Ofori-Danson, P.K., Asenso, J.K., Amponsah, S.K., Khondker, B., Raihan, S., Hossen, Z. 2018. Biophysical and Socioeconomic State and Links of Deltaic Areas Vulnerable to Climate Change: Volta (Ghana), Mahanadi (India) and Ganges-Brahmaputra-Meghna (India and Bangladesh). *Sustainability*. 10. (3) 893.
- Kebede A.S., Nicholls R.J., Allan A., Arto I., Cazcarro I., Fernandes J.A., Hill C.T., Hutton C.W., Kay S., Lázár A.N., Macadam I., Palmer M., Suckall N., Tompkins E.L., Vincent K., Whitehead P.W. 2018. Applying the global RCP-SSP-SPA scenario framework at sub-national scale: A multi-scale and participatory scenario approach. *Science of the Total Environment*. 635. 659-672.
- Lauria, V., Das, I., Hazra, S., Cazcarro, I., Arto, I., Kay, S., Ofori-Danson, P., Ahmed, M., Hossain, M.A.R., Barange, M., Fernandes, J.A. 2018. Importance of fisheries for food security across three climate change vulnerable deltas. *Science of the Total Environment*. 640. 1566-1577. DOI (10.1016/j.scitotenv.2018.06.011).

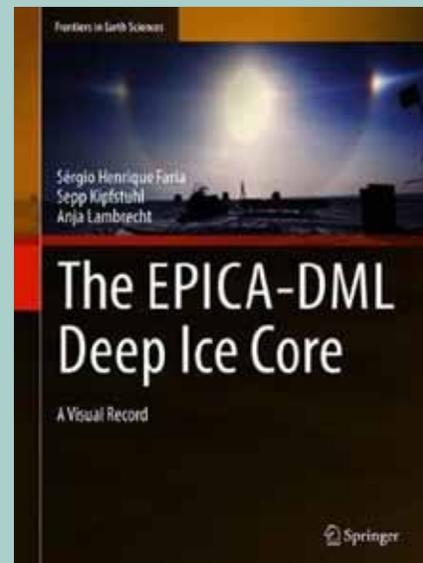
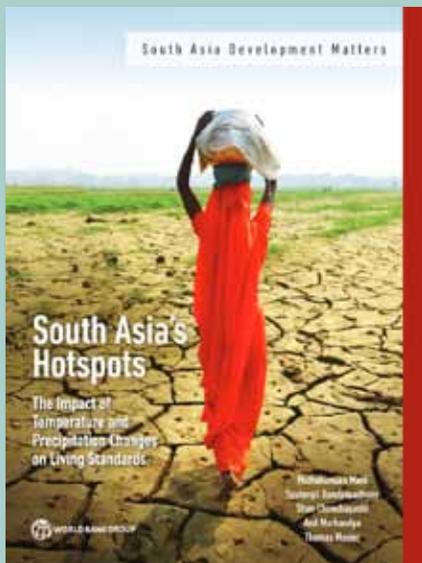
07

HIGHLIGHTED ACHIEVEMENTS



OBTAINING THE MARÍA DE MAEZTU UNIT OF EXCELLENCE ACCREDITATION

BC3 received the **María de Maeztu Unit of Excellence** accreditation (July 2018 – June 2022) from the State Research Agency and the Spanish Ministry of Science, Innovation and Universities, in acknowledgement of the quality and level of excellence in the research it conducts and the proposed 2018-2021 Strategy Plan. The evaluation committee stressed that “the multidisciplinary research conducted by BC3 is an example of what natural sciences should implement in the future”. In the assessment report, the scientific committee underscored “the multidisciplinary character of the centre and its high level of productivity in terms of scientific production and other research results, such as, for instance, contributions to international panels like IPCC or IPBES, and its capacity to attract external funding as a result of the excellence in the research it conducts”.



BC3 PUBLICATIONS

During 2018, BC3 put its scientific production within the best scholarly and the most influential leading publishers. 130 publications were published.

88

JOURNAL
ARTICLES

23

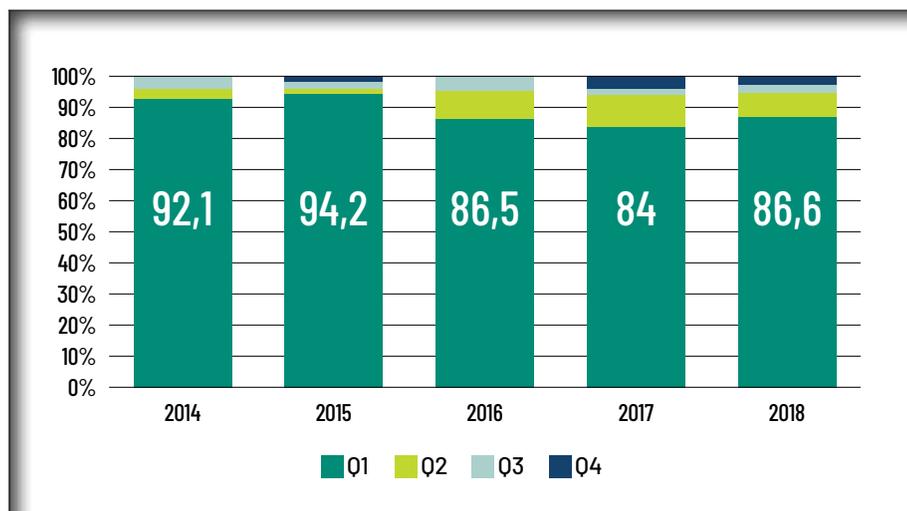
BOOKS AND
CHAPTERS

19

OTHER RELEVANT
PUBLICATIONS

BC3 PUBLICATIONS

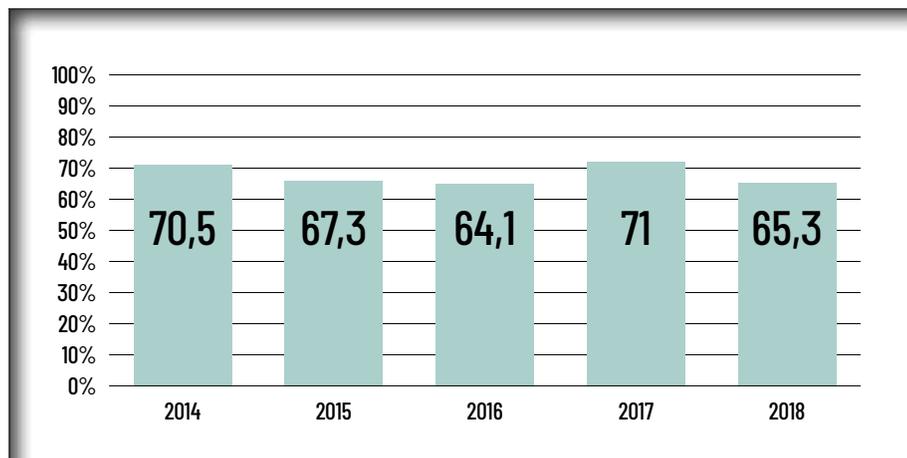
INDEXED JOURNAL ARTICLES 2014-2018
BY QUARTILE DISTRIBUTION (%)



BC3 increased the number of produced and indexed articles, in SCOPUS, along with their quality and impact. The 86,6% of Journal articles published in Indexed Journals (Scopus) were published in Q1 Journals and the 65,3% in D1 Journals.

Accordingly, the number of citations have increased, during 2018 over 2500 citations were received by BC3 publications.

INDEXED JOURNAL ARTICLES IN D1
EVOLUTION 2014-2018 (%)



BC3 PUBLICATIONS

JOURNAL ARTICLES

- Abadie, L.M. 2018. Sea level damage risk with probabilistic weighting of IPCC scenarios: An application to major coastal cities. *Journal of Cleaner Production*. 175. 582–598. DOI (10.1016/j.jclepro.2017.11.069).
- Akizu-Gardokia, O., Bueno, G., Wiedmann, T., Lopez-Guede, J.M., Arto, I., Hernandez, P., Moran, D. 2018. Decoupling between human development and energy consumption within footprint accounts. *Journal of Cleaner Production*. DOI (10.1016/j.jclepro.2018.08.235).
- Alonso O.G., Etxano I., Garmendia, Eneko. 2018. The resurgence of commons and the governance of traditional commons systems at risk: The case of Enirio-Aralar. *Lurralde: Investigacion y Espacio*. 41. 225–248.
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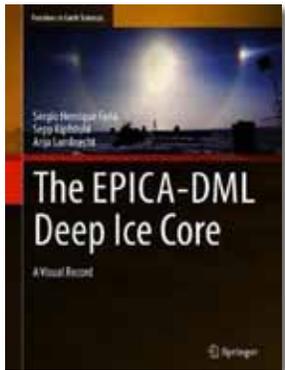
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BC3 contributed to a major World Bank Study on the impacts of climate change on living standards in South Asia.



The line-scan images collected in this book edited by BC3, represents the most accurate optical record of Antarctic ice cores ever presented.

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- [PB 2018 - 01] Are we on the right track? This is what we found when re-viewing climate policies in 885 European cities. Marta Olazabal, Oliver Heidrich and Diana Reckien.



Scientific Director of BC3, María José Sanz in the presentation of the results of the Report Global Warming of 1.5° C with the Minister of Ecological Transition (Teresa Ribera) and the Minister of Research and Competitiveness (Pedro Duque), Madrid 2018.

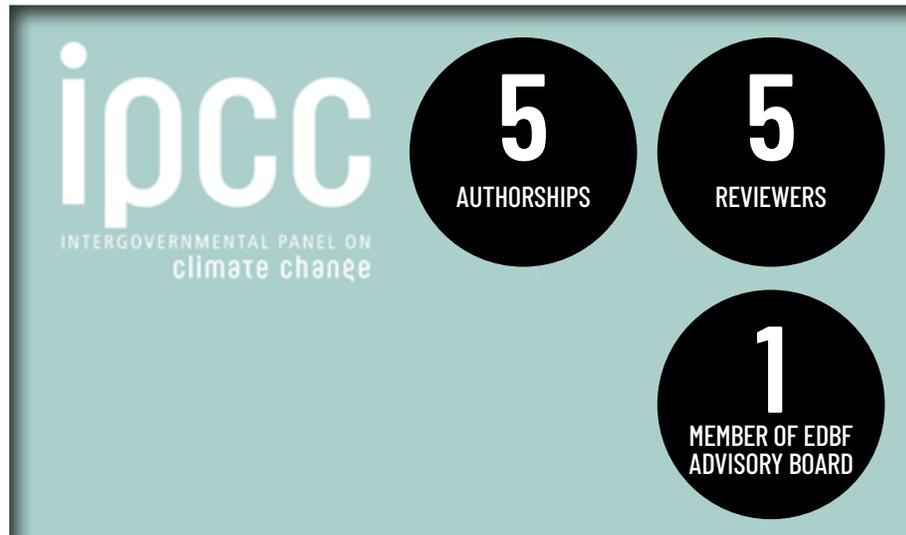
CONTRIBUTIONS TO KEY INTER-DISCIPLINARY INTERNATIONAL PANELS: IPCC AND IPBES

During 2018, 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.

**RESEARCH CENTRE WITH THE
HIGHEST REPRESENTATION AT THE
IPCC AND IPBES IN SPAIN IN 2018**

CONTRIBUTIONS TO KEY INTER-DISCIPLINARY INTERNATIONAL PANELS

IPCC and IPBES



IPCC

BC3 is contributing to most of the **Sixth Assessment cycle key reports that were mandated after the Paris Agreement**. This has allowed us to strengthen BC3's international collaboration with leading researchers from key climate change research institutions worldwide.

Authorships: **AR6 Synthesis Report, Working Group I Report, Chapter 1** (Sergio H.Faria, Leading Author); **Special Report: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories** (Maria Jose Sanz, Coordinating Leading Author & Agustin del Prado, Leading Author); **Special Report: Global Warming of 1.5°C** (Anil Markandya, Contributing Author); **Special Report on Land and Climate Change** (Maria Jose Sanz, Review Editor Chapter 1).

Of all the IPCC reports BC3 was contributing to, the Special Report Global Warming of 1.5°C has been published in 2018. BC3 represented the research community in the presentation of the results of the report by a joint event with the Minister of Ecological Transition (Teresa Ribera), the Minister of Research and Competitiveness (Pedro Duque) and the Co-Chair of IPCC Prof. Thelma Krug in Madrid.

On top of that, the Scientific Director acted as Expert Advisor and Member of the Spanish Delegation at IPCC Plenary (Adoption of the 6AR outline), 5-9 September, Montreal 2018.

