

Development of “National Flood Monitoring System (NFMS)” based on Remote Sensing Techniques

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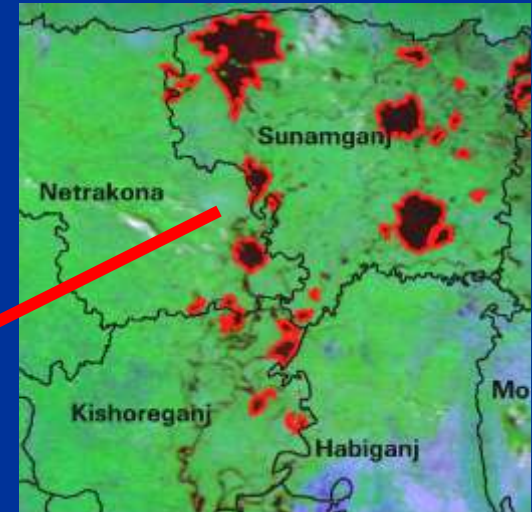
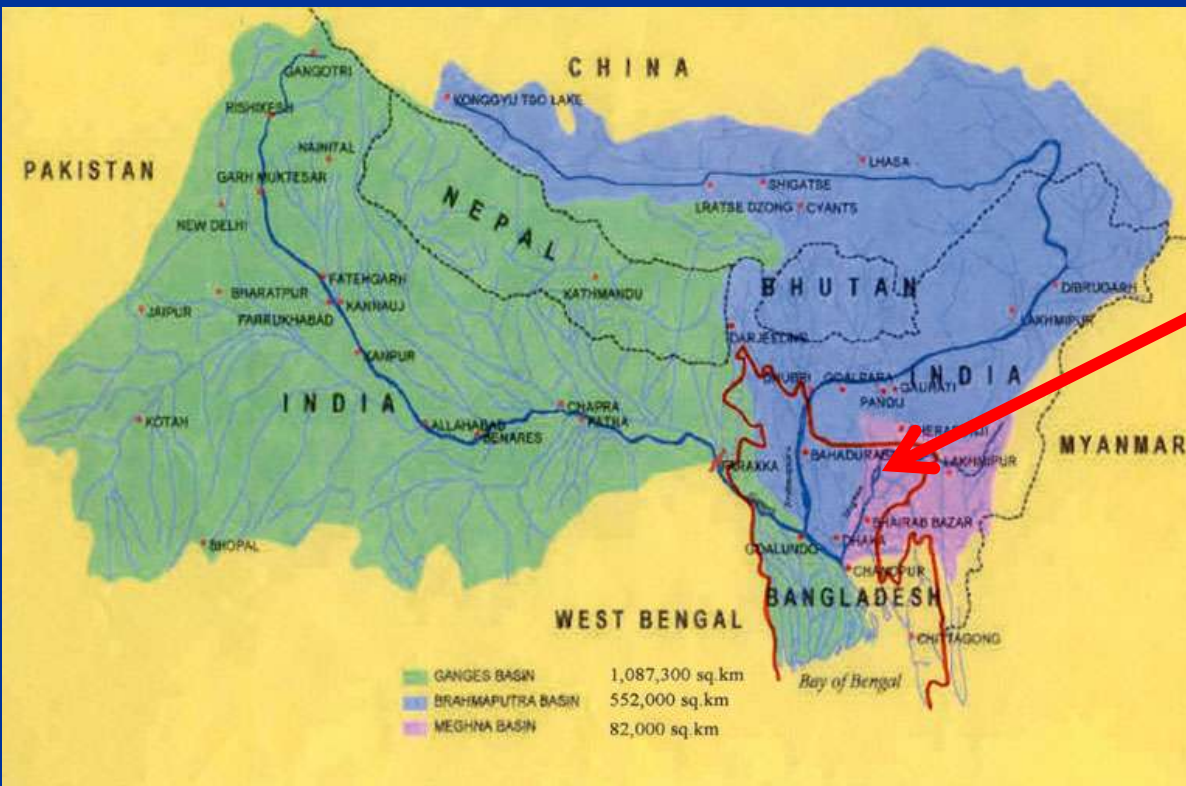
**International Symposium on “Benefiting from Earth Observation: Bridging the Data
Gap for Adaptation to Climate Change in the Hindu Kush-Himalayan Region”,
4-6 October, Kathmandu, Nepal.**

INTRODUCTION

- Bangladesh is a flood prone country.
- During the last two decades, she has made efforts to establish operational flood monitoring system with the objective to impart valuable role in safety and security of the people.
- Bangladesh Space Research and Remote Sensing Organization (SPARRSO) is underway to develop a National Flood Monitoring System (NFMS) based on remote sensing and GIS techniques.

