

K&C Phase 4 – Final Report

Inundation mapping in East Africa and Southeast Asia

Lisa-Maria Rebelo

***International Water Management Institute (IWMI)
Regional office for South East Asia and the Mekong
Vientiane, LAOS***

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Project outline and objectives

Development of regional-scale applications: identifying seasonal patterns of inundation

- PALSAR/2 ScanSAR mosaics will be used to determine flooding patterns and to map the temporal dynamics of inundation across selected regions

Project activities involved mapping regional scale patterns of flooding and inundation across East Africa

- Initial assessment of these ecosystems and their seasonal dynamics was undertaken during the first phases of the K&C, and with data acquired by ALOS 1. The continuation of the data archives with acquisitions from ALOS 2 allows for the continued monitoring of these important wetlands, and provides the opportunity to better understand their dynamics over a longer period
 - Describe the original project objectives, and whether any changes have been made to those (and if so, why)

Links to the K&C “3C” thematic drivers:

- The activities are of direct relevance to the Ramsar Convention on Wetlands of International Importance, demonstrating the application and use of L-band SAR for wetland assessment, inventory and monitoring. The deliverables will also provide the information required for environmental conservation in the relevant regions

Ayerwaddy Delta, Myanmar

- Deep water rice (floating rice/flood based farming system) (FBFS) are unique rice varieties grown under deep water conditions (> 50 cm) where typical rice varieties do not survive
- Considered environmentally friendly since they can be farmed without the use of agro-chemicals and serve as biodiversity hotspots for fish and other aquatic species
- Provide a number of ecosystems services including supporting services, provisioning services, regulating services and cultural services

Decline across SE Asia

- Over the last 3 decades production in southeast Asia has been on a steady decline
- Myanmar has lost 42% between 1990 and 2015
 - drastic changes in rice production policies in favour of high yield varieties
 - development of flood control structures and irrigation schemes
 - rapid development of hydropower dams for energy generation and other major non-agricultural water uses
- Vietnam decline from 570 000 ha in 1990 to 200ha in 2015
- Cambodia 87%, Myanmar 42% decrease in area (1990-2015)

Decline across SE Asia

- changes in rice production policies & research
 - undeveloped international and local markets
 - lack of research and development
 - extreme weather events due to climate change
 - upstream development
- Renewed focus on preserving and extending adaptation of FR farming
- FR varieties depend on the depth of flooded water, rate of water level increase and the recession characteristics of the floods

Quantify the flood pulse associated with floating rice systems
using EO and field measured hydro-meteorological data

Flood based farming systems

Suite of activities assessing flood-based farming systems in Myanmar, as part of an international program on Flood Based Farming Systems

- **Contributes to a wider, international program to build capacity in Flood Based Farming Systems (FBFS)**
- **Support government to exploit floods in the Ayeyarwady Delta to meet development goals sustainably and inclusively**
- **Support dialog around managing multi-functional landscapes**

Flood based farming systems

- **Deep water rice (floating rice) grown under deep water conditions where typical rice varieties do not survive**
- **Quick adaptation to flooding conditions (stem elongation at rates of up to 20-25 cm/day)**
- **Environmentally friendly (no agro-chemicals) serve as biodiversity hotspots for fish and other aquatic species**
- **Ecosystems services (supporting services, provisioning services, regulating services and cultural services)**

Changing flood regimes

- Cultivation of floating and deep water rice varieties depend on:
 - depth of flooded water
 - rate of water level increase
 - recession characteristics of the floods
- Changing due to upstream development of flood control structures, irrigation schemes, hydropower dams
- Changes in flood patterns presents new risks to farmers in terms of crop exposure to flood damage if water levels rise faster than usual or inundation occurs for extended periods