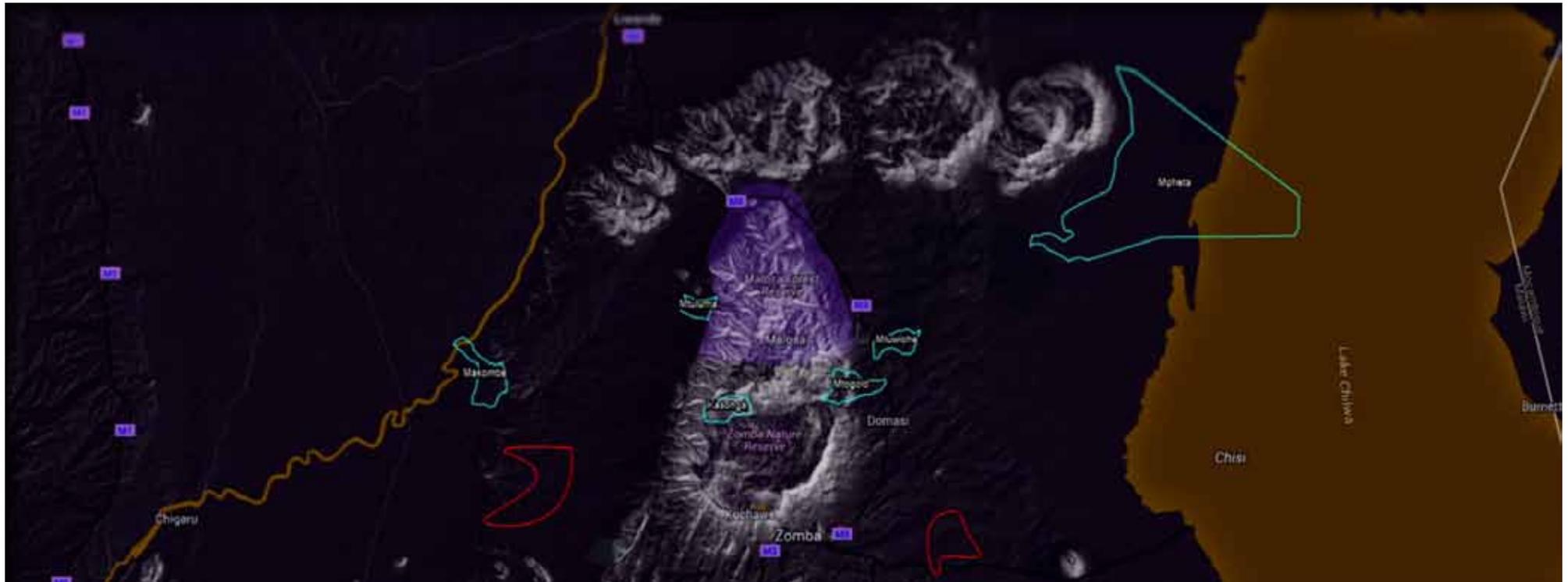


IPBES

BC3 is the research centre with largest representation at IPBES at Spanish Level (4 BC3 scientists).

Authorships: **IPBES Global Assessment** (Unai Pascual, Leading author of Chapter 1, and Ignacio Palomo contributed as Author Fellow), **IPBES Land degradation and Restoration Report** (David Moreno, Leading Author chapter 4) and, **IPBES Values Assessment** (Ignacio Palomo, Lead Author Chapter 3, Bosco Lliso contributed as Author-Fellow, and Unai Pascual acted as Co-Chair).

Unai Pascual is also member of the Multidisciplinary Expert Panel (MEP).

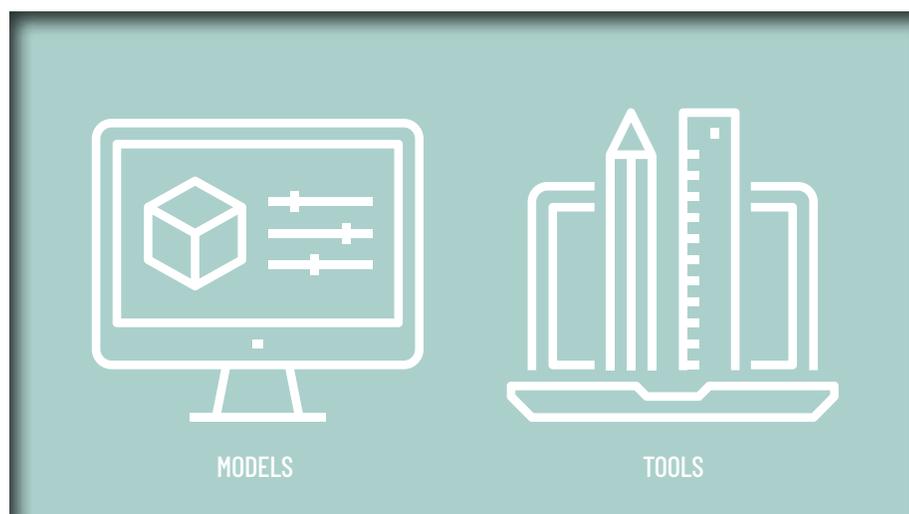


MODELS and TOOLS

BC3 continued developing models, methodologies and tools to contribute, among others, to science-based decision making.

These models and tools are targeted to a range of varied stakeholders and are aligned with BC3's 6 objectives. The focus and application of these models range from academia focused models, to policy solution-oriented models, or the ones produced to assess society's perception of climate change.

MODELS AND TOOLS



During 2018, 50 models and tools were updated or developed. Highlights:

■ TERRESTRIAL SYSTEMS MANAGEMENT-ORIENTED MODELS

- **RothC - GIS:** models for simulating SOC dynamics.
- **SIMSDAIRY:** simulates the effect of heat stress and climate change in animal welfare.
- **SIMSNIC:** assess to mitigated GHG emissions and promote soil C sinks in livestock and indirect sectors.
- **SIMSWASTE:** assess the effects of closed nutrient loops on agri-food system,(integrating agriculture, land use and waste management).
- **Keylink II:** Process-based soil biochemical model.
- **REDD+ Model:** Assess distribution of REDD+ funds impacts on deforestation and biodiversity.

■ HEALTH BENEFIT-ORIENTED MODELS AND TOOLS

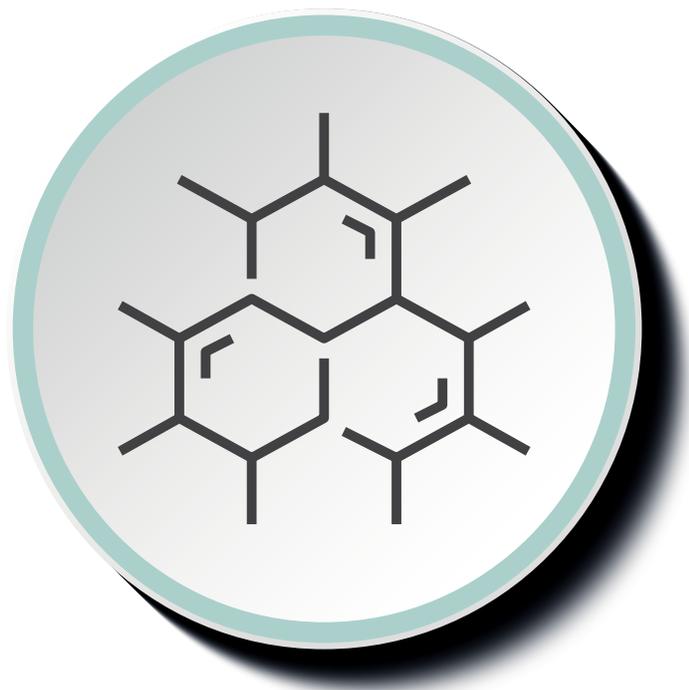
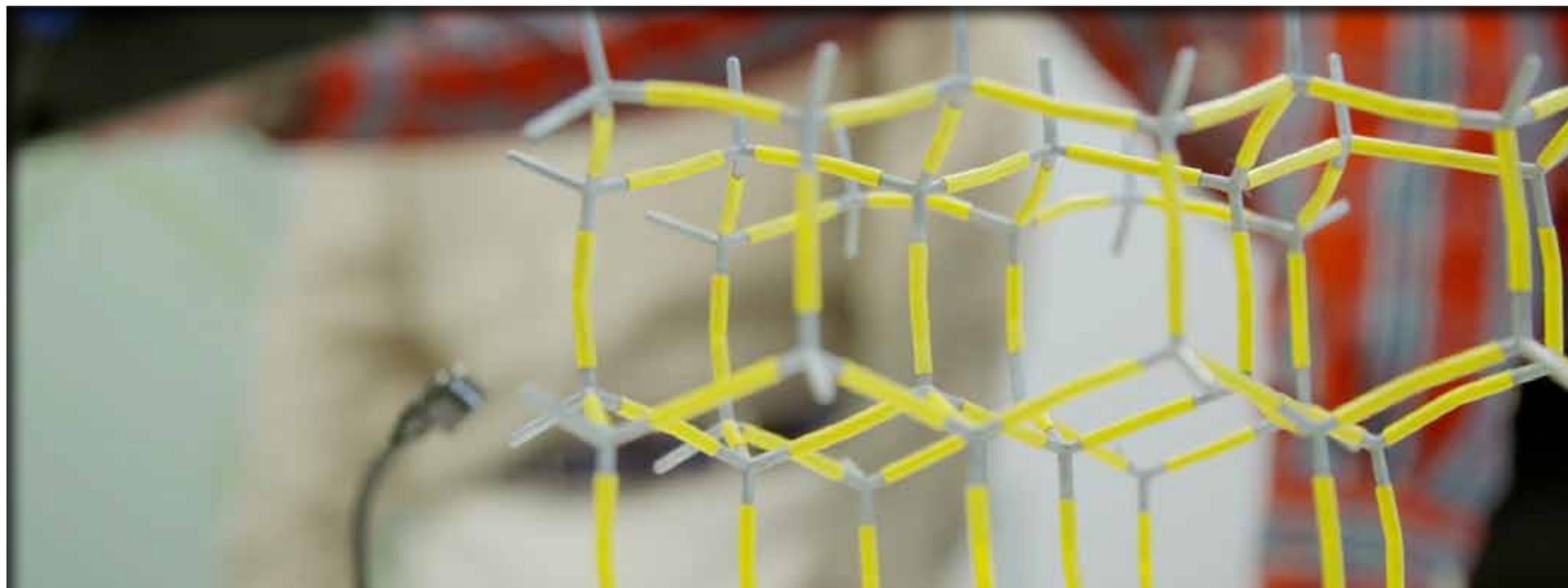
- FCM Map Applied to Madrid heatwaves.
- Model to assess heatwaves attributable mortality.
- eDPSEEA-based framework for green areas.
- Tool to model health benefits from exposure to green areas.

■ POLICY SOLUTION-ORIENTED GENERAL MODELS

- **DENIO:** Dynamic Econometric Input-Output model for Spain.
- **Delta-CGE** Computable General Equilibrium model for deltas.
- **DERIO Model:** implications of industrial, energy and environmental policies in the Basque Country.
- **GCAM-TM5-FASST.R:** air quality model.
- **Trade-SCAN:** support the analysis of the environmental and socio-economic consequences of international trade.
- **Adaptation Policy Checklist Tool:** to assess local and regional adaptation policies and plans to identify improvement areas.
- **Social-Ecological Integrated ARIES Model.**

■ PRESTIGIOUS ICE DYNAMICS MATHEMATICAL AND PHYSICAL MODELS

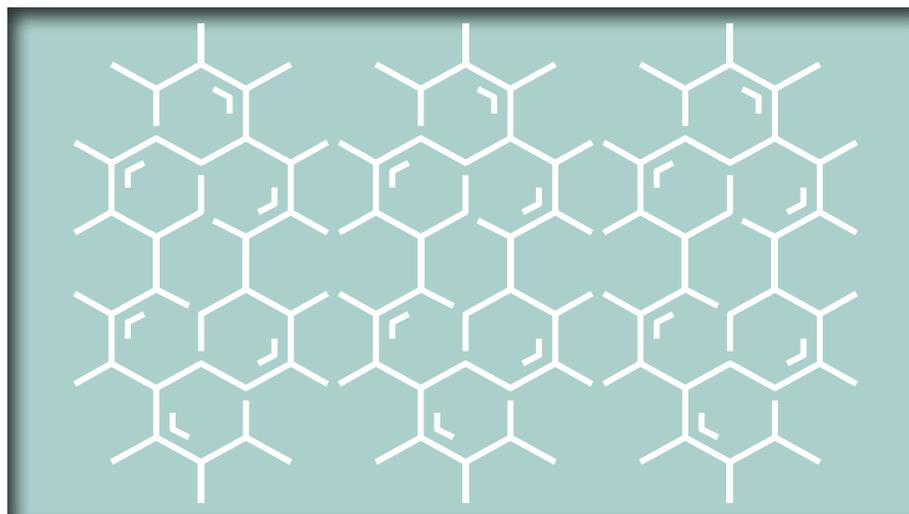
- Model of Iceberg Dynamics.
- Model of Polydisperse Granular Flow and Comminution.
- Model of Strain-Induced Anisotropy in the North East Greenland Ice Stream (NEGIS).
- Model of Visual Stratigraphy Formation in Polar Ice.



BC3 NETWORKS

BC3 was directly involved in **over 50** research and stakeholder networks, and has created, supported or led **9** networks to co-produce and share knowledge.

