The South/Southeast Asia Research Initiative (SARI)

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and
SARI Core Team
• Background to the SARI initiative

• SARI Science Rationale

• SARI Program Coordination and Current Activities

• Next Steps
The South/Southeast Asia region is undergoing rapid land cover/land use changes due to population growth and economic development with implications for greenhouse gas emissions, hydrology, biodiversity, land atmosphere interactions, human livelihood.

Satellite data are used widely by regional scientists (NASA and ISRO data) for land use/cover change studies.

Much of the research using satellite data has societal relevance with a developing country perspective.

Good collaboration exists between NASA LCLUC and Regional Scientists from South/Southeast Asia (Myanmar – just started).
How it started - strong interest in a SARI from local scientists

Jan-10-13th, 2013-Regional Science Meeting, Coimbatore

Total participants =120
US – 18 researchers
Nepal-3; Srilanka-2; Myanmar-1; Afghanistan, Myanmar, Bangladesh-1 each
Pakistan, China invited but could not attend – Visa issues

India – University Researchers, Government, Non-Government, NGO’s
• Precedents for NASA initiated Regional Integrated Science Initiatives

  • TE – ISLSCP (International Satellite Land Surface Climatology Project; Boreas, LBA (Large Scale Biosphere-Atmosphere-Experiment in Amazonia), ABOVE (Arctic Boreal Vulnerability Experiment)

  • SAFARI (2000-2005)


  • MAIRS – Monsoon Asia Integrated Regional Study (2006 – 2014) - initiated by China, implemented by START, supported by LCLUC - transition to Future Earth.
Regional Priorities – Workshop Panel Summary

- Unanimous agreement for the development and need for SARI.
- International programs such as GOFC-GOLD, START, MAIRS, GEO-GLAM, etc. should be engaged as a means to strengthen SARI.
- A series of SARI planning workshops needed to converge on a science plan, identify, prioritize and address regional scale questions.

- SARI to aid in:
  - Developing and strengthening bilateral science collaborations among SARI + US and other countries.
  - Enable data collection and sharing mechanisms.
  - Assist in capacity building activities.

- Funding mechanisms needs to be explored through national/regional as well as international sources through Regional Scientists involvement.
Meeting Summary-The Earth Observer

March/April 2013

Discussions at the meeting by some LCLUC principal players raised the desirability and opportunity for a research initiative.
To develop an innovative research, education, and capacity building program involving state-of-the-art remote sensing, natural sciences, engineering and social sciences to enrich LCLUC science in South/Southeast Asia.
To strengthen the theoretical underpinnings of LCLUC science in the Asian region. SARI will help in:

- Developing new science partnerships between space agencies, research agencies, universities and non-government organizations;
- Developing integrated methodologies for regional scale LCLUC products; enhancing data sharing mechanisms;
- Organizing international workshops to exchange science results and formulate new research projects;
- Conducting capacity building programs, facilitating leadership training and experience;
- Facilitating international student/researcher exchange.
SARI Science Rationale
SOUTH ASIA REGIONAL SCIENCE INITIATIVE (SARI) - A RESPONSE TO REGIONAL NEEDS IN LAND COVER/LAND USE CHANGE (LCLUC) SCIENCE AND EDUCATION

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Abstract

The goal of this initiative is to develop an innovative regional research, education, and capacity building program involving state-of-the-art remote sensing, natural sciences, engineering and social sciences to enrich LCLUC science in South Asia. Our objectives are twofold. First, we aim to advance LCLUC science in the region. Second, we endeavor to strengthen existing and build new collaborations between US and South Asia researchers in the areas of LCLUC research. The impetus for such an initiative came from the LCLUC science team meeting held in Coimbatore, India, January 19-23, 2013.