ALOS

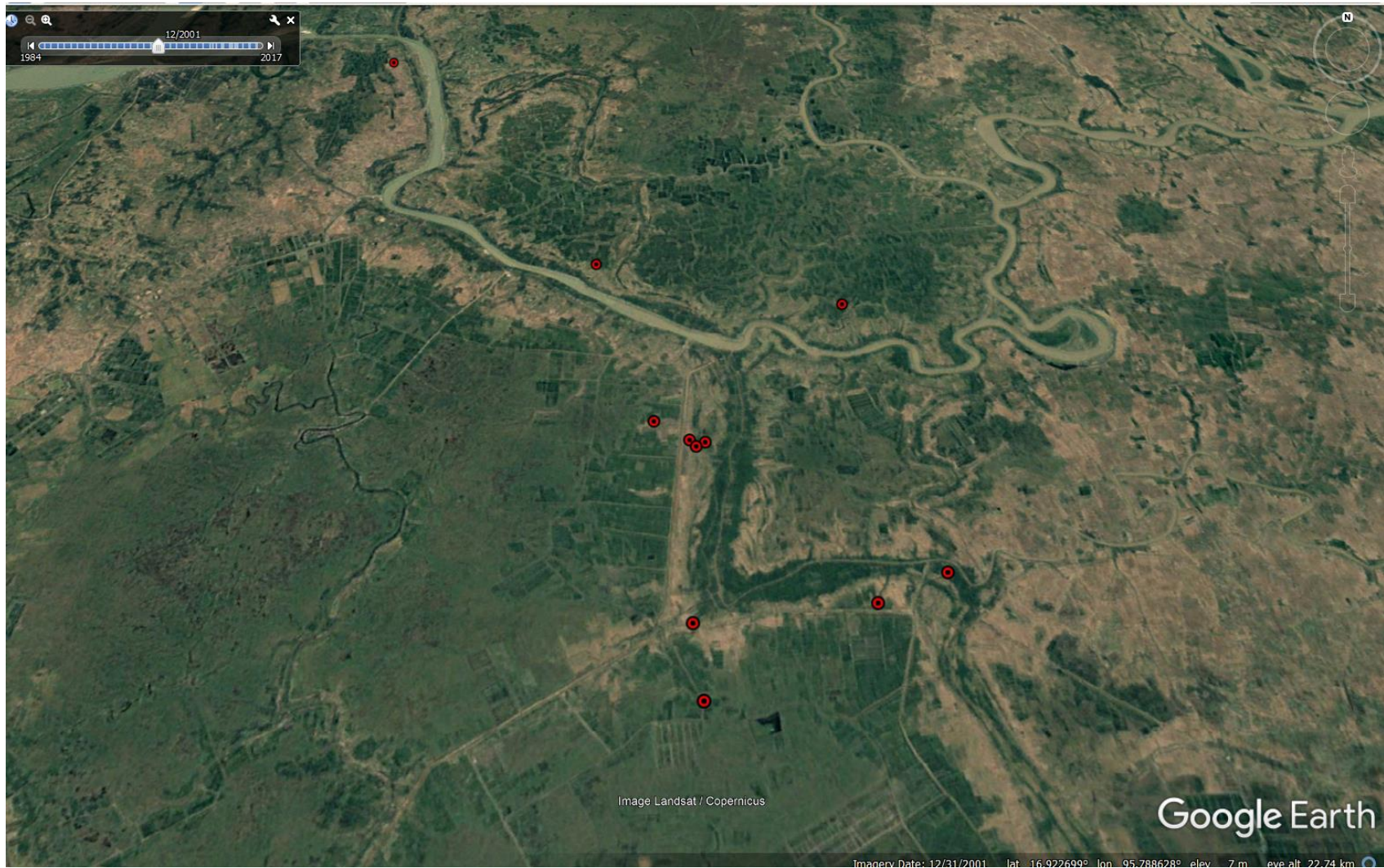
K&C Initiative
An international science collaboration led by JAXA



