

International Geosphere-Biosphere Program (IGBP)

Generating policy relevant knowledge
for a Planet under Pressure

Jose A. Marengo
Chief, INPE CCST
SC IGBP member



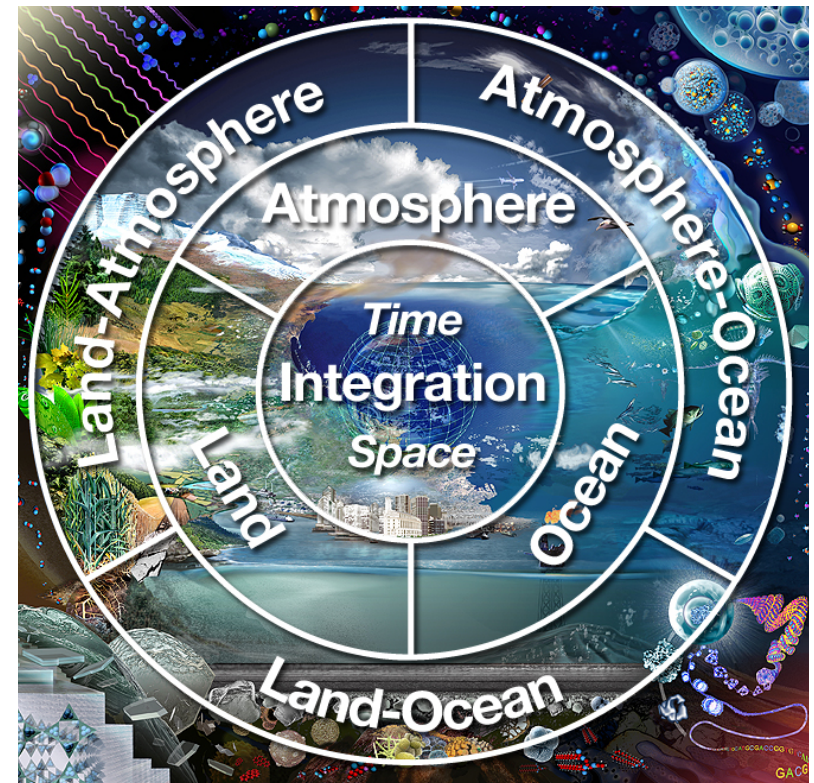
GLOBAL
IGBP International
Geosphere-Biosphere
Programme
CHANGE



Integrated Earth-system Approach

IGBP launched 1987:

- Leading international research on the planet's key biogeochemical processes *including humans*
- Integrated Earth-system approach, working globally and regionally.
- Addressing impacts, adaptation and vulnerability
- Using a range of tools (models, inter-comparisons, data evaluation)



How are IGBP's vision and activities addressing changes in the Earth system?

IGBP Strategic Vision: To provide essential scientific **leadership** and knowledge of the **Earth system** to help guide society onto a **sustainable** pathway during rapid global change

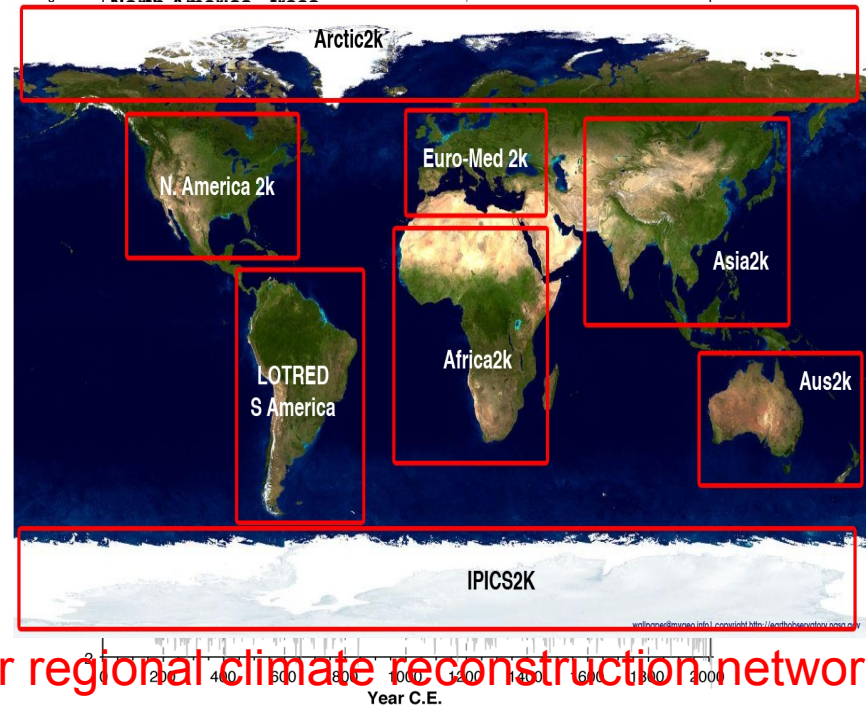
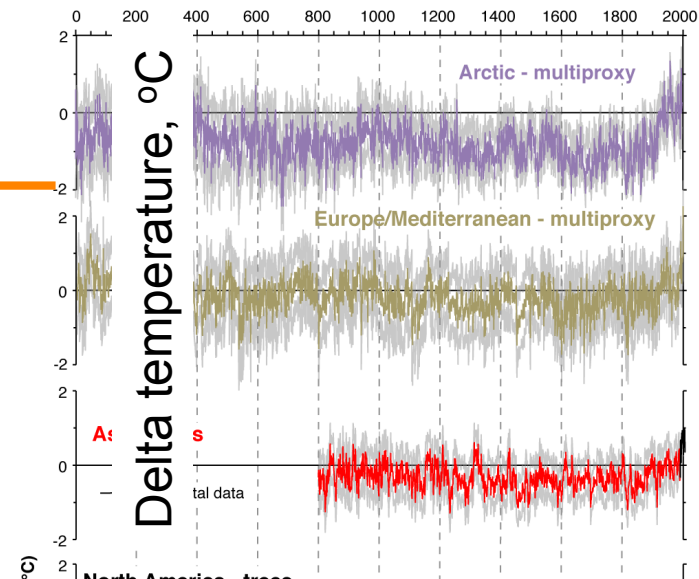
Fundamentals of the Earth system
Impacts of environmental disturbances
Bio-geophysical and social diversity
Resource management
Mitigation and adaptation

