

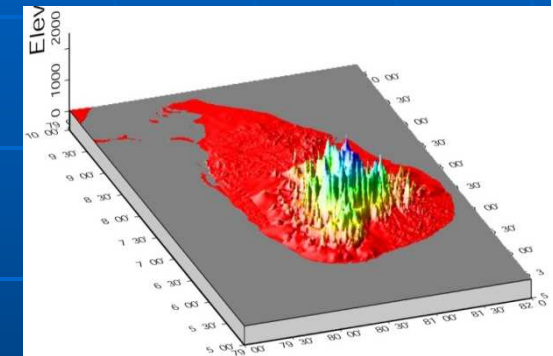
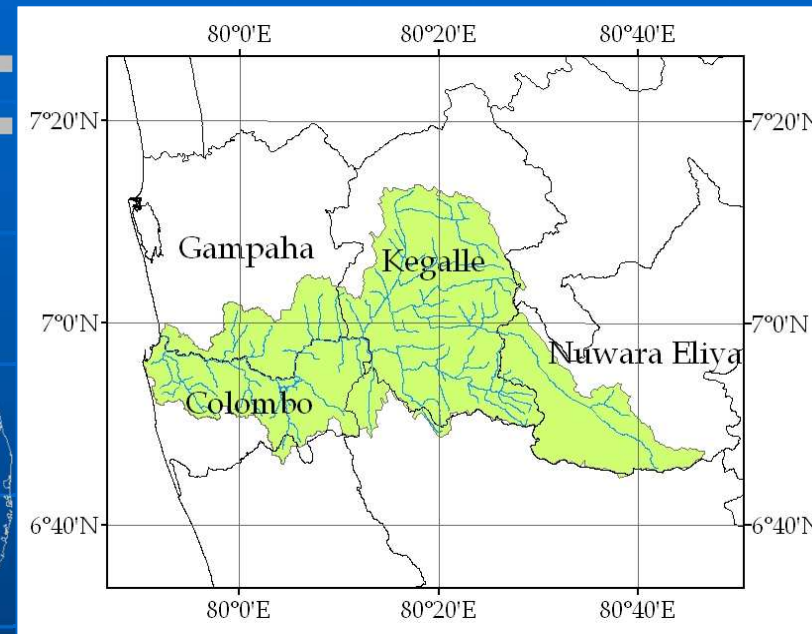
Climate Change Adaptation and Water Nexus

Country Report, Sri Lanka

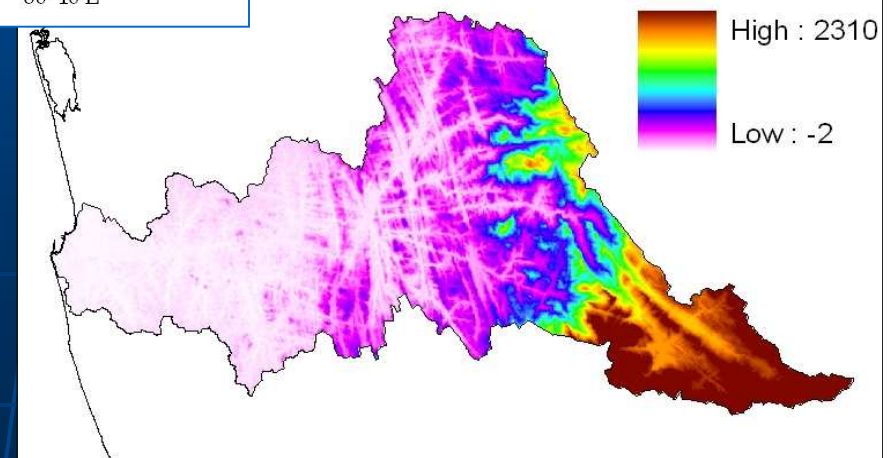
S. B. Weerakoon
University of Peradeniya

