

# Ecology, Evolution and Environmental Change in Insular Contexts

- The Azores show the way

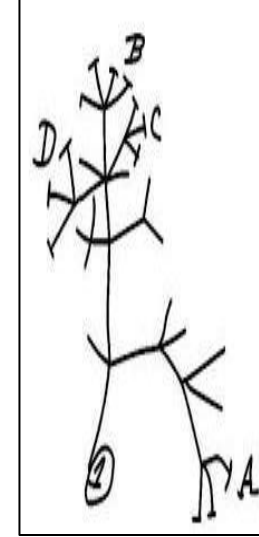
## Paulo A. V. Borges



PVB



JT



PVB

Societal dilemmas

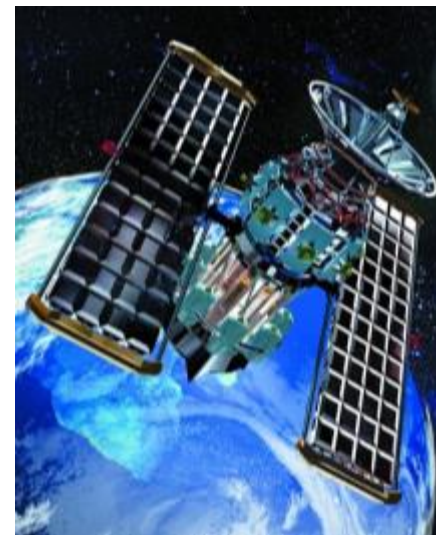
Public



Political



Scientific



PR5



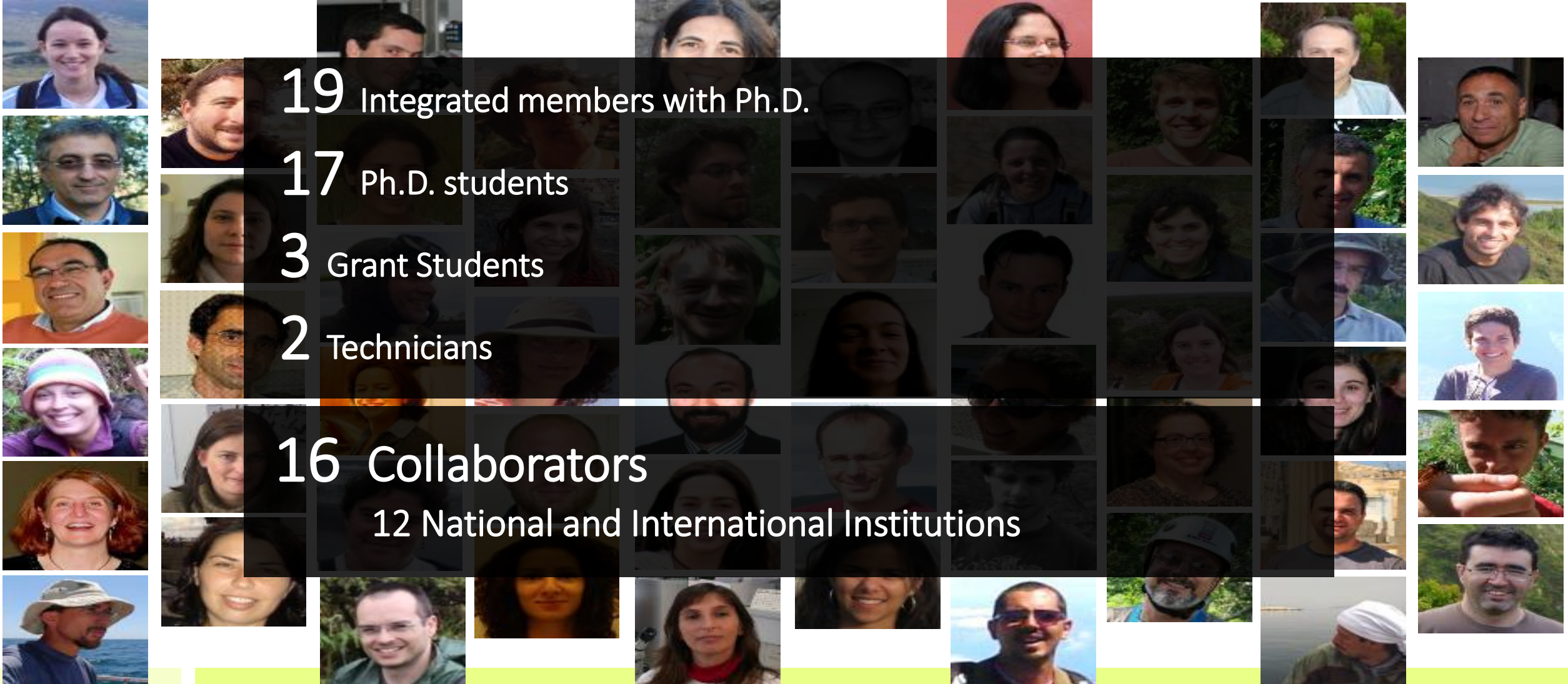
grupo de biodiversidade  $\alpha\beta\gamma$  dos açores  
<http://www.angra.uac.pt/gba>

