



SUSTAINABILITY, RISK MANAGEMENT AND GOVERNANCE

Climate Change

First InPrInt Seminar

Partnership Building towards

Stronger Engagement in International Collaboration

UFMG, Belo Horizonte

19-23 November 2018

Where ever we are... climate is changing



Nordeste

Seca histórica já dura seis anos e ameaça tornar-se regra no semiárido



Litoral paulista

No litoral de SP, erosão come praias e até casas inteiras; obras buscam proteção contra ressacas mais frequentes



Panamá

Ressacas e superpopulação forçam indígenas gunas a abandonar ilhas



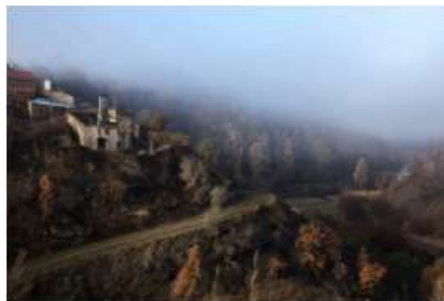
Porto Rico

Quase meio milhão de pessoas deve abandonar Porto Rico após furacão devastar ilha



Peru

Camponês processa empresa alemã e pede indenização por encolhimento de geleiras



Portugal

Tempestades de fogo mataram 115 portugueses em 2017



Cidade do Cabo

Estiagem e herança do apartheid criam pânico com torneiras secas no Dia Zero



Ártico

Aquecimento de região polar impõe reforma no Cofre Global de Sementes

We are witnessing many climatic phenomena that are bringing drastic consequences to society

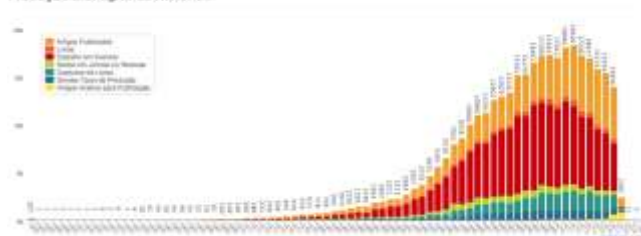


Photo by Sebastião Salgado

**We are facing Herculean battles in Climate Change!
But we live for the challenges!**

**How is UFMG facing climate change? We do Science to provide a better
future for the next generation !**

Produção Bibliográfica Histórica



We are many !

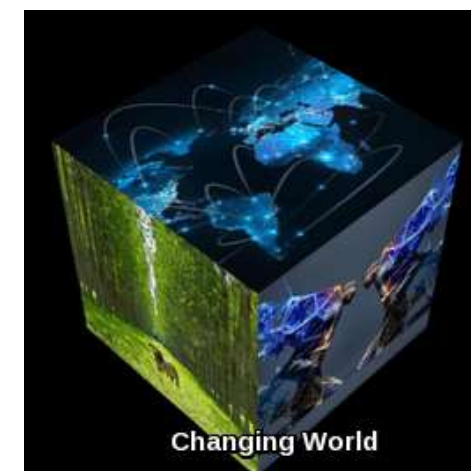
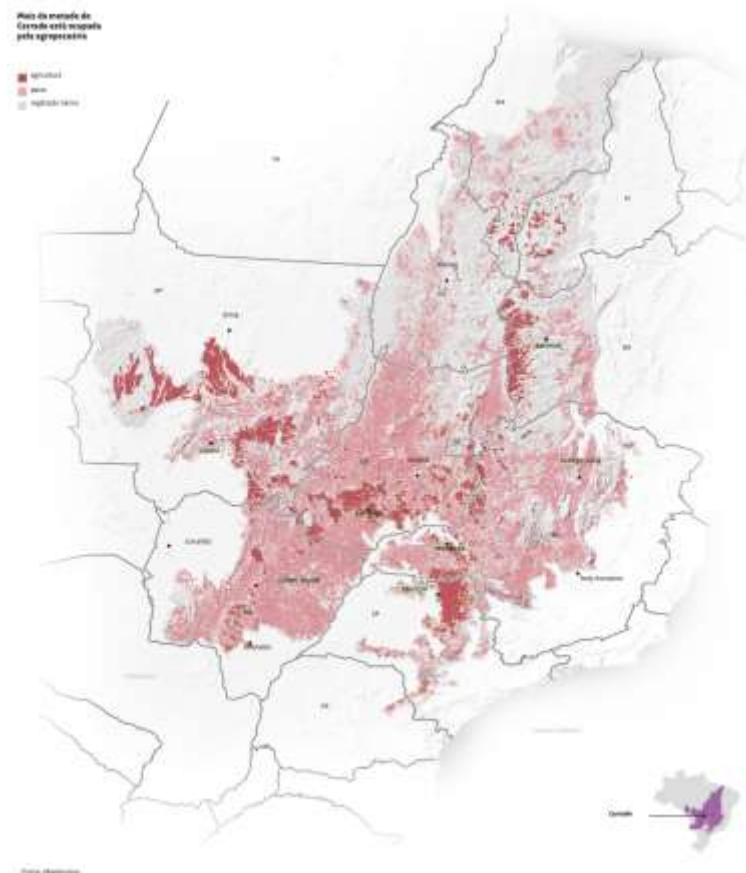
We have the logistics !



...and are in the right place !