***9th Meeting of GEOSS AWCI ICG and
2nd AWCI CCAA Study Workshop***
Tokyo, Japan, 29 September-2 October, 2012

1. Climate Change Impacts on Floods in the Lower Kelani River Basin and Adaptation

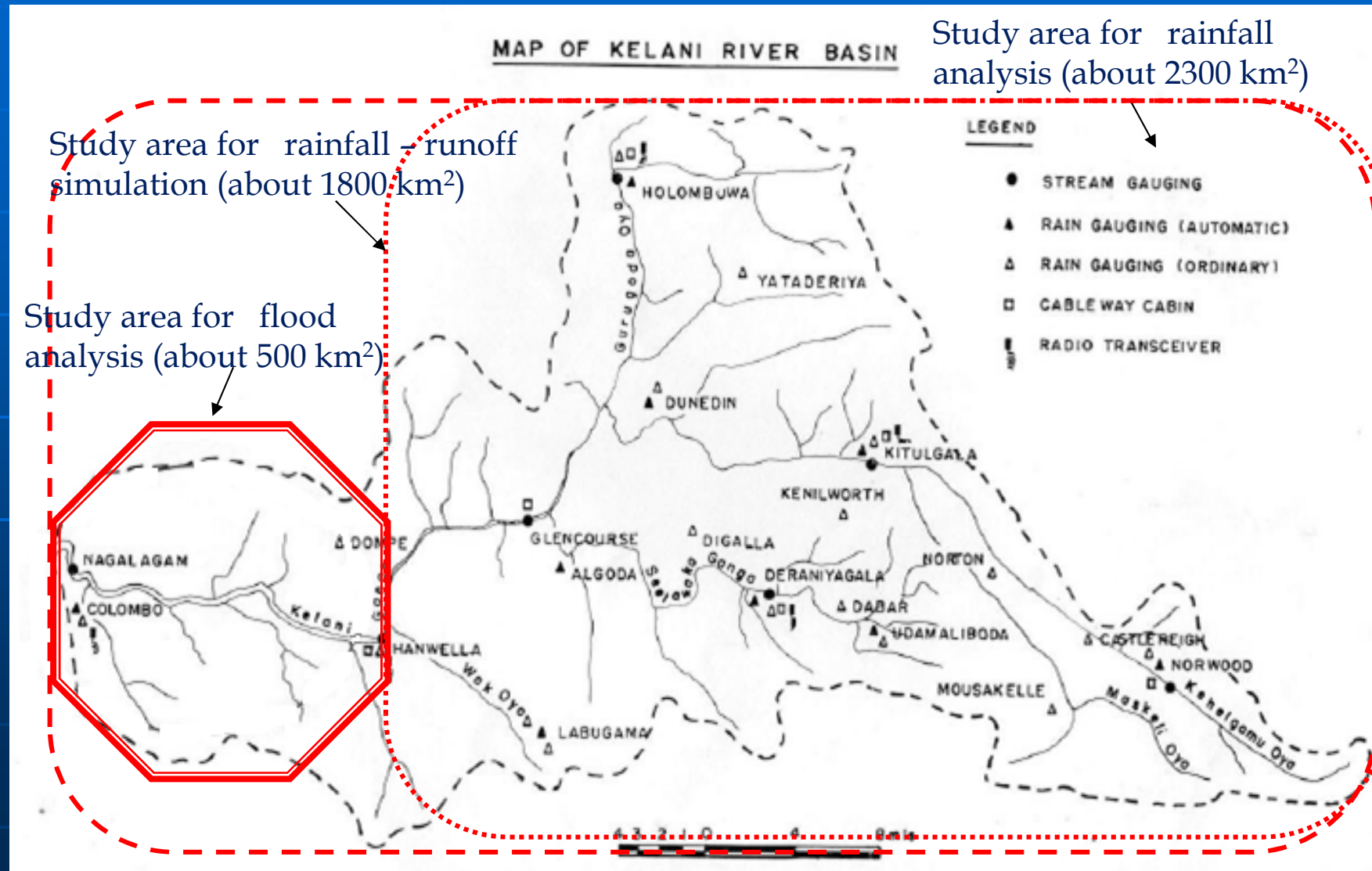


- Basin Area = 2300 km²
- Uppermost Elevation = 2250 m
- Annual Rainfall = 3450 mm