# Azorean Biodiversity Group





# Azorean Biodiversity Group



**19** Integrated members with Ph.D.

**17** Ph.D. students

**3** Grant Students

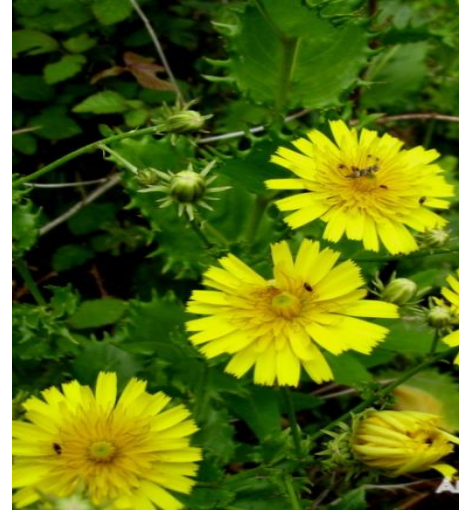
**2** Technicians

**16** Collaborators

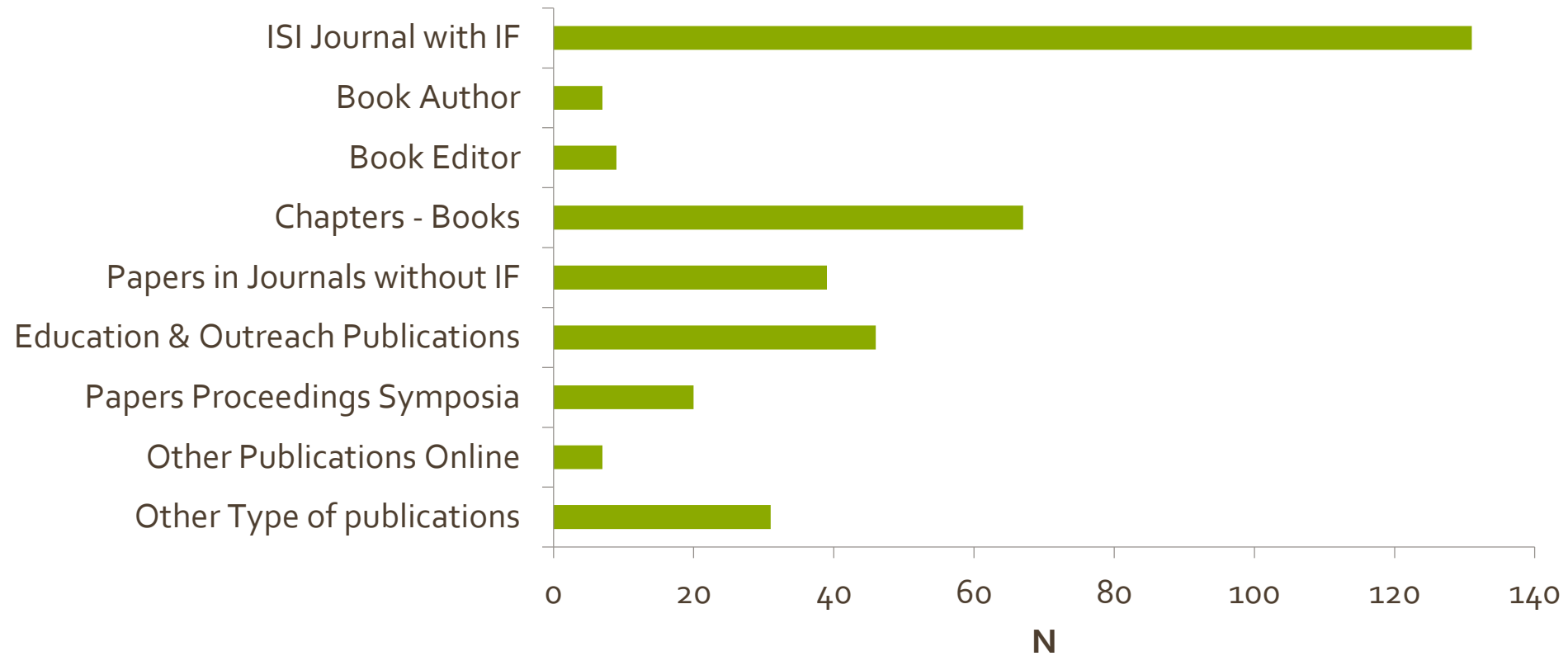
12 National and International Institutions



# We study a wide range of taxonomic groups



# RESEARCH IN THE PERIOD 2008-2013





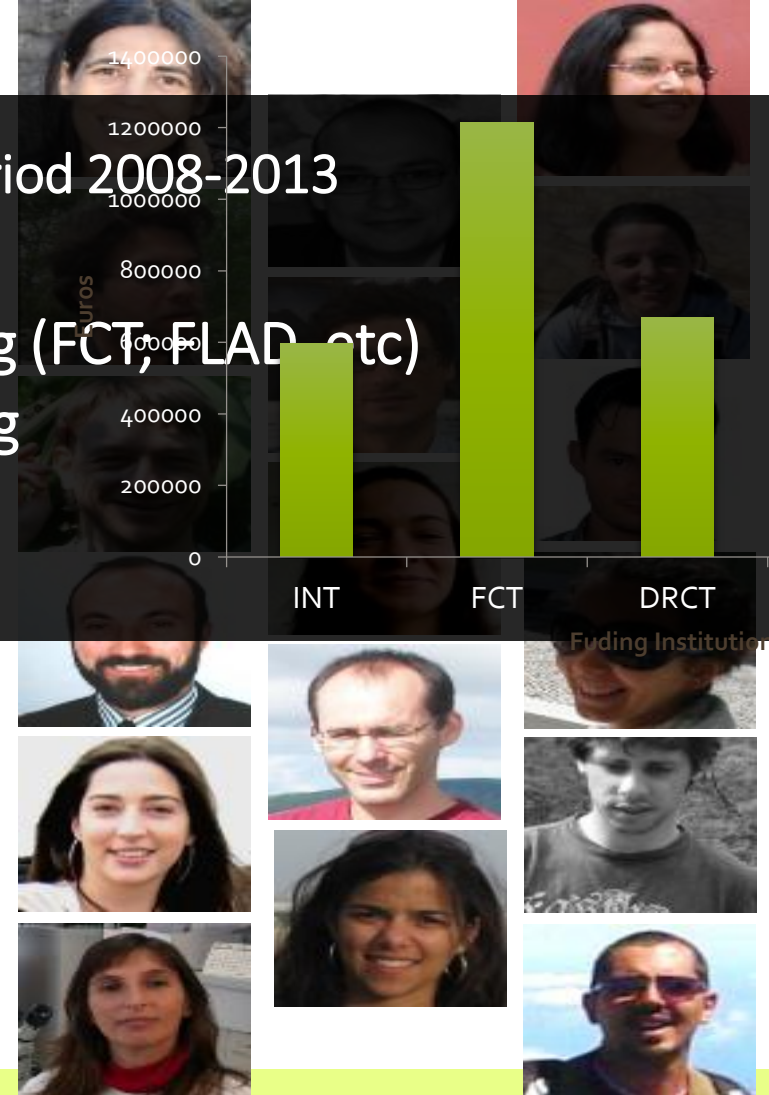
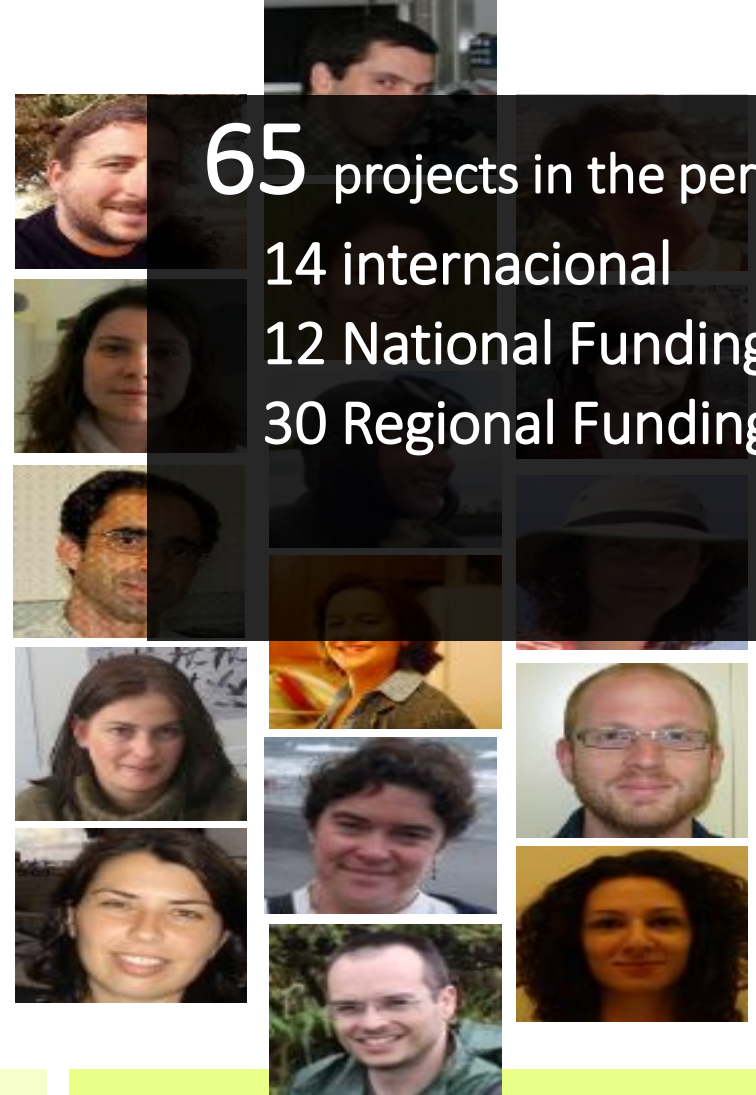
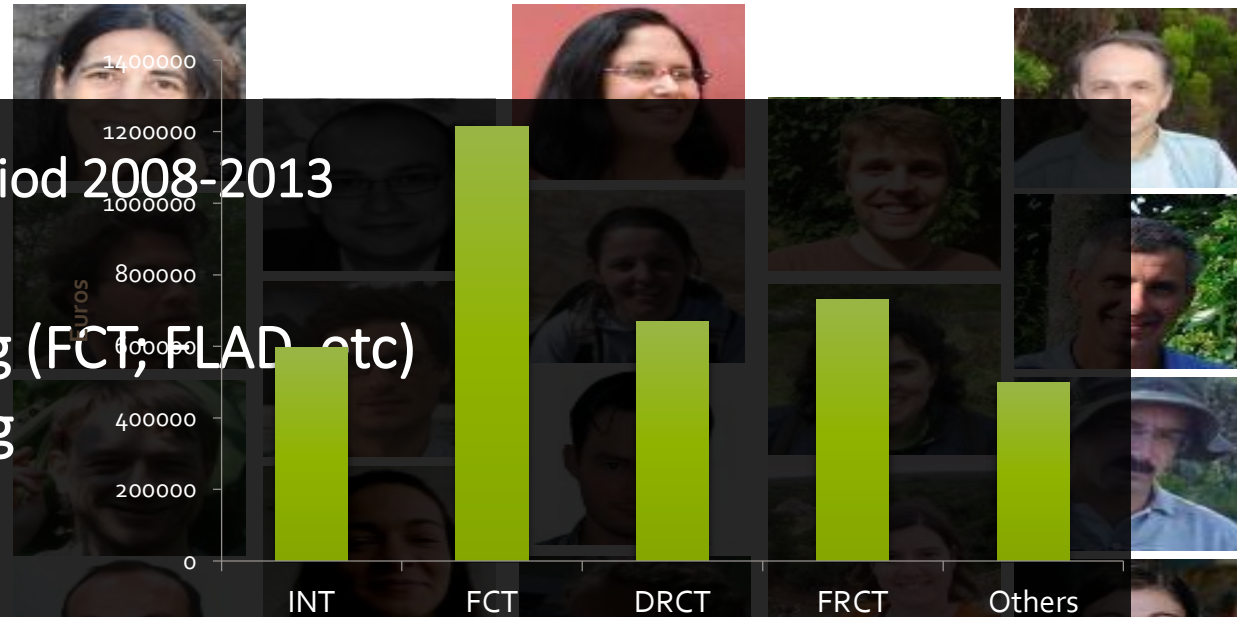
# Azorean Biodiversity Group