BC3 NETWORKS



Network Highlights:

■ ECOSOIL

- The Ministry of Science, Innovation and University awarded in 2018 a network of excellence to the "Biodiversity, trophic levels and ecological interactions in the soil system and its relationship to ecosystem functioning and services" network, led by Jorge Curiel.

■ URRN

- Urban Resilience Research Network: The aim of this network is to support researchers with different concerns, in dealing with the complexity of framing and operationalising urban resilience.

■ OTHER HIGHLIGHTED NETWORKS

- ARIES Network (IM partnership)
- GIGAKU TechnoPark Network
- REMEDIA Network
- MANURE Network

■ K.LAB JAPAN

- Network created in the framework of ARIES project, which aims to facilitate the training and use of the k.LAB software, developed by BC3 in Japan. BC3 supported the founder Prof. Kii Hayashi (Nagoya).

■ SHAIO

- Hispanic-American Input-Output Society has the aim of contributing to the promotion and dissemination of research into input-output analysis and other scientific and economic-related issues.

08

MEANS OF RESEARCH



RESEARCH PROJECTS

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 2018 the **43%** of the total funding came from international projects.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_TRANSRISK

NAME OF THE PROJECT: TRANSRISK "Transitions pathways and risk analysis for climate change mitigation and adaptation strategies"

FUNDING AGENCY: European Commission

FUNDING PROGRAM: Horizon 2020 research and innovations programme

CALL: Horizon 2020 H2020-SC5-3-2014

TIME FRAME: 2015-2018

STATUS: Completed

FUNDING: 799.331 €

PARTNERS:

Cambridge Econometrics Limited
 Stichting Energieonderzoek Centrum Nederland
 Fundacja Naukowa Instytut Badan Strukturalnych
 Eidgenoessische Technische Hochschule Zuerich
 Stichting Joint Implementation Network
 Stiftelsen The Stockholm Environment Institute
 Universitaet Graz
 University Of Piraeus Research Center
 National Technical University Of Athens - Ntua
 Pontificia Universidad Catolica De Chilertner

LINK WITH BC3's OBJECTIVES

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

KEY BC3 RESEARCHERS INVOLVED

Prof. Anil Markandya
 Dr. Mikel González
 Dr. Iñaki Arto
 Dr. Marc Neumann
 Dr. Cristina Pizarro
 Dirk Van De Ven
 Jon Sampedro

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 research and innovations programme under grant agreement N° 642260

URL ADDRESS

<http://transrisk-project.eu/>



PROJECT DESCRIPTION

Both the models concerning the future climate evolution and its impacts, as well as the models assessing the costs and benefits associated with different mitigation pathways face a high degree of uncertainty. There is an urgent need to not only understand the costs and risks associated with climate change but also the risks, uncertainties and co-effects related to different mitigation pathways as well as public acceptance (or lack thereof) of lowcarbon (technology) options.

The main aims and objectives of TRANSrisk therefore are to create a novel assessment framework for analysing costs and benefits of transition pathways, that will integrate well-established approaches to modelling the costs of resilient, low-carbon pathways with a wider interdisciplinary approach including risk assessments. In addition TRANSrisk aims to design a decision support tool that should help policy makers to better understand uncertainties and risks and enable them to include risk assessments into more robust policy design.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



JRC_TALES

NAME OF THE PROJECT: TALES "Tools and analyses of value chains, income and employment"

FUNDING AGENCY: European Commission -Joint Research Centre

FUNDING PROGRAM: Joint Research Centre - JRC Tender

CALL: EC_JRC_TALES

TIME FRAME: 2017-2018

STATUS: Completed

FUNDING: 99.972 €

LINK WITH BC3's OBJECTIVES

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

KEY BC3 RESEARCHERS INVOLVED

Dr. Iñaki Arto
Dr. Ignacio Cazcarro

ACKNOWLEDGEMENT

EUROPEAN COMMISSION- Joint Research Centre JRC. Technical specifications JRC/SVQ/2017/B.5/0015/NC Contractor's tender of Ref. Ares (2017) 3254628 - 29/06/2017

URL ADDRESS

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



PROJECT DESCRIPTION

The objectives of this project are:

OBJECTIVE 1:

Provide the JRC with a user-friendly code and graphical user interface (GUI) allowing the user to calculate and represent in the desired aggregation levels the domestic and foreign embodied employment and value added in bilateral gross exports using the WIOD (2016) database and other related labour statistics.

OBJECTIVE 2:

Produce one pocketbook with two volumes titled: "EU Exports: Effects on Employment and Income": the first volume would constitute the update of the publication "EU Exports to the World: Effects on Employment and Income" by using the new release of WIOD (2016); the second volume would consist of the same output but for Exports to the rest of the EU (Intra-EU effects). The publications will take necessarily the form of a pocketbook with the same format and contents as the published one for extra-EU trade (except for the gender dimension, which would be new in both cases).

RESEARCH PROJECTS: HIGHLIGHTS

Other International Funded Projects (Competitive Programmes)



FUTURE EARTH_EQUIVAL

NAME OF THE PROJECT: EQUIVAL "Nurturing a Shift towards EQUitable VALuation of Nature in the Anthropocene"

FUNDING AGENCY: Future Earth Program, Pegasus Grant by Colorado State University (USA)

CALL: Future Earth Program for Early-stage Grants Advancing Sustainability Science (PEGASuS). Future Earth Colorado Hub at Colorado State University, the University of Colorado Boulder, and the CSU Global Biodiversity Center

TIME FRAME: 2015-2019

STATUS: Active

FUNDING: 140.000€

PARTNERS:

Universidad Autónoma de México

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Dr. Unai Pascual

Dr. Noelia Zafra

URL ADDRESS

<https://www.bc3research.org/projects/equival.html>



PROJECT DESCRIPTION

In order to secure more ethical and more effective approaches for nature conservation, social equity needs to be integrated as a key aspect in environmental governance. This involves recognizing and creating transparent and participatory mechanisms that can explicitly include the voices of the diversity of stakes and worldviews about human-nature relations. This necessarily requires that valuation of biodiversity (a shorthand for nature or any biotic system as seen by modern science, or other knowledge systems) is also an equitable process. Equitable valuation requires: recognition of diversity of worldviews on human-nature relations, guaranteeing transparent participation of stakeholders, and being mindful of the distribution of benefits and burdens of valuation-based decisions. EQUIVAL provides the seed for a transdisciplinary (integration of multiple disciplines together with involvement of stakeholders) vision of the role of equity in the valuation of nature. It seeks to identify and analyze on-the ground cases with varying degrees and understandings of equitable valuation-led decision-making processes. By so doing it aims to demonstrate the impacts of equitable valuation on nature conservation, as well as the opportunities and challenges that equitable valuation faces under varying social-ecological conditions. EQUIVAL will select and document about 30 case studies from the Global South and come up with a set of robust indicators that can connect equity in valuation and the level of conservation effectiveness. EQUIVAL will establish a network of scientists, and other stakeholders, such as NGOs, end-users, including indigenous peoples, policy makers focused on nature conservation-poverty reduction nexus, across administrative scales and intergovernmental science-policy organizations such as the Intergovernmental Platform of Nature and Ecosystem Services (IPBES).

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_ISAGE

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

FUNDING AGENCY: European Commission

FUNDING PROGRAM: Horizon 2020 research and innovations programme

CALL: H2020-SFS-2015-2

TIME FRAME: 2016-2020

STATUS: Active

FUNDING: 474.259 €

PARTNERS:

Aristotle University of Thessaloniki (Coordinator) • Kentro Genetikis Beltiosis Zoon Neas Mesimvrias • LEVER S.A. Development Consultants LEVER • Agricultural Cooperative of Pieria Sheep and Goat Farmers • Agricultural Livestock Cooperative of Western Greece • Luke - National Resource Institute Finland • ProAgria Association of Rural Advisory Centers • Institut National de la Recherche Agronomique • L'Institut de l'Elevage • Capgenes • Comite National Brebis Laitieres • 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 • Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria • Agencia Estatal Consejo Superior de Investigaciones Cientificas • BC3 - Klima • Carnes Oviarogon SCL • CABRANDALUCIA Federacion Andaluza de Asociaciones de Ganado Caprino de Raza Pura • ASSAFE (ES); ARDIEKIN SL • Asociación Nacional de Criadores de Ganado Ovino Selecto de Raza Manchega • Asociacion Espanola 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 Ili Damizlik Koyun Keçi Yetistiricileri Birliđi • 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. Agustin del Prado
Guillermo Pardo

ACKNOWLEDGEMENT

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

URL ADDRESS

www.isage.eu



PROJECT DESCRIPTION

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

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_RESIN

NAME OF THE PROJECT: RESIN "Climate Resilient Cities and Infrastructures"

FUNDING AGENCY: European Commission

FUNDING PROGRAM: Horizon 2020 research and innovations programme

CALL: Horizon 2020- H2020-DRS-9-2014

TIME FRAME: 2015-2018

STATUS: Completed

FUNDING: 258.876 €

PARTNERS:

Netherlands Organisation for Applied Scientific Research (coordinator)

Fraunhofer IAIS

Tecnalia

ICLEI Europe

Standardisation Institute of the Netherlands (NEN)

Arcadis Nederland

ITTI Sp. z o.o.

Siemens Österreich

Siemens Deutschland

Uniresearch

The University of Manchester

Comenius University of Bratislava

Basque Centre for Climate Change

School of Engineering of the City of Paris (EIVP)

Greater Manchester

City of Bratislava

City of Bilbao

LINK WITH BC3's OBJECTIVES

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

Prof. Anil Markandya

Dr. Ibon Galarraga

Dr. Sebastien Foudi

Dr. Marta Olazabal

Ambika Markanday

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 research and innovations programme under grant agreement N° 653522

URL ADDRESS

<http://www.resin-cities.eu>



PROJECT DESCRIPTION

With most of its population and capital goods concentrated in urban areas, cities are key to the European economy. One of the major challenges cities face are more frequent extreme weather events due to climate change. The current diversity of approaches and methods available for cities developing an adaptation strategy limits the comparability between cities of vulnerabilities, adaptation options, infrastructures, etc., and, as a result, the resilience capability. The lack of standardized information to prioritize and select appropriate adaptation options restricts the exchange of experiences between cities. The objective of RESIN is to provide standardised methodologies for vulnerability assessments, performance evaluations of adaptation measures, and for decision support tools supporting the development of robust adaptation strategies tailored to the city. To this end, RESIN aims to create a common unifying framework that allows comparing strategies, results and identification of best practices by: Creating an urban typology that characterises European cities based on different socio-economic and biophysical variables. Delivering standardised methods for assessing climate change impacts, vulnerabilities, and risks; providing an inventory of adaptation measures and developing standardised methods to assess the performance of such adaptation measures. Collaborating closely with 4 'case cities' for practical applicability and reproducibility, and with European Standardisation organisations to ensure a systematic (standardised) implementation. Integrating findings in a coherent framework for the decision making process, with associated methods, tools and datasets. The consortium consists of 17 partners from 8 different European countries, experienced in urban resilience and climate change, and combining theory (knowledge institutes/universities) with practice (cities, consultancies, network organisation, standardisation institute).

RESEARCH PROJECTS: HIGHLIGHTS

Other International Funded Projects (Competitive Programmes)



AXA_CLIC

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

FUNDING AGENCY: Fundacion AXA

CALL: AXA_POSTDOCTORAL RESEARCH

FELLOWSHIP GRANTS 2017

TIME FRAME: 2018-2020

STATUS: Active

FUNDING: 130.000 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

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

ACKNOWLEDGEMENT

-

URL ADDRESS

<https://clic.bc3research.org>



PROJECT DESCRIPTION

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

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_AQUACROSS

NAME OF THE PROJECT: AQUACROSS "Knowledge, Assessment, and Management for AQUatic Biodiversity and Ecosystem Services aCROSS EU policies"

FUNDING AGENCY: European Commission

FUNDING PROGRAM: Horizon 2020 research and innovations programme

CALL: Horizon 2020-H2020-SC5-6-2014

TIME FRAME: 2015-2018

STATUS: Completed

FUNDING: 282.736 €

PARTNERS:

Ecologic Institute (Coordinator) • Leibniz Institute of Freshwater Ecology and Inland Fisheries (FVB-IGB) • Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO) • Stichting Dienst Landbouwkundig Onderzoek (IMARES) • Fundación IMDEA Agua (IMDEA) • University of Natural Resources & Life Sciences, Institute of Hydrobiology and Aquatic Ecosystem Management (BOKU) • Universidade de Aveiro (UAVR) • ACTeon – Innovation, Policy, Environment (ACTeon) • University of Liverpool (ULIV) • Royal Belgian Institute of Natural Sciences (RBINS) • University College Cork, National University of Ireland (UCC) • Stockholm University, Stockholm Resilience Centre (SU-SRC) • Danube Delta National Institute for Research & Development (INCDDD) • Eawag, the Swiss Federal Institute of Aquatic Science and Technology (Eawag) • International Union for Conservation of Nature (IUCN) • BC3 Basque Centre for Climate Change