TYPES OF FLOOD

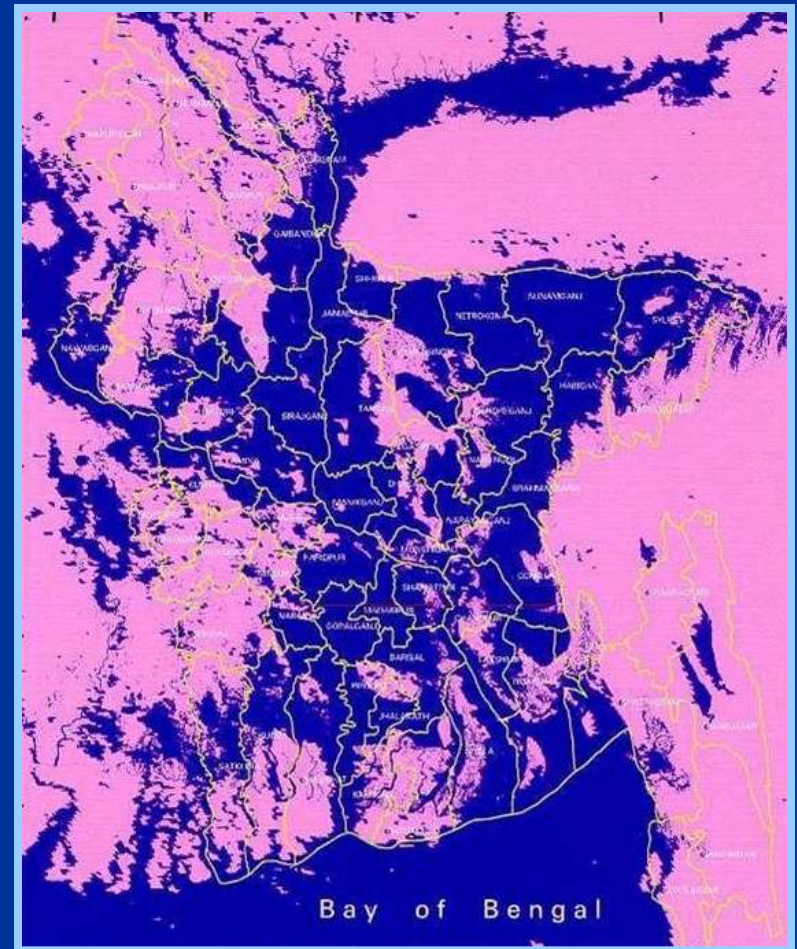
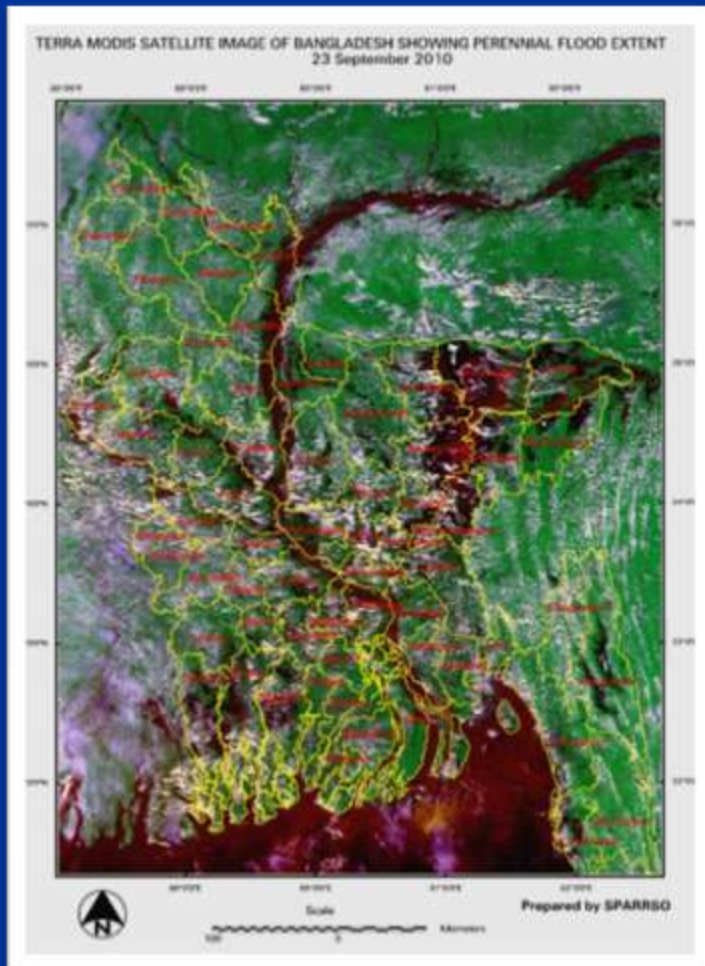
Flash Flood