65 projects in the period 2008-2013

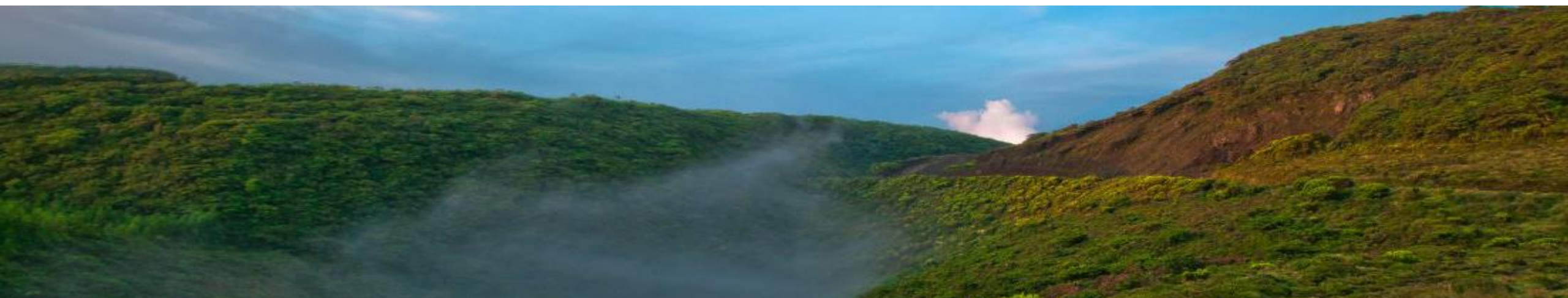
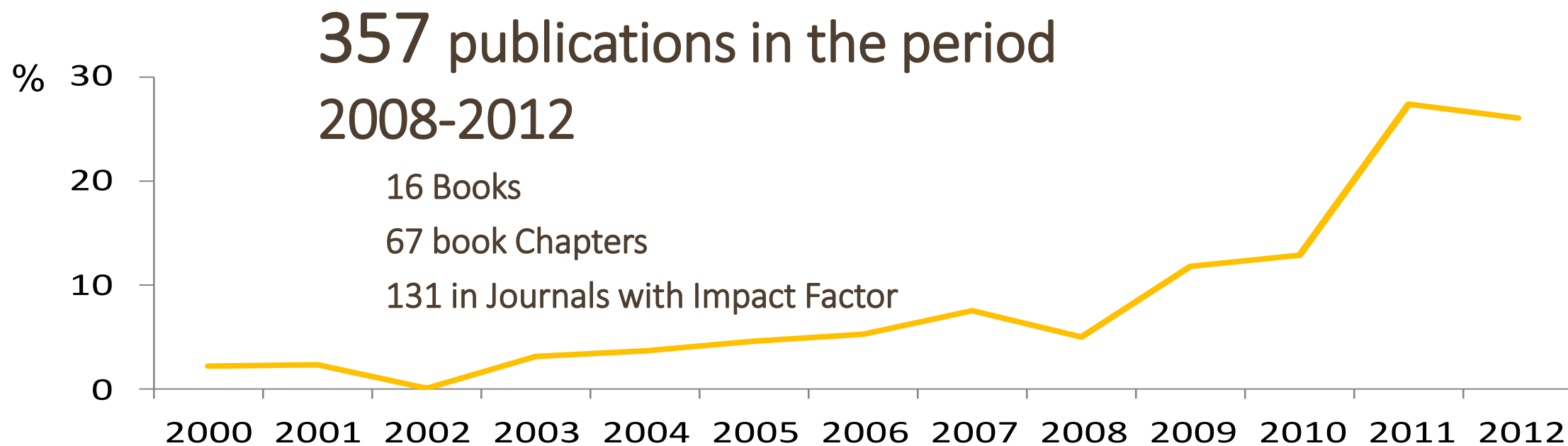
14 internacional