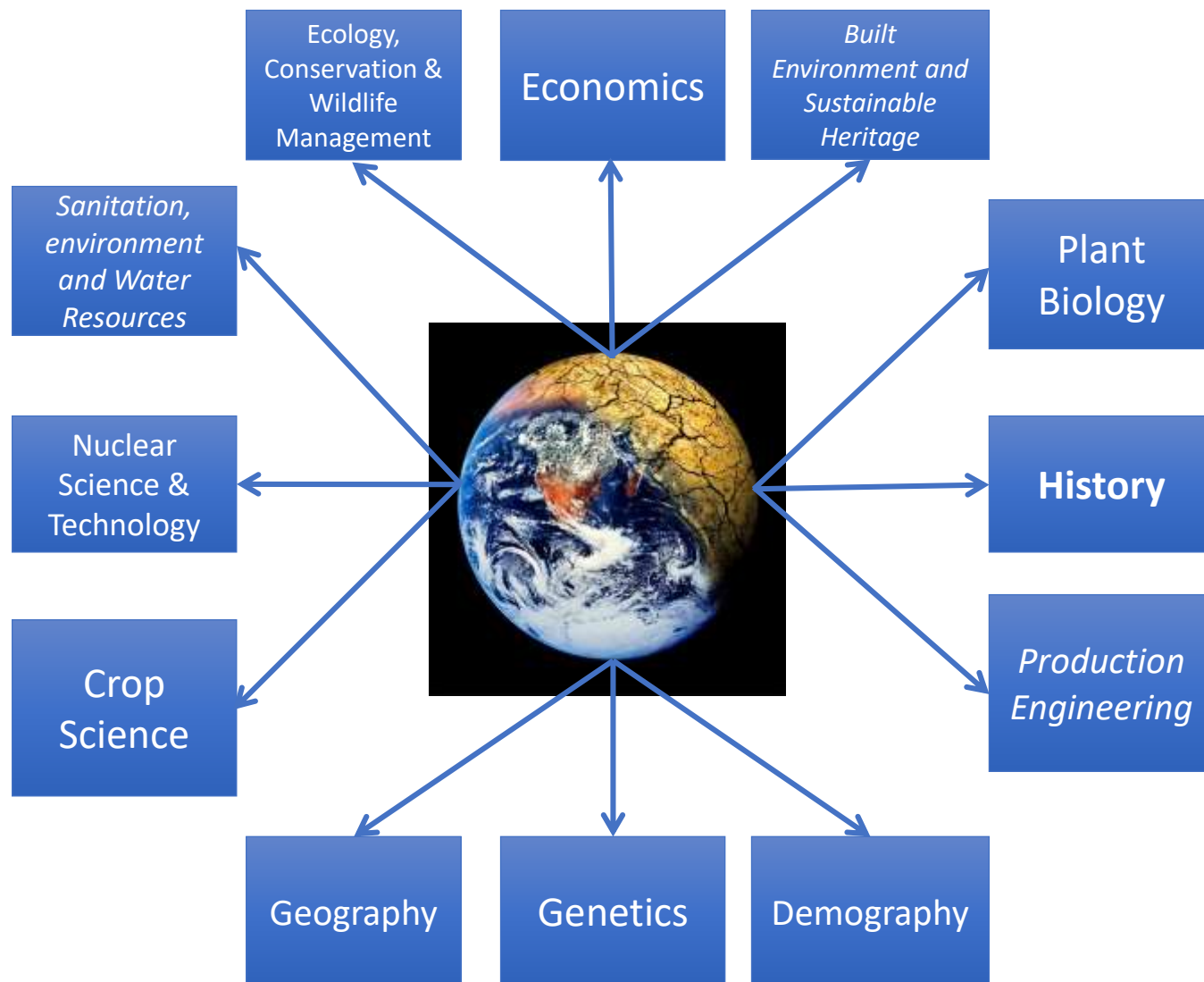


UFMG is focused on many themes as the causes are multiple and intertwined



Changing World

UFMG Graduate programs taking part in the project on CLIMATE CHANGE





Ecology & Conservation

Plant Biology

Economy

Science and Nuclear Techniques

Demography

Genetics

Environment and Hydric Resources

Production Engineering

Constructed Env.and Sustain. Patrimony

Stanford.U
The.George.Washington.U
Northern.Arizona.U
Cornell.U
U.of.Nebraska
U.of.Michigan
U.of.Arizona
EPIC.Network
Duke.U
U.of.North.Carolina
U.of.Texas
U.of.California.UCSB
U.of.Illinois
U.of.North.Carolina.1
North.Carolina.State.U
U.of.Toronto
U.de.Montreal
McGill.U
U.Nacional.Autonoma.do.Mexico
U.of.Oxford
Lancaster.U
U.East.Anglia
Kew.Gardens
U.of.Exeter
U.of.Edinburgh
U.of.Surrey
U.College.London
U.of.Reading
U.de.Kassel
ICLEI
U.of.Bremen
U.of.Bonn
Max.Planck.Institute.for.Meteorology
U.of.Tuebingen
Radboud.U
Wageningen.U
OREA
U.Politecnica.de.Madrid
U.of.Seville
U.de.Salamanca
U.de.Barcelona
CSIC.Madrid
U.Politecnica.de.Valencia
U.Avignon
U.de.Montpellier
INRA.BIOGECO
Institut.des.Sciences.Analytiques
U.Claude.Bernard.de.Lyon
James.Cook.U
U.of.New.South.Wales
Victoria.U
U.Nacional.de.Cordoba
U.San.Francisco
U.Peruana.Cayetano.Heredia