Elevation distribution (DEM)

Upper and Lower Kelani River Basins



Models used

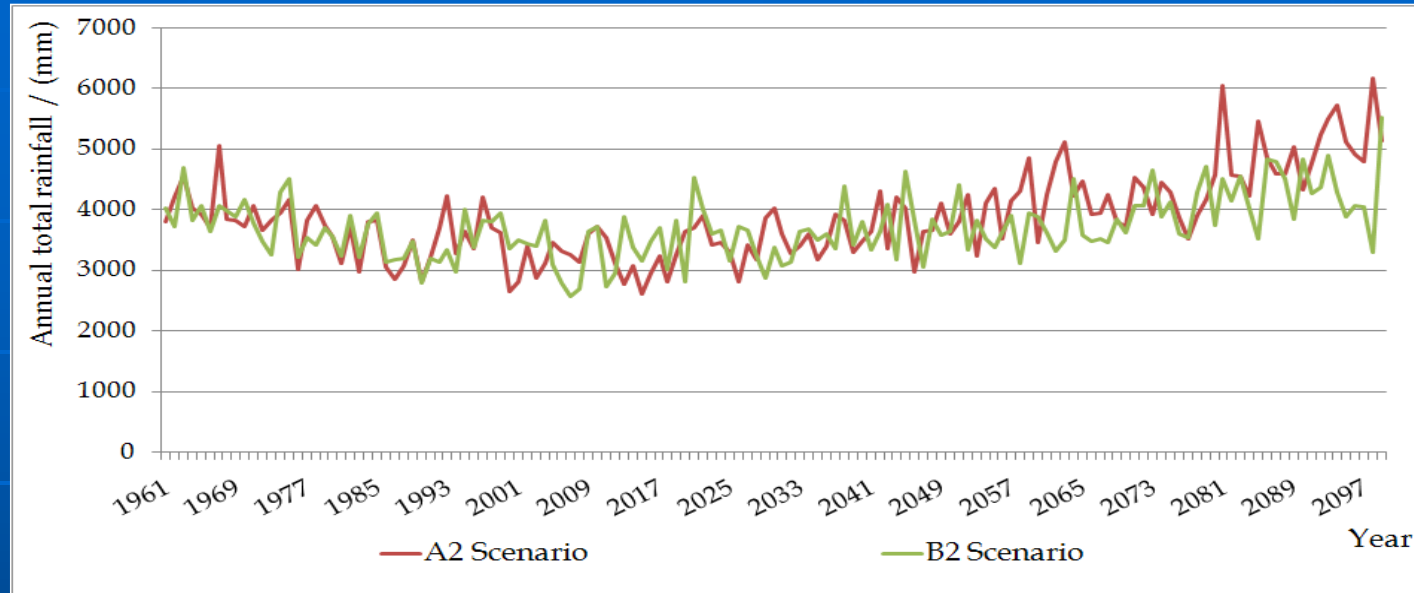
Rainfall

- ❖ Statistical Downscaling Model (SDSM) – for rainfall forecast under A2 & B2 scenarios of climate change
 - Calibration – 1961 to 1975, Validation – 1976 to 1990