12 National Funding (FCT, FLAD, etc)

30 Regional Funding



# Proportion of the publications in relation to overall Azorean Scientific Publications



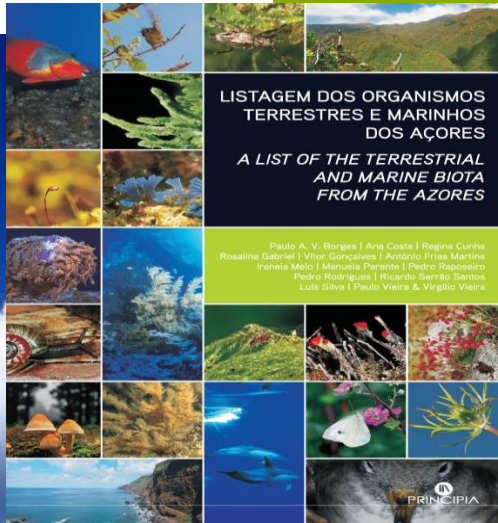
The mean Impact Factor was 2.2 in 2008, increasing for 2.88 in 2013





# 15 years of research in Azores...

- Probably the most comprehensive database for an entire archipelago in the globe.
- Island biogeography  
(Area – Age – isolation: e.g. Borges & Hortal 2009, Cardoso et al. 2010, )
- Macroecology  
(Abundance-occupancy relationship, e.g. Gaston et al. 2006, Rigal et al. 2013 Species abundance distribution, e.g. Borges et al. 2008, Matthews et al. 2014)
- Conservation biology  
(Extinction debt, Triantis et al. 2010, area prioritization Cardoso et al. 2007, Fattorini et al. 2012)



# Ce3C

## A Strategy with Future







Centre for **C**limate **C**hange **I**mpacts **A**daptation **M**odelling

azorean biodiversity  group  
<http://www.angra.uac.pt/gba>



Internet Illustration





# NEW STRUCTURE

## RESEARCH GROUPS

RG1. Conservation Ecology (J Palmeirim)

RG2. Environmental Stress and Functional Ecology (C Máguas)

RG3. Plant-Soil Ecology (C Cruz)

RG4. Evolutionary Genetics (C Fernandes)

RG5. Evolutionary Ecology (F Dionisio)

RG6. Computational Biology and Population Genomics (O Paulo)

RG7. Natural History and Systematics (M Sim-Sim)

RG8. Development & Evolutionary Morphogenesis (Solveig)

RG9. Theoretical Ecology & Biodiversity Change (H Pereira)

RG10. Climate Change Impacts, Adaptation & Modelling (G Penha-Lopes)

RG11. Island Biodiversity, Biogeography and Conservation (P Borges)

RG12. Island Environmental Risks and Society (P Ventura)

## 4 Pillars of Action

**Build and Integrate Knowledge and Experience (BIKE)**

**Improve Research InfraStructures (IRIS)**

**Expand Advanced Training (EAT)**

**Increase Societal Participation, Intervention and Recognition (INSPIR)**

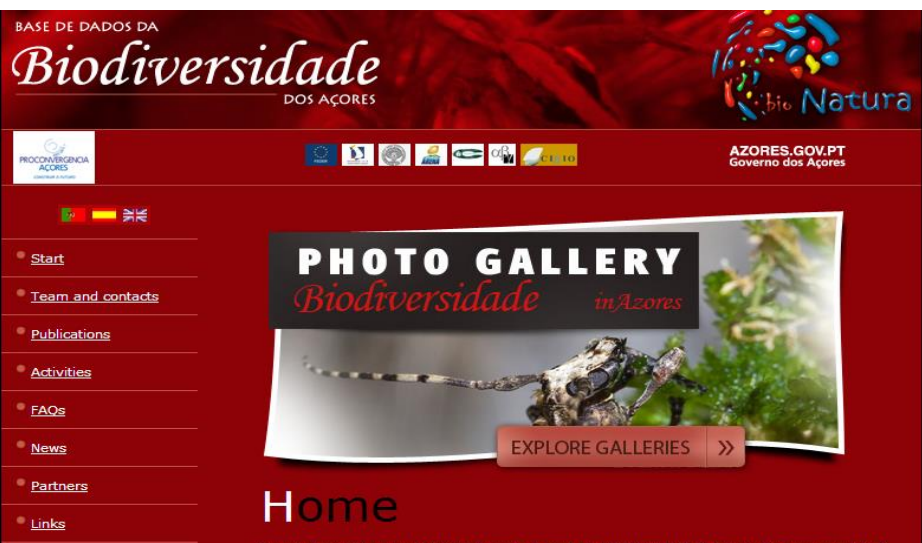


## Build and Integrate Knowledge and Experience (BIKE)

- Assess Ecological Patterns and Processes
  - Understand Evolutionary Patterns and Processes
  - Study drivers and impacts of Environmental Change
- 
- Increase knowledge of Agro-Forestry Systems with emphasis on the cork oak woodlands (*Montado*).
  - Investigate Biological Invasions
  - Develop Environmental Change Scenarios
  - Contribute to sustainable ecosystems in an Urban Context

## Pillar B. Improve Research InfraStructures (IRIS)

8. Maintain and improve existing research facilities.



### Base de Dados da Biodiversidade dos Açores



PORBIOTA

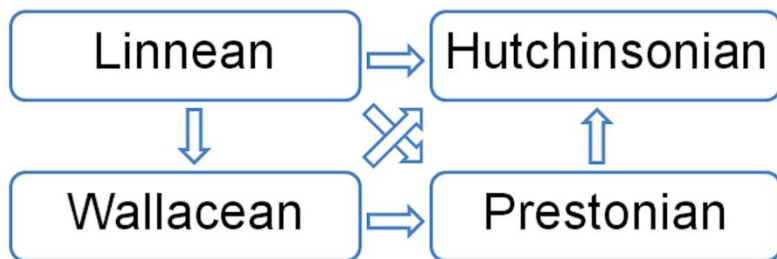
RNIIE

FCT  
Fundação para a Ciência e a Tecnologia

LTER PORTUGAL

AZOREAN  
BIODIVERSITY  
PORTAL





Scientific shortfalls

Establish an internationally recognised

Island Ecology Laboratory

9. Foster the use of established long-term ecological research and monitoring sites (in mainland and Azores), as platforms for collaborative studies and cross-site experiments, and training, both nationally and internationally.

## Expand Advanced Training (EAT)

- Create new curricula (PhD/MSc programmes and advanced courses).
- Implement innovative methodologies, e.g. e-learning classes in Portuguese-speaking countries





## Increase Societal Participation, Intervention and Recognition (INSPIR)

- Create a Science Communication and Outreach Office
- Involve local populations and decision makers
- Contribute to the development of strategies, policies and solutions with the principles of sustainable development

PEERS – Platform for Enhancing Ecological Research & Sustainability



UNIVERSIDADE DE COIMBRA



# Island Ecology & Environmental Risks (IEER) Thematic Strand - Our VISION for 2015-2020



# Island Ecology & Environmental Risks (IEER) Thematic Strand

Main objectives :

1. Use the **Azores** as a **model system** to investigate ecological and evolutionary mechanisms responsible for shaping island biotas;
2. Collect **long-term ecological data** to evaluate species distributions and abundance at multiple spatial and temporal scales;
3. Identify pathways impacting **oceanic indigenous assemblages** under global change for conservation purposes;
4. Improve and ensure the protection of island ecosystems and human health by carrying out multi-faceted research on **environmental risks** (natural and anthropogenic)
5. Develop strategic approaches for **risk communication** and societal awareness to risks
6. Performe robust and cost-effective environmental characterization, assessment and management, to assist **decision making** on island environmental policy.





