

Land Cover and Land Use Change in South Asia

Background and Objectives of the Meeting

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Land Cover and Land Use Change (LCLUC):

“the other global change!”

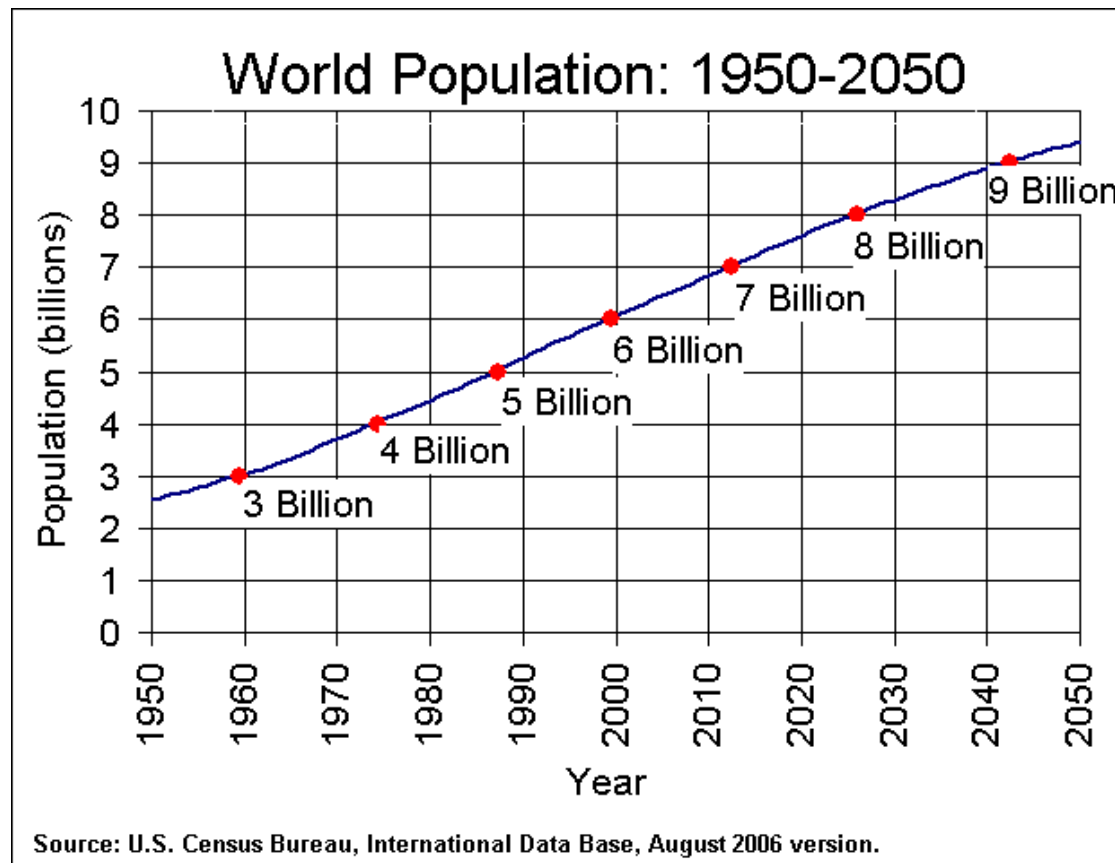
- LCLUC is the most pervasive and visible form of environmental change - In a rapidly changing world - all regions of the World are experiencing some aspect of LUC
- The impacts of LU Change on the Earth System are significant
- In most places more immediate than climate change ?
- All land use change is local – but there are regional patterns
- Relatively little has been developed in terms of the underpinning science of LCLUC in the context of global change – support for LU science is continuing to grow
- LCLUC will continue to be important, driven by world population growth and economic development and the associated demands for land, the need for an increased food supply, wood products and natural resources