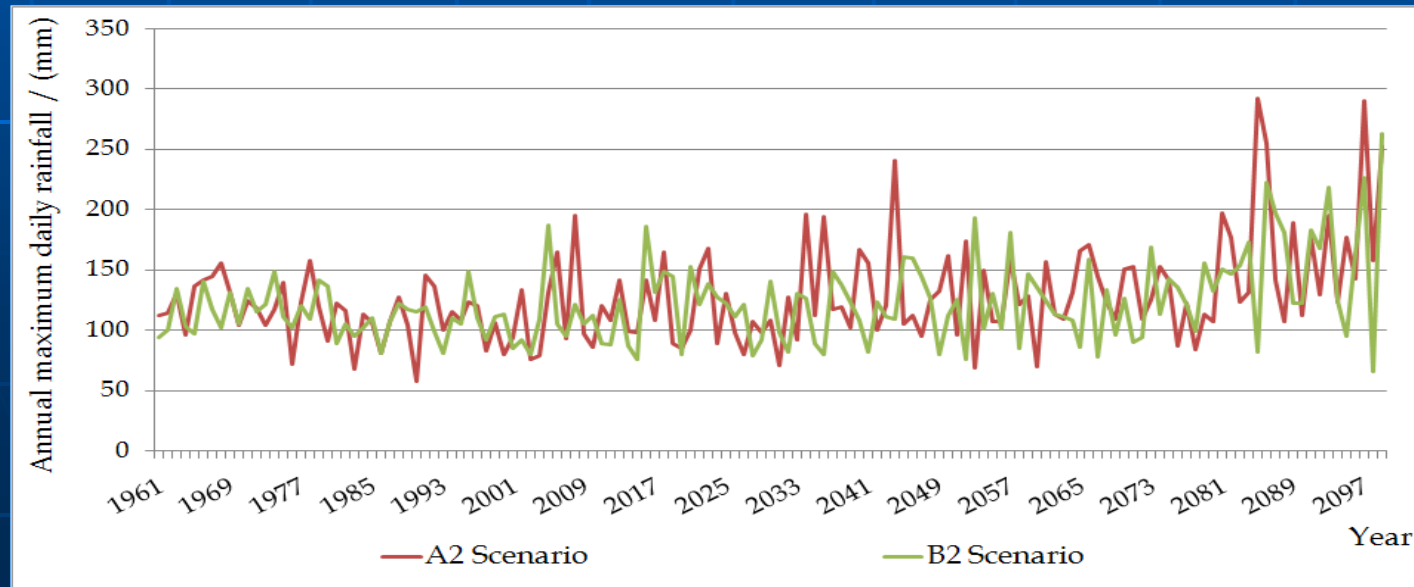
Run off

- ❖ Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) – for rainfall runoff simulations in the upper basin i.e., up to the entry to the lower basin
 - Calibration – November 2005, Validation – April, May & June 2008, May 2010 and 2005 to 2010
- ❖ FLO-2D – for flood and inundation analysis in the lower basin
 - Calibration – November 2005, Validation – April 2008, June 2008 and May 2010