*Some science highlights from the past
year*



1st Global climate reconstruction – with regional detail

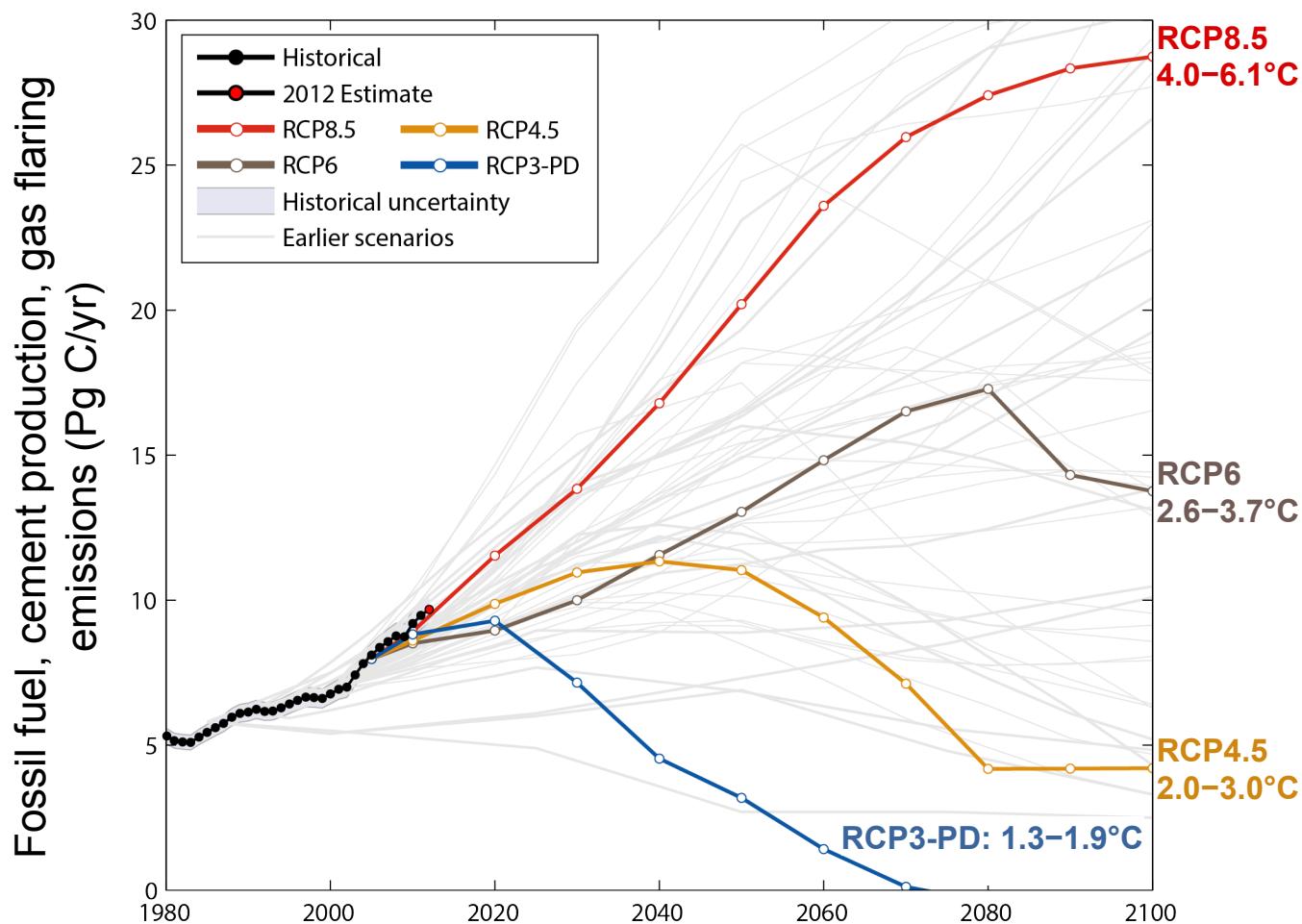
- 7 regions, >500 sites
- multi-proxy approach
- worldwide Medieval Climate Anomaly (ca. 950-1300 AD)
- worldwide Little Ice Age (c. 1450-1850)
- robust millennial-scale cooling
- warming over last few decades



2K year regional climate reconstruction network

CO₂ emissions follow worst case scenario

Emissions are heading to a 4.0-6.1°C “likely” increase in temperature
Large and sustained mitigation is required to keep below 2°C



