



PAGES Focus 4: Past Human-Climate-Ecosystem Interactions (PHAROS)

- What are the historical patterns of human interactions with climate change and ecological processes?
- How can we learn from past patterns and interactions in order to better understand and manage natural ecosystems at present and in the future?



Aims

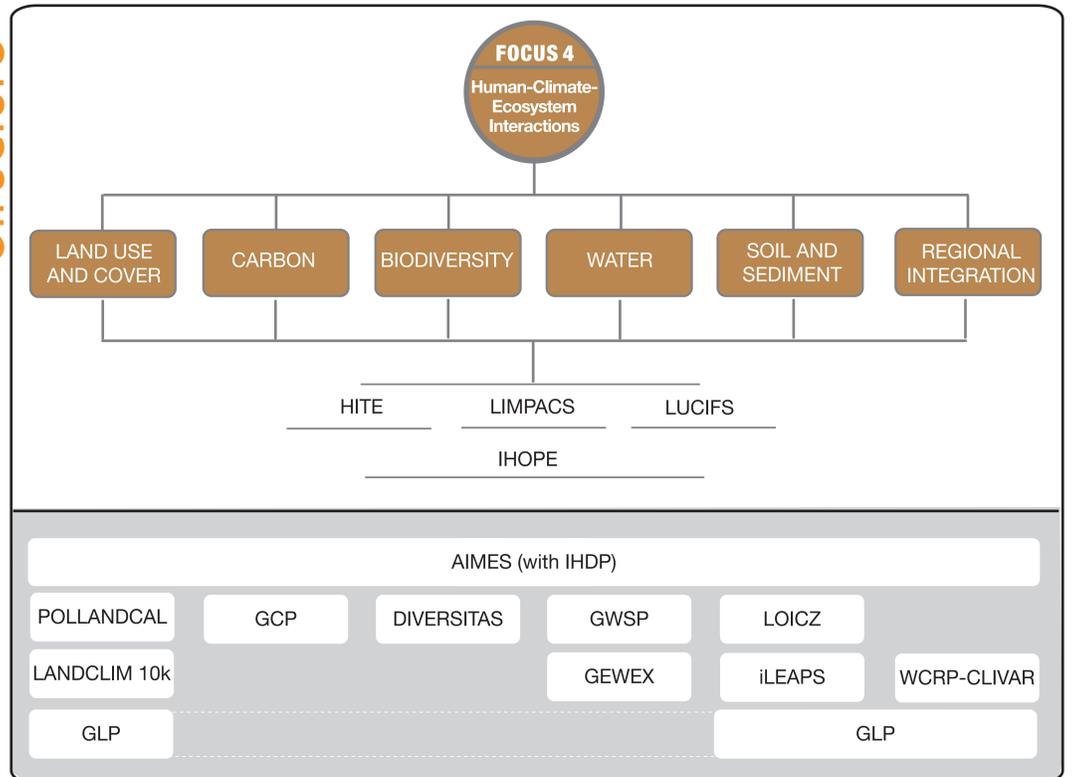
Focus 4 addresses the long-term interactions among past climate conditions, ecological processes and human activities during the Holocene. Emphasis lies in comparing regional-scale reconstructions of environmental and climatic processes using natural archives, documentary and instrumental data, with evidence of past human activity obtained from historical, paleoecological and archeological records. The Focus promotes regional integration of records and dynamic modeling to: 1) Understand better the nature of climate-human-ecosystem interactions, 2) Quantify the roles of different natural and anthropogenic drivers in forcing environmental change, 3) Examine the feedbacks between anthropogenic activity and the natural system, and 4) Provide integrated datasets for model development and data-model comparisons.

Rationale

The research enhances the use of paleorecords and other archives to provide past perspectives of environmental change that may be used to understand the functioning of present and future ecosystems. In this respect, the Focus is forward-looking, with the ultimate goal of delivering tools and strategies for the sustainable management of ecosystems and landscapes.

This Focus has taken the name "PHAROS" from Alexander the Great's iconic lighthouse that served to warn travelers of danger, and illuminated their past and future directions.

Structure



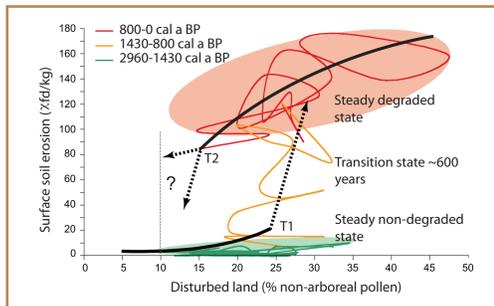
Structure of Focus 4. Top: Focus Themes (brown boxes) with the corresponding Working Groups below. Bottom: Overlap with external programs (white boxes).

Activities & Goals



Goals across all 6 Themes:

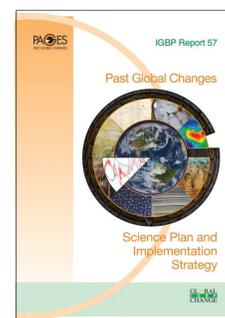
- To understand and quantify the nature of human activities that have influenced the functioning of ecological systems. For example, the historical links between climate, human activities (such as irrigation practices) and soil erosion in different world regions.
- To elucidate feedbacks from human activities to the climate system. For example, determining the impact (local to global) of deforestation on climate.
- To describe how human and climate impacts have interacted with internal system dynamics. For example, the extent to which river channel changes are a consequence of external forces, such as land use and climate, or internal forces, such as hydraulic dynamics and system configuration.
- To explore the sensitivity and resilience of modern ecological systems to new or increased stresses from human activities and climate change. For example, to identify those ecological processes that have been the most responsive to past rapid climate change and which may be sensitive to projected climate change in the future.
- To synthesize and integrate findings on past human-climate-ecosystem interactions in order to help develop appropriate sustainable management strategies. For example, determining the historical range of variability in natural disturbance regimes, the reference conditions that are most relevant for ecosystem restoration, or the land use that appears most appropriate in the face of projected change.



Reconstructed landscape stability in alternative steady states. T1 and T2 represent likely positions of major thresholds in the system. The dashed arrows from T2 show possible future trajectories of landscape recovery (Dearing, 2008).

Implementation

The Themes of Focus 4 will be addressed by specialists from one or more of three Working Groups: **Human-Climate Interactions with the Terrestrial Environment (HITE)**, **Human-Climate Interactions with Lake Ecosystems (LIMPACS)**, and **Land Use-Climate Interactions with Fluvial Systems (LUCIFS)**. These Working Groups are comprised of large, well-established scientific communities with national and international identities. They will focus on the synthesis and integration of data, and the dynamic modeling of processes within a specific interdisciplinary topic. **Integrated History and Future of People on Earth (IHOPE)** is a joint research initiative of PAGES and the AIMES (Analysis, Integration and Modelling of the Earth System) project with the International Human Dimensions Programme (IHDP). IHOPE seeks to better understand the dynamic interactions between all aspects of human behavior and the environment by connecting the histories of humans, climate and environment at multiple temporal scales (millennial, centennial, decadal and future scenarios).



PAGES Science Plan and Implementation Strategy

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