Web of Interactions UFMG -International Institutions

North
America

UK

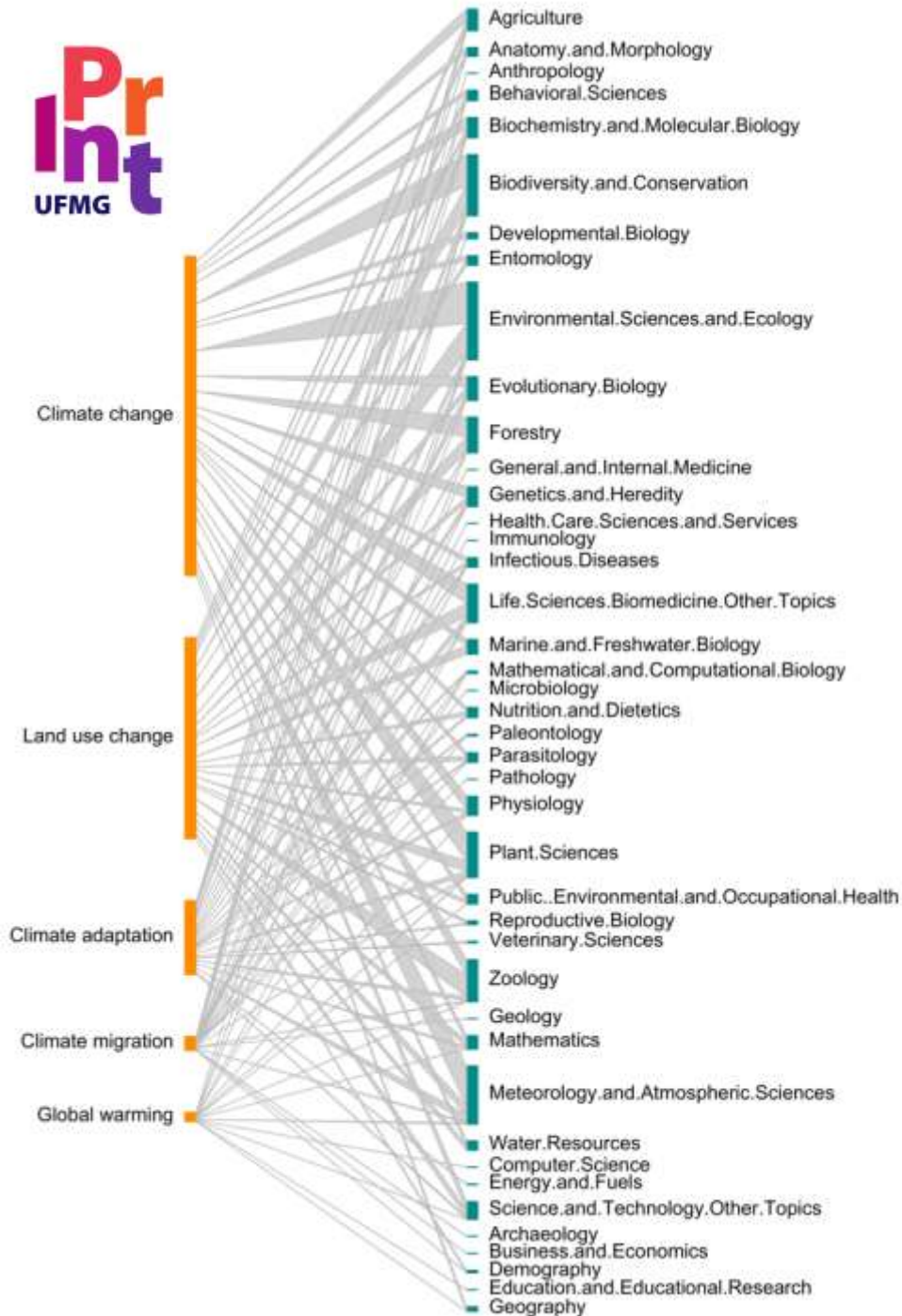
Europe

Australia

South America

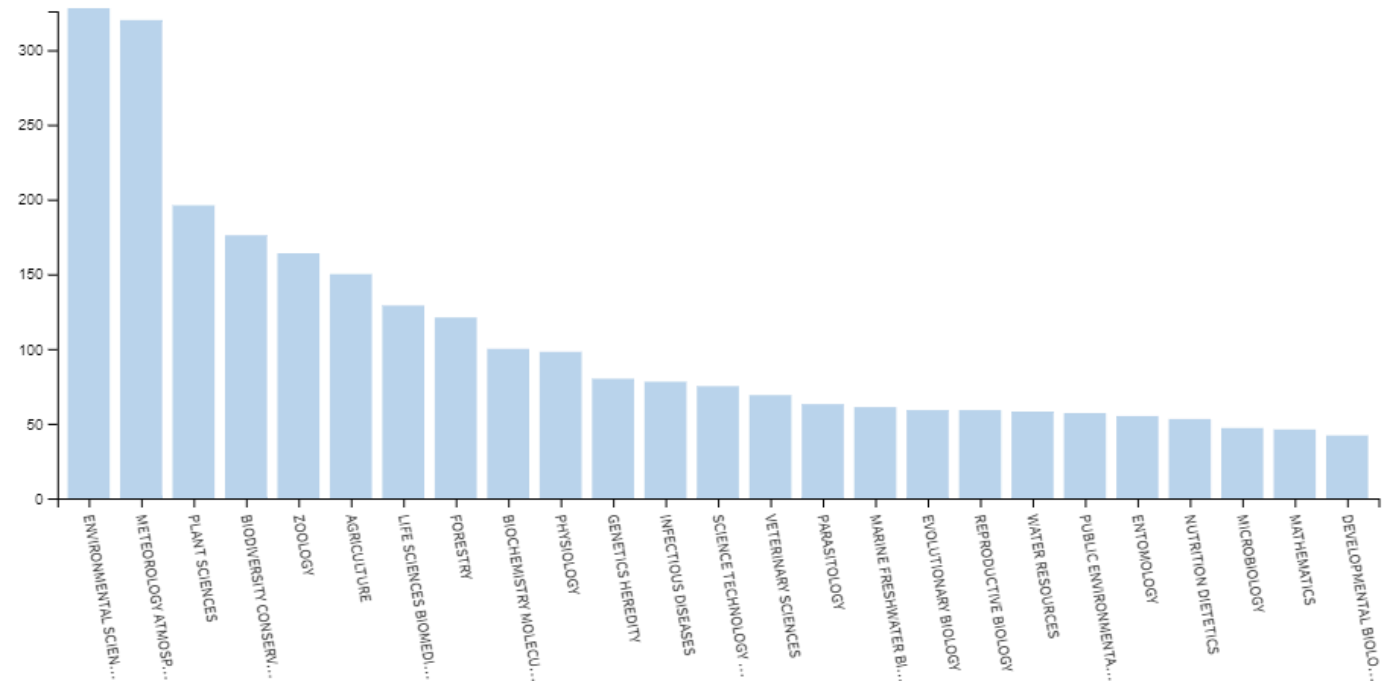
**Partner institutions to
which we have
collaboration in Climate
Change (so far)**

**New
collaborations
will be most
welcome!**



UFMG and Climate Change

- Production of articles by different departments on climate change topics



Current Projects

Foto | ASCOM
Publicado no Jornal Grande Bahia



Miguel Andrade