Black Carbon: heats up the atmosphere because it absorbs sunlight

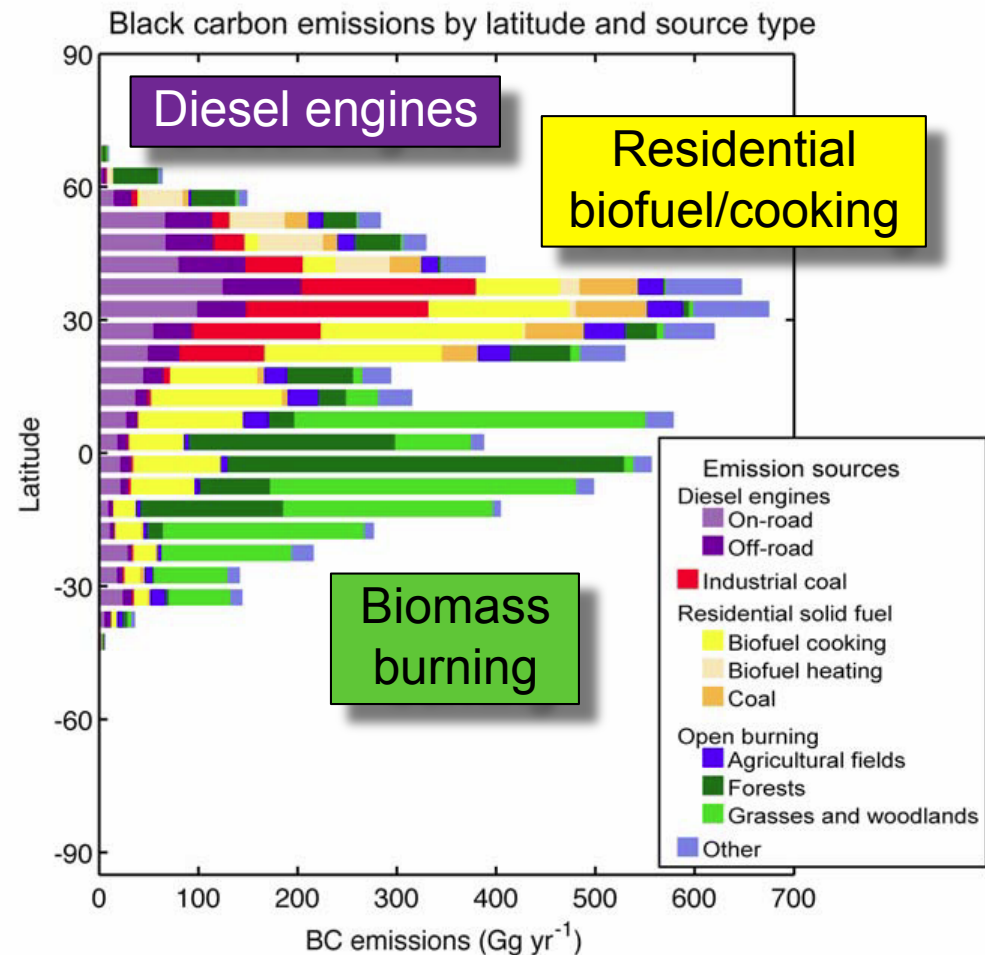
Second only to CO₂ as warming agent

1.7 vs 1.1 W/m²

Climate and health impacts

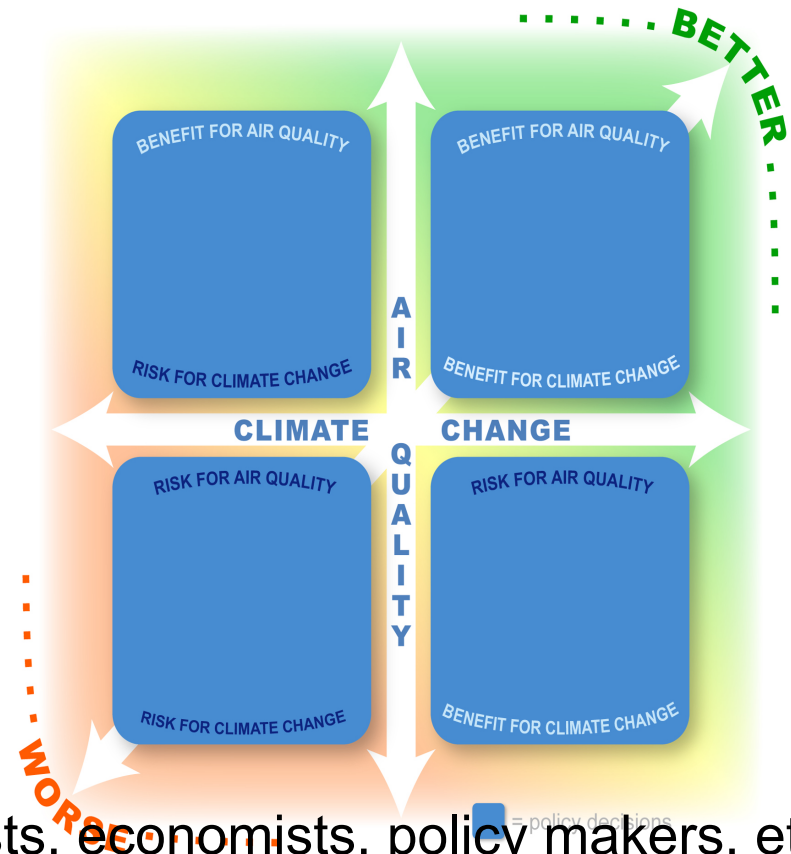
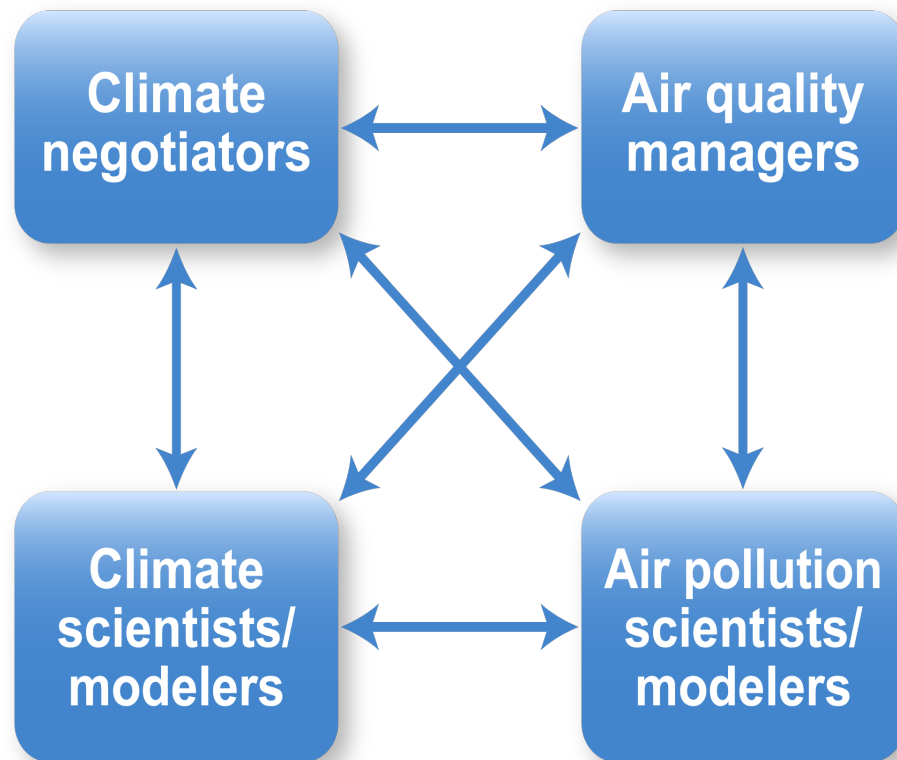
Short atmos life-time