# RG 11 - Island Biodiversity, Biogeography & Conservation

## Research Team:

- **Paulo A.V. Borges:** Arthropod diversity; Taxonomy; Macroecology; Biogeography.
- **Rosalina Gabriel:** Bryophyte diversity; Ecophysiology; Conservation.
- **Rui Elias:** Plant ecology; Conservation and management.
- **João Pedro Barreiros:** Tropical marine fish and cetacean diversity; Taxonomy; Etology; Ecology.
- **Virgílio Vieira:** Agriculture pest management; Insect migration; Lepidoptera.
- **António Onofre Soares:** Biological control agents; Insects; Predator-prey interaction.



# RG 11 - Island Biodiversity, Biogeography & Conservation

## 7 Pos-Docs:

- **Carla Rego**

UAc, FCUL

- **François Rigal**

UAc

- **Isabel Borges**

UAc

- **José Marcelino**

UAc

- **Margarita Florencio**

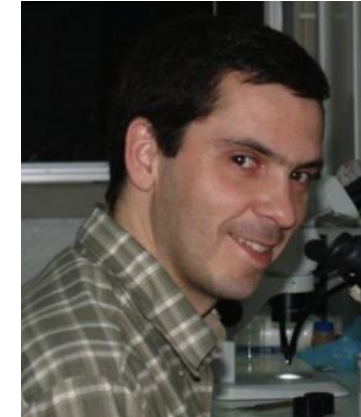
UAc

- **Mario Boieiro**

UAc, FCUL

- **Isabel R. Amorim**

UAc





# RG 11 - Island Biodiversity, Biogeography & Conservation

## 8 PhD students:

- **Ana Picanço**

FRC, UAc

- **Christiana Faria**

CNPQ, UEA

- **Débora Henriques**

FRC, UAc

- **Márcia Coelho**

FRC, UAc

- **Marta Costa**

FRC, UAc

- **Rui Nunes**

FRC, UAc

- **Sofia Terzopoulou**

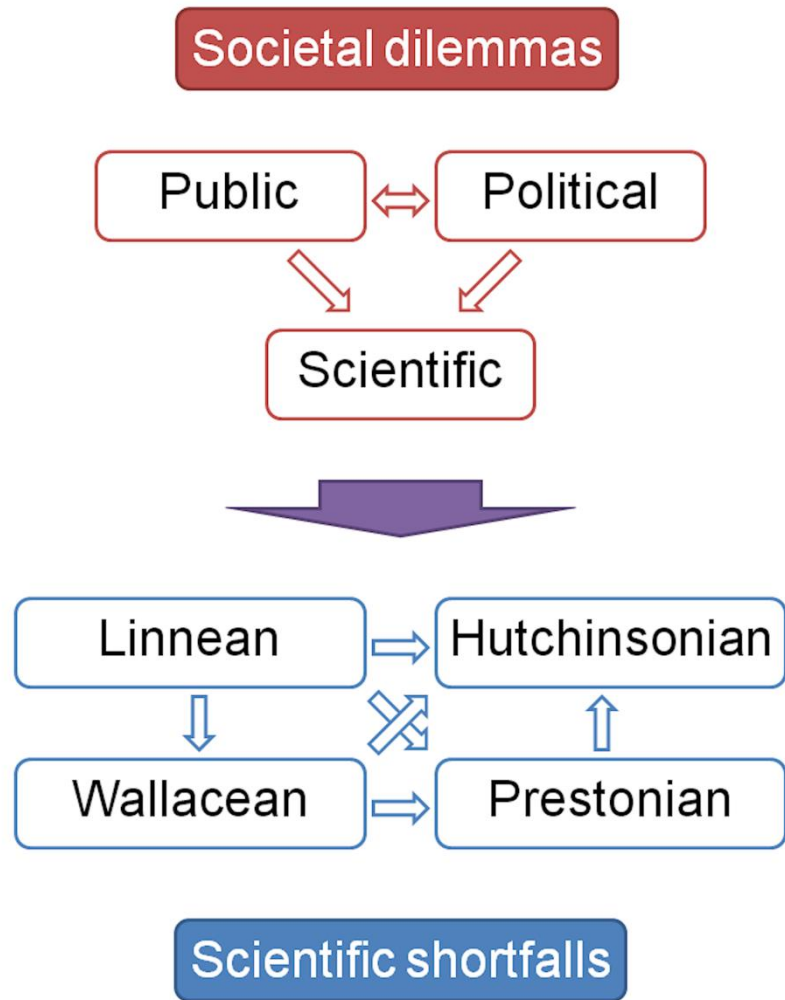
Uni. of Athens

- **Tom Matthews**

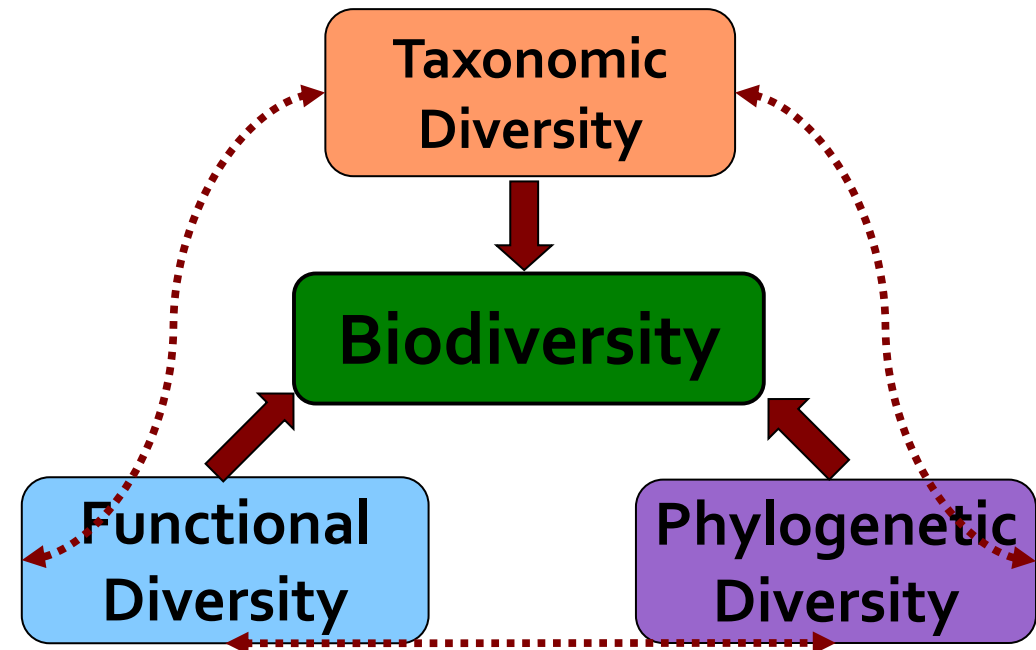
Oxford Uni.