SDSM Results - Upper Basin

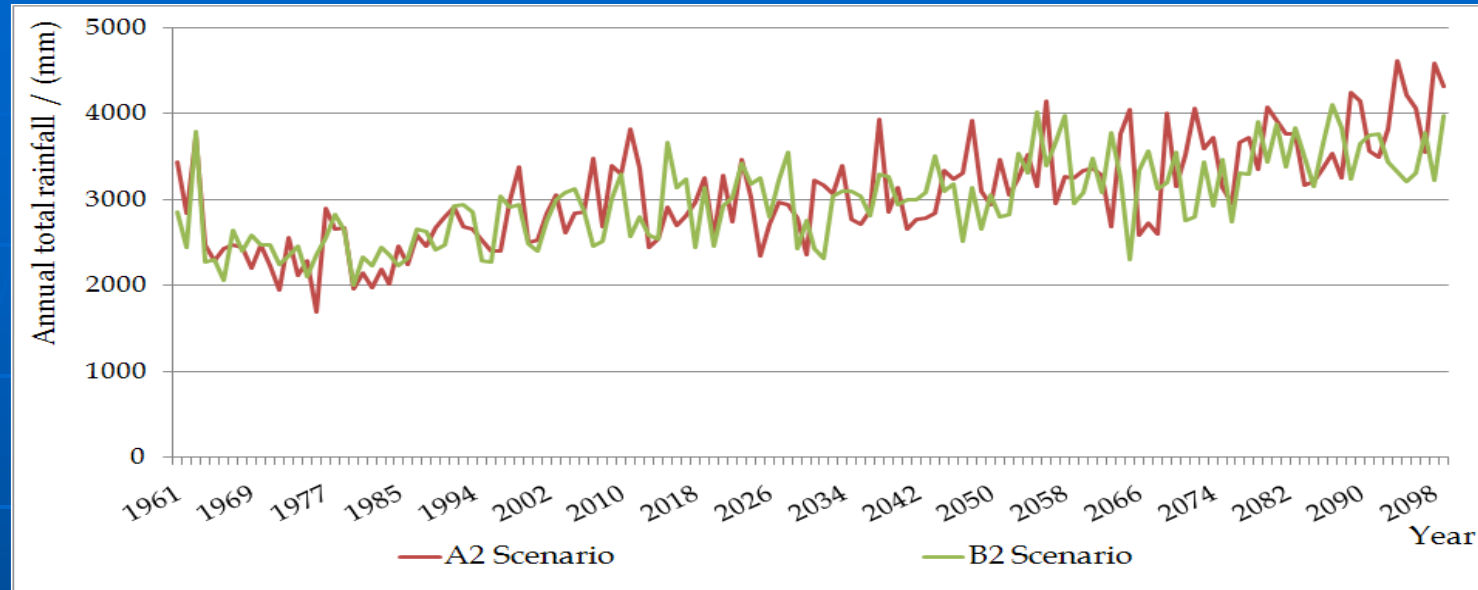


Variation of total annual rainfall

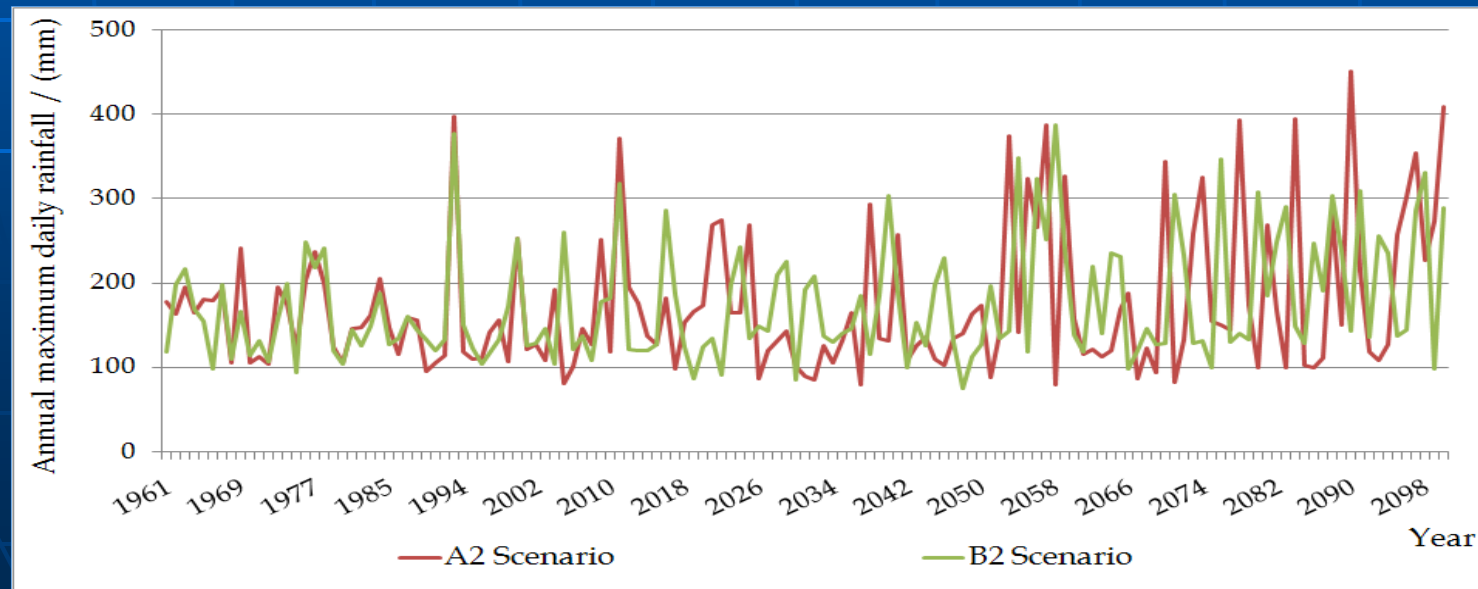


Variation of annual maximum daily rainfall