1984

ALOS

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2001

ALOS

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2008

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2013

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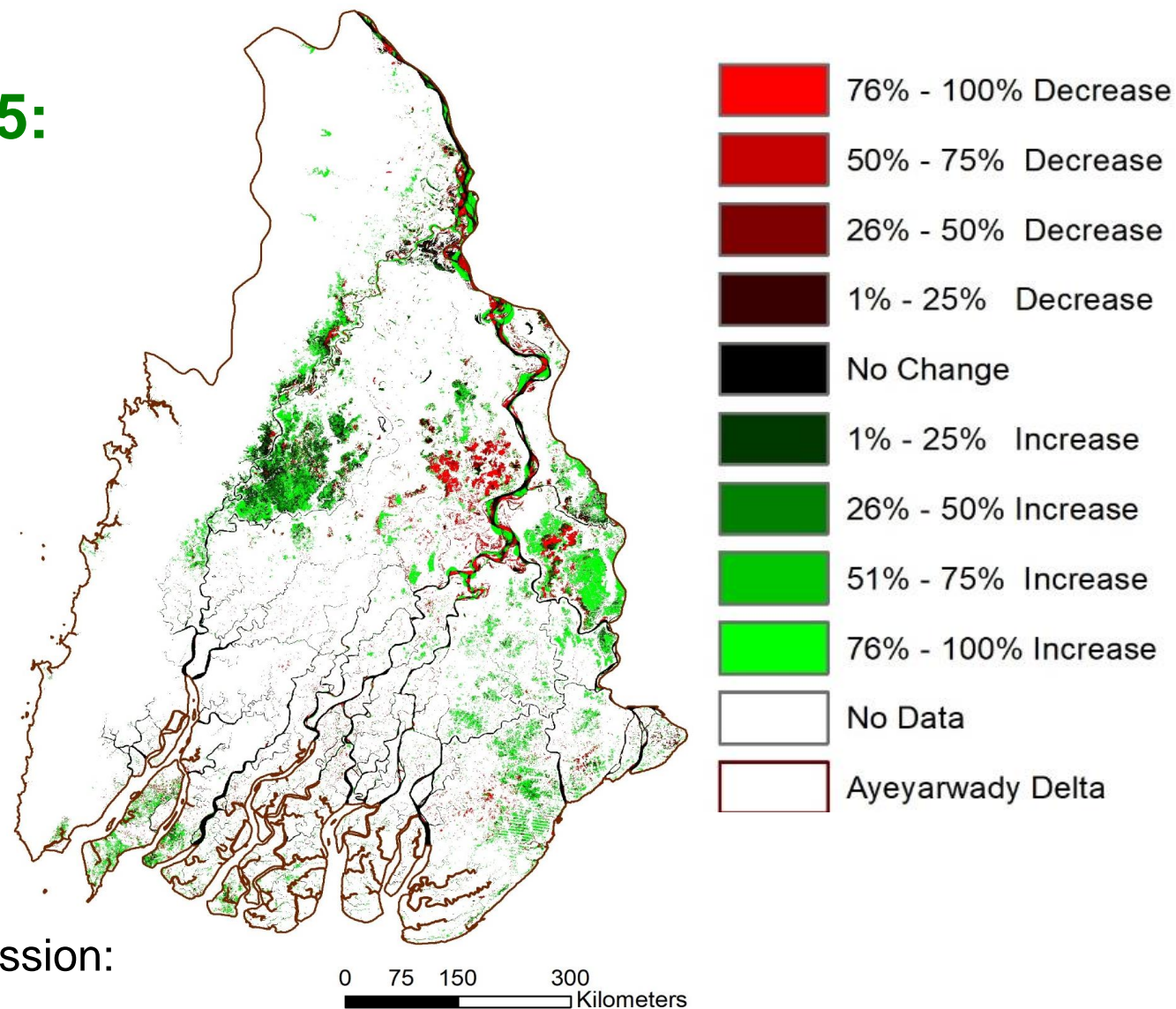


2017

EO data to address information gaps:

- Quantify the flood pulse associated with floating rice systems using EO and field measured hydro-meteorological data
- Develop a spatially distributed map of potential areas for the development of floating rice systems
 - Update DoA data to reflect hydrological change
 - Support farmers reduce flood risks by better matching rice type to flood conditions

Surface water change 1984 - 2015:



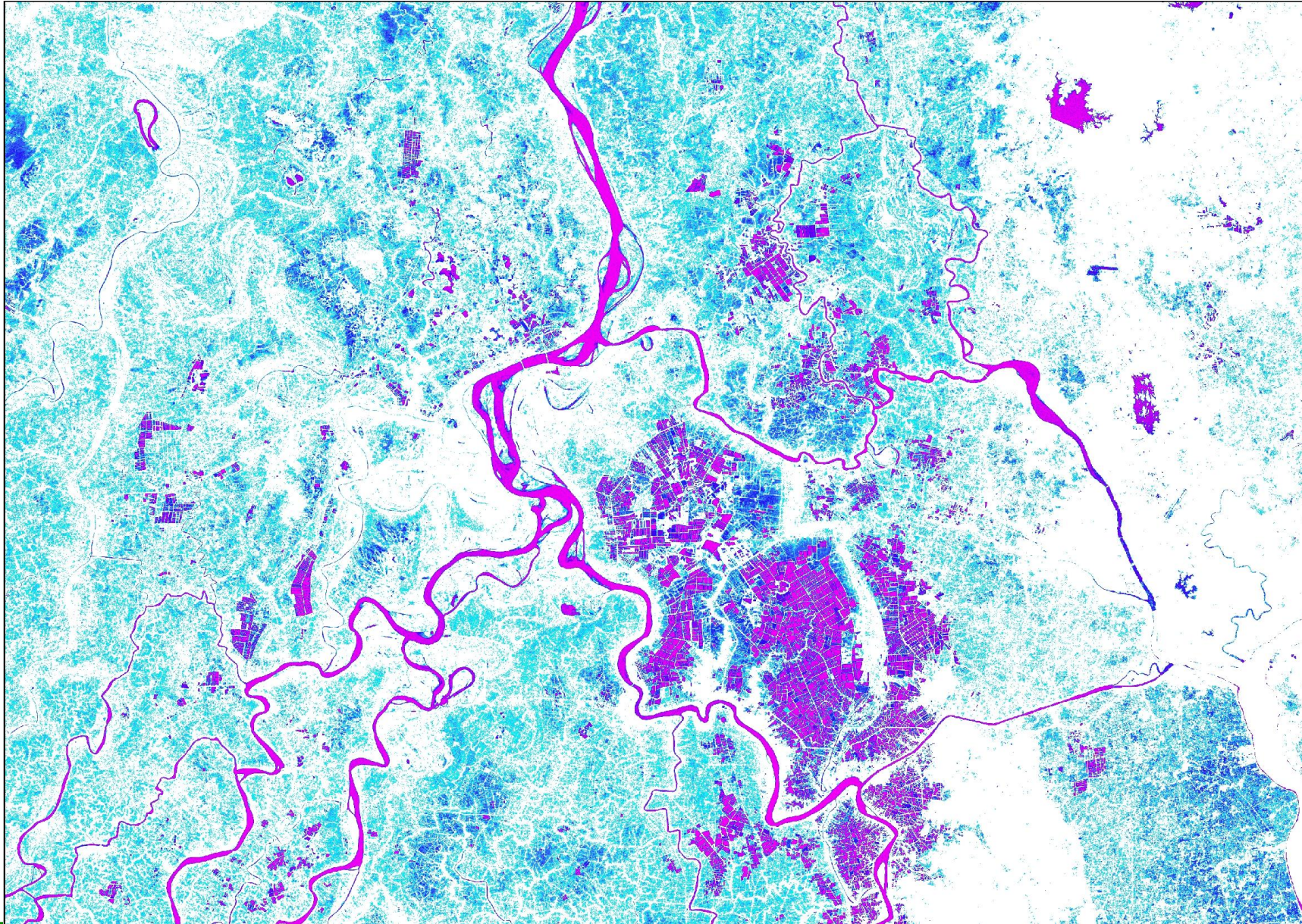
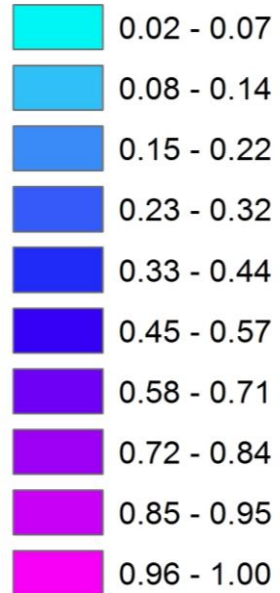
Source: European Commission:
Surface Water Extent