BC emissions by latitude and source type – important information for policy decisions on reducing BC



Air pollution & climate: CO2 and BC

mitigation options and policy discussions



engaging a range of stakeholders (scientists, economists, policy makers, etc.) to assess the status of knowledge with regard to current understanding about air pollution and climate change



Sustainability in an ever urbanizing planet

Urbanization and Built Environments

- If 3.2 billion additional people by 2100
- Mostly in cities of 1 million
- Require 3200 cities of 1 million over 89 years
- Or a **new 1 million person city every 10 days**

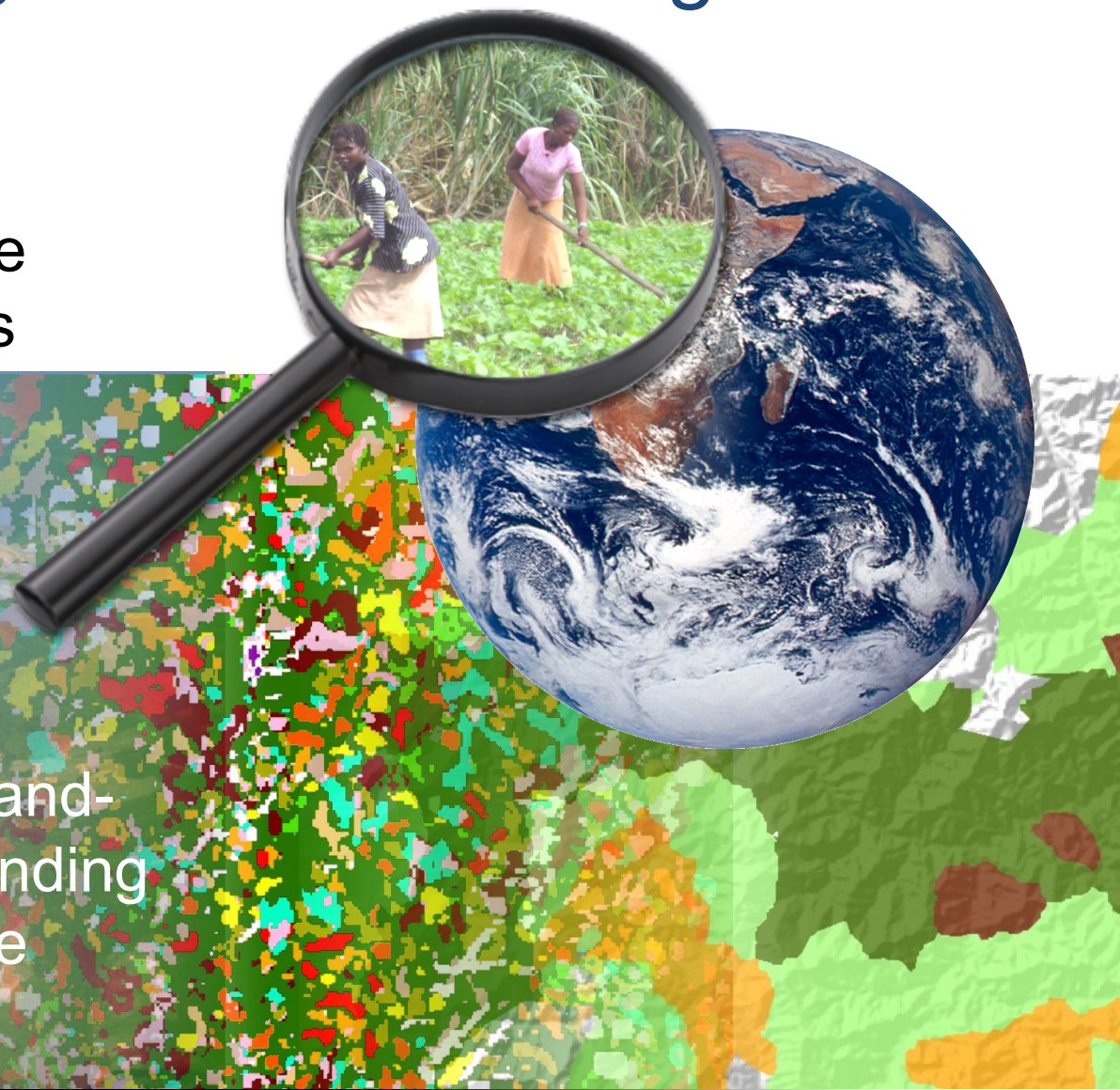


Land-use, land-cover change

Linking local and global observations of land use and ecosystem services

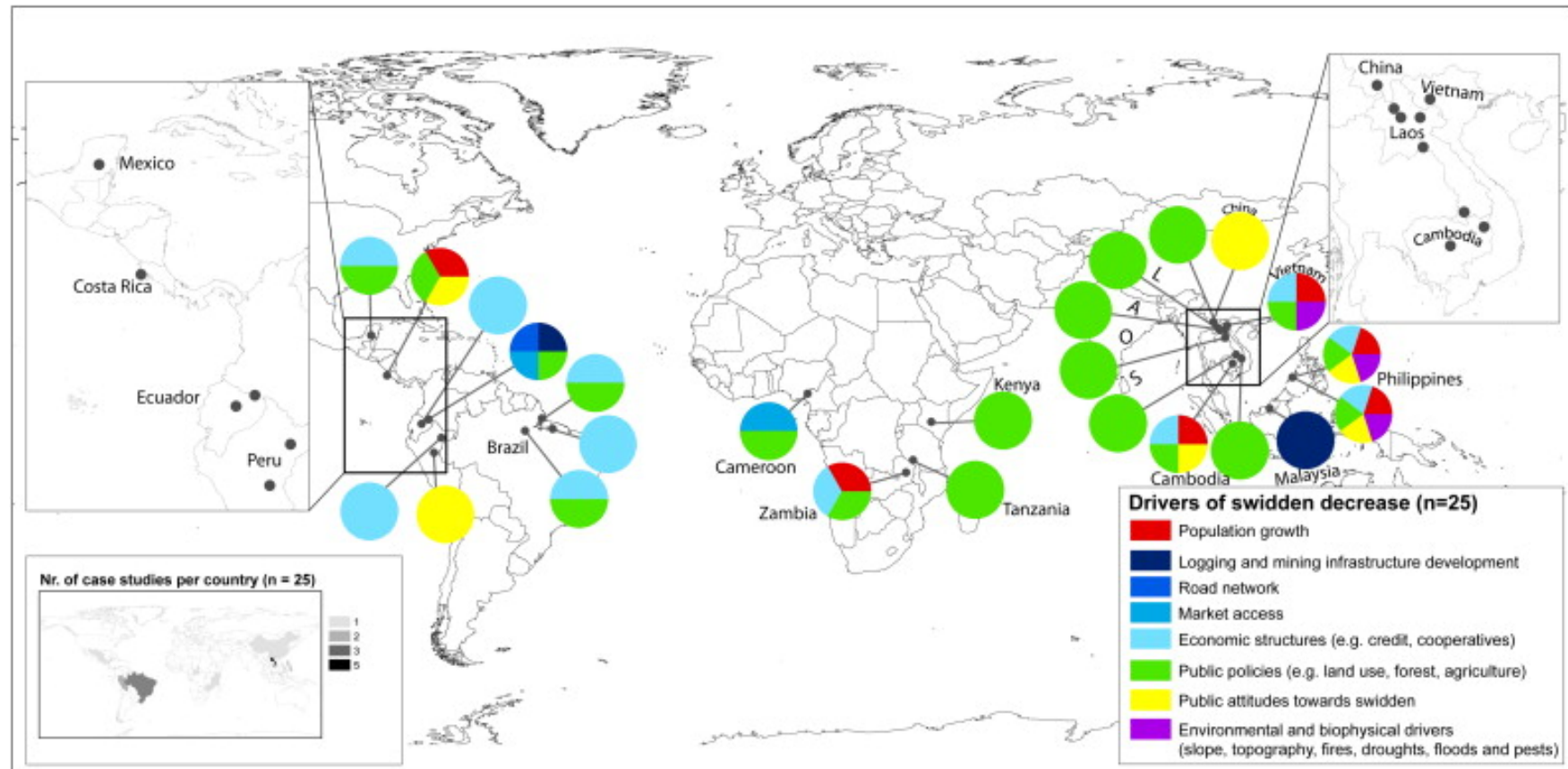
From large scale land cover changes to subtle modifications of land use

Detecting and quantifying changes in land-use and land-cover, as well as understanding the factors driving land-use change,