TYPES OF FLOOD

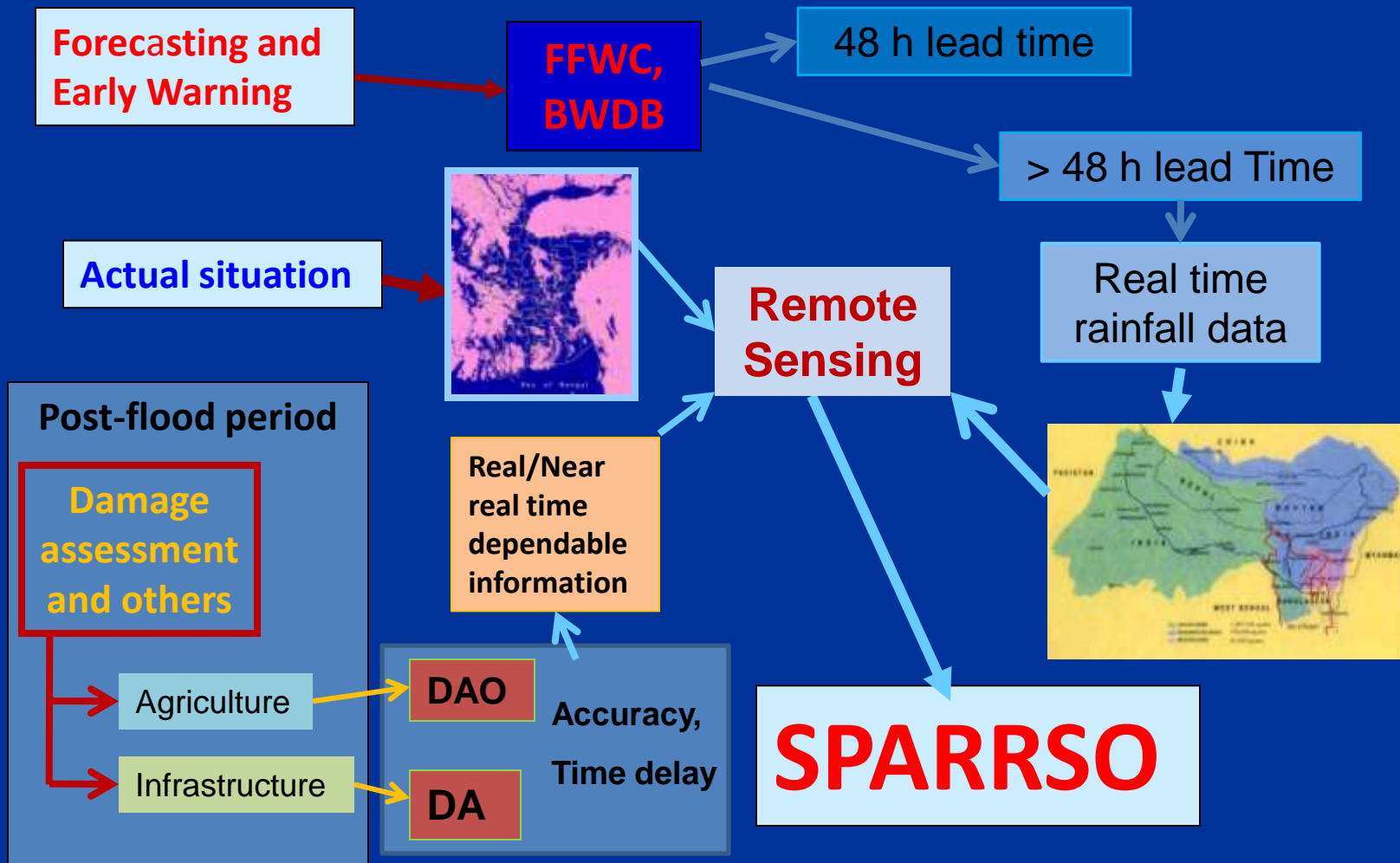
Perennial Flood

Extended Flood



Present Scenario of Flood Monitoring

Absence of technology based comprehensive operational flood monitoring system in the country.



Strategy of the Development

Design of the NFMS

Research for Development

Put into Operation

Design of the NFMS

Thematic areas for research and development:

- Flood areas
- Population affected
- Flood damage
- Flood early warning

The objective of the research is to find out RS/GIS based methods and operational procedures for extraction of information in the four thematic areas.

Objective of the development is to incorporate the operational procedures with the framework of the NFMS.

- The NFMS is designed to provide information based on its grade.
- Accomplishment of the development has been improving the grade of the NFMS.

Design of the NFMS

Gradation

Theme	Output	Grade
Flood area	Flood map (with district/upazila based statistics) showing only gross flood area	G -1
	Flood map (with district/upazila based statistics) showing perennial and extended flood area	G -1A
Population	G -1A + Upazila based population affected	G -2
	G -2 + Union based population affected	G -2A
Damage	G -2A + District based Aman damage	G -3
	G -3 + Upazila based Aman damage	G -3A

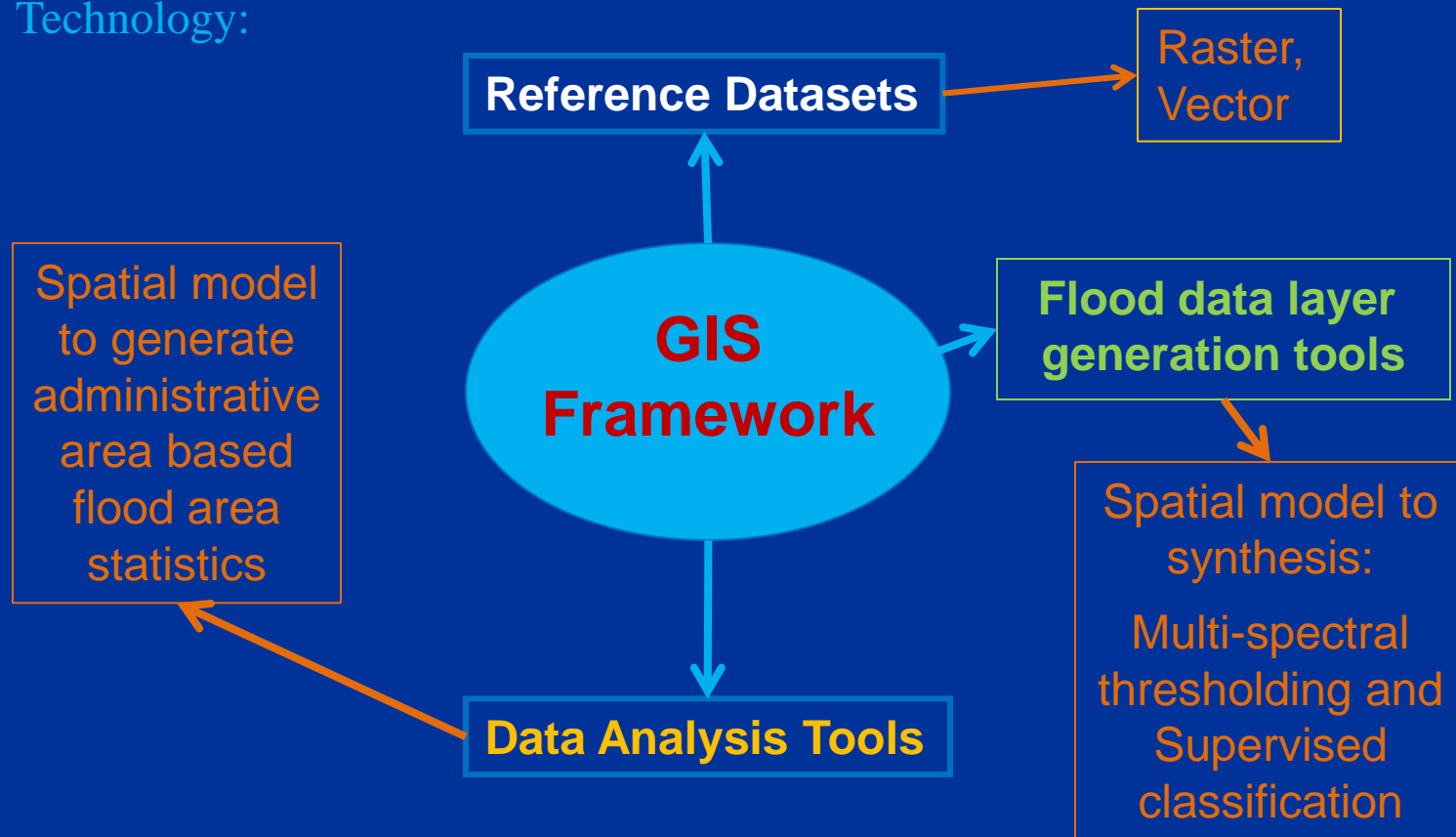
Early warning	G -3Z + Early warning with 3 day lead time	G -4