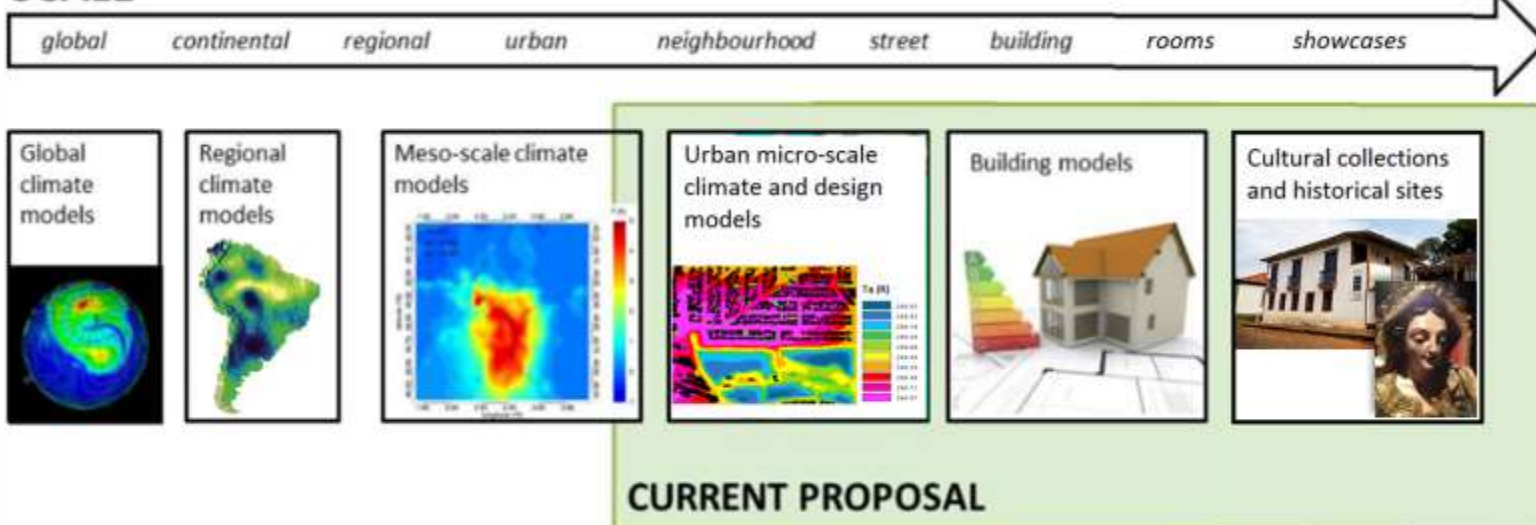
Built Environment and Sustainable Heritage

Aim: study the urbanization influence on local climate change by means of experimental approach and modeling. Study the impacts of climate change on the preservation of cultural collections and historical sites. Develop new interdisciplinary methods and techniques for urban climate and water sensitive planning and design, protection of cultural collections, risk analysis and public politics and governance.

