Welcome NEESPI!
Researching the Earth system

Our approach to understanding the Earth System has been to cut the “big picture” into small pieces.

Some of the pieces lack detail, others are missing entirely - but…
Researching the Earth system

Earth System Science and sustainable development need a systemic approach -

someone needs to put together the puzzle!
IGBP Vision and Goal

The Vision of IGBP is to provide scientific knowledge to improve the sustainability of the living Earth.

- IGBP studies the interactions between biological, chemical and physical processes and human systems.
- IGBP collaborates with other programmes to develop and impart the understanding necessary to respond to global change.
The IGBP Network
Investigating the sensitivity of marine biogeochemical cycles and ecosystems to global change

- Interactions between biogeochemical cycles and marine food webs
- Sensitivity to global changes
- Feedbacks to the Earth system
- Responses of society
The goal of GLOBEC is to advance our understanding of the global ocean ecosystem, its major subsystems, and its response to physical forcing in order to forecast responses to global change. GLOBEC foci:

- Retrospective analyses
- Process Studies
- Modelling
- Feedbacks to the human system
44% of the world’s population live within 150 km of a coastline

LOICZ
Land - Ocean Interactions in the Coastal Zone

- Vulnerability of coastal systems & hazards to human societies
- Implications of global change & land & sea use on coastal development

- Anthropogenic influences on the river catchment & coastal zone interaction
- Fate & transformation of materials in coastal & shelf waters
- Towards coastal system sustainability by managing land-ocean interactions
• The nature and causes of land system change.

• The consequences of land system change for ecosystem services and Earth System functioning.

• Support for sustainable use of land systems using integrated analysis and modelling.
iLEAPS
Integrated Land Ecosystem - Atmosphere Processes Study

- Land-atmosphere exchange of reactive and long-lived compounds: Interactions and feedbacks
- Feedbacks between land biota, aerosols and atmospheric composition in the climate system
- Feedbacks and teleconnections in the land surface, vegetation, water, atmosphere system
- Transfer of material and energy in the soil, canopy, boundary layer system: Measurements and modelling
• The role of atmospheric chemistry in amplifying or damping climate change.

• The effects of changing regional emissions and depositions, long-range transport, and transformations on tropospheric chemical composition and air quality.
SOLAS
Surface Ocean - Lower Atmosphere Study

- Biogeochemical interactions and feedbacks between ocean and atmosphere
- Exchange processes at the air-sea interface and the role of transport and transformations in atmospheric and ocean boundary layers
- Air-sea flux of CO₂ and other long-lived radiatively active gases

SeaWIFS, NASA/GFSC & ORBIMAGE
The ice cap on Kilimanjaro is melting so fast it may disappear by 2020

Restructure (under development 2005)
- Present-Past liaison
- Regional variability
- Human dimension eg. HITE
- Hydrological Cycle
- Polar Regions
- Greenhouse gases
- Interglacial variability
- Ocean acidification

Thompson et al (2002)
AIMES
Analysis, Integration and Modeling of the Earth System

- Earth System modelling at various complexities
- Systems-level analysis and integration
- Formalisation of the human dimensions in the Earth System
- Institutional network
- Postdoc Network
- Earth System Atlas, C⁴MIP, GEIA, IHOPE, EPICA...
Earth System Science Partnership

DIVERSITAS, IGBP, IHDP, WCRP

• an integrated study of the Earth System,
• the changes occurring to the System, and
• the implications for global sustainability.
Earth System Science Partnership

DIVERSITAS, IGBP, IHDP, WCRP
Human Health
(Under Development)

Project Goals:

• To determine the past, current, and future health impacts of global environmental change.

• To enrich the policy discussion about mitigation and adaption from a human health perspective.
Carbon Cycle

• **Patterns and variability:** what are the geographical and temporal patterns of carbon sources and sinks?

• **Processes, controls and interactions:** what are the controls and feedback mechanisms - natural and anthropogenic - that determine the dynamics of the carbon cycle on scales of years to millennia?

• **Management of the carbon cycle:** what are the future dynamics of the carbon-climate system and what are the points of intervention and windows of opportunity for managing this system?

http://www.globalcarbonproject.org/
Water Resources

• What are the relative magnitudes of changes in the global water system (GWS) due to human activities and environmental factors?

• What are the social and Earth System feedbacks of human-driven change to the global water system?

• To what extent is the GWS resilient and adaptable to global change?

www.gwsp.org
Food Systems

A food-secure future for those most vulnerable to environmental stress

• How will global environmental change (GEC) affect the vulnerability of food systems in different regions?

• How can we adapt food systems to cope with GEC and improve food security?

• How will the various adaptation options feed back on environmental and socioeconomic conditions?

http://www.gecafs.org/
Integrated Regional Studies

• assess the influence of regional processes on Earth System functioning (and vice-versa)
• be integrative (natural and social sciences, all components of the Earth System, planning to synthesis)
• contribute sound scientific understanding in support of sustainable development in the region
• be scientifically-driven by scientists in the region, with global collaboration

Ongoing activities in Monsoon Asia region, possible new IRSs in Africa, Northern Eurasia
SysTem for Analysis Research and Training

• Develop a system of **regional networks** of collaborating scientists and institutions.

• **Enhance scientific capacity** in developing countries, by strengthening and connecting existing institutions, training global change scientists and improving their access to data and results.

• Help **mobilise the resources** required to augment existing global change scientific capabilities, infrastructure and activities in developing countries.
IGBP looks forward to interactions with NEESPI!