High resolution inundation frequency (%) maps: 1994 – 2017

Produced by EO4SD / Satelligence

Collaborative
Innovation led by JAXA

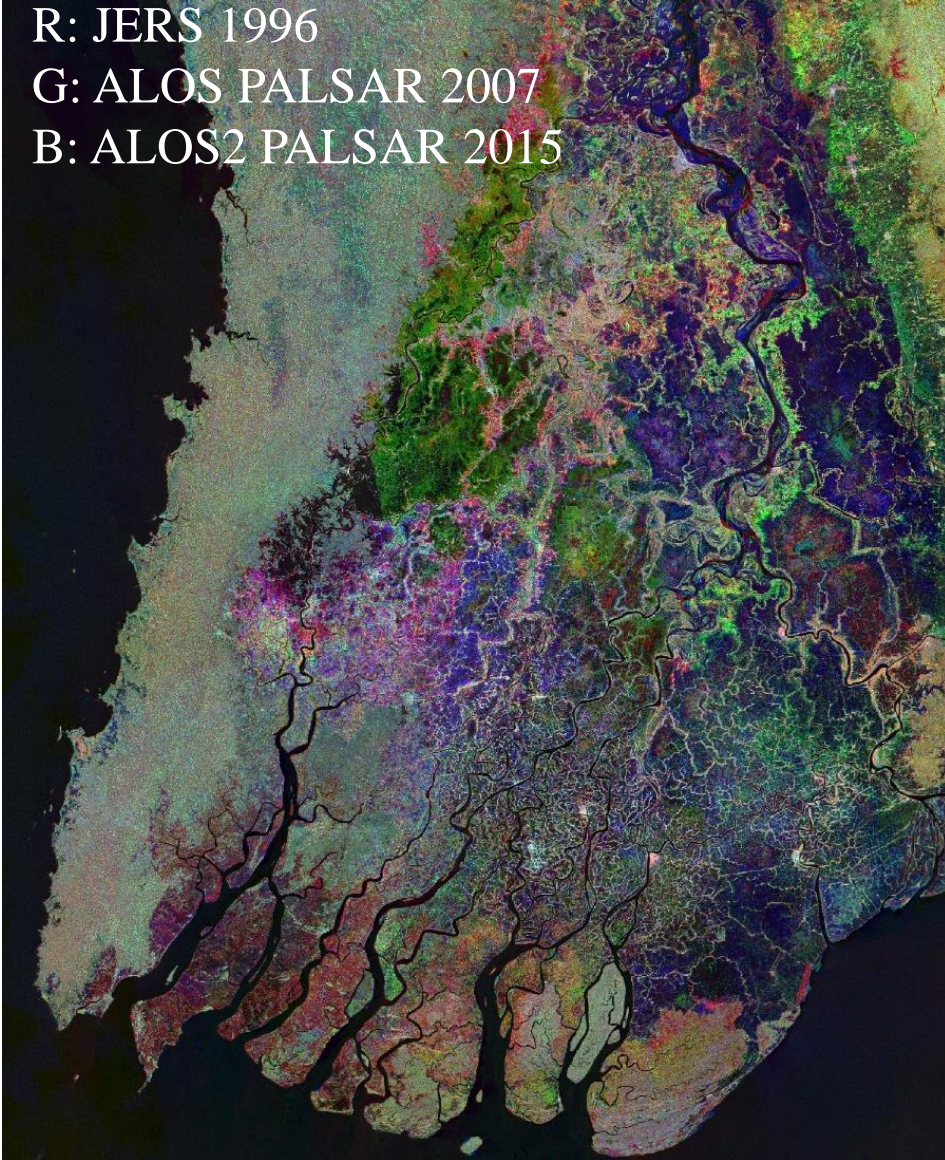
Flood frequency



R: JERS 1996

G: ALOS PALSAR 2007

B: ALOS2 PALSAR 2015



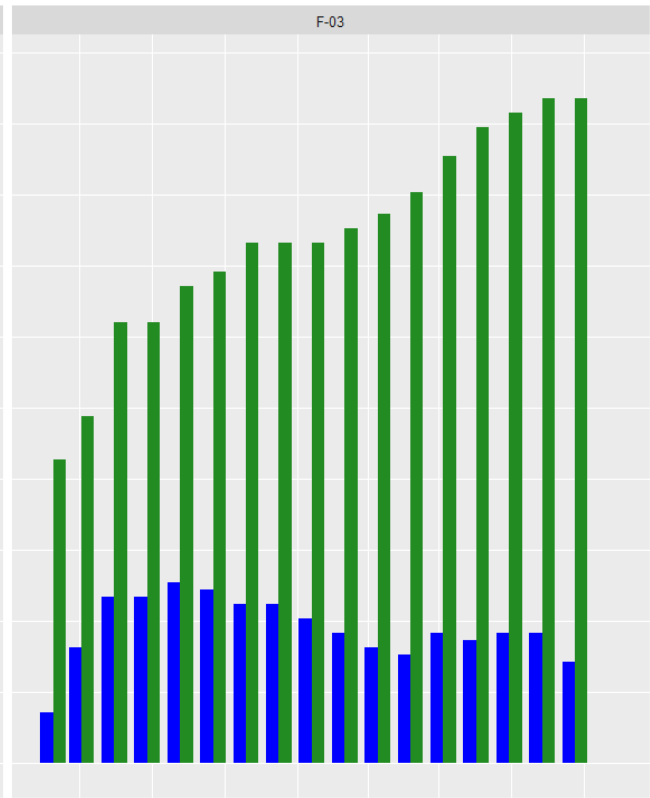
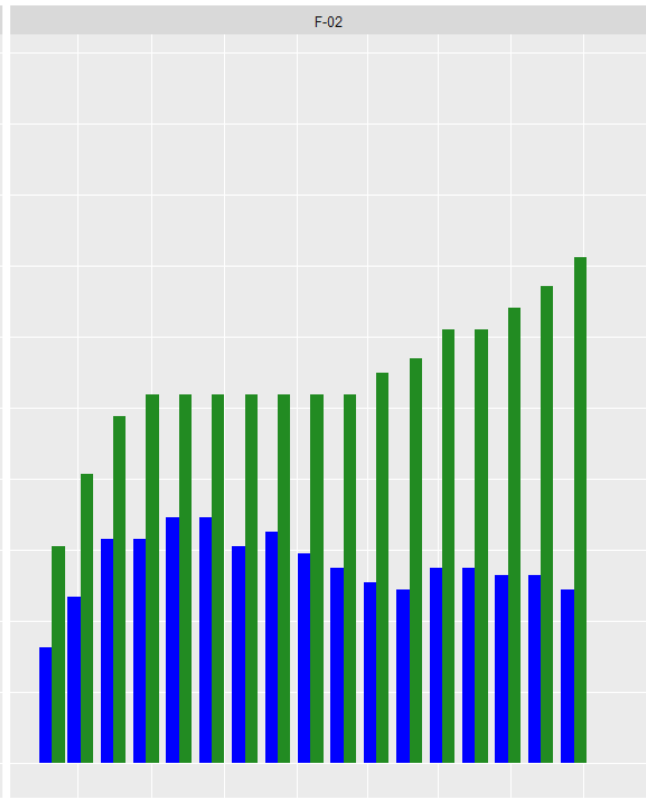
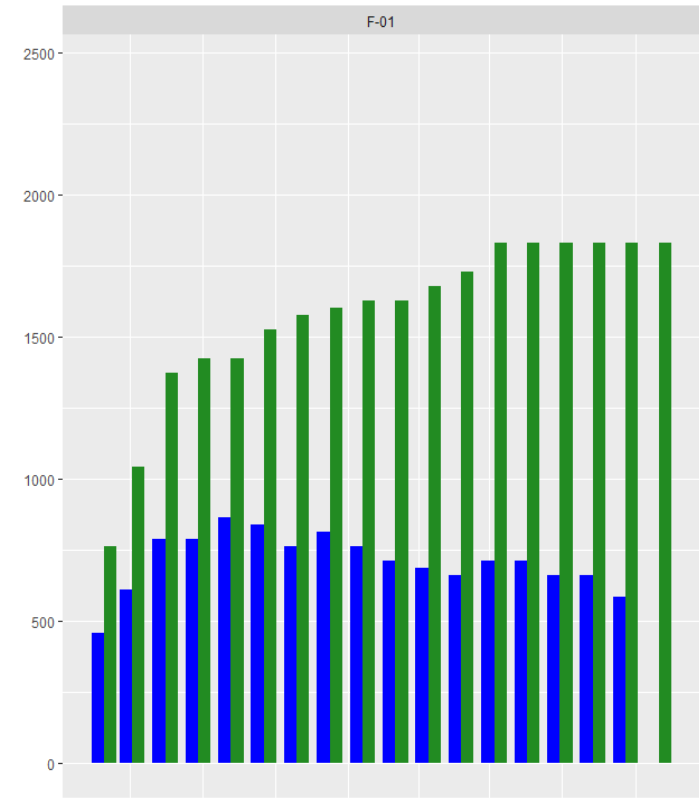
Changes in inundation: 1996 - 2015