LINK WITH BC3's OBJECTIVES

OBJECTIVE 5. Integrated modelling of coupled human-natural systems

KEY BC3 RESEARCHERS INVOLVED

Dr. Ferdinando Villa
Dr. Javier Martínez
Dr. Stefano Balbi
Dr. Marta Pascual

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 research and innovations programme under grant agreement N° 642317

URL ADDRESS

<http://aquacross.eu>



PROJECT DESCRIPTION

AQUACROSS seeks to expand current knowledge and foster the practical application of the ecosystem-based management (EBM) concept for all aquatic (freshwater, coastal, and marine) ecosystems (as a continuum) by contributing to the development of robust and cost-effective responses integrated management practices, and innovative business models addressing current and future changes in major drivers and pressures, integrated management practices, and innovative business models. It thereby provides an unprecedented effort for seeking synergies and overcoming barriers between policy objectives, concepts, knowledge, data streams, and management approaches for freshwater, coastal, and marine ecosystems to support the timely achievement of the targets set out by the EU 2020 Biodiversity Strategy and the Strategic Plan for Biodiversity (2012-2020) adopted at COP10 of the Convention on Biological Diversity (CBD). AQUACROSS has four key objectives:

- I. To support the coordinated implementation of the EU 2020 Biodiversity Strategy and international biodiversity targets for an improved functioning of aquatic ecosystems as a whole.
- II. To explore, advance and support the implementation of the Ecosystem-Based Management concept across aquatic ecosystems in the EU and beyond for the purpose to enhance human wellbeing.
- III. To specifically identify and test robust, cost-effective and innovative management and business models and tools for seizing all the opportunities offered by aquatic ecosystems services that correspond to the objectives and challenges faced by stakeholders, businesses, and policy makers.
- IV. To mobilize policy makers, businesses, and societal actors at global, EU, Member State, and case study levels in order to learn from real-world experiences with EU policy implementation and to co-build and test assessment frameworks, concepts, tools, management approaches, and business models, to ensure end-users' uptake of project results.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



INTERREG_ALICE

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

FUNDING AGENCY: Interreg Atlantic Area

FUNDING PROGRAM: Interreg Atlantic Area

CALL: Interreg Atlantic Area 2016

TIME FRAME: 2017-2020

STATUS: Active

FUNDING: 285.178 €

PARTNERS:

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

LINK WITH BC3's OBJECTIVES

OBJECTIVE 5. Integrated modelling of coupled human-natural systems

KEY BC3 RESEARCHERS INVOLVED

Dr. Ferdinando Villa (PI)
 Dr. Stefano Balbi
 Dr. Javier Martinez
 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

URL ADDRESS

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



PROJECT DESCRIPTION

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

RESEARCH PROJECTS: HIGHLIGHTS

Other International Funded Projects (Competitive Programmes)



CARIAA_DECCMA

NAME OF THE PROJECT: DECCMA "DEltas, vulnerability and Climate Change; Migration as an Adaptation"

FUNDING AGENCY: IDRC

FUNDING PROGRAM: Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA)

CALL: Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA)

TIME FRAME: 2014–2018

STATUS: Completed

FUNDING: 229.484 €

PARTNERS:

University of Southampton–Coordinator (United Kingdom)
 BC3, Basque Centre for Climate Change
 University of Dundee (United Kingdom)
 University of Exeter (United Kingdom)
 International Water Management Institute (Sri Lanka)
 Met Office Hadley Centre (United Kingdom)
 Plymouth Marine Labs (United Kingdom)
 UN Food and Agriculture Organisation (FAO) (Italy)

LINK WITH BC3's OBJECTIVES

OBJECTIVE 6. Promoting integrated interdisciplinary and transdisciplinary research

KEY BC3 RESEARCHERS INVOLVED

Prof. Anil Markandya
 Dr. Iñaki Arto
 Dr. Mikel González
 Dr. Ignacio Cazcarro

ACKNOWLEDGEMENT

URL ADDRESS

<http://www.bc3research.org/projects/deccma.html>



PROJECT DESCRIPTION

With their large and often poor populations in low-lying areas, deltas have long been seen as highly vulnerable to climate change and non-climate drivers with, in the most extreme, large-scale displacement of people being the result.

Migration is a complex process which is already occurring in all deltas, largely independent of climate change. Most research on deltas and migration tends to focus on individual system elements and issues rather than taking a systems-level perspective. This fails to consider the wider consequences of climate change and the interdependence between these phenomena and people's behaviour. In contrast to previous research, this programme of research will take a systemic and multi-scale analytical perspective to understand gendered vulnerability and adaptation in deltas under a changing climate by analysing four contrasting populous delta systems in South Asia and Africa where there is significant potential for migration.

The dual research aims are:

- To assess migration as an adaptation in deltaic environments with a changing climate.
- To deliver policy support to create the conditions for sustainable gender-sensitive adaptation.

RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)



MCIU_Retos15_CLIMAECON

NAME OF THE PROJECT: CLIMAECON "Políticas climáticas y transición a una economía baja en carbono"

FUNDING AGENCY: MINECO - Spanish Ministry for Economy and Competitiveness

FUNDING PROGRAM: MINECO-Retos

CALL: Programa Estatal de I+D+i Orientada a los Retos de la Sociedad 2015

TIME FRAME: 2016-2018

STATUS: Completed

FUNDING: 6.700 €

PARTNERS:

University of the Basque Country (UPV-EHU)

LINK WITH BC3's OBJECTIVES

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

KEY BC3 RESEARCHERS INVOLVED

Prof. Anil Markandya

Dr. Iñaki Arto

Dr. Mikel González

Dr. Luis M^a Abadie

Dr. Ignacio Cazcarro

Dr. Kishore Dhavala

ACKNOWLEDGEMENT

URL ADDRESS



PROJECT DESCRIPTION

The main objective of this research project is to contribute to the advancement of scientific knowledge to promote the reduction of carbon emissions and to promote the transition to a low carbon economy. This project is specifically aimed at acquiring new knowledge to advance the resolution of Challenge 5 ("Action on climate change and efficiency in the use of resources and raw materials") identified in the Spanish Strategy for Science and Technology and Innovation.

There is a growing scientific consensus that, if we are to avoid the potential adverse effects of climate change, carbon emission levels should be reduced globally by 50% by 2050. Achieving this objective without the economic and social well-being of each country, especially for the most vulnerable, is disadvantaged is not an easy task. In fact, this international and intergenerational dimension of climate change explains the difficulties encountered in the negotiations in the context of the United Nations Framework Convention on Climate Change. There is, therefore, a need to investigate different national and / or international strategies for reducing CO2 emissions. In this project we will analyze different key dimensions related to the design of climate policies to favor the transition towards a low carbon economy. For example, the importance of financial mechanisms for climate policy, the interaction between climate policy and international trade, or how to design climate policies that incorporate the risk and uncertainty inherent in climate change will be analyzed. We will also explore alternative ways to achieve mitigation objectives through changes at the macroeconomic level, technological changes and changes in consumption patterns, to foster the decoupling of economic growth and CO2 emissions. In addition, the economic impact (in terms of efficiency and equity) of different policies and instruments such as different types of fiscal reform, as well as the additional benefits in terms of local pollution and public health associated with some climate policies will be studied.

RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)



MCIU_Retos_IBERYCA

NAME OF THE PROJECT: IBERYCA "The role of plant-microbiota interactions in the resilience and collapse of Mediterranean forest of holm-oaks"

FUNDING AGENCY: MINECO – Spanish Ministry for Economy and Competitiveness

FUNDING PROGRAM: MINECO – Spanish Ministry for Economy and Competitiveness

CALL: Programa Estatal de I+D+i Orientada a los Retos de la Sociedad 2017

TIME FRAME: 2018-2020

STATUS: Active

FUNDING: 66.550 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Jorge Curiel

ACKNOWLEDGEMENT

Proyecto financiado por el Ministerio de Economía, Industria y Competitividad y la Agencia Estatal de Investigación con el nº exp: CGL2017-84723-P

URL ADDRESS

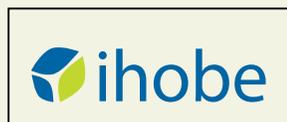
https://www.bc3research.org/projects/iberyca_ES

PROJECT DESCRIPTION

Despite being a species historically adapted to Mediterranean drought conditions, Holm-oak (*Q ilex* subsp *Baillota*) has shown clear signs of vulnerability in recent years reflected in an incipient process of defoliation and mortality. Given the urgent need to promote the conservation of this species of enormous ecological and socioeconomic importance in the Iberian Peninsula, it is a priority to improve our current understanding on the mechanisms and agents involved in health loss and vulnerability to extreme droughts and/or pathogenic attacks (eg *Phytophthora cinnamomi*). In this respect, the development of new "omics" has allowed to advance in the exploration of territories so far unexplored, such as the multifunctional role of the microbiota, the most diverse yet unknown ecosystem community, and its relation to physiological health. The project IBERYCA brings together an international and multidisciplinary team of experts (microbial ecologists, modelers, ecophysiologicals, phytopathologists and biogeochemists) that will use the latest generation of "omics" techniques (metabarcoding and metabolomics) to deepen the multifunctional role of the microbiota (Prokaryotes, archaeas and fungi) in the health of Holm-oaks and their resilience to the increasing incidence of, e.g. extreme summer droughts and/or pathogen attacks.

RESEARCH PROJECTS: HIGHLIGHTS

Basque Government and Other Basque Institutions (Competitive Programmes)



IHOBE_OASIS_KLIMATEK

NAME OF THE PROJECT: OASIS Project "Olas de calor e impactos sobre la salud humana" (Heatwaves and impacts of human health)

FUNDING AGENCY: IHOBE Sociedad Publica

CALL: KLIMATEK - Proyectos de Innovación y Demostración en Adaptación al Cambio Climático en Euskadi 2017-2018. IHOBE

TIME FRAME: 2017-2018

STATUS: Completed

FUNDING: 65.000 €

PARTNERS:

BC3, BASQUE CENTRE FOR CLIMATE CHANGE (coordinador)
Grupo de Investigación Atmosférica de la Universidad del País Vasco/ Euskal Herriko Unibertsitatea (GIAUPV/EHU). Escuela de Ingeniería de Bilbao a través de la Fundación Investigación Universidad Empresa / Jakintza Lanezko Ikerkuntzan Euskoiker (subcontratado)

LINK WITH BC3's OBJECTIVES

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

Dr. Maria José Sanz

Dr. Aline Chiabai

Dr. Silvestre García de Jalón

URL ADDRESS

<https://www.bc3research.org/projects/oasis.html>



PROJECT DESCRIPTION

Among the different impacts of climate change, in the Basque Autonomous Region it is expected that by the end of this century there will be a significant increase in both air and ocean temperatures, an annual reduction in precipitation and an increase in sea level (Basque Government, 2011).

In relation to temperature, increases of 1-3°C of the minimum temperature in winter and a 50% decrease in the number of days with minimum temperatures below 0°C are estimated (Gobierno Vasco, 2011). Significant increases in maximum temperatures are also expected, especially during the summer, which could reach 3°C by the end of the century. Specifically, it is estimated that the average maximum temperatures for the period 2071-2100 will approach 39°C, which is a difference of 4°C compared to the period 1978-2000. Consequently, an increase in the intensity, frequency and duration of heat waves is expected during this century.

Among other consequences, these changes in temperature can have effects on human health. On the one hand, milder winters would help reduce the peak winter mortality. On the other hand, it is estimated that the higher temperatures will contribute to the increase of certain infectious diseases, the propagation of vectors of them (such as mosquitoes or ticks), as well as the increase of certain diseases of food origin linked to the increase in temperature (for example, salmonellosis). In addition, heat waves can lead to an increase in heart disease and certain respiratory diseases such as asthma and rhinitis, which will mainly affect the most vulnerable segments of the population (the elderly and children) as well as those who already suffer from a disease of this type.

OASIS It is a pioneering study on heat waves and health in the Basque Country. This is the first study in the Basque Country that aims to analyze and characterize a wide range of atmospheric parameters associated with heat waves and other atmospheric agents that can cause health impacts (mortality or morbidity).

RESEARCH PROJECTS: HIGHLIGHTS

Basque Government and Other Basque Institutions (Competitive Programmes)



SEES

NAME OF THE PROJECT: SEES "The role of Social Equity in the Governance of Nature: A Social-Ecological approach"

FUNDING AGENCY: Basque Government: Proyectos de Investigación Básica y/o Aplicada

FUNDING PROGRAM: Eusko Jaurlaritza-Gobierno Vasco:Proyectos de Investigación Básica y/o Aplicada

CALL: PIBA 2015

TIME FRAME: 2015-2018

STATUS: Completed

FUNDING: 81.833 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Dr. Unai Pascual (IP)

Dr. Elena Ojea

Dr. Ferdinando Villa

Dr. David Moreno

Bosco Lliso

URL ADDRESS

https://www.bc3research.org/research_projects/climate_and_natural_environment_completed_projects/sees.html

PROJECT DESCRIPTION

SEES aims to contribute to the knowledge of the decision makers and agents involved in the conservation of nature regarding the interrelation between social equity and conservation from a socio-ecological point of view. The project is based on a vision of the conservation of nature from a socio-ecological point of view, not only from a biophysical perspective, as normally the instruments of conservation are analyzed. The general objective of the project is to empirically analyze the interrelationships between social equity, understood in a multi-dimensional way and the socio-ecological impacts of PES programs as new systems of governance of conservation. This objective arises from the limited conceptual and empirical emphasis of the ecosystem services framework adapted to the economy (eg Bateman et al., 2012), regarding the relationship between social equity and PES. The conceptual framework that has dealt with this issue from a socio-ecological point of view is based on the recent studies published by Pascual et al (2010) and Pascual et al (2014). This is the conceptual frame of reference for the present project, which in turn will be complemented with a new vision making explicit the role of power relations in PES programs, p. ex. the role of intermediaries between beneficiaries and providers of services, an element that has usually been overlooked in the PES literature (Muradian et al, 2010; Pascual et al., 2010).