Definitions: Land Cover, Land Use, Change

- **Land Cover** – what we observe – vegetation/bare soil/buildings etc – (amenable to remote observations - land cover type, land cover parameterization, vegetation continuous fields, objects)
- **Land Use** – the use to which the land is put with the associated management practices (e.g. agriculture mechanized or subsistence, clear cutting, selective logging, afforestation, recreation, conservation)
 - A piece of land may have multiple uses at one time
- **Changes in Land Cover** - change in cover type (forest to pasture, cropland to woodland, agriculture to urban), change in characteristics (structure, field size, degradation, productivity, species composition)
 - Disturbance - change followed by recovery (fire, logging, wind throw)
- **Changes in Land Use** – change in management practices, intensification, extensification, mechanization, irrigation, abandonment, cropping system, protection

A major driver of Land Use Change

- World population has increased almost by a factor of 2 in 35 years to 6.3 billion people



Land Cover and Land Use Change

- Why does land use change? – changing human needs and economic development *and a changing climate (seasonal > centennial)*
- The needs of an increasing human population for example:
 - A place to grow food and keep animals - agriculture, fishing
 - A place to live – build or rent a house,
 - A place to work / conduct business - extraction of resources – e.g. Forestry, Mining, Industry, Manufacturing, Service
- Changes in LCLU driven by
 - socio-economic factors, demographics, land ownership, government policies,
 - changing physical conditions (climate,), water availability, etc
- LCLUC science requires an integration of physical and social science – integrated science

Roots of the Current LCLUC Research Agenda:

The International LUCC Program

- The global environmental change community recognized the significance of land-use and land-cover change and the need for an interdisciplinary research approach to the subject.
- This recognition in the early 1990's prompted the **International Geosphere-Biosphere Programme** and the **International Human Dimensions of Global Environmental Change Programme** to explore a cooperative research project/program with the general goal of improving our basic understanding of the dynamics of Land-Use and Land-Cover Change (LUCC) globally, with a focus on improving our ability to model and project such change
- Current manifestation through the Global Land Project www.globallandproject.org

Examples of LU Current Science Questions

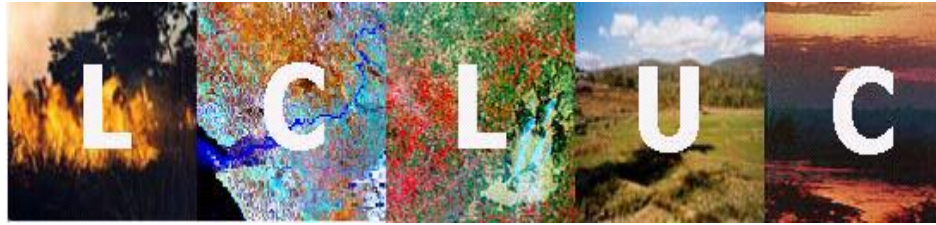
- What are the processes of LCLUC– explaining the current distributions and the socioeconomic drivers of change
- What is the role of LCLUC in biogeochemical and water cycles
 - Changing carbon stocks, changing land cover, changing albedo, water supply
- How does LCLUC contribute to climate change e.g. source of greenhouse gases and aerosols and trace gases and albedo forcing
 - Impact of LUC on regional climates – isolating the land use term
 - Impact of resulting LU policies and mitigation activities on land use – reducing deforestation (REDD), no-till agriculture, biofuels,
- How are LC and LU impacted by climate change - effect of interannual, decadal and centennial climate variability and trends on land cover and land use
 - Adaptation – changing LU in marginal lands, shifting cropping patterns
- How does LC and LUC impact the provision of ecological goods and services e.g. food supply, water quality, biodiversity
- What are the impacts of LCLUC on society – quality of life, economic benefits, health
- How to develop more sustainable LU systems !!!!!!!!