Social drivers of land use change

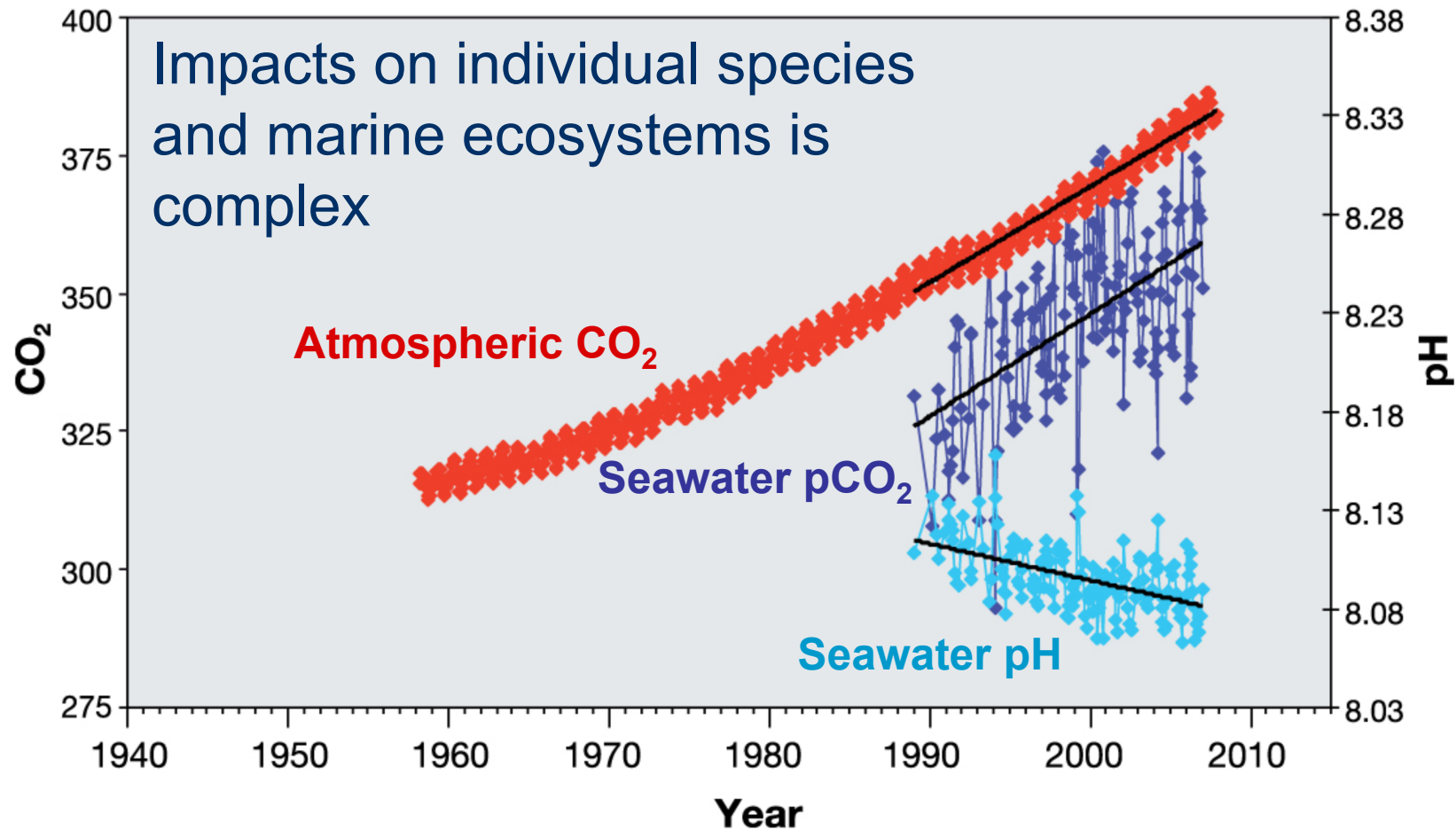
Transformation from swidden (slash-and-burn) to other land uses in tropical forest-agriculture frontiers



*Continuing to build the dialog
science and decision makers*



CO₂ and pH time series in the North Pacific Ocean: Ocean acidification



Adapted from R. Feely 2008



PLANET
UNDER
PRESSURE
2012 MARCH 28-29
LONDON

PUP 2012 was the largest and most ambitious engagement effort in IGBP's 25-year history

NEW
KNOWLEDGE
TOWARDS
SOLUTIONS



Conference co-chairs, Lidia Brito (UNESCO), Mark Stafford Smith (CSIRO)

- State of the planet
- Linking communities
- Solutions
- 3000 delegates

SCIENCE POLICY DEVELOPMENT INVESTMENT
INDUSTRY ENGINEERING TECHNOLOGY MEDIA



And their Earth System Science Partnership



The Ocean in a High-CO₂ World

Ocean Acidification

Third Symposium • Monterey • California • 24-27 September • 2012

BLUE



GLOBAL
IGBP International
Geosphere-Biosphere
Programme
CHANGE

Policy Panel

Jane Lubchenco NOAA

HSH Prince Albert II of Monaco

Congressman Sam Farr (D-California)