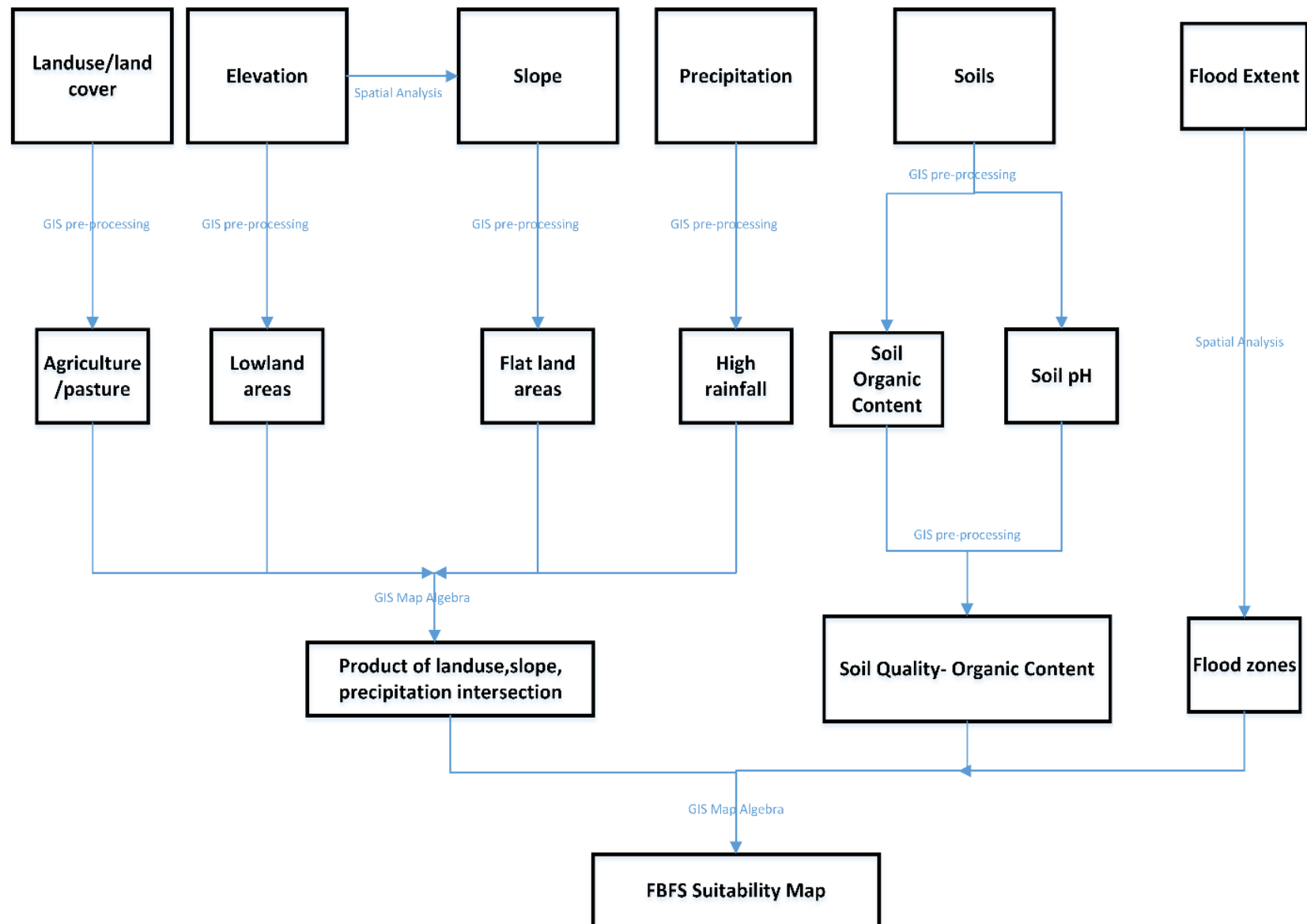
- Spatial assessment of inundation over the last 10-20 years
- Assessment of variability in the flood pulse and spatial inundation patterns over this time period