NFMS: Present operational status

Present grade: G-1

Thematic area: **Flood area (gross) statistics and flood map.**

Technology:



NFMS: Operation so far

Satellite based area estimation was started in 1998 when ever devastating flood occurred in Bangladesh.



RADARSAT

**Upazila Based
Statistics**

NFMS: Present research

Improvement of grade : G-1A

Thematic area: Flood area (**perennial** and **extended**) statistics and flood map.

Title : Generation of perennial flood water digital data layer of Bangladesh using optical and micro-wave remote sensing datasets.

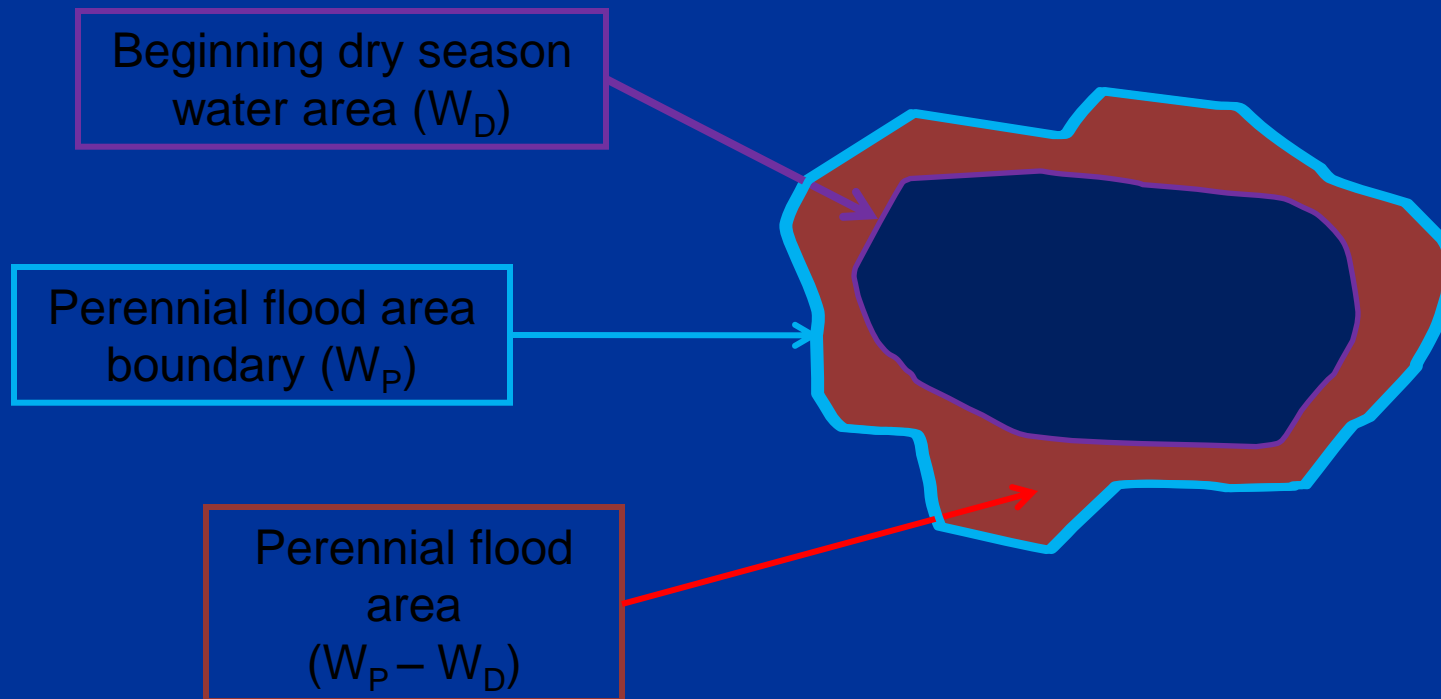
Objectives:

- 1. To identify the perennial flood water areas in Bangladesh.**
- 2. To generate digital data layer of the perennial flood water areas of Bangladesh using Remote Sensing datasets.**
- 3. To establish nation-wide GIS based information benchmarks for launching warning on the risk of extended flood in the country.**

NFMS: Present research

Title : Generation of perennial flood water digital data layer of Bangladesh using optical and micro-wave remote sensing datasets.