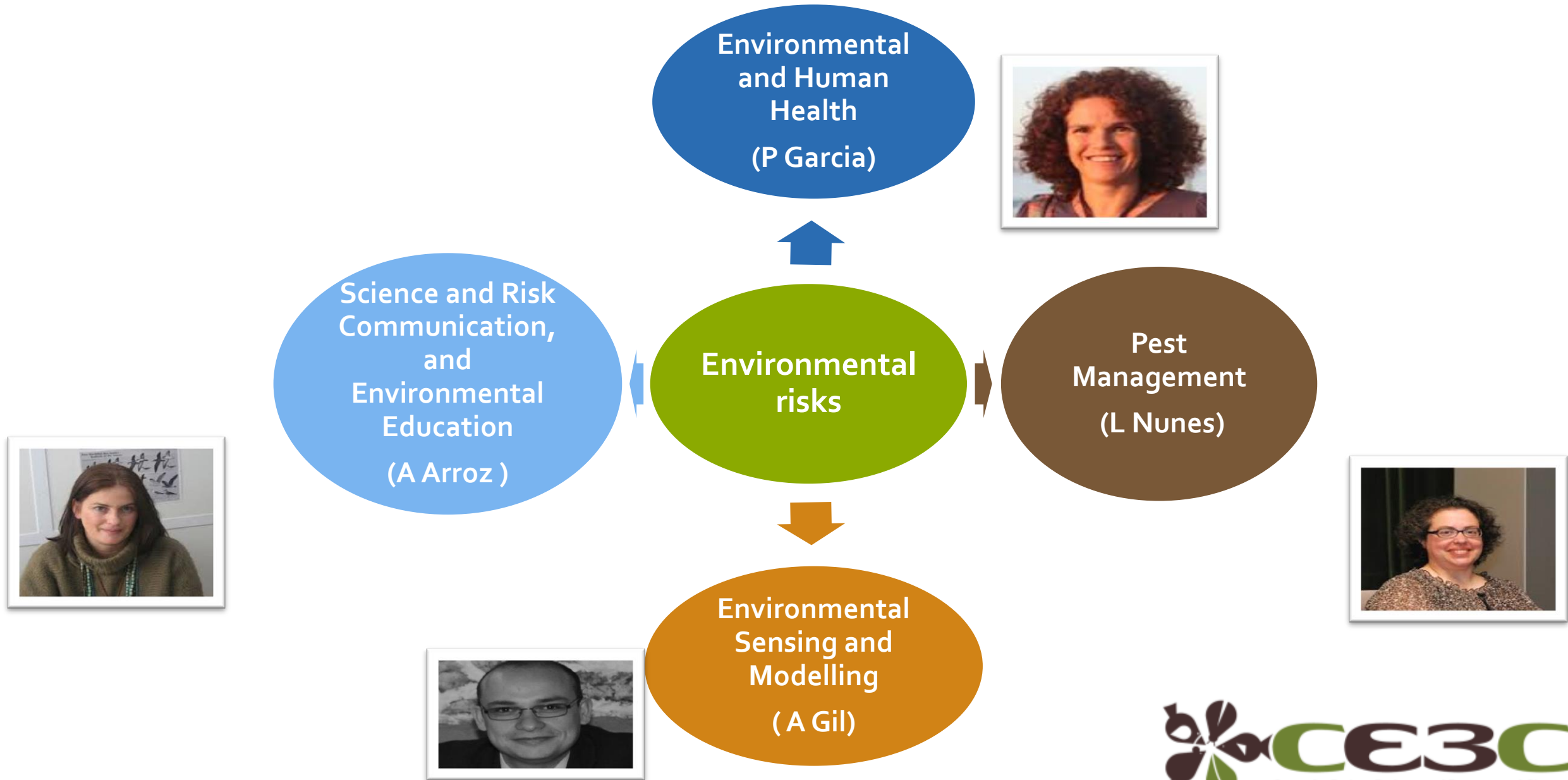




Essentially: a synthesis of ecology with evolutionary biology to Understand differentiation and diversification in long-term community assembly



# RG 12- Island Environmental Risks & Society



# RG 12 - Island Environmental Risks & Society

## Research Team:

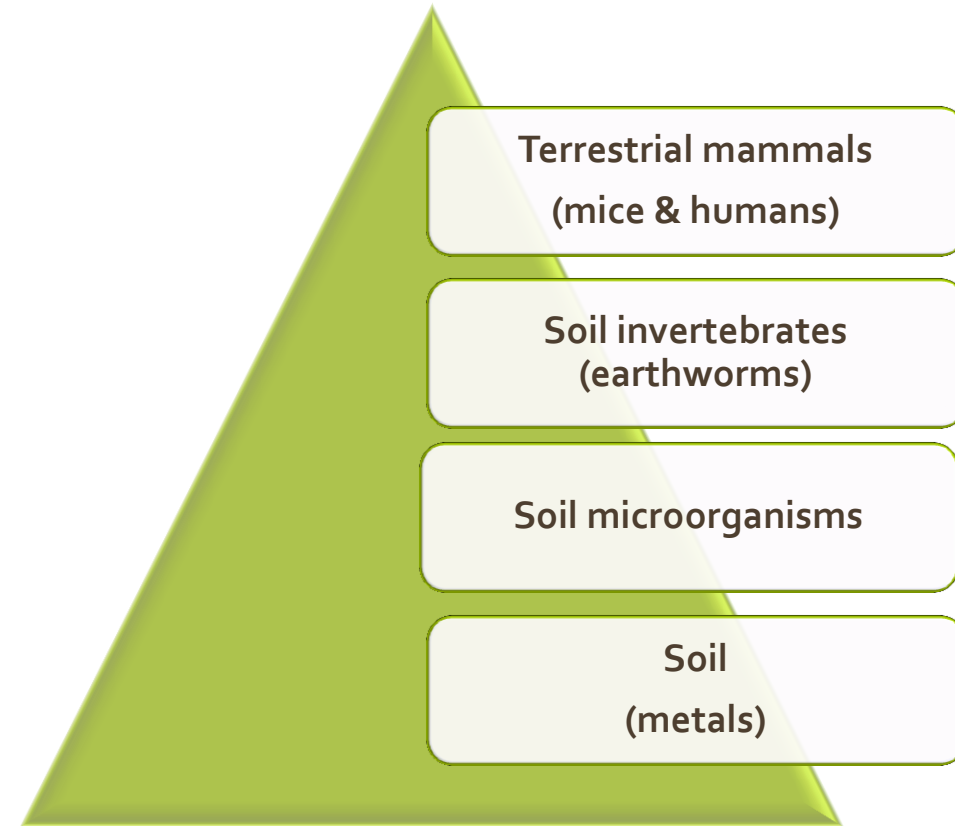
- **Patrícia Garcia**, PI, (Prof. at UAc): Ecotoxicology; Environmental and Occupational Health
- **Lina Nunes** (Researcher at LNEC): Building Materials (Timber); Termite biology and control
- **Ana Arroz** (Prof. at UAc): Risk Communication and Awareness; Environmental Education
- **Artur Gil** (Post-Doc Researcher at UAc): Applied GIS & Remote Sensing; Small Islands Management
- **Carolina Parelho** (PhD Student at UAc): Environmental and Occupational Health; Ecotoxicology
- **Orlando Guerreiro** (PhD Student at UAc): Termite biology and control; Urban Pest Management
- **Reinaldo Pimentel** (PhD Student at UAc): Agrarian Sciences
- **Rita Godinho** (PhD Student at UAc): Applied GIS & Remote Sensing; Landscape Analysis
- **Sónia Duarte** (PhD Student at LNEC): Forest and Agrarian Sciences; Pest Management