RESEARCH PROJECTS: HIGHLIGHTS

Other Funding Agencies: Collaboration agreements and Contracts



ARARTEKO

NAME OF THE PROJECT: ARARTEKO Research Contract "Technical Report under demand on Energy Transition at the Basque Country"
FUNDING AGENCY: Ararteko
CALL: Contract
TIME FRAME: 2017-2018
STATUS: Completed
FUNDING: 17.500 €

LINK WITH BC3's OBJECTIVES

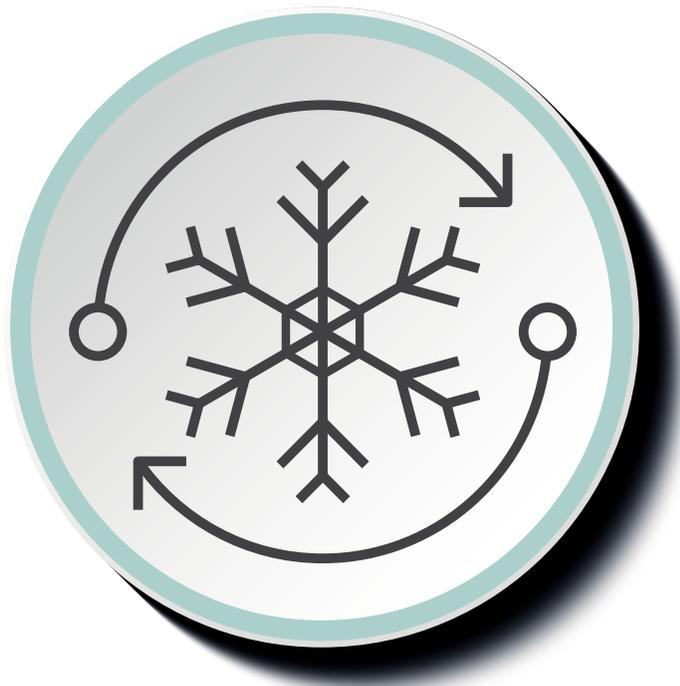
OBJECTIVE 2. Support decision making in the transition to a low carbon society

KEY BC3 RESEARCHERS INVOLVED

- Dr. Mikel González de Eguino
- Jon Sampedro
- Dr. Ibon Galarraga
- Dr. Cristina Pizarro
- Dr. Elisa Sainz de Murieta
- Dr. Maria José Sanz

PROJECT DESCRIPTION

Assessing energy transitions with the engagement of stakeholders. An innovative aspect of the research conducted to support decision making in the transition to a low carbon society 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 the last year we have been working together with stakeholders and policy makers from different institutions such as Ararteko. During 2018 we have worked together with the Ararteko (Basque Ombudsman) in a document that assesses the basic pillars of a sustainable energy transition in the Basque Country. For its preparation, a series of interviews and meetings have been held with a number of regional stakeholders. Based on this assessment, Manuel Lezertua, the Basque Onmbusman, prepared a set of recommendations that where presented in the Basque Parliament on the 25th of October of 2018. The results of the collaboration were published in a special report of the Ararteko (La transición energética del País Vasco hacia un modelo sostenible Informe extraordinario de la institución del Ararteko al Parlamento Vasco, 2018).



BC3 New Scientific Infrastructure: **IZOTZALAB**

BC3 is expanding its current facilities and scientific infrastructures. Specific laboratories needed for research projects and for training purposes are being developed. In this sense, BC3's own infrastructure **Izotzab** was built in 2018.

A UNIQUE APPROACH TO LOW-TEMPERATURE RESEARCH

IZOTZALAB



IZOTZALAB

The IzotzaLab is BC3's low-temperature laboratory for testing and analysing the physics and chemistry of cold samples and prototypes, including ice, snow, permafrost, microorganisms, porous polymers, liquid crystals, mecatronic components, etc. It is a unique laboratory in the Iberian Peninsula for low-temperature science and technology.

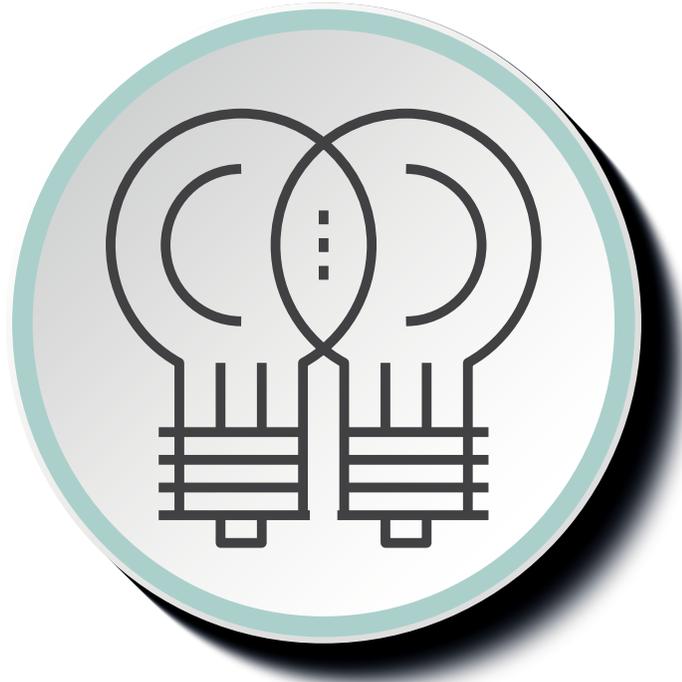
The facilities of the IzotzaLab are set up to operate at freezing temperatures down to -30°C . All tests and experiments can be carried out inside its state-of-the-art cold room, which features a wide variety of analytical instruments and data ports, offering full remote control through an exterior computer, mobile device, or the network.

PROJECTS

- **Projects CORaHE**
CORaHE - Design and construction of an X-Y-Z-motorized head to perform deep-UV Raman measurements at microscopic level in cold environments from -5 to -30°C .
- **PaleoICE**
PaleoICE - "Is the current period the warmest of the last millennia? Evidence from the ice Pyrenees glacier".
- **TGU-GIGAKU**
TGU-GIGAKU - Top Global University Project: The GIGAKU Education Program for Innovative Global Engineers.

PARTNERS

- Nagaoka University of Technology (NUT), Japan.
- National Institute of Polar Research (NIPR), Japan.
- Instituto Pirenaico de Ecología (IPE), Spain.
- University of the Basque Country (UPV/EHU), Spain.
- ProbTech Innovations S.L., Spain.
- University of Baltistan (UOBS), Pakistan.



BC3 COLLABORATORS

During 2018 BC3 continued strengthening and expanding its national and international relationships with many leading research institutions worldwide.

A wide network of international, national and local collaborators, as a key pillar of its Strategy Plan 2018-2021.

OVER 300 ACTIVE COLLABORATORS DURING 2018

09

**TRAINING,
DISSEMINATION
AND CAPACITY
BUILDING**



TRAINING ACTIVITIES CONDUCTED

During 2018 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

Supervised PhD Students

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Eñaut Izagirre	Sérgio H. Faria	University of the Basque Country	Evolution of glaciers and glacial lakes in response to climate change in the Cordillera Darwin Icefield, Tierra del Fuego.
Freddy Eliseo Michel Portugal	Sérgio H. Faria	University of the Basque Country	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
Gonzalo Morcillo	Sérgio H. Faria	University of the Basque Country	Statistical analysis of climate and paleoclimate records
Itxaso Ruiz	Sérgio H. Faria	University of the Basque Country	Modelling of public opinion and awareness of climate change
Nicolás González	Sérgio H. Faria	University of the Basque Country	Estudio comparativo de la formación del hielo de los Pirineos, Antártida y Groenlandia, así como de su evolución estructural
Dirk Jan Van de Ven	Mikel González Iñaki Arto	University of the Basque Country	Integrated Assessment and behavioural options for mitigation
Jon Sampedro	Mikel González Iñaki Arto	University of the Basque Country	Integrated Assessment and the co-benefits of mitigation
Sofia Ávila	Alevgul Sorman	Universidad Autónoma de Barcelona	Social and Biophysical Dimensions of Clean Electricity Production
Aitor Andonegi	Eneko Garmendia Agustín del Prado	University of the Basque Country	Análisis y evaluación integral de sistemas de pastoreo de ovejas lecheras: propuesta de escenarios y herramientas de gestión
Alberto González	Ignacio Palomo	Universidad Autónoma de Madrid	Planificación socio-ecológica del territorio en Madrid
Asma Jebari	Agustín del Prado	Universitat de Lleida	Cuantificación del secuestro de carbono en la ganadería ligada a los pastos del País Vasco
Asun Rodríguez	David Moreno	University of the Basque Country	Recuperación de la estabilidad de las redes de interacción en bosques templados tras impactos causados por la minería desde la edad media
Bosco Lliso	Unai Pascual	University of Osnabrueck	Trade offs between effectiveness and equity in Payments for Ecosystem Services
Daniel Garcia	Jorge Curiel Yuste	Universidad Autónoma de Madrid	Effect of the holm-oak die-off on the taxonomy and functioning of soil microbial communities
Javier Moreno	Ignacio Palomo	University Pablo de Olavide	Incorporating complexity into ecosystem services governance
Juanita Aldana	Ignacio Palomo	Universidad Autónoma de Madrid	Towards social-ecological planning of the Barranquilla Metropolitan Area (Colombia): integrating biodiversity and ecosystem services for human well-being
Karlos Mas (Lorra)	Agustín del Prado	University of the Basque Country	Assessing the sustainability of dairy cattle production systems in Karrantza region (approximate title, PhD in progress)

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Noelia Saavedra Berlanga	Teresa Gimeno	Swedish Agricultural University	Characterizing and quantifying the important trees play in the boreal hydrological cycle
Omar Flores	Jorge Curiel Yuste	Universidad Autónoma de Madrid	Modelling the effects of climate and forest die-off over soil carbon dynamics in Mediterranean holm-oak (<i>Quercus ilex</i> L.) forests
Alessandro Silvestri	Sebastien Foudi (Before I. Galarraga)	University of the Basque Country	On energy efficiency
Alina Tepes	Ibon Galarraga	University of the Basque Country	Implications of uncertainties for adaptation decision making in the agriculture sector
Ambika Markanday	Ibon Galarraga	University of the Basque Country	On economics of adaptation
Elena Lopez	Ibon Galarraga	University of the Basque Country	On energy efficiency
Estibaliz Sainz	Aline Chiabai	Universidad Internacional de Cataluña (UIC)	Mainstreaming of climate change adaptation in urban planning
Iratxe Rubio Benito del Valle	Elena Ojea	University of Vigo	New insights into industrial fisheries: adaptation to climate change from an interdisciplinary point of view
Laetitia Pettinotti	Anil Markandya	University of the Basque Country	Economics of Ecosystem Services
Mari Mar Solá	Ibon Galarraga	University of the Basque Country	On energy efficiency
Pablo Martinez	Aline Chiabai	University of the Basque Country	Desarrollo de herramientas para evaluar los efectos de las medidas de adaptación al cambio climático
Fengzhi He	Simone Langhans	Free University Berlin	Diversity and risk patterns of freshwater megafauna: a global perspective
Martin Friedrichs	Simone Langhans	Free University Berlin	Uncertainties in species distribution models: effects of spatial and temporal scales on future predictions
Michele Zen	Stefano Balbi	Ca' Foscari University	Development of agent-based approaches to integrate supply and demand of selected ecosystem services, within the Local Action Group Alto Bellunese, Eastern Alps

TRAINING ACTIVITIES CONDUCTED

Supervised Master Students

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Alfonso Tascon Yugueros	Noelia Zafra-Calvo	University of Copenhagen	Climate change adaptation, protected areas and social equity: a systematic review
Ion Fernández Salaberria	Mikel Gonzalez-Eguino and Xaquín García-Muros	University of the Basque Country	Evolución de la pobreza energética durante la última recesión económica
Ander Aranceta	Silvestre García Jalón, Aline Chiabai	University of the Basque Country	Evaluación de la contribución de los parques públicos a la salud
Andrea Giralt	Cristina Pizarro	University of the Basque Country	An option analysis of the Spanish renewable energy support mechanisms
David Lizaso San Martín	David Moreno Mateos	University of the Basque Country	Datación de hayas recuperadas en una mina medieval en Navarra
Guillermo Asens Casado	David Moreno Mateos	University of the Basque Country	Análisis del nivel de recuperación de la comunidad ectomicorrícica del hayedo de las minas de hierro de Artikutza (Navarra)
Estibaliz Treviño Gil-García	Elisa Sainz de Murieta	University of the Basque Country	Valoración económica de los servicios de los ecosistemas para la gestión sostenible de la reserva de la biosfera de Urdaibai: impactos y adaptación al cambio climático
Sébastien Huclin	Dirk-Jan Van de Ven and Mikel González	Université Paris-Sud	How to improve the representations of storage and backup as a support for the integration of wind and solar energy?