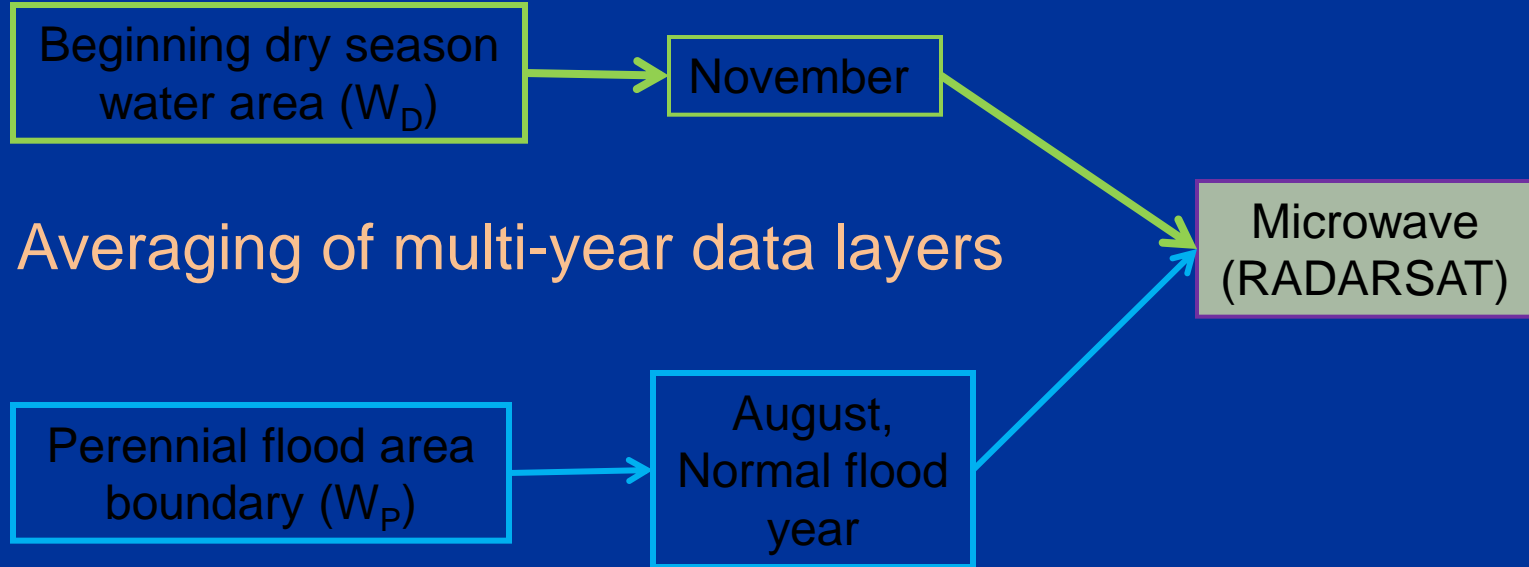
Devised methodology



NFMS: Present research

Title : Generation of perennial flood water digital data layer of Bangladesh using optical and micro-wave remote sensing datasets.