SDSM Results - Lower Basin



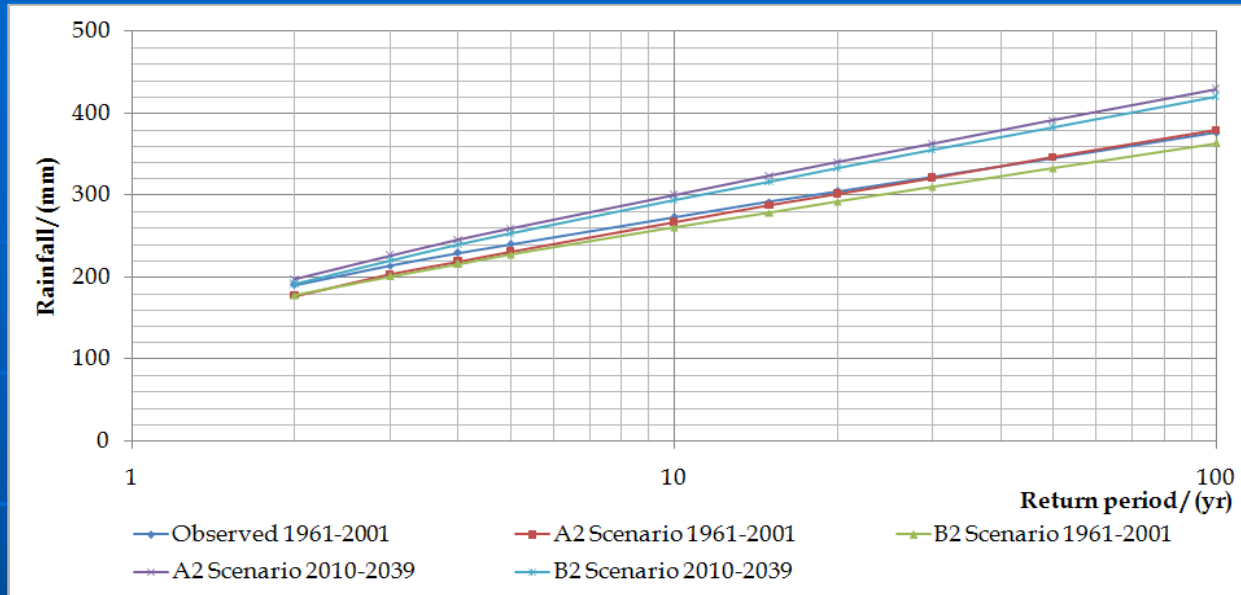
Variation of annual rainfall



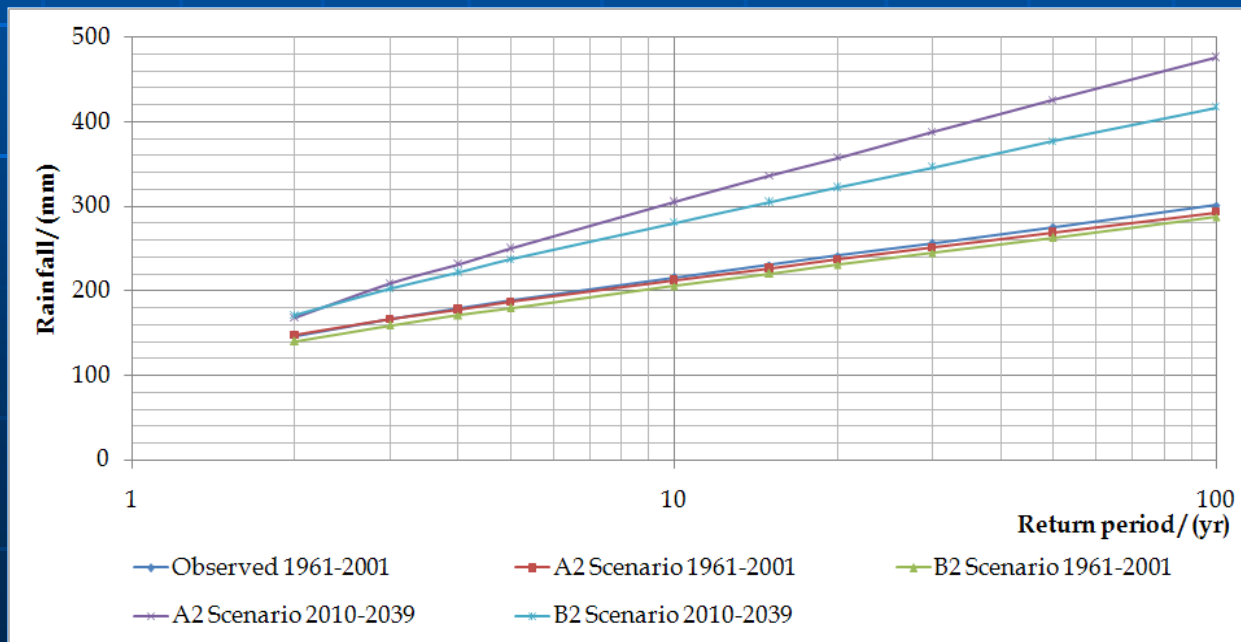