FOCUS ON

- ✓ Monitoring of the surface energy balance in the city of Belo Horizonte
- ✓ Project Mega-City
- ✓ Project Climate Map for Urban Planning in Belo Horizonte
- ✓ Climate change impacts on the cultural collections preservation

SCALE



Crop Science

Aim: Assessment of carbon stocks and greenhouse gas emissions from land use change and in different agricultural systems

Focus on

- ✓ Measurement and modeling soil carbon stocks
- ✓ Measurement of greenhouse gas emissions from land use change
- ✓ Measurement of greenhouse gas emissions from agriculture
- ✓ Conservation agriculture and soil carbon sequestration
- ✓ *Biochar as a soil amendment and carbon sequestering tool*

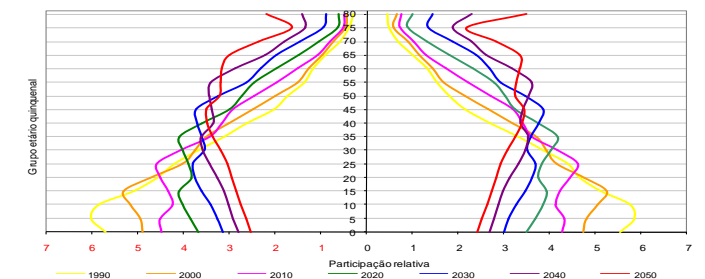


Demography

Aim: To understand the Human Dimensions of Global Environmental Change, specifically:
i) the vulnerability of coupled human – environment systems, ii) design and implementation of methodologies of vulnerability analysis, iii) design of adaptation policies and planning capacities at several scales

Focus on

- ✓ Urbanization
- ✓ Amazon
- ✓ Semi-Arid
- ✓ Brazil
- ✓ Latin America

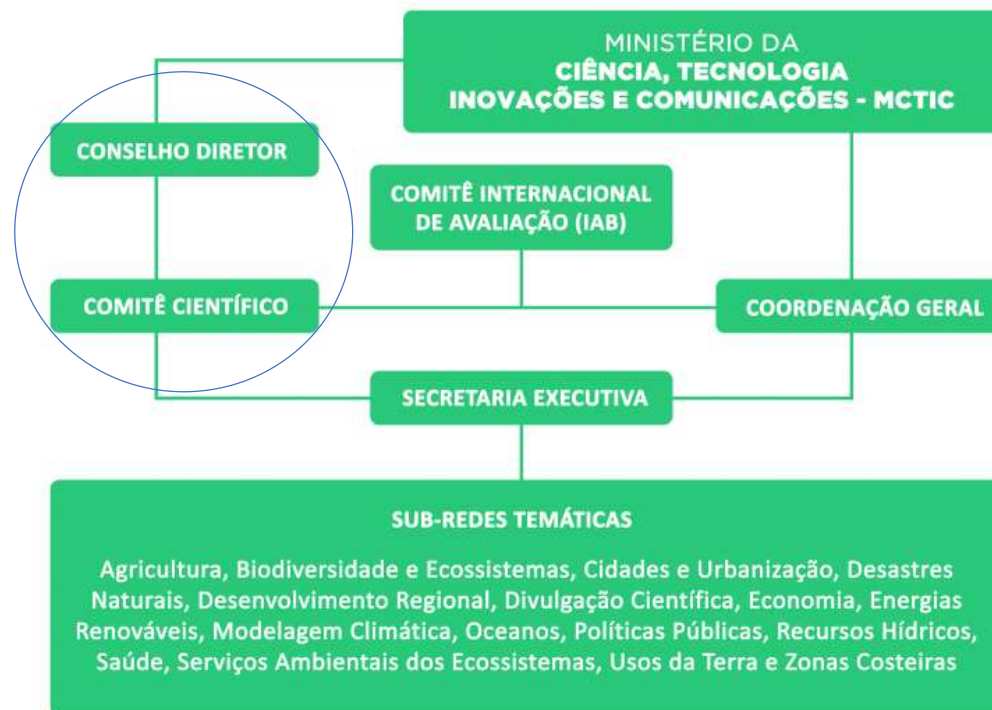


Demography

Rede Clima – Brazilian Network for Climate Change Research

*Active participation
of Demography at
Rede Clima:*

- *Titular member in
the Scientific
Committee*
- *Coordination of the
network “Cities
and Urbanization”*



Ecology, Conservation & Wildlife Management

Aim: To understand the effects of climate change on the mechanisms and processes that shape biodiversity and functioning of Brazilian ecosystems, especially in mountain and aquatic environments

CLIMATE SIGNALS in Climate Sensitive Areas

Focus on

- ✓ *Mountain ecosystem biodiversity and functioning*
- ✓ *Mountains as barometers of climate change*
- ✓ *Deep web Interactions*
- ✓ *Restoration of extreme ecosystems*
- ✓ *Bee collapse and pollination impact*
- ✓ *Enriched CO₂ and Temperature effects on wildlife and agriculture*
- ✓ *Ecosystem services and sustainability*
- ✓ *Climate and aquatic ecosystem biodiversity*
- ✓ *Mining and ecosystem functioning*
- ✓ *Policy making and science*



Economics

Aim: To measure the economic impacts of climate change and adaptation and mitigation policies, assessing costs, benefits and opportunities

Focus on

- ✓ *Economic impacts of climate change in Brazil*
- ✓ *Impacts of land use change and policies*
- ✓ *Impacts of carbon pricing on the Brazilian economy*
- ✓ *Economic impacts of low carbon technology policies in agriculture*
- ✓ *Impacts, costs and opportunities of energy policies*



Genetics

Aim: Study the evolutionary dynamics of high altitude grassland biodiversity: past responses to climate changes and future projections

Focus on

- ✓ Genetic data on species populations threatened by climate change at mountain tops in Southeastern Brazil
- ✓ Evolutionary interactions of microorganisms and plants at the rhizosphere and leaf levels
- ✓ *Endophyte-plant relationships*
- ✓ *Bioprospection: plant secondary chemistry, adaptation, and drug discovery*