To address LCLUC science, this initiative will utilize a systems approach to problem-solving that examines both biophysical and socioeconomic aspects of land systems, including the interactions between land use and climate and the interrelationships among policy, governance, and land use. A central component of this initiative will be the use of geospatial data from both remotely sensed and in situ sources and models. To strengthen the theoretical underpinnings of LCLUC science in the South Asian region, SARI will facilitate: a) new partnerships with space agencies, universities and non-government organizations; b) novel and regionally-appropriate methodologies and algorithms for LCLUC products; c) data sharing mechanisms; d) leadership training; e) international workshops to identify regional priorities, discuss and share scientific findings; f) capacity building programs; and g) international student/researcher exchanges, including among LCLUC scientists in the region. SARI will serve as a facilitator and catalyst for LCLUC research in South Asia. The outputs will be beneficial to the U.S., South Asia and international researchers and will serve as a model for interdisciplinary research that links LCLUC science with NASA assets.
Nearly 60% of world's population is in Asia (4.5 billion people); of which South/Southeast Asia accounts for ~70%.

Nearly 2/3rd of world population growth is in Asia

Nearly 50 million people are being added every year!
In recent years, croplands in the region are have been decreasing rapidly due to increasing urbanization and industrialization.

To meet the demands of the growing population, more than 80% of the increase in production will have to come from yield increase, since there is very little scope for expansion of agricultural lands.

Increasing extreme events are negatively affecting agricultural production.

*Understanding cropland changes and the impact of intensive agricultural practices on ecosystem services require integrated approaches.*
Urbanization is occurring rapidly at the cost of agriculture and forest lands.

Currently, 28.33% of South/Southeast Asian population lives in urban areas and it is estimated that by 2030, more than 55% of the population will be urban.

Urban sprawl has been increasing in different cities at the cost of agricultural lands, ecologically sensitive and natural areas.

Increasing Urbanization is resulting in air, water and solid waste pollution problems in most cities.

LCLUC interactions in urban environments are poorly understood and need immediate attention.
Increasing industrialization is a major cause of Atmospheric pollution.

Region is well known for Atmospheric brown clouds (ABC) (AOD>0.3 and percentage of absorbing aerosols exceeds >10%).

Increasing amounts of soot, sulphates and other aerosol components in ABC are causing major threats to the air, water and food security in Asia.

ABC pollutants were shown to have resulted in surface dimming, atmospheric solar heating and soot deposition in the Hindu Kush-Himalayan-Tibetan (HKHT) glaciers and snow packs.

**Linking standing LCLUC and atmospheric interactions impacts on regional climate is one of the priority areas of research.**
Floods: Although a natural calamity, poor land use planning and unplanned development in the hill areas through road construction, buildings, hydro-power projects and mining the river beds aggravating the havoc.

Droughts: The South Asian countries have been among the perennially drought-prone regions of the world. For example, Afghanistan, India, Pakistan and Sri Lanka have reported droughts at least once in three years in the past five decades (SAARC, 2012).

Landslides: Several mountain regions of Pakistan, Afghanistan, India and Myanmar are impacted by landslides.

*Understanding the linkages between LCLUC and extreme events such as fires, floods, tsunamis, droughts, etc., is important to aid mitigation efforts.*
• The projected warming due to the combined effect of greenhouse gas and sulfate aerosols over Asia is estimated to increase 2.7-3.7 degree C by the 2050’s (AR-5).

• Rainfall more extreme near the center of tropical belts making landfall in South Asia.

• Increased surface temperatures can have drastic effect on:
  • Glacier melts; Ag. Yield loss;
  • Severe droughts in some regions;
  • Decrease water availability

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*In the Asian countries, Adaptive capacity of humans is low and vulnerability is high.*
• Characterize the nature, magnitude, drivers and impacts of LCLUC in South Asia.

• Assist in the development of regional scale land surface and socioeconomic products useful for LCLUC research.

• Address LCLUC interactions on climate, water resources, biodiversity, atmosphere, etc.

• Address the vulnerability, impacts and adaptation issues associated with LCLUC.

• Develop regional scale land cover change models useful for decision support.