- Development of biomarkers (molecular, cellular and tissue) for evaluation of agricultural management impacts in:

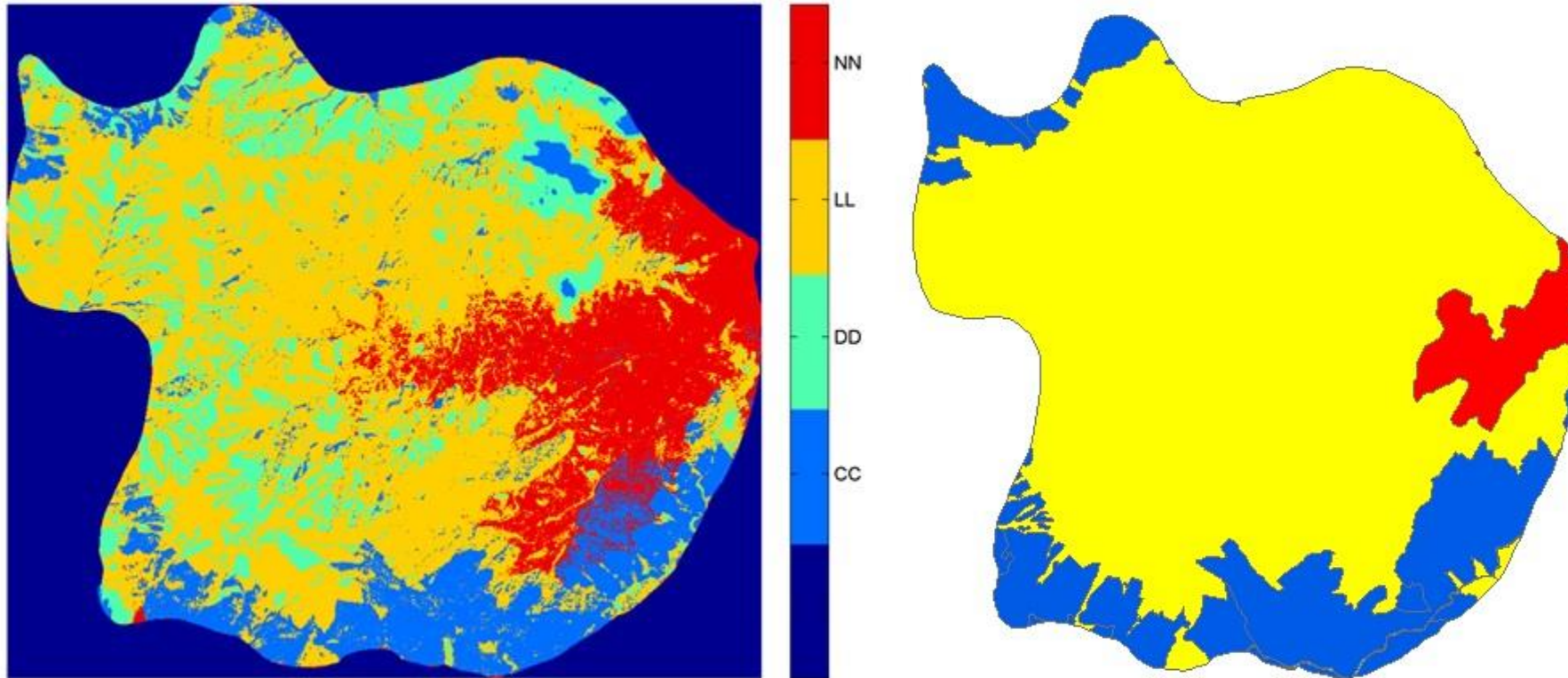
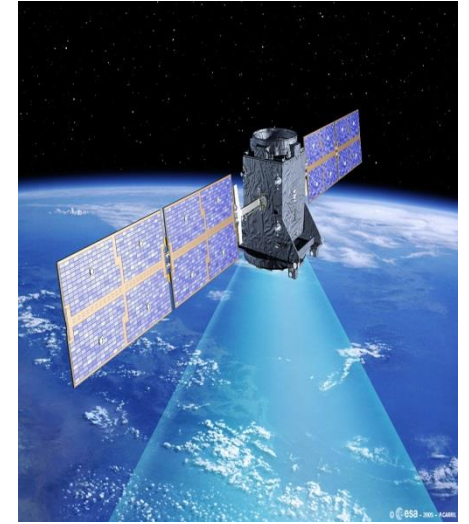
**Project: [HOLI-BioPest]- FLAD**  
**Implementation of a**  
**biomonitorization program for**  
**agroecosystems**



Conventional, organic and traditional farming

# Comparing mapping results among satellite image processing and traditional GIS-based approach (on-screen digitizing through photo-interpretation )

## Mapping Woody Invasive Species (*Pittosporum* woodland) in Pico da Vara Natural Reserve (815 ha) using IKONOS imagery

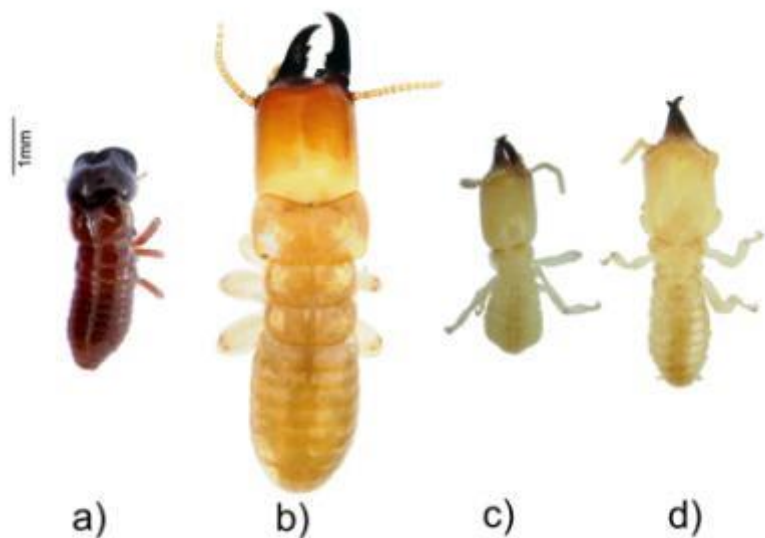


For the same area (815 ha) -  
difference of **91** ha:  
- “Incenso” mapping through  
IKONOS image processing: **126** ha  
- “Incenso” mapping in Regional  
Forest Inventory (GIS-based  
approach): **35** ha



## Térmitas afetam algumas áreas no Convento da Esperança

Edifício mais atingido e que tem sido alvo de limpezas, é o que albergava o Patronato de São Miguel. Foi, entretanto, encomendado a um arquiteto um estudo prévio visando a recuperação e otimização dos espaços no Convento PIGMA5