ALOS

K&C Initiative

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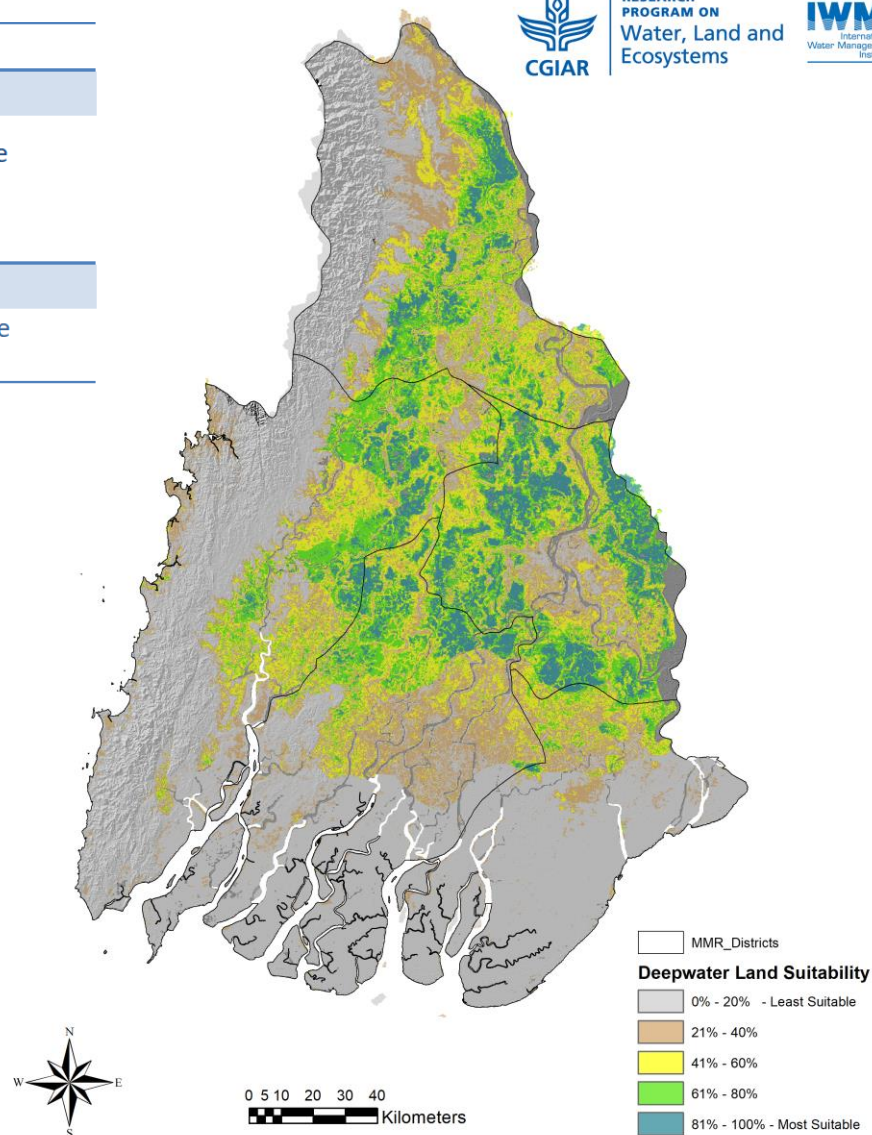