• Develop an understanding of LCLUC dynamics through facilitating systematic and integrated case studies.
Coordination and on-going activities
SARI Update and Next Steps

- Phase-I. Design Phase - Completed
  - Organizational Committee with Co-leads and Task Force members formed
    - **SARI Formulation Leads:** Krishna Vadrevu and Rama Nemani
    - **Task-Force leads:** Ruth DeFries, Karen Seto, Dan Brown, Chris Justice, Thenkabail Prasad (USGS), Ivan Csiszar (NOAA),
    - **Regional leads:** In formation
  - Science plan prepared highlighting the need for SARI and Action Plan.
  - Initial Projects funded through LCLUC ROSES
Phase-II Implementation – On going

- Project Office established;

- Burma Meeting, January, 2016 – Official Regional launch of SARI;

- Regional Review/Feedback on draft science plan in South Asia planned;

- Organizing internationally sponsored regional workshops to bring researchers together and identify priority areas.
Project Office Task-1: Development of Science Advisory Group Involving Regional Scientists and Implementation Teams

NASA Land Cover/Land Use Change Program

Phase I - Development Phase

- SARI Project Scientist
- Co-Lead

- Task Force
  (US scientists with expertise on South Asia)

SARI Developmental Tasks
- Serve as a Liason between SARI and NASA LCLU Program
- Formation of SAG involving Regional Scientists
- Promote Capacity Building and Training activities
- Development of SARI website
- Promotion of NASA products and data dissemination
- Publications

Science Advisory Group

Phase II - Implementation Phase

- SARI Scientist and Project Office

- Implementation Team Co-Leads

- Contributory Projects
  - Agricultural LCLU
  - Land Atmospheric Interactions
  - Urban LCLU
  - Forests and LCLU
  - Others
**Task-2:** Serve as a Liaison between SARI and the NASA LCLUC program. SARI project office will help in building collaborations/partnerships between the US and regional scientists.

**Task-3:** Facilitate NASA LCLUC Science Team meetings in South/Southeast Asia. SARI website for updates.

**Task-4:** Capacity building and training activities. Co-funding for some of the meetings secured through JAXA-National Institute of environmental Studies (NIES), Japan.

**Task-5:** Promotion of NASA products + regional datasets

**Task-6:** Publications, journal special issues, books, brochures.
Landsat images for the whole country of Myanmar Images from new Landsat sensor L8 for the period of January-March, 2015.

Contact: Sumalika Biswas
Previous LCLUC projects in SARI region

- **Jefferson Fox** – East West Center, Hawaii - Twenty-Five Years of Community Forestry: Mapping Forest Dynamics in the Middle Hills of Nepal – 2015-2018

- **Atul Jain**, University of Illinois at Urbana Champaign - Land Cover and Land Use Changes and Their Effects on Carbon Dynamics in South and South East Asia: A Synthesis Study – 2014-2017

- **Jinwei Dong** – Oklahoma State University-Mapping Industrial Forest Plantations in tropical Monsoon Asia Through Integration of Landsat and PALSAR Imagery – 2014-2017

- **Ruth DeFries**- Columbia University - Multi-sensor Fusion to Determine Climate Sensitivity of Agricultural Intensification in South Asia-2011-2014

- **Karen Seto** – Yale University - Multi-Scale and Multi-Sensor Analysis of Urban Cluster Development and Agricultural Land Loss in China and India - 2011-2014
Additional NASA LCLUC projects (LCLUC ROSES 2015 call)

- Bring together existing national and regional projects

- Exploring new non-NASA funding sources for SARI
  - International (Belmont Forum, USAID, NIES, Japan, etc.)
  - National – Dept. of Science and Technology (India); Private Companies, etc.
Inclusion of SEA Countries in SARI underway
(4 Regional Workshops already funded by NIES Japan and Regional partners)
International Workshop on Air Quality in Asia, Hanoi, Vietnam
June 24th-26th, 2014

Local Host
UNIVERSITY OF ENGINEERING AND TECHNOLOGY
This meeting outputs – “Remote Sensing” journal special issue solicitation

Special Issue “Mapping, Monitoring and Impact Assessment of Land Cover/Land Use Changes in South and South East Asia”

Quicklinks
- Special Issue Editors
- Special Issue Information
- Published Papers

A special issue of *Remote Sensing* (ISSN 2072-4292).

Deadline for manuscript submissions: 30 July 2016

Special Issue Editors

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Welcome to SARI

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SARI website
www.sari.umd.edu