Data requirement



NFMS: On-going development

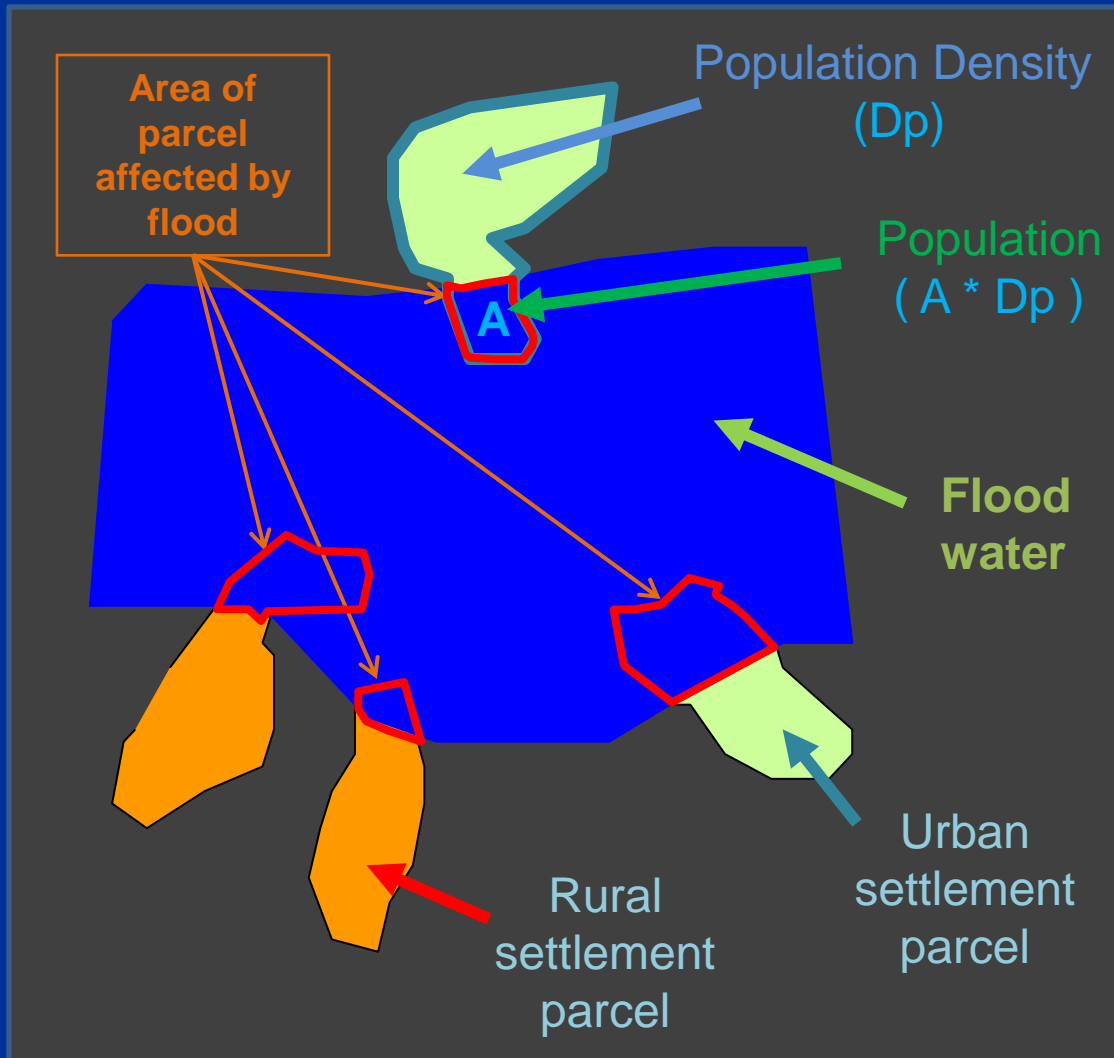
Improvement of grade : **G-2**

Thematic area: **Upazila based estimation of population affected by flood.**

- RS/GIS based methodology for estimation of the population affected by flood is developed**
- Work is going on to generate GIS background dataset to apply the method operationally.**

NFMS: On-going development

- GIS based methodology for estimation of the population affected by flood.



Total population affected

$$= \sum A * D_p$$

$$= \sum (A_r * D_{p_r}) + \sum (A_u * D_{p_u})$$

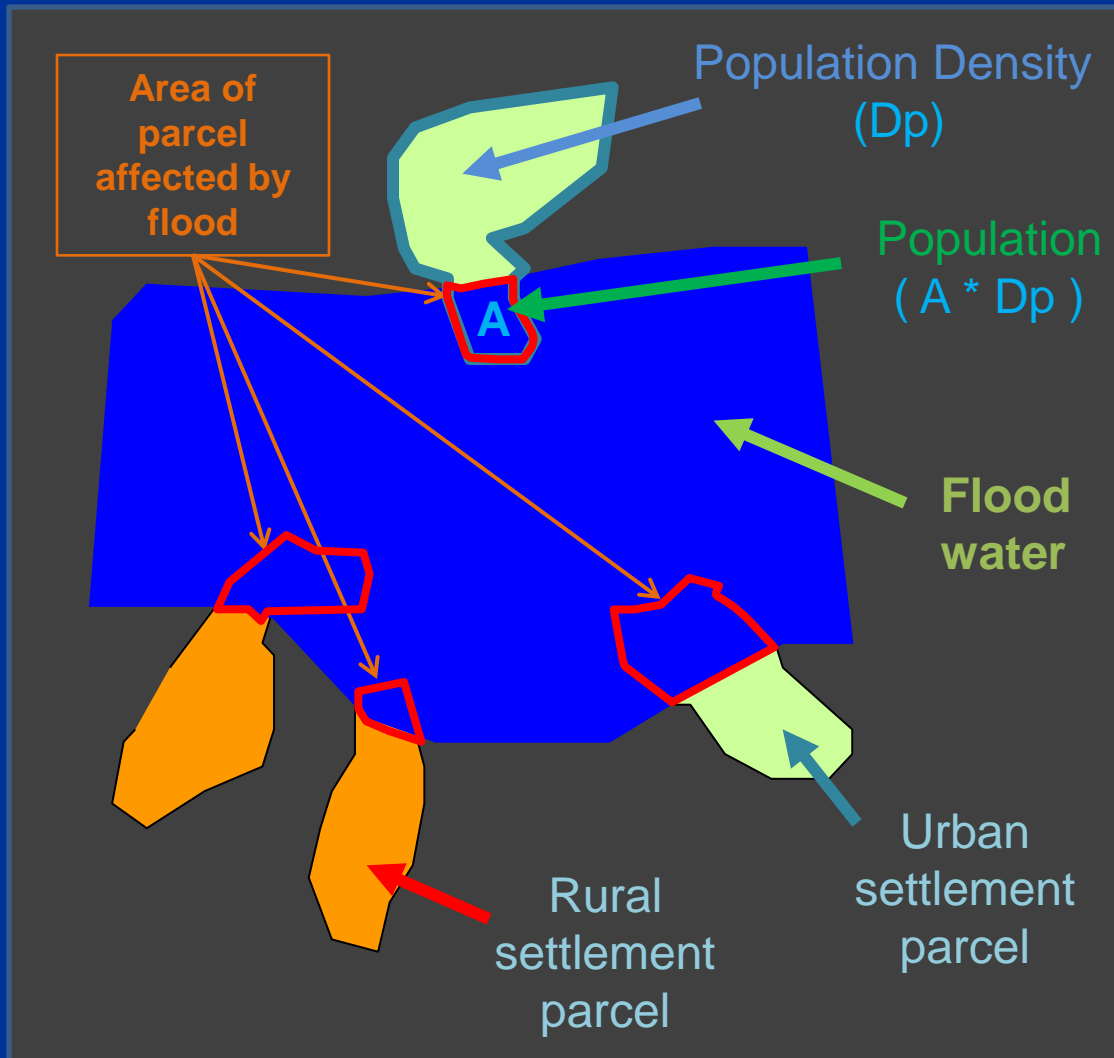
Population Density:

$$D_{p_r} = \text{Rural population} / \text{Rural area}$$

$$D_{p_u} = \text{Urban population} / \text{Urban area}$$

NFMS: On-going development

- ❑ GIS based methodology for estimation of the population affected by flood.



Data needed:

- Administrative area data layer.
- Parcel (rural, urban) data layer.
- Flood data layer.
- Administrative area based population (rural, urban) data.