Variation of annual maximum daily rainfall

Frequency Analysis

Gaouri Silva et al, UoP & UNU



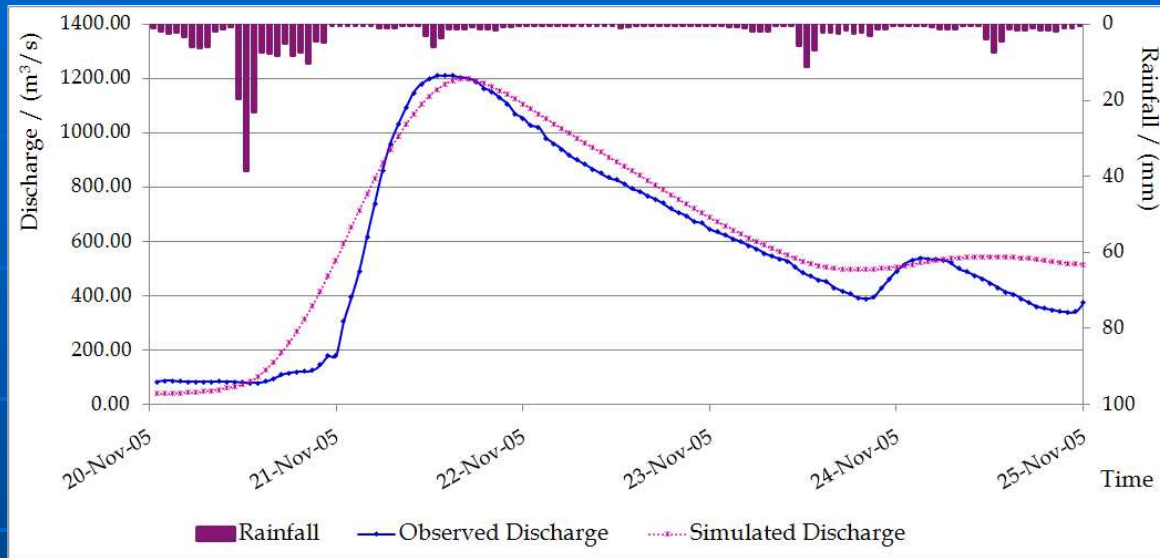
Frequency analysis of 3 day total rainfall in upper basin