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Laura Clavé	Teresa Gimeno	INRA-Bordeaux	Fractionnement isotopique lors du prélèvement d'eau par les racines: expérience contrôlée avec <i>Fagus sylvatica</i> L. (Testing for isotopic fractionation during root water uptake on <i>Fagus sylvatica</i> L. under controlled conditions)
Alejandro Rodríguez-Zúñiga	Mikel González-Eguino e Iñaki Arto	Tecnun, University of Navarra	Electrificación de las flotas de vehículos de la Administración Pública en Euskadi
Sandra El Debal Duque	Iñaki Arto	Universidad de Cantabria	Exposición de la economía vasca a una transición hacia una economía baja en carbono
Amaia Alberdi Elola	Guillermo Pardo Nieva	University of the Basque Country	Comparación de diferentes tipos de explotaciones de ovino Latxo mediante el Análisis de Ciclo de Vida
Giulia Gadani	Ibon Galarraga Gallastegui	University of Ferrara (Italy)	Non-state climate policies: the case of sub-national governments
Victor Alfonso Rivera Meza	Ainhoa Magrach	Universidad Veracruzana	Influencia de la urbanización en interacciones mutualistas del bosque mesófilo de montaña Xalapa, Veracruz.

TRAINING ACTIVITIES CONDUCTED

Courses given in Postgraduate Courses

TYPE OF COURSE	NAME OF THE COURSE	MAIN ORGANIZER	BC3 RESEARCHERS
Master course	Clase invitada ("Course on environmental & economic top-down and bottom up link with GIS") en el curso del Máster Universitario en Economía "Medio ambiente, crecimiento y ecología industrial" (código 61339).	University of Zaragoza	Ignacio Cazcarro
Master course	Problemas y Políticas Medioambientales en la Globalización	Universidad Autónoma de Santo Domingo	Xaquín García-Muros
Master course	Master en Gestión y Restauración de Ecosistemas Seminario: Recuperar la complejidad para restaurar ecosistemas	Universidad de Alicante	David Moreno Mateos
Master course	Modélisation du fonctionnement des peuplements végétaux	Université de Bordeaux	Teresa E. Gimeno
Master course	Processes and references in restoration	Universidad de Alcalá (Madrid)	David Moreno Mateos
Master course	Course on Fuzzy Cognitive Mapping and Course on Climate Change and the city	International University of Catalonia	Marta Olazabal
Master course	Course: Sostenibilidad, Cambio Climático y ciudad.	Mondragon Unibertsitatea	Marta Olazabal
Master course	Heatwaves and impacts on human health, in the 13th International Postgraduate Course "Research in Marine Environment and Resources" - RiMER (Erasmus Mundus Masters Course 2013-2019 EUROPEAN MSc	Plentzia PIE-UPV/EHU	Aline Chiabai

TYPE OF COURSE	NAME OF THE COURSE	MAIN ORGANIZER	BC3 RESEARCHERS
Master course	International Postgraduate Course "Research in Marine Environment and Resources (RiMER18)"	University of the Basque Country UPV/EHU	Aline Chiabai Ibon Galarraga Elisa Sainz de Murieta
Master course	Urban resilience to Climate change	Universidad Pablo Olavide	Marta Olazabal
Advanced course	III Summer School Tatiana de Guzman el Bueno. Una nueva estrategia de agricultura, clima y medio ambiente "Herramientas de mitigación y adaptación al cambio climático para la sostenibilidad de la agricultura española en la futura PAC post 2020"	UIMP	María José Sanz
Advanced course	Incentivos a la conservación de páramos	Instituto de Investigación de Recursos Biológicos Alexander von Humboldt	Bosco Lliso
Advanced course	iSAGE Summer School	CIHEAM	Agustín del Prado Guillermo Pardo

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.

TRAINING ACTIVITIES CONDUCTED

Courses Organized by BC3



9th EDITION OF THE BC3-UPV/EHU SUMMER SCHOOL: Climate risk and the future of international climate policy

4TH 6TH OF JULY, 2018 IN BIZKAIA ARETOA (BILBAO)

Directors of the School:

Dr. S.H. Faria (BC3), Dr. Ibon Galarraga (BC3) and Dr. Marta Escapa (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.

60 Students were enrolled in the 9th edition of the School. As in its previous editions, the structure of the 2018 edition of the BC3 –EHU/UPV Summer School followed that of the General Meetings of IPCC (Intergovernmental Panel for Climate Change): three sessions focused on broad themes roughly related to those of the three IPCC Working Groups. Accordingly, the session themes were (1) climate science, (2) climate change impacts and adaptation, and (3) the role of energy in the mitigation of climate change.

SPRING UNIVERSITY ON ECOSYSTEM SERVICES MODELING

8TH - 12TH OCTOBER 2018 (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. Between 8 and 12 October, the International Spring University (ISU) was held in Bilbao, the annual international meeting organised by BC3 to explore ecosystem modelling in greater depth. This 2018 edition included the collaboration of the Novia Salcedo Foundation and the Basque Ecodesign Hub from Iñobe and was attended by 25 experts.

TRAINING ACTIVITIES CONDUCTED

Other Courses organized by BC3



ADVANCED COURSE: Greenhouse gas assessment and mitigation in agriculture: concepts, methods and simulation tools

12TH - 16TH MARCH, 2018 (ZARAGOZA)

Coordinator of the course:
Dr. Agustin del Prado (BC3)

The course was jointly organized by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), through the Mediterranean Agronomic Institute of Zaragoza (IAMZ), the International Center for Agricultural Research in the Dry Areas (ICARDA-CGIAR) and Red Remedia (Scientific network for greenhouse gas mitigation in the agroforestry sector).



DISSEMINATION AND CAPACITY BUILDING

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Dissemination in Scientific Meetings



Participation in national and international congresses, conferences or summits.

BC3 research body disseminated in 2018 the main research findings, methodologies and best practices in key international Climate Change scientific meetings and forums.

Highlights

SCIENTIFIC MEETING	TOWN	CONTRIBUTION TITLE
15th Congress of the International Society for Ecological Economics	Puebla, Mexico	Authoritarian Developmentalism in Turkey from Social Metabolism's Vantage Point & The Triple Point of Energy Transitions: Stakeholder Perceptions, Policy Mixes and The Climate Change and Energy Transition Law in Spain
69th Annual Meeting of the European Federation of Animal Science	Dubrovnik, Croatia	Implications of climate change on small ruminant systems in Europe
Adaptation Futures 2018 (AF18)	Cape Town, South Africa	Special Session 22I: Finance and nature for change: grasping opportunities in transformative adaptation and disaster risk management for positive social and environmental impact. Chair.
AGU Fall Meeting	Washington, DC, USA	A Continuous 100 Thousand-year Stalagmite δ18O Record from the Yucatan Peninsula: Implications for Caribbean Hydroclimate on Orbital and Millennial Timescales. M. Hill*, M.A. Medina-Elizalde, S.J. Burns, J. M. Polanco-Martínez, D. McGee, M. DeCesare, C.-Y
BES Annual Meeting	Birmingham, UK	Evaluating how plant-pollinator network structure affects plant reproductive success
Biodiversity Symposium	Montreal, Canada	Social network structure as a frontier for agriculture sustainability? An example from Navarre (Spain)
Colloque Q11 sur le Quaternaire	Oreleans, France	Western Mediterranean vegetation and climate re- sponse to a warmer world: Insights from early Pleistocene Marine Isotope Stage 3I. D. Oliveira*, M.F. Sánchez Goñi, F. Naughton, J.M. Polanco-Martínez, et al.
Conference of Parties on Climate Change	Katowice, Poland	why non-STATE ACTION MATTERS? Setting the ground
XIII Congreso de la Asociación Española de Economía Energética	Zaragoza, Spain	The Potential Land-use Impacts from Solar Energy
EGU General Assembly 2018	Vienna, Austria	Microstructure in EastGRIP
Eleventh Annual Meeting of the IAMC 2018	Sevilla, Spain	Identifying optimal subsidy portfolios to simultaneously achieve SDG 3 (health), 7 (energy access) and 13 (climate action) in Eastern Africa
European Geosciences Union (EGU) General Assembly	Viena, Austria	Alterations of C allocation patterns associated with climate-change induced vegetation die-off: effect over soil pools, soil biodiversity and functions and controls of soil respiration

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Seminars



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 2018 we organized 21 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.

SEMINAR	DATE	LECTURER	INSTITUTION OF THE LECTURER	POSITION
The limits of valuing ecosystem services and the search for alternative ways of conceiving human-nature relations	31/01/2018	Roldan Muradian	Universidade Federal Fluminense	Professor
Academic Writing	28/02/2018	Erik Dietzenbacher	University of Groningen - The Netherlands	Professor
Global Value Chain Analysis	01/03/2018	Erik Dietzenbacher	University of Groningen - The Netherlands	Professor
Environmental futures studies of urban mobility and energy solutions – experiences from Swedish policy work and engineering education	22/03/2018	Katarina Larsen	KTH Royal Institute of technology, Division of History of Science, Technology and Environment, Stockholm, Sweden	
The expanding geography of wind power conflicts: Debating scale, control and distribution at the low-carbon transition	22/03/2018	Sofia Avila-Calero	Institute of Environmental Science and Technology (ICTA), Autonomous University of Barcelona (UAB)	PhD candidate
Revisiting changing energyscapes of coal: Opportunities for engaged social science of energy	22/03/2018	Ethemcan Turhan	KTH Environmental Humanities Lab, Division of History of Science, Technology and Environment, Stockholm, Sweden	
Exploring national survey data to quantify household dependence on ecosystem services	07/04/2018	Oridilwe Selomane	Stockholm Resilience Centre	Postdoctoral Researcher
Key plant above ground and belowground mutualisms and ecosystem dynamics	03/05/2018	Susana Rodriguez	Centre for Functional Ecology – University of Coimbra (Portugal)	Researcher
Linking bottom-up and top-down energy modeling in the framework of EIO analysis	08/05/2018	Kurt Kratena	CESAR (Centre of Economic Scenario. Analysis and Research)	Professor

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Seminars



SEMINAR	DATE	LECTURER	INSTITUTION OF THE LECTURER	POSITION
Climate change in the courts: litigation as a governance mechanism?	05/06/2018	Joana Setzer	Grantham Research Institute on Climate Change and the Environment	Researcher Officer
What's happening to the bees? Integrating causes and consequences of bee declines	13/06/2018	Ignasi Bartomeus	Estación Biológica de Doñana (EBD-CSIC)	Researcher
Credible, effective and publicly acceptable policies to decarbonise the European Union	03/07/2018	Maria D. Calvalho	Grantham Research Institute on Climate Change and the Environment	Postdoctoral Researcher
Plural values of nature - the means determine the end	10/07/2018	Sander Jacobs	Research group Nature and Society, Institute for Nature and Forest Research INBO	Researcher
What is the future of the Paramos in a warmer world?	06/09/2018	Eloisa Lasso	Universidad de los Andes (Bogotá, Colombia)	Professor
Centre for Environmental and Resource Economics	11/09/2018	Mattias Vesterberg	Researcher	Researcher
Cambio climático e impacto antrópico en el registro arqueo-paleontológico del Cuaternario	13/09/2018	Maria Jose Iriarte	Ikerbasque Professor - University of the Basque Country UPV/EHU	Ikerbasque Professor
Green Public Procurement and Organic Food Policy in Sweden - responses of the public and the private sector and possible implications thereof	26/09/2018	Hanna Lindström	PhD Student	Researcher
Long-term Patterns of Continuity and Change in Climate Adaptation: Three Centuries of Droughts in a Municipality of the Barcelona Province (NE Spain)	24/10/2018	Mar Grau Satorras	Universitat Oberta de Catalunya, Urban Transformation Lab (IN3)	Postdoctoral Researcher
The Energy efficiency gap - insights from behavioural economics	08/11/2018	Eleanor Denny	Bachelor of Arts (BA) in Economics and Mathematics from University College Dublin (UCD)	Professor
Education as a global tool for adaptation and mitigation of Climate Change	12/11/2018	Camilo Ruiz Méndez	Departamento de Didáctica de las CCNN e Instituto de Física Teórica y Matemáticas de la Universidad de Salamanca	Professor
Physical adequacy of a power generation system: The case of Spain in the long term	05/12/2018	Jose Manuel Chamorro	University of the Basque Country UPV/EHU	Professor

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Organization of Scientific Events



During 2018 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

3RD EXPERT WORKSHOP ON LESSONS LEARNED FROM ACCURACY ASSESSMENTS IN THE CONTEXT OF REDD+:
Uncertainties of emission factors and biomass maps

12 -14 OF FEBRUARY 2018, (BC3) BILBAO

Workshop Sponsored by BC3, Center for International Forest Research (CIFOR), European Space Agency (ESA), GFOI R&D Coordination component, GFCF-GOLD Land Cover Office, US Silvacarbon Program, Wageningen University and World Bank FCPF.