- ❑ Work is going on for generation of GIS background dataset to apply the method operationally.

NFMS: On-going development

Assessment of Crop Damage

Improvement of grade : G-3

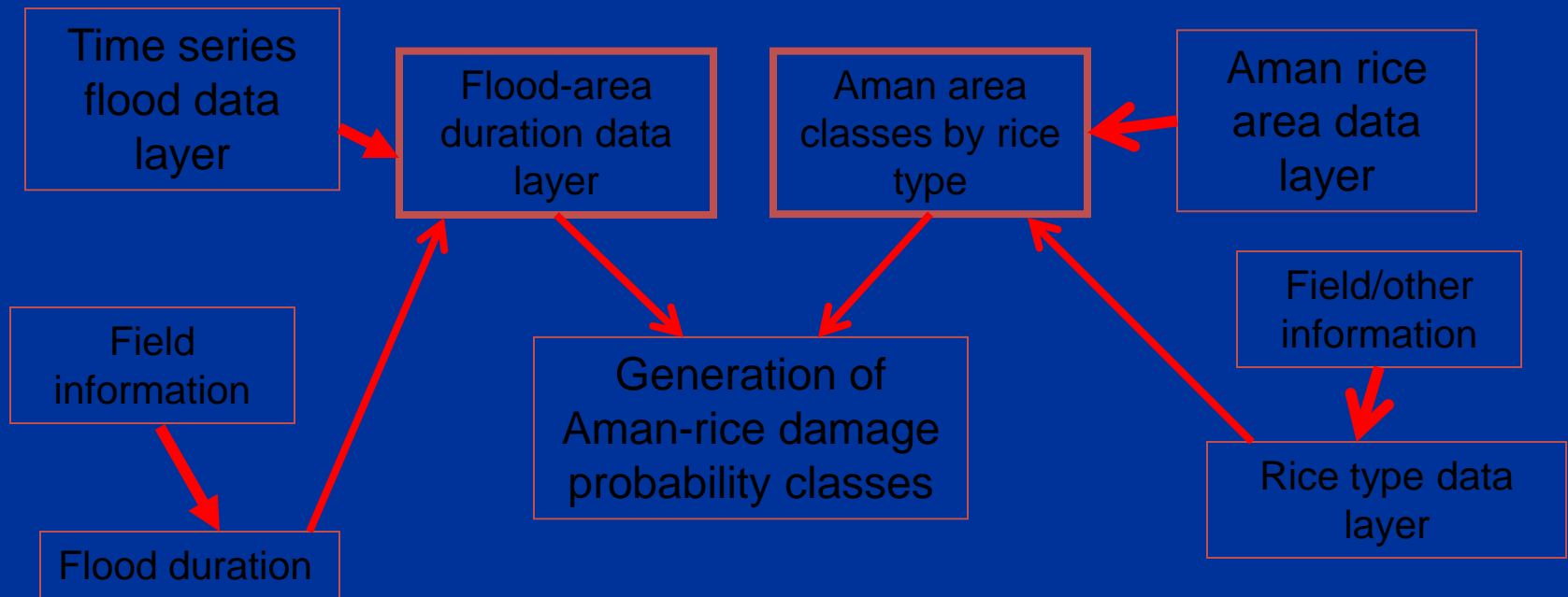
Thematic area: **District based estimation of Aman rice damaged by flood.**

- Concept of RS/GIS based method for estimation of Aman rice damaged by flood has been developed.
- Operational procedures for estimation of Aman rice damaged by flood is under development.

NFMS: On-going development

Assessment of Crop Damage

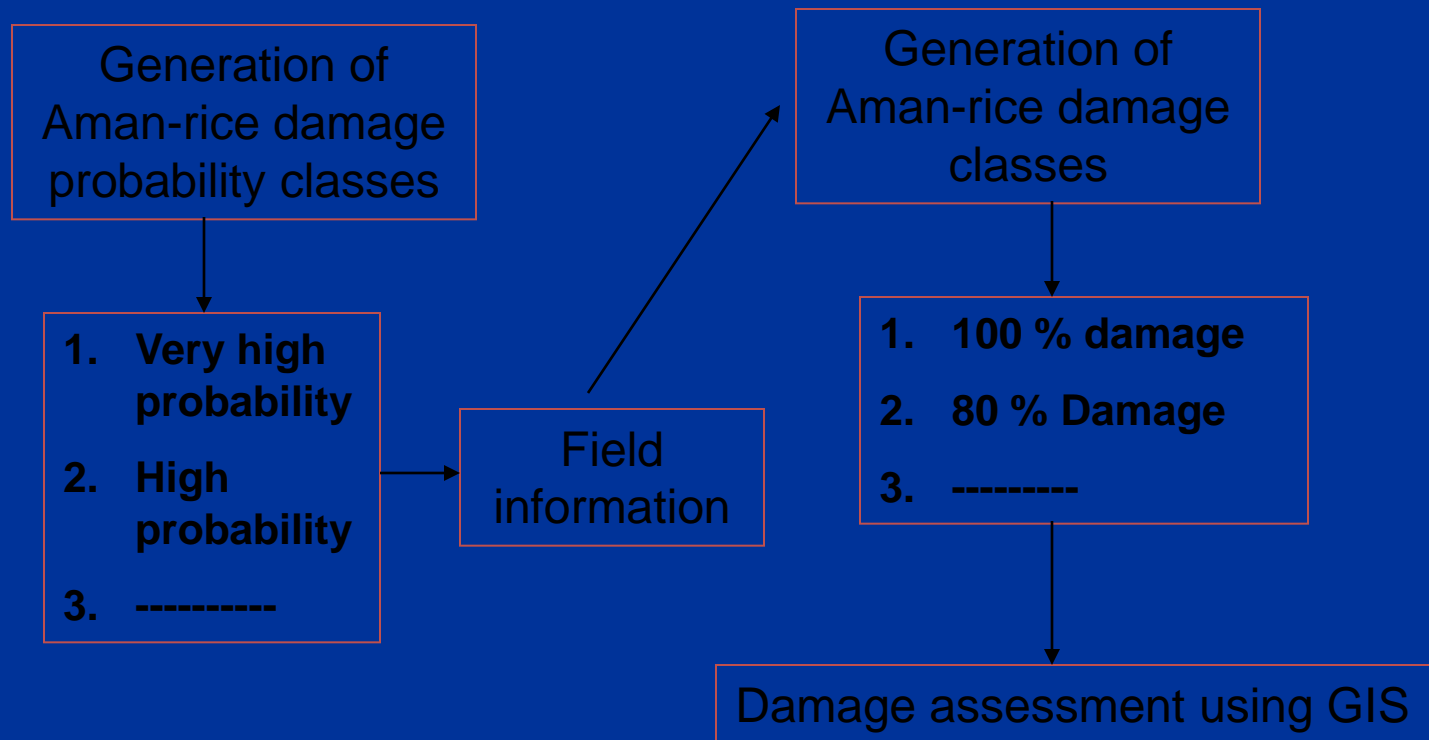
- ❑ Concept of RS/GIS based method for estimation of Aman rice damaged by flood has been developed