# Integrated Climate Change Research

P1

## BASIC RESEARCH PILLAR

Climate change causes & environmental impacts/risks

Methodological frameworks for integrative models and indicators

Climate change scenarios

Climate extreme events

Floods

Droughts

Agro-forestry systems

Vulnerabilities

Ecosystem based adaptation

P2

## SOCIETY-SCIENCE INTERFACE RESEARCH PILLAR

Adaptation & Sustainability

Governance & policies

Community-led initiatives

Communication and uncertainties

P3

## SERVICE PILLAR

Climate change services

Regional and local climate change scenarios

Socio-economic scenarios

Project coordination

Adaptation strategies

# Environmental Change Research Strand

## EXPLORE scenarios & impacts

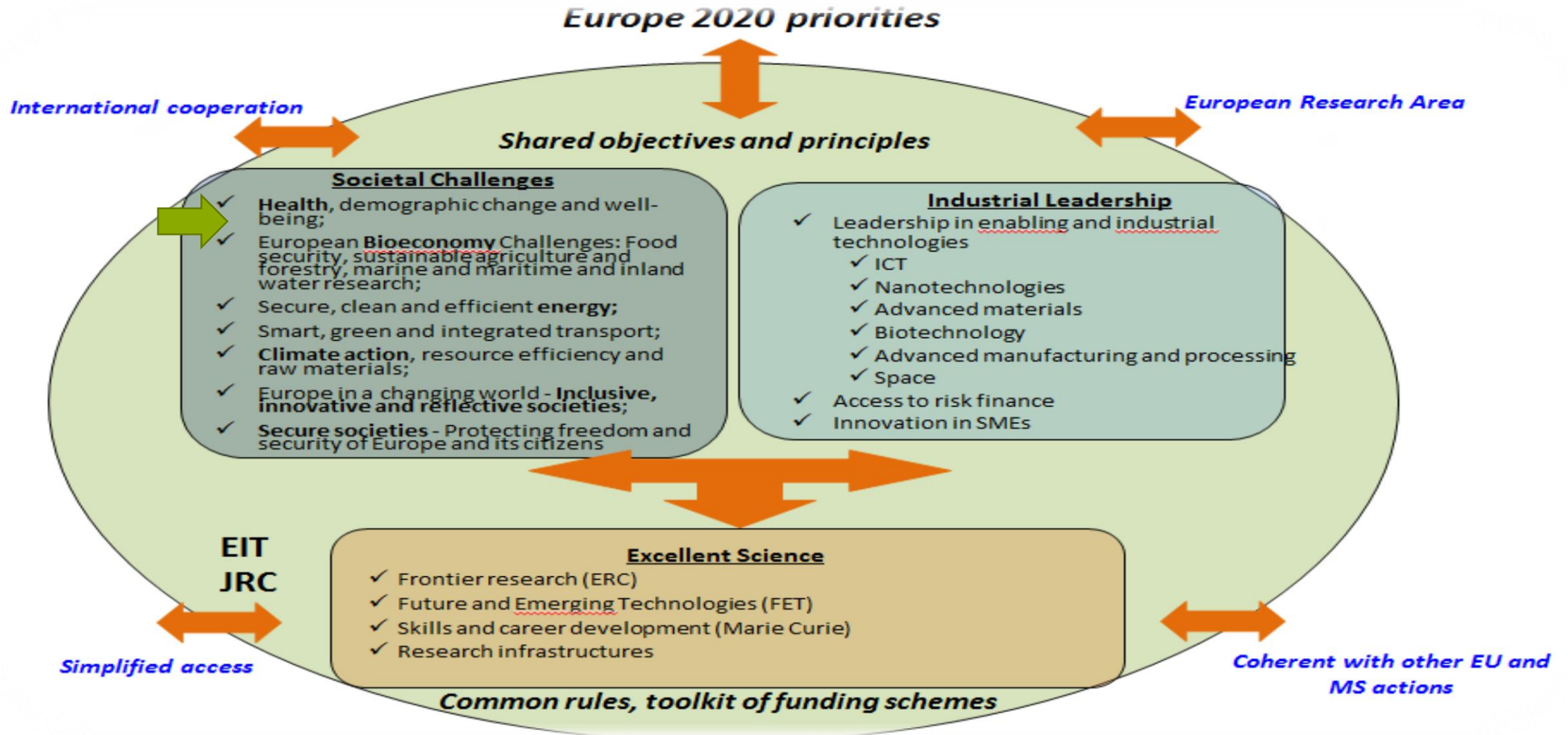
- Development of reference climatic and land use scenarios

## PREPARE responses to change

- Development of adaptation plans and policies regarding preservation of biodiversity and ecosystem services
- Ecosystem-based Adaptation

## INTEGRATE environmental change research

- Methodological Frameworks for integrative models and indicators of environmental change and responses



## Horizonte 2020- Desafios sociais

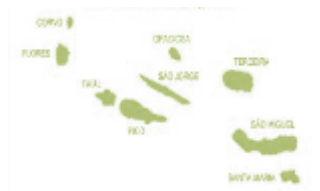


Como exemplo de projetos-piloto a apoiar no âmbito da RIS3 temos:

- Cluster – Criação e dinamização de programa de clusterização nos Açores;
- AQUA – Centro experimental de aquacultura dos Açores;
- SMART TOURISM – Laboratório de aplicação de tecnologias ao turismo;
- SUSTENTA – Sustentabilidade na agricultura e pecuária;
- ATLANTIC PLATFORM – Escola intercontinental de formação avançada;
- SMART-START – Programa internacional de atração de empreendedores qualificados nas áreas de especialização inteligente dos Açores;
- VALORFISH – Valorização dos produtos da pesca;
- DIVERURAL – Diversificação da atividade agrícola;
- OBSERMAR – Monitorização oceânica e dos ecossistemas;
- MARKETUR – Novos segmentos turísticos.

Serão consideradas as seguintes tipologias de ações:

- Projetos promovidos por empresas que envolvam atividades de investigação aplicada e/ou desenvolvimento experimental;
- Criação e desenvolvimento de unidades estruturadas dedicadas exclusivamente a atividades de ID&I em contexto empresarial:



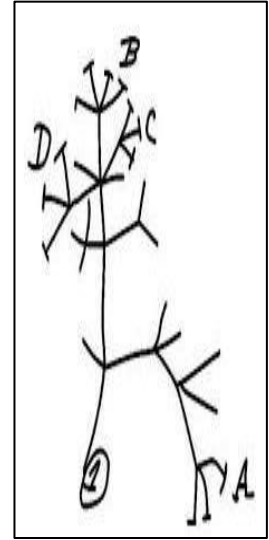
# Thanks for your attention!



PVB



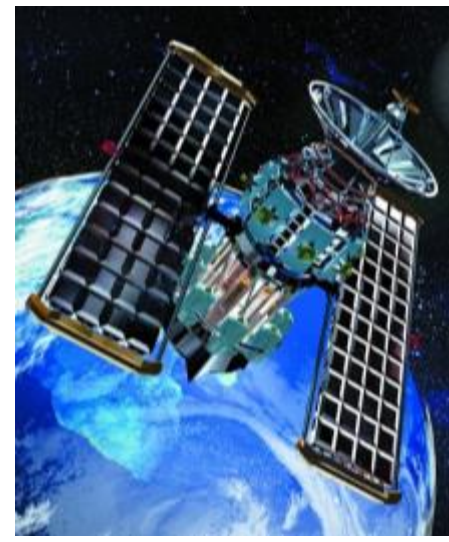
JT



PVB



Soil diffuse degassing and fumarolic discharges



PR5