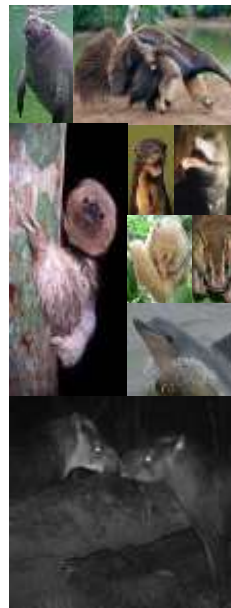
Microorganisms



Birds



Mammals



Herpetofauna



Invertebrates



Geography

Aim: Understanding the environmental dynamics from the integration between the climate and the natural and anthropic systems (relief, vegetation and land use).

Focus on

- ✓ Simultaneous comparisons in urban, rural and remnant areas
- ✓ Obtaining climatic indicators of environmental change
- ✓ *Climate as a component of space organizations, based on the relationship between natural and anthropic system*



History

Aim: *to understand the impact of climate change on past societies and cultures, with a focus on climate sensitive/arid-prone landscapes and non-élite contexts in Brazilian and World History.*

THE OCCUPATION OF DROUGHT-PRONE AREAS: A COMPARATIVE APPROACH (left: northeast Brazil; right: Roman-period south Italy)



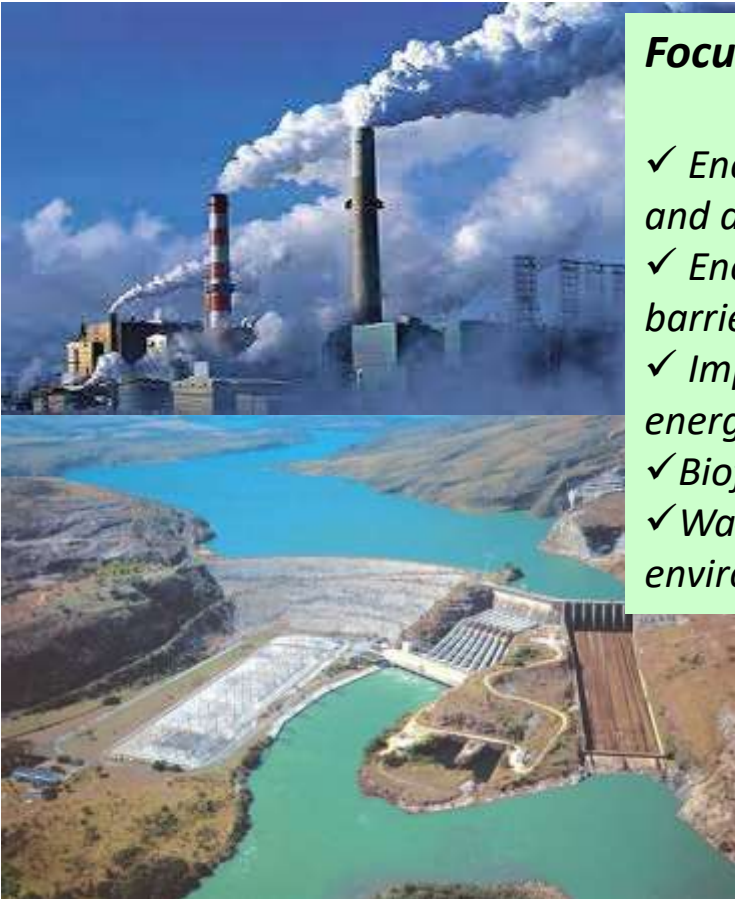
Focus on the effects of past climate change on:

- ✓ Social inequality, marginalization and abuse
- ✓ The agency of non-élite people
- ✓ Migration and mobility
- ✓ Human resilience
- ✓ Societal change and collapse
- ✓ Socio-environmental stress
- ✓ Violence and warfare



Nuclear Science and Technology

Aim: (1) Nuclear energy for GHG mitigation; (2) historical-social construction of the pattern of use and supply of energy; (3) evaluation of the inclusion of costs that may affect society and / or the environment; (4) Environmental consequences of energy production and use: decommissioning of energy production and use infrastructures and waste management. (5) Exergy analysis: cogeneration (6) Increased CO₂ emissions due to burning of fossil fuels and deforestation (7) Possible scenarios for insertion of energy efficiency and hybrid and electric cars. The role of energy in the anchoring of environmental projects



Focus on

- ✓ *Energy transitions and its consequences and determinants*
- ✓ *Energy efficiency, opportunities and barriers*
- ✓ *Impacts of carbon pricing on the Brazilian energy sector*
- ✓ *Biofuels versus electric mobility*
- ✓ *Waste as energy resource and the environmental and economic consequences*



Plant Biology

Aim: To evaluate the effect of climate change in plant communities at the micro- and macroecological and evolutionary level; Changes in the physiological limits, development and germination, adaptation to temperature and moisture; responses in the dynamic and biodiversity of aquatic communities to climate change indicators.

Focus on

- ✓ Temperature limits for plant germination and development
- ✓ Temperature and soil moisture in modulating seed dormancy cycles
- ✓ Plant macroecology and evolutionary ecology
- ✓ Plant genetic diversity, evolutionary history and distribution
- ✓ Shifts in phytoplankton communities in tropical and temperate aquatic environment.