Jean-Pierre Gattuso, Scientist

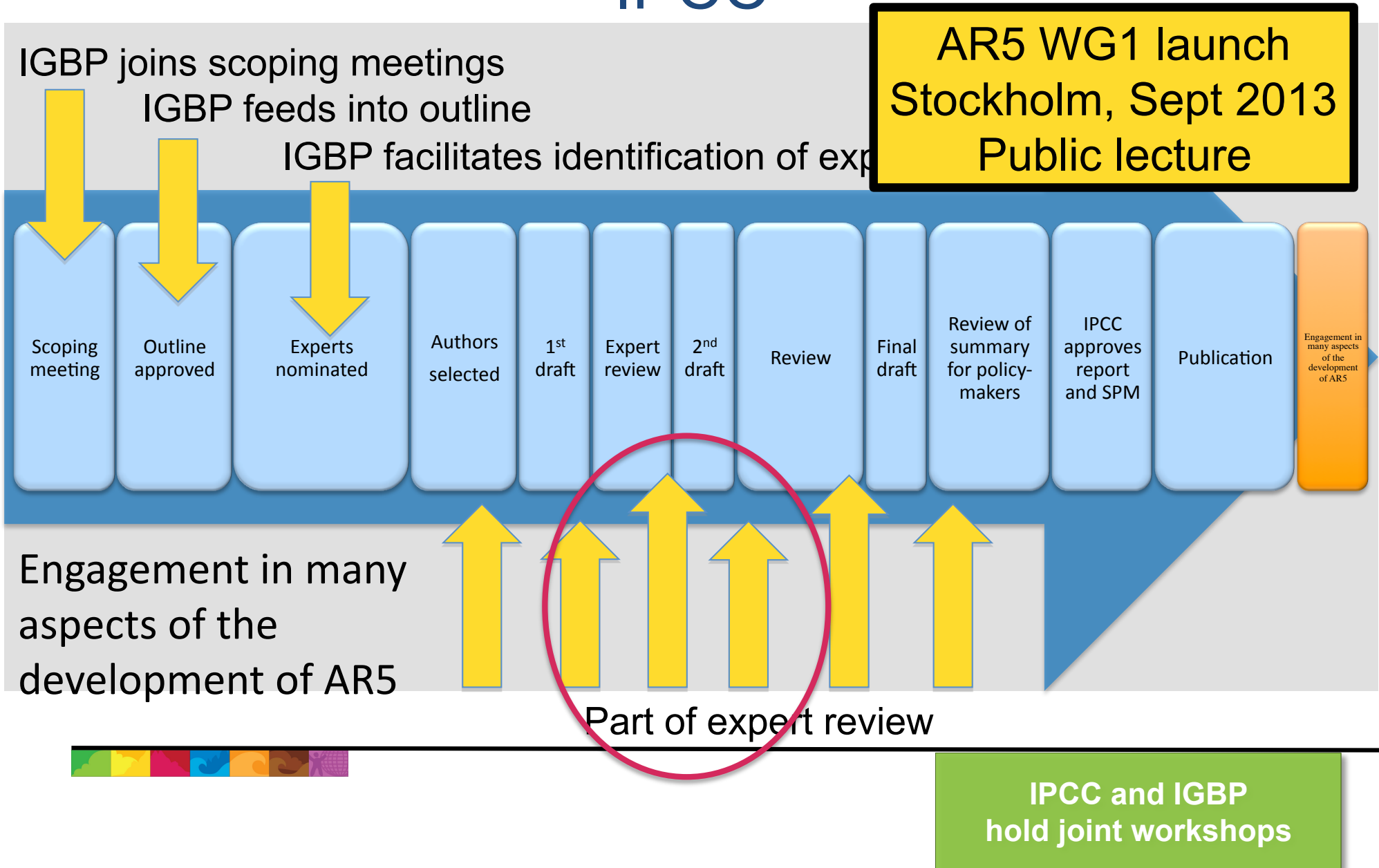
Bill Dewey, Taylor Shellfish Farms

Virginia Gewin, Nature



Ocean Acidification Google Tour

Intergovernmental Panel on Climate Change IPCC



Forward look

IGBP SC meeting
17-19 April 2013
Bern, Switzerland

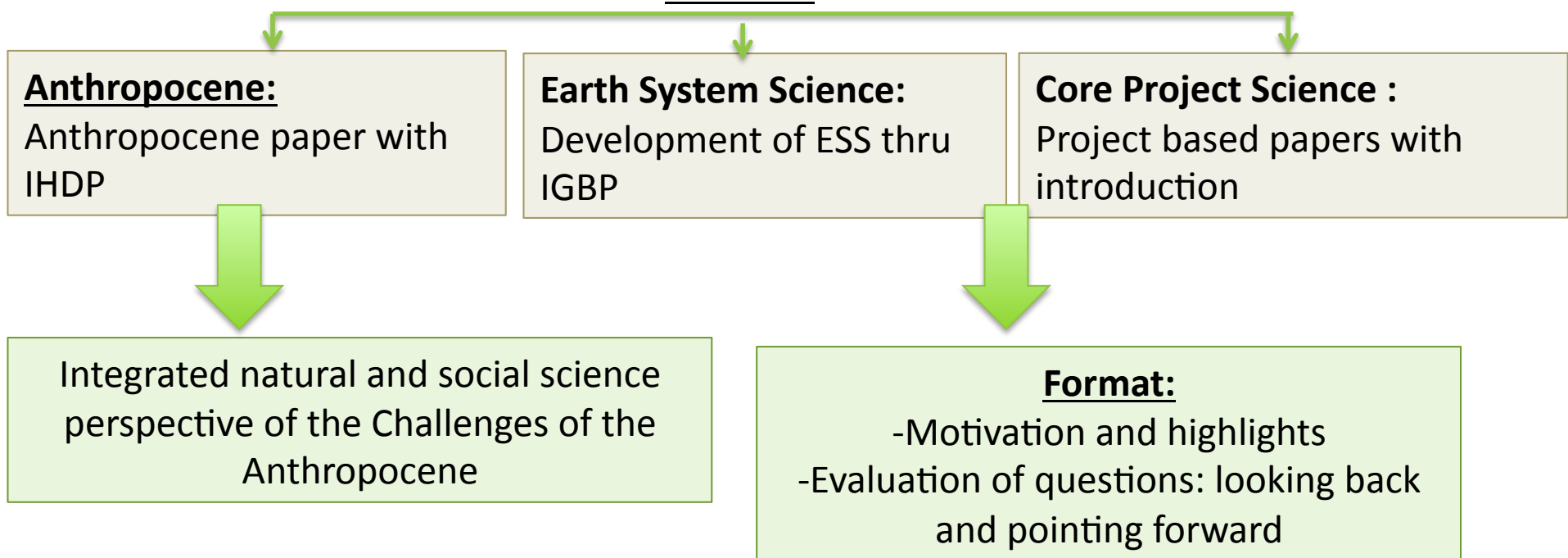


IGBP Synthesis

Goals:

- Frame contribution of IGBP core project science & big picture view of development of Earth System science thru IGBP
- Forward look

Products



Complete by December 2015





photos: www.dawide.com

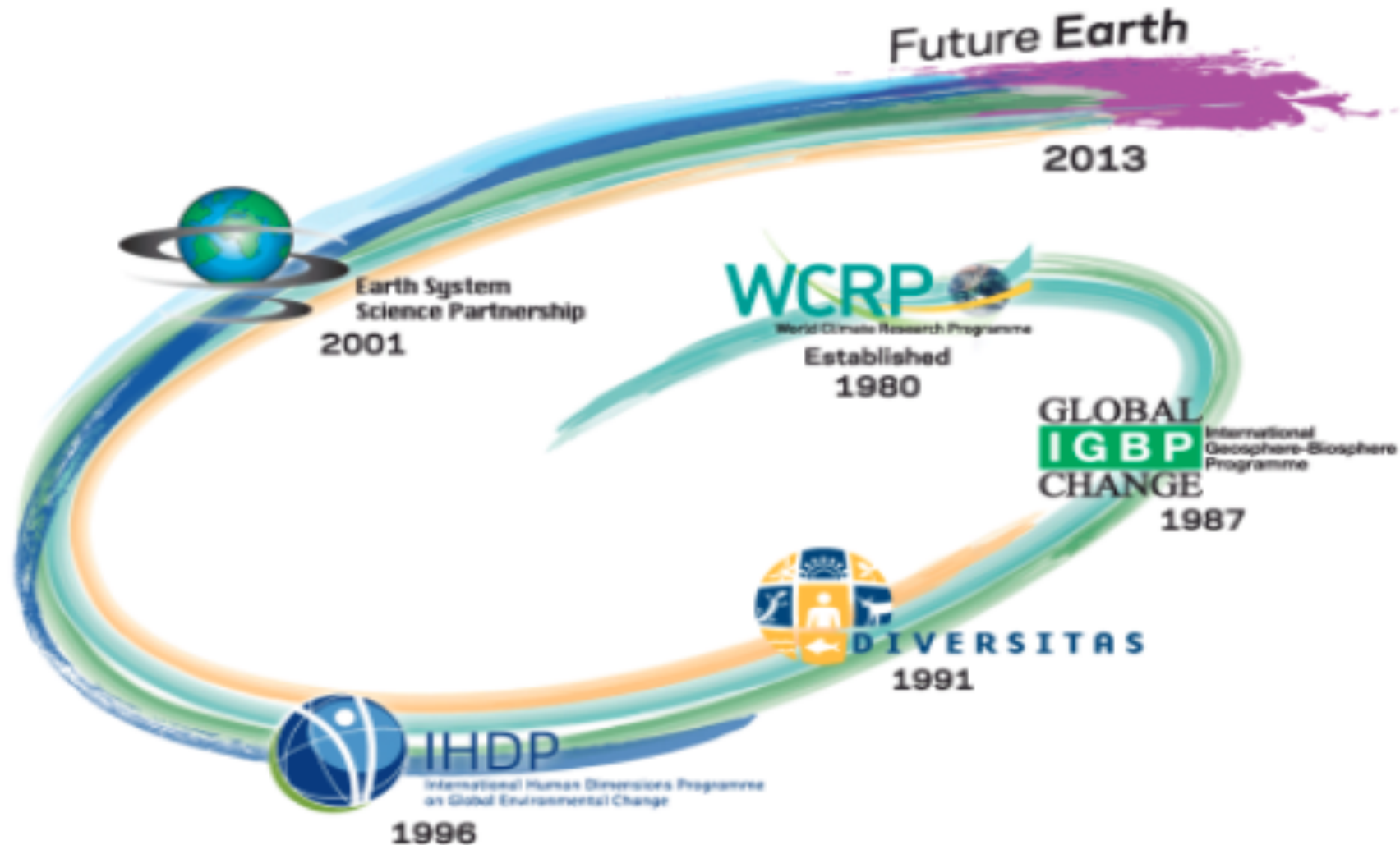
futureearth

research for global sustainability



WMO





The Earth System Science Partnership was set up in 2001 to address integrative research questions and foster greater interaction between the natural and social sciences. In 2013, a new initiative – Future Earth – will respond to the growing emphasis on solutions and greater engagement. (Raupach 2012-IGBP)

IGBP transition into Future Earth

- Core projects are invited to join Future Earth
- IGBP will continue until December 2015 to help ensure a smooth transition of core projects and key activities of IGBP**
- IGBP working with our scientific community, funders, stakeholders, to support smooth transition



** and finalize synthesis