The overall aim was to provide improved guidance on accuracy assessments in the context of REDD+. In particular, the workshop provided guidance to practitioners to meet the IPCC good practice criteria related to bias and uncertainty in estimates of emissions factors.

EUSKAMPUS WORKSHOP

19TH OF NOVEMBER, (BC3), BILBAO

Biodiversity, ecological functioning, resilience and human impact of conventional and emerging contaminants on health under climate change.

RENEWABLE ENERGIES AND THE ENERGY TRANSITION IN SPAIN 2030-2050

23RD OF APRIL, MADRID

Workshop organized by the BC3, the Spanish Association of Energy Economics (AEEE) and the Spanish Club of Energy (Enerclub).

The event was organized as a part of the H2020 European project TRANSrisk, led in BC3 by Mikel González-Eguino, with participation of international, European and National actors regarding renewable energies and energy transition.

Experts from the energy and climate change sector discussed **the key factors for the development of renewable energies in Spain.**

- **Jose Blanco**, head of the Renewables Directive in the European Parliament.
- **Valvanera Ulargui**, director of the Spanish Office of Climatic Change.
- **Dolf Gielen** and **Luis Janeiro** of the International Renewable Energy Agency (IRENA).
- **Miguel Antoñanzas**, vice president of the Spanish Energy Club (Enerclub) and president of Viesgo.

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

BC3 Visiting and Guest Programme

Visitors: Some Highlights

NAME	VISIT MONTH	INSTITUTION	POSITION
Odirilwe Selomane	April 2018	Stockholm Resilience Centre	Postdoctoral Researcher
Kurt Kratena	May 2018	CESAR (Centre of Economic Scenario Analysis and Research)	Director
Susana Rodriguez	May 2018	Universidade de Coimbra	Researcher
Joana Setzer, PhD	June 2018	Grantham Research Institute, LSE	Research Officer
Maria Carvalho	July 2018	Grantham Research Institute on Climate Change and the Environment	Policy Analyst
Sander Jacobs	May- August 2018	Institute for Nature and Forest (INBO)	Scientific Researcher
Eloisa Lasso de Santis	June- October 2018	Universidad de los Andes (Bogotá, Colombia)	Associate Professor

The dissemination of BC3 main results and findings, were done also through the exchange of knowledge with relevant researchers that participated in the 2018 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.

47
GUEST
RESEARCHERS
HOSTED

77%
INTERNATIONAL
VISITORS

17
COUNTRIES
CONNECTED THROUGH
THE PROGRAMME

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Open Access: Strategy



In 2018 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 Working Papers series and BC3 Policy Briefings in a public repository that is interconnected with **OPENAIRE** in a way that optimizes the visibility of the BC3 publications series. Besides that, BC3 made Open Access a significant percentage of scientific articles.

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**KNOWLEDGE
CO-PRODUCTION
AND TRANSFER**



FOR POLICY-MAKING

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.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING



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

During 2018, BC3 reinforced 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 2018 played an active role contributing and engaging with actors, directly addressing policy-makers at the highest possible levels as well as developing capacity building activities and supporting policy making process with a range of tools and activities conducted to this end.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to key actors in 2018: 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 2018, BC3 has reinforced its collaboration with UNFCCC (United Nations Framework Convention on Climate Change). The conducted actions in 2018 were:

- 1 BC3 advised UNFCCC Secretariat on the Technical Assessment process of the REDD+ Reference Levels.
- 2 BC3 supported the Minister of Ecological Transition the Ministerial Consultations on Transparency (as member of the Spanish official delegation at COP24).
- 3 UNFCCC accepted the BC3 submission, on Modalities for implementation of outcomes of the five in-session workshops on issues related to agriculture and other future topics, submitted to the Subsidiary Body for Scientific and Technological Advice (SBSTA) by BC3.
- 4 UNFCCC selected BC3 to organize a Side Event (as leading institution) in the Official Programme at the annual Conference of the Parties (COP)24, Katowice. COP 24 - Side Event: "Implementation on non-state climate policies and targets".

BC3 advised **UNFCCC Secretariat** on the Technical Assessment process of the REDD+ Reference Levels. The secretariat supports a complex architecture of bodies that serve to advance the implementation of the Convention, the Kyoto Protocol and the Paris Agreement.

BC3 made a submission to the to the Subsidiary Body for Scientific and Technological Advice (SBSTA) on Koronivia Joint Program on Agriculture. BC3 as expert observer of UNFCCC, offered the centre's opinion and views on the mentioned programme, and the UNFCCC accepted the submission was made it available to the negotiators (open access by its website).

The UNFCCC selected BC3 to organize a **Side Event** (as leading institution) in the Official Programme at the annual Conference of the Parties (COP) 24, Katowice. COP 24 - Side Event: "Implementation on non-state climate policies and targets". One

of the relevant contributions to the EU policy making process is taking part in the UNFCCC Side Events. These were established as a platform for observer organizations to highlight diverse climate change issues at UNFCCC conferences, and are a vital component of the UNFCCC sessions, as they provide opportunities for information dissemination, capacity building, policy discussions and a way to legitimize global governance. The side-event addressing the implementation of climate policies and targets by non-state actors was **organized and led by BC3**, as UNFCCC Observer, in collaboration with the Centre For Research on Energy and Environmental Economics and Policy (IEFE) of Bocconi University Milan and the Foundation for Gaia. The theme addressed during this High Level Policy oriented meeting was: Regional governments, cities, businesses, non-governmental organisations and others are progressively committing to ambitious climate targets and policies, both in adaptation and mitigation.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to key actors in 2018: Highlights

Results of the BC3 scientific evidence-based policy support co-production 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 "Economic, environmental and social effects of globalisation".



European Commission

BC3 provided scientific evidence-based policy support co-producing an analysis of the "Economic, environmental and social effects of globalization". The contribution was conducted 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 "Economic, environmental and social effects of globalisation" through the participation in the project TALES, "Tools and analyses of value chains, income and employment" and EU-TiVA. Key results produced were: Quantification of the socio-economic implications of EU trade. A software (Trade-SCAN toolkit) for the analysis of environmental and socioeconomic consequences of trade. Publication of a pocketbook with two volumes. These outputs were released during the EU trade Policy day and were introduced by the Commissioner for Trade Cecilia Malmström and the results of this project have been quoted by key policy-makers including the President of the European Commission, Jean-Claude Juncker.

- Arto, I., Rueda-Cantuche, J.M., Cazcarro, I., Amores, A.F., Dietzenbacher, E. Román, M. V. and Kutlina-Dimitrova, Z. 2018. **EU exports to the World: Effects on Income**. Luxembourg. Publications Office of the European Union. ISBN 978-92-79-93280-9.
- Arto, I., Rueda-Cantuche, J.M., Cazcarro, I., Amores, A.F., Dietzenbacher, E. Román, M. V. and Kutlina-Dimitrova, Z. 2018. **EU exports to the World: Effects on Employment**. Luxembourg. Publications Office of the European Union. ISBN 978-92-79-93284-7.

Other highlights of key institutions and panels through which BC3 has conducted its policy oriented contributions during 2018 were: Contribution to the European Commission Horizon 2020 Advisory Group for Societal Challenge 5 'Climate Action, Environment, Resource Efficiency and Raw Materials' (E02924) 2018-2020. Anil Markandya was Advisory Board Member. The advice provided contributes to a broader policy context: to the Europe 2020 Strategy, the innovation Union, and to other relevant EU policies. This group assists the Commission in the preparation of legislative proposals and policy initiatives. Participation in the European Commission EIP-AGRI Focus Group "Reducing emissions from cattle farming", Agustin del Prado was Selected member of the European Commission focus group member on Livestock and GHG emissions. The agricultural European Innovation Partnership (EIP-AGRI) that works to foster competitive and sustainable farming and forestry that 'achieves more and better from less'. Participation in the Scientific Advisory Board Member (Maria Jose Sanz) of the H2020 "Action for climate, environment, efficiency of resources and raw materials" NAAID, co-chairing the Advisory Board "Connecting Climate Knowledge for Europe" (JPI Climate) a pan-European intergovernmental initiative gathering European countries to jointly coordinate climate research and fund new transnational research initiatives that provide useful climate knowledge and services for post-COP21, or chairing (Unai Pascual) the Scientific Advisory Committee of Joint Programming Initiative. Natural Assets Knowledge Action Network (Future Earth), that brings science on natural assets into decision makers for sustainability transformations.

EU EXPORTS
TO THE WORLD:
EFFECTS ON
INCOME



EU EXPORTS
TO THE WORLD:
EFFECTS ON
EMPLOYMENT



DEVELOPMENT OF **TRADE-SCAN (V.1.0) SOFTWARE**, TO SUPPORT THE ANALYSIS OF THE ENVIRONMENTAL AND SOCIO-ECONOMIC CONSEQUENCES OF INTERNATIONAL TRADE

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to key actors in 2018: Highlights

MINISTRY FOR THE ECOLOGICAL TRANSITION OF THE SPANISH GOVERNMENT (MITECO)

BC3 has been in charge of the evaluation of the economic impact assessment of the Spanish National Energy and Climate Plan 2021-2030, a document that all Member States of the European Union had to submit to the European Commission.



BC3 has been in charge of the evaluation of the economic impact assessment of the Spanish Climate and Energy Integrated Plan for 2021-2030, conducted by the Ministry for the Ecological Transition of the Spanish Government.

This document, submitted to the European Commission, is the master plan of the low-carbon transition for the Spanish economy for the next decade.

Development BC3 model DENIO : Dynamic Econometric National Input-Output model for Spain. 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 during 2018.

NATIONAL, REGIONAL AND LOCAL GOVERNMENTS

During 2018, 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.

National governments: Highlights

SPANISH GOVERNMENT

BC3 has pursued to establish regular collaborations with the Spanish Government, Spanish Office of Climate Change, Basque Government and local Governance Bodies as well as other National and Regional Governments worldwide. In 2018, BC3 collaborated with the **Ministry for the Ecological Transition of the Spanish Government (MITECO)**. BC3 has been in charge of the evaluation of the economic impact assessment of the Spanish National Energy and Climate Plan 2021-2030, a document that all Member States of the European Union had to submit to the European Commission. This document is the master plan of the low-carbon transition for the Spanish economy for the next decade and in its elaborations BC3 has worked together with many institutions such as the Spanish Climate Change Office or the Institute for the Diversification and Saving of Energy (IDAE), among others. Our economic evaluations, such as the implication in terms of investments, green jobs or co-benefits in terms of health have been quoted by key policy-makers, including the President of Spain, Pedro Sánchez.

Model developed by BC3: DENIO Model: Dynamic Econometric National Input-Output model for Spain (v.1.0_PNIEC). DENIO is a new-Keynesian dynamic econometric model and represents a hybrid between an econometric input-output model and a computable general equilibrium (CGE) model. It is a disaggregated model with a breakdown of 74 sectors, 88 products, 22,000 types of households and 16 categories of consumption and allows analyzing the economic and environmental impacts of different scenarios and policies. This version of the model 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 during 2018.

OTHER NATIONAL GOVERNMENTS

BC3 also offered scientific advice and training to other national governments. One highlight is the contribution done to ISPRA (Italian Institute for Environmental Protection and Research). Application in Study of Natural Capital Accounting for the Italian Ministry of the Environment and Training and advisory service on artificial intelligent modelling for ecosystems services assessment based on Aries software. Results will be presented at the Parliament in 2019.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to key actors in 2018: Highlights



Regional Governments: Highlights

BASQUE OMBUDSMAN (Ararteko)

At Basque Country scale, during 2018, BC3 made science-based contributions to multiple stakeholders. One highlight is the contribution done to the Basque Ombudsman (Ararteko). During 2018, we have worked together with the Ararteko (Basque Ombudsman) in a document that assesses the basic pillars of a sustainable energy transition in the Basque Country. For its preparation, a series of interviews and meetings have been held with a number of regional stakeholders. Based on this assessment, Manuel Lezertua, the Basque Ombudsman, prepared a set of recommendations that were presented in the Basque Parliament on the 25th of October of 2018. The results of the collaboration were published in a special report of the Ararteko (La transición energética del País Vasco hacia un modelo sostenible Informe extraordinario de la institución del Ararteko al Parlamento Vasco, 2018).