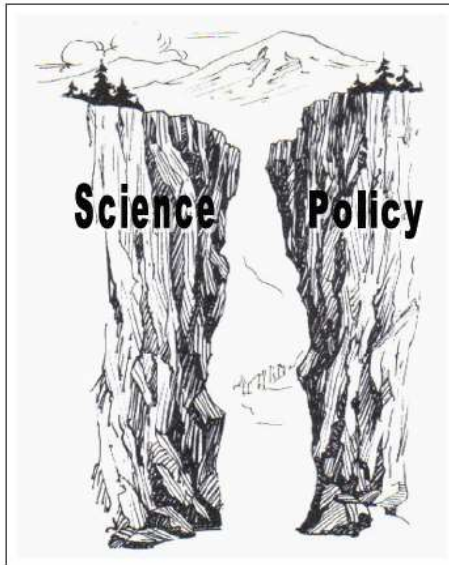


Production Engineering

Aim: Economic engineering, Statistical modeling and social studies of science and technology, Work and expertise applied to understanding and intervening in the management of policies to mitigate climate change and sustainable productive chains.

Focus on

- ✓ Implementation of the Brazilian Forest Code
- ✓ Impact assessment of Low Carbon Agriculture, focusing on livestock
- ✓ Transparency of production chains and deforestation data
- ✓ History of land use models and territorial management of the Amazon.
- ✓ Climate policy evaluation and making processes
- ✓ Interface between science-activism-policy