NFMS: On-going development

Assessment of Crop Damage

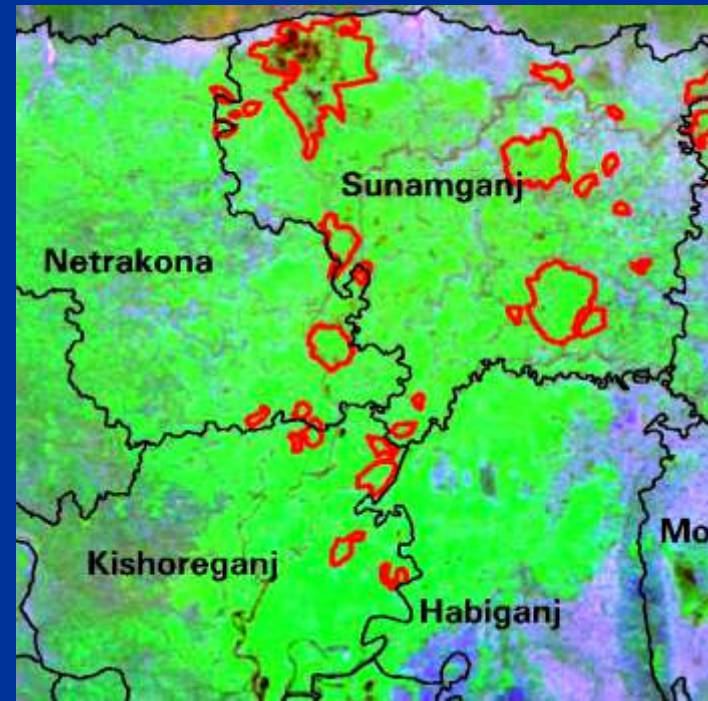
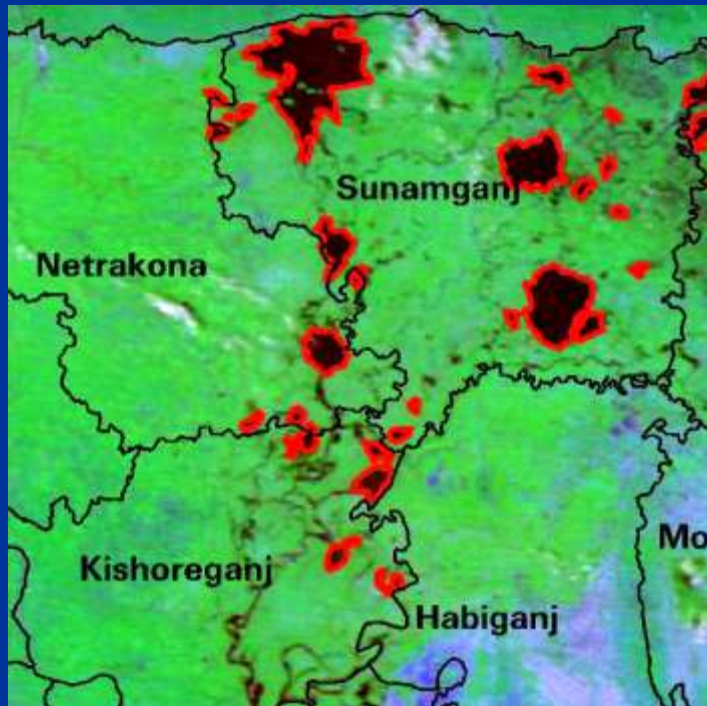
- ❑ Concept of RS/GIS based method for estimation of Aman rice damaged by flood has been developed



NFMS: On-going development

Assessment of Crop Damage

- Application of the concept as a primary test



50,500 hectare Boro rice was damaged

NFMS: On-going development

Flood Early Warning

Improvement of grade : **G-4**

Thematic area: **Early warning with 3-7 day lead time**

Empirical relation of the precipitation over the catchment areas of the concerned river system and the river hydrographs.

Needs to study:

- Variability of K as a function of rainfall amount, rainfall spatial pattern over the catchments and initial condition of river water level.
- Time lagging of the water wave.

Remote sensing application:

Satellite derived rainfall amount and rainfall spatial pattern will be used to predict the river water level

$$K = (WL_{t2} - WL_{t1})/Rainfall$$

**Thank You
Very Much**