Current Topical LU Issues in a Changing World

- Globalization of markets – e.g. China and S. American Soybeans, Europe and African Beef, Japan and Indonesian Hardwoods – volatile markets
- Unprecedented urban growth and increasing # of megacities – loss of productive agricultural land
- Expanding/ sprawling Suburbia and associated energy Implications
- Land use aspects of the emerging Carbon Economy –carbon offsets, mitigation
- UN FCCC and REDD (Monitoring Reporting and Verification)
- Food to fuel, forests to fuel (corn ethanol, sugar cane, palm oil, rubber)
- Changing Agricultural Land Use
 - Extensification in the Developing World, and intensification of Agriculture
 - Changing patterns of Agriculture, small farms aggregated, collectives divided,
 - Land abandonment related to demographics and economics – labor costs
 - Climate Change Impacts on Agriculture - adaptation
 - Local food, local markets
- Competing demands for Water – Irrigated Agriculture – International conflicts
- Land Grabs in the Developing World (investment for the future)
- Sustainability – Economic and Environmental Priorities (UNCED, Agenda 21, WSSD, Millennium Development Goals)



NASA Land Cover and Land Use Change



- NASA LCLUC is a global program with a focus on global to regional scale science and an emphasis on the use of remotely sensed data
- The LCLUC Program aims to strengthen LCLUC research for example by
 - Connecting NASA/US researchers to regional scientists with a better understanding regional land use issues
 - Promoting and fostering LCLUC research in the international community
 - Encouraging the establishment of regional networks of LCLUC scientists to strengthen regional LCLUC research (working with international programs START, GOF-C-GOLD, GEO)
 - To promote the use of satellite data for LCLUC related research and strengthen international cooperation on Earth Observations

National Regional Science Meeting
Land Cover and Land Use Change in South Asia
Karunya University, Coimbatore, Tamil Nadu, India
January 10-13, 2013

International Scientific Program Committee

- Dr. Prasad Thenkabail, USGS
- Dr. Garik Gutman, LCLUC Program Manager, NASA Headquarters, USA
- Dr. Chris Justice, University of Maryland, USA
- Dr. Atul Jain, University of Illinois, USA
- Dr. Martin Herold, Wageningen University, The Netherlands
- Dr. Jiaguo Qi, Michigan State University, USA
- Dr. Krishna Vadrevu, University of Maryland, USA
- Dr. Olga Krankina, Oregon State University, USA
- Dr. Hassan Virji, START Program

Local Organizing Committees

- Dr. E.J. James – Director, Water Institute and Dean, Karunya University, Coimbatore, Tamil Nadu.
- Dr. N.B. Narsimha Prasad, Executive Director, CWRDM, Calicut, Kerala

Meeting Coordinators

- Lydia Prentiss UMD, Priya Ram and J. Brema Karunya Univ

Goals for the Meeting

- To provide an opportunity to present and review LCLUC related research in Southern Asia
- To gain a better understanding of current land use change issues in the region
 - to advance the understanding of large scale land cover changes underway in Southern Asia – their spatial extent, intensity and social consequences, feedback to regional climate and future projections
- To explore opportunities for collaboration on Land Use research between scientists within and outside the S. Asia region
- To promote and enhance the use of remotely sensed data in land use research
- To identify regional LU research priorities and explore the possibility of establishing a regional network of scientists working on these issues – strengthening land use science and the regional LU research community

Outline Meeting Agenda

- **Technical Session – I: Global, Regional & National Land-Use and Land-Cover Change Science Programs : summary introductions**
- **Technical Session – II: Agricultural Land Use Change**
- **Technical Session – III: LCLUC-related Earth Observations (Missions, Data and Products)**
- **Technical Session – IV: Atmosphere / Land Use Interactions (Rain, Clouds, Aerosols, GHG)**
- **Technical Session – V: LCLUC and Carbon Cycle**
- **Technical Session – VI: Forests and LCLUC in Mountainous Areas**
- **Technical Session – VII: Synthesis Presentations on Land use in Coastal Zones and Water Resources**
- **Technical Session – VIII: Urban LCLUC**

- **Panel Discussion on S. Asia Regional Research Priorities**
- **Poster Sessions**
- **Regional Panel Session**
- **Meeting Wrap Up: recommendations and next steps**

Logistics

- Please load your presentations ahead of your presentation
- Please keep your presentation strictly to time – you will be notified of time left
- Please take the opportunity to discuss your research with attendees at the meeting
- If you have ideas that you would like included in the recommendations from the meeting please provide them to C. Justice/ E. James/ G. Gutman in advance of the wrap up session