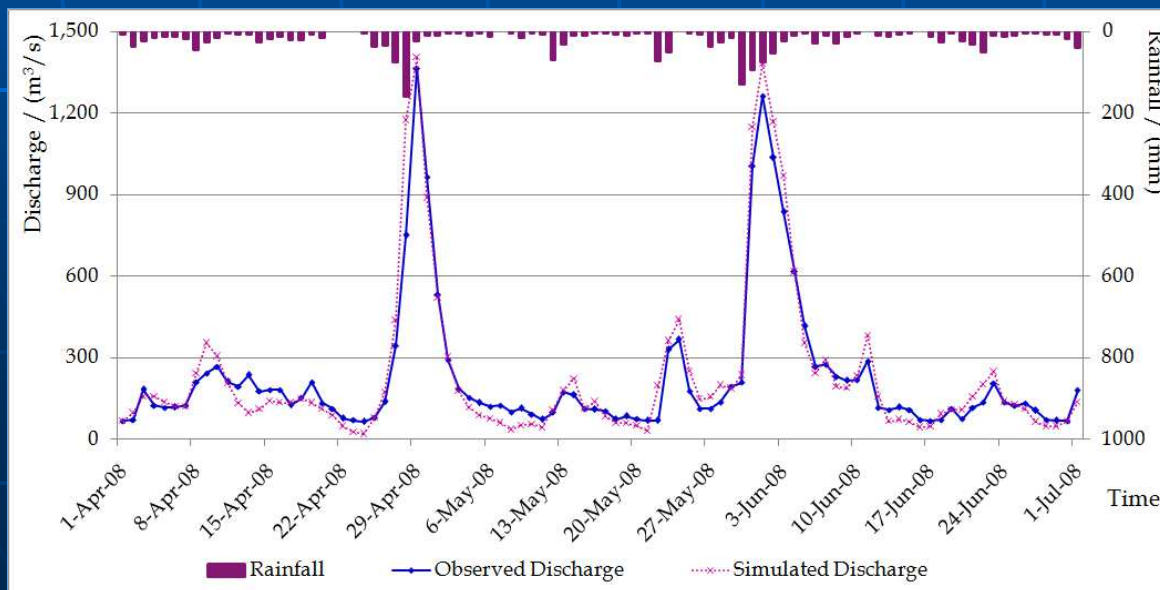
Frequency analysis of daily rainfall in lower basin

Rainfall runoff modeling

- ❖ HEC-HMS model to upper basin as event based and continuous, calibrated and validated



Discharge at Hanwella and rainfall at upper basin for November 2005 flood event



Discharge at Hanwella and rainfall at upper basin for April-May-June 2008

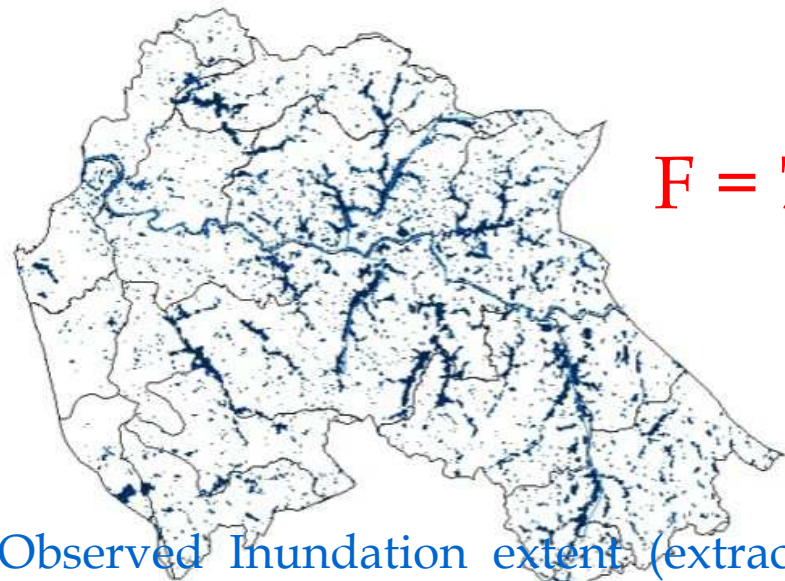