RESEARCH
PROGRAM ON
Water, Land and
Ecosystems

LED BY
IWMI
International
Water Management
Institute

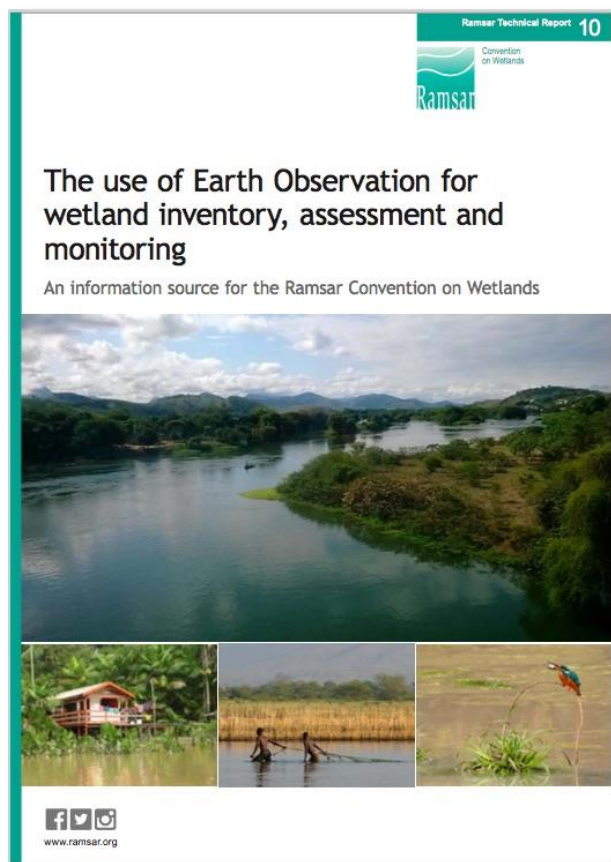
	Favourable land	Flooded land	Deepwater land
<u>Growing season:</u>	<i>June – November</i>	<i>July – November</i>	<i>May – December</i>
Monsoon rice (MR)	<ul style="list-style-type: none"> • traditional rice • HYVs, if SP 	<ul style="list-style-type: none"> • traditional rice • partly HYVs • floating rice • deepwater rice 	<ul style="list-style-type: none"> • traditional rice • HYVs • floating rice
Summer rice (SR)	<i>November/December – March/April</i>		
	<ul style="list-style-type: none"> • HYVs 	<ul style="list-style-type: none"> • HYVs 	<ul style="list-style-type: none"> • deepwater rice • HYVs



Summary:

- Recovery and maintenance of flood-based agro-ecological farming systems in the Ayeyarwady Delta is a way to conserve natural resources for food security and boost climate resilience
- Develop maps for DoA that document trends in flooding in the delta to help determine where to cultivate specific paddy varieties in the monsoon
- Minimise the loss of ecosystem services through development activities
- Build a coalition of organisations to promote a multi-sectoral approach to development planning in the delta through high level policy dialog

Links to the K&C “3C” thematic drivers:



Thematic Global Datasets: Mangrove Extent

The Global Mangrove Watch

Ake Rosenqvist (JAXA/soloEO)
Pete Bunting (Aberystwyth Univ.)
Richard Lucas (Aberystwyth Univ.)
Lisa Maria Rebelo (Int'l Water Management Inst.)
Lammert Hilarides (Wetlands International)
Nathan Thomas (NASA GSFC)
Max Finlayson (Charles Sturt Univ)
Chris McOwen (UN-WCMC)
Takuya Itoh (RESTEC)

www.globalmangrovetwatch.org

Deliverables and other output

Project deliverables include maps showing the spatial-temporal variations in inundation at a regional scale from ScanSAR data for the prototype areas including:

- Minimum water extent
- Maximum water extent
- Seasonally inundated extent
- Analysis of intra as well as inter-annual variations and changes occurring to the wetlands during the full time period of analysis (2007 – 2018)

List of ground truth data provided to JAXA:

- 100 sites in the Ayerwaddy Delta

For KC members who have submitted
proposal for Post-KC

Post-KC proposal

- ☐ Project objectives
- ☐ Project area(s)
- ☐ Satellite data requested from JAXA (sensor, proc. level, amounts, etc.)
- ☐ Other data sources to be used
- ☐ Relevance to the 4 K&C thematic drivers (Carbon cycle science, Climate Change, International Conventions, Environmental Conservation)
- ☐ Expected outcomes and deliverables