



BRAZILIAN ECOSYSTEMS AND THE GLOBAL CARBON CYCLE



CSSP BRAZIL



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Brazilian ecosystems are responsible for absorbing and storing a significant amount of the carbon dioxide (CO²) released worldwide by fossil fuel emissions, helping offset the build-up of greenhouse gases in the atmosphere.

The Amazon rainforest contains an incredible diversity of plants and wildlife, and is a source of medicine, food and a major store of carbon. The Cerrado covers more than 20% of Brazil and is the most biodiverse savannah in the world, locking up a significant amount of carbon. Another ecosystem, the Pantanal, is a vast network of lakes, rivers, lagoons and marshes which combine to form the world's largest wetland area, providing food and fresh water for over 8 million people.

However, the efficient functioning of these ecosystems is vulnerable to climate change, deforestation and changes in wildfire and drought occurrence in the future.



CSSP Brazil is developing UK-Brazil science partnerships

To help address these global challenges the Climate Science for Service Partnership (CSSP) Brazil project, supported by the UK Government's Newton Fund, is bringing together researchers and organisations from the UK and Brazil to understand the vulnerability of Brazilian ecosystems to climate change and deforestation.

Building our observations

CSSP Brazil is working with the Brazilian National Institute for Amazonian Research (INPA) to support field experiments such as AmazonFACE (Amazon Free-Air Carbon dioxide Enrichment), which will measure the response of the Amazon rainforest to enhanced levels of CO² at a site near Manaus. This data, in combination with other field campaigns, will help scientists understand how climate change will affect the Amazon forest and the ecosystem services it provides to humanity.



AmazonFACE experimental site, near Manaus, Brazil

Developing and improving modelling tools

Wildfire and drought are part of the natural functioning of ecosystems. For example, fire is an important contributor to the maintenance of savannah vegetation in the Brazilian Cerrado and can also be used for land-clearance in the Amazon forest. However, it is likely that climate change will increase the severity and likelihood of drought and fire, which will affect the functioning of these ecosystems. Under CSSP Brazil we are incorporating fire processes into our cutting-edge ecosystem models, which improves the simulation of vegetation cover across Brazil. Scientists from the Brazilian National Institute for Space Research (INPE) and the UK are using these models to understand how climate change could affect future ecosystem resilience.

Methane emissions from the world's biggest wetland

Tropical wetland ecosystems such as the Pantanal and flooded forests naturally produce methane, which is 25 times more potent than CO² as a greenhouse gas. CSSP Brazil is quantifying the contribution of natural sources to the global methane budget by investigating the history of the air before reaching a measurement site, to understand where the methane came from.

CSSP Brazil is also improving the representation of Brazilian wetlands in models by including new processes such as emissions from Amazon floodplain trees. Accounting for this new process has been shown to increase the amount of methane released by Brazilian wetlands in future climate projections. This work is supporting improved information about how Brazilian ecosystems might contribute to and be affected by climate change, which will help inform national climate mitigation and adaptation policy.

International context

It is increasingly important for the scientific research community to be able to quantify the role of natural carbon sinks and other greenhouse gas emissions, in order for international negotiations to be fully informed about how to set emissions targets to achieve the goals of the Paris Climate Agreement. The latest Intergovernmental Panel on Climate Change (IPCC) report on achieving 1.5 degrees showed how close we already are to emitting more CO² than is compatible with that target. Increased knowledge of natural processes, especially in tropical forests, will enable more robust planning of how to stay within sustainable planetary boundaries.

Andy Wiltshire, CSSP Brazil science lead at the Met Office, explained how important these new results are. “We’ve known for many years the important role Brazilian ecosystems play in regulating the global climate system. The advances being made in the CSSP Brazil partnership are helping understand the importance of these ecosystems and their vulnerability to climate change and deforestation. This collaboration between UK and Brazilian scientists is enabling us to address important issues for global well-being”.



CSSP Brazil is building strong science partnerships

CSSP Brazil is a research project that supports collaboration between the UK and Brazil. It aims to develop capability to inform decision makers in climate mitigation and adaptation strategy and to underpin services to support climate and weather resilient economic development and social welfare.

CSSP Brazil is building strong, sustainable partnerships between Brazil’s National Institute for Space Research (INPE), National Institute for Amazonian Research (INPA), National Centre for Monitoring and Early Warning of Natural Disasters (CEMADEN) and the Met Office, the UK’s national meteorological service, and other key UK and Brazilian scientific institutes.

The Weather and Climate Science for Service Partnership Programme – of which CSSP Brazil is a part - is funded by the UK Government’s Newton Fund.

For further information visit the Newton Fund website (www.newtonfund.ac.uk) and follow via Twitter: @NewtonFund

For more information on CSSP Brazil visit the Met Office website <https://www.metoffice.gov.uk/research/collaboration/newton/cssp-brazil/index>

Met Office

The Met Office is the UK’s national weather service working at the forefront of weather and climate science for protection, prosperity and well-being. The Met Office Hadley Centre, formed in 1990, is one of the UK’s foremost climate change research centres.

National Institute for Space Research (INPE)

The National Institute for Space Research (INPE) is responsible for fostering Earth and space science and technology to offer products and services in benefit of the Brazilian nation.

National Institute for Amazonian Research (INPA)

The National Institute of Amazonian Research (INPA) is a public research and educational institution and world reference in tropical biology, headquartered in Manaus, Brazil. INPA was founded in 1952, with the purpose of furthering scientific knowledge of the Brazilian Amazon Region through scientific studies of the physical environment and living conditions to promote human well-being and socio- economic development.

National Centre for Monitoring and Alerts of Natural Disasters (CEMADEN)

The National Center for Monitoring and Alerts of Natural Disasters (Cemaden) is linked to the Brazilian Ministry of Science, Technology and Innovation (MCTI). Cemaden was formed in July 2011 with its main objective being to monitor and issue natural disaster alerts that help safeguard lives and reduce social, environmental and economic vulnerability resulting from these events.