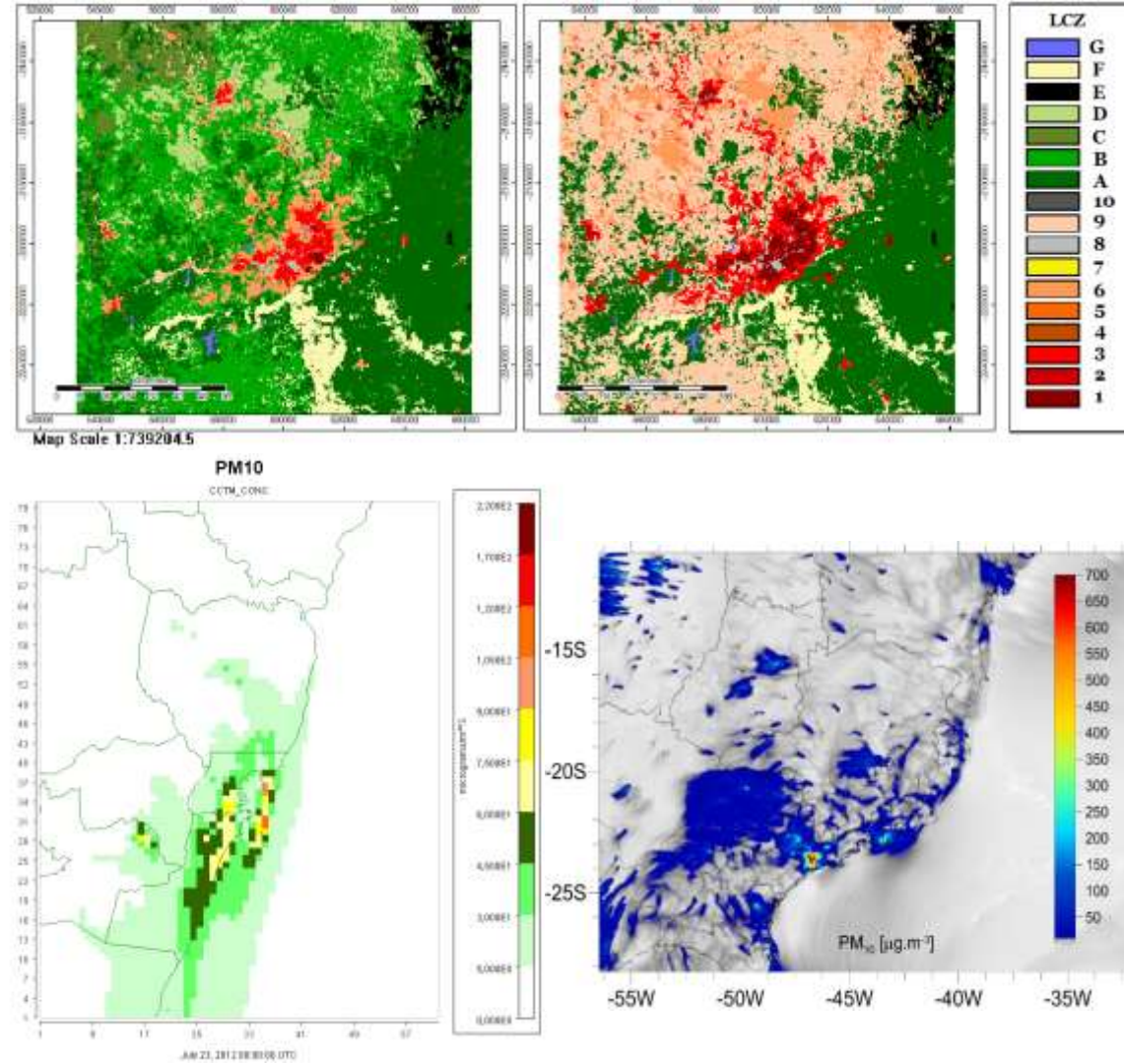


Sanitation, Environment and Water Resources

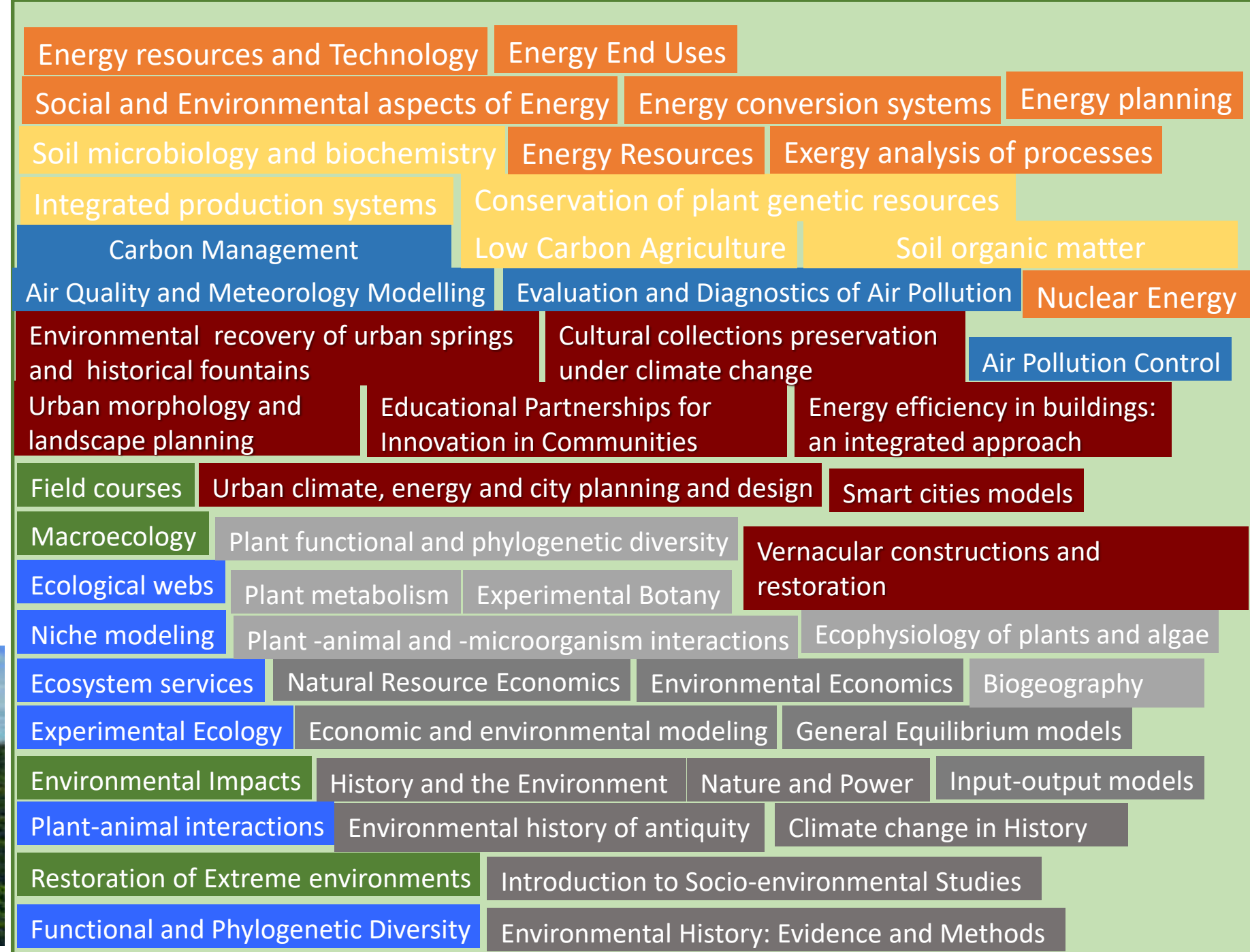
Aim: To understand the impact of local air pollution in climate change, to estimate health and economic impacts, to simulate emission control strategies and benefits.

Focus on

- ✓ Air quality impacts of climate change in Brazil
- ✓ Impacts of land use change in meteorological conditions
- ✓ Atmospheric conditions in urban areas
- ✓ Effect of Local Climate Zone classification
- ✓ Emissions Control Strategies
- ✓ Numerical Modelling Applications in Air pollution and Meteorology Studies



SAMPLE OF MAJOR GRADUATE COURSES THAT HAVE A FOCUS ON CLIMATE CHANGE



Funding agencies

- **FAPEMIG**
- **CNPQ**
- **CAPES**
- Anglo American
- Arcelor Mittal
- CNEM
- Conservation International
- CYTED
- Eletronuclear
- EMBRAPA
- FAPESP
- FINEP
- Fundação Carlos Chagas
- Genome Canada
- Global Opportunities Fund (United Kingdom)
- International Association for Plant Taxonomy
- Inter-American Institute (IAI)
- Ministry of Environment
- Ministry of Science, Technology, Innovations, and Communications
- Rede Clima – Brazilian Network for Climate Change Research
- The Andrew Mellon Foundation
- United Nations Development Program (UNDP)
- Vale
- WHO (World Health Organization)



Concluding remarks for the project on **CLIMATE CHANGE**

- We are following the heat provoked by climate change on ecosystems, societies, and human welfare
- We have the space, the motivation and people to better predict and craft the future of all
- But we can do much better in synergy, in collaboration with you!





Gracias !
Thank you !
Tack !
Merci !
Grazie !
Danke !
Bedankt !
Obrigado !