Another example of the scientific evidence-based policy support conducted by BC3, is the capacity building activity BC3 carried out, jointly with the Environment Department of the Basque Country, focused on training the Basque Government technical staff on climate change issues. This contribution is one of the main activities deployed in the Klima 2050 Strategy for the fulfillment of the specific actions proposed in Goal 9: **Responsible, exemplary Public Administration and reference in climate change**. *Knowledge co-production* of several aspects of climate change were addressed under the different research lines, while using participatory methodologies was tested through a project oriented to the **Integration of the Cross-Cutting Issue Climate Change in the Public Administration Training Plan**.

OTHER REGIONAL GOVERNMENTS

Other regional Governments BC3 contributed to were: Consejería de Economía y Competitividad y Agricultura, Medioambiente y Cambio Climático de la Comunidad Valenciana, Regional Government of CUTGANNA (Catania, Italy) or Nagoya Prefecture (Japan).

HIGHLIGHT: NETWORKS OF REGIONAL GOVERNMENTS

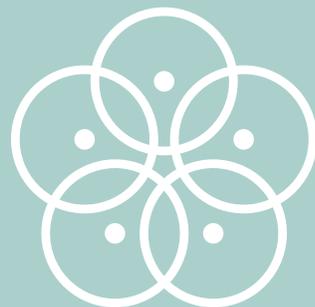
BC3 has supported the regional governments successfully providing decision making support BC3 tools (Regions Adapt). An **adaptation tracking tool** was developed and it has been adopted by the Regions Adapt initiative, a global network to inspire and support regional governments to take concrete action, collaborate and report efforts on climate change adaptation. This tool is now being used by leading regions (application in Jalisco and Rio de Janeiro regions (testing this tool)) and will provide substantial amount of data for future analysis. RegionsAdapt's Secretariat has partnered with the Basque Centre for Climate Change (BC3) to offer a new phase of commitments to their members based on solid and innovative scientific contributions.

LOCAL GOVERNMENTS

BC3 made contributions to the following local governments: City Hall of San Sebastian (Foro Donostia, where BC3 is member of its Expert Advisory Board), City of Bilbao (during 2018 the BC3 has finalized the project RESIN on city Adaptation, a project that has been developed under the close cooperation of the city of Bilbao). Other contributions were made to the city of Durban (metropolitan area), CSIR (South Africa), and in the case studies of research projects CLIC and Procesa. and in the case studies of projects Clic and Procesa.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to other Socio-Economic actors in 2018: Highlights



OTHER SOCIO-ECONOMIC ACTORS

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

IBERDROLA

Collaboration with Iberdrola: During 2018 we prepared 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 renewables in Spain. The report will be presented in 2019 in Madrid and Bilbao.

BBK Foundation

Collaboration with BBK Foundation: Collaboration Agreement between UPV/EHU, BBK Foundation and BC3 within the framework of the Low Carbon Program. In 2018, 3 master theses were supported by this agreement, and a report on green growth has been produced.

Foundations

Other relevant contributions were conducted with an Axa Foundation grant and a Leonardo grant from the BBVA Foundation, among others.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Activities, Supporting Information and Tools Produced



Science-Policy Interface

BC3 supported policy making through activities, information and tools produced in 2018.

2

BC3 POLICY BRIEFINGS
RELEVANT SCIENCE-BASED,
SOLUTION-ORIENTED BC3
DOCUMENTS PRODUCED

27

METHODOLOGIES AND TOOLS
PRODUCED TO SUPPORT
SCIENCE-BASED DECISION
MAKING FOR TARGETED
STAKEHOLDERS

3

TRAINING AND
CAPACITY BUILDING
COURSES TARGETED
AT POLICY MAKING

16

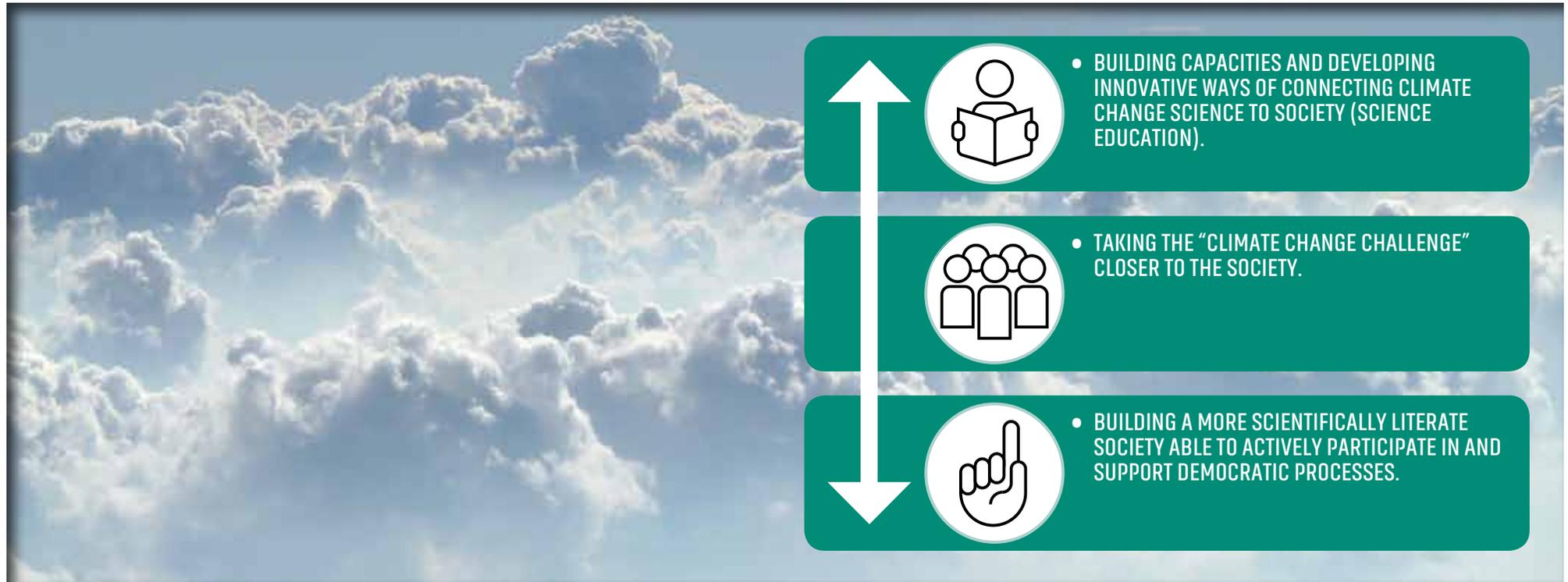
CAPACITY BUILDING
EVENTS ORGANIZED

5

BC3 PROMOTED
NETWORKS TO SUPPORT
POLICY MAKING PROCESS

46

HIGH-LEVEL
POLICY ORIENTED
MEETINGS HELD



FOR SOCIETY

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 SOCIETY

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR SOCIETY

Activities, Supporting Information and Tools Produced



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 2018 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 2018 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> Twitter: [#trainingcaravan](https://twitter.com/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 2018, BC3 developed climate change knowledge transfer activity to high School faculty and stakeholders connected through Agenda21 Crosscutting programme.

Lanaldi programme

BC3 also contributed to Education programmes by participating in two sessions of Lanaldi. The initiative gives to the students a new perspective of the importance of education and formation, and in this particular case the importance of Climate Change and and academic research, providing some possible paths for them to follow in the future.

10

SCIENCE EDUCATION TALKS GIVEN AT HIGH SCHOOL CLASSROOMS TO OVER 500 STUDENTS

1

KNOWLEDGE TRANSFER ACTIVITY ORGANIZED TARGETED AT SCIENCE EDUCATION TO BASQUE COUNTRY HIGH SCHOOL FACULTY (INGURUGELA PROGRAMME)

50

STUDENT VISITS HOSTED AT BC3 (LANALDI PROGRAMME)

1

ACTIVE PARTICIPATION IN THE WORKSHOP: 100XCENCIA IN THE FRAMEWORK OF BC3 SCIENCE EDUCATION PROGRAMME

5

CONTRIBUTIONS TO INSPIRA STEAM PROGRAMME

+600

ATTENDEES TO BC3 SCIENCE EDUCATION PROGRAMME ACTIVITIES

KNOWLEDGE TRANSFER FOR SOCIETY

Mass and Social Media



BC3 IN THE MEDIA



Interviews in TV	5
Interviews in Press/magazines	78
Interviews in Radio	26
Interviews in Digital Media	48
Website Traffic	174.409 visits
Social media Activity	658 tweets

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 and innovation activities. In this sense, we promoted our communication activity to citizens based on a comprehensive stakeholder analysis.

As a result of active press and social media management, 157 interviews and media appearances were obtained during the year 2018. This activity jointly with the dissemination activity conducted by the centre has enabled BC3 to increase its visibility within society as a whole. BC3 is regularly consulted by different media as an expert adviser in climate change. In this regard, we had significant presence in national and international communication media. Its final objective is therefore to bridge science with policy-making and 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. **Science with and for society.**

11

SET OF INDICATORS (BERC INDICATORS)

SET OF INDICATORS

BERC Indicators

PUBLICATIONS (Production)

● Total number of publications published in the given year	130
● Number of articles published in the given year	88
● Number of Books and Chapters published in the given year	23
● 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	2

PUBLICATIONS (Impact Factor)

● % of Indexed articles in Quartile 1	86,67%
● % of Indexed articles in Decile 1	65,33%
● Citation number in the given year	2673
● H index	40

TRAINING

● PhD - Supervised students	31
● Master - Supervised students	14
● BC3 courses organized	3

KNOWLEDGE TRANSFER

● Dissemination in Scientific events	131
● Number of BC3 seminars	21
● Number of Dissemination events organized	37

OUTREACH AND SOCIAL MEDIA

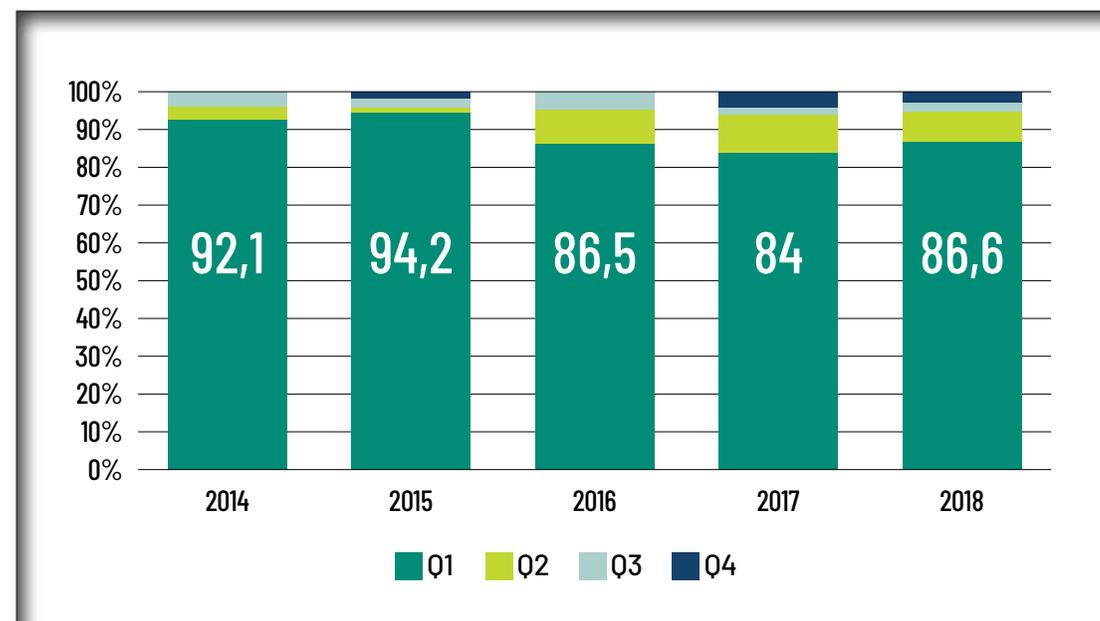
● Interviews in TV	5
● Interviews in press/magazines	78
● Interviews in radio	26
● Interviews in digital media	48
● Website traffic	174.409 visits

FUNDING

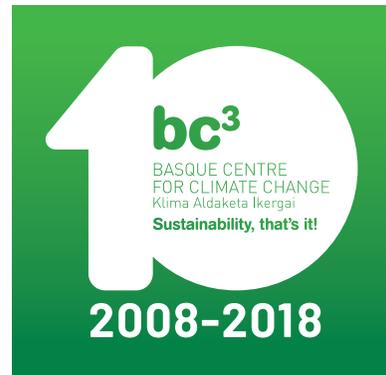
● Total budget	3.860.903€
● % of Funding (non BERC)	70%

PEOPLE

● Total BC3 Team	58
● Number of researchers	52
● Number of administration staff	6
● Number of guest researchers	47

INDEXED JOURNAL ARTICLES 2014-2018
BY QUARTILE DISTRIBUTION (%)

Sustainability, that's it!





bc³

BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

Sustainability, that's it!

Sede Building 1, 1st floor
Scientific Campus of the
University of the Basque Country
48940 Leioa (Spain)
www.bc3research.org
Telephone: 00 34 94 401 46 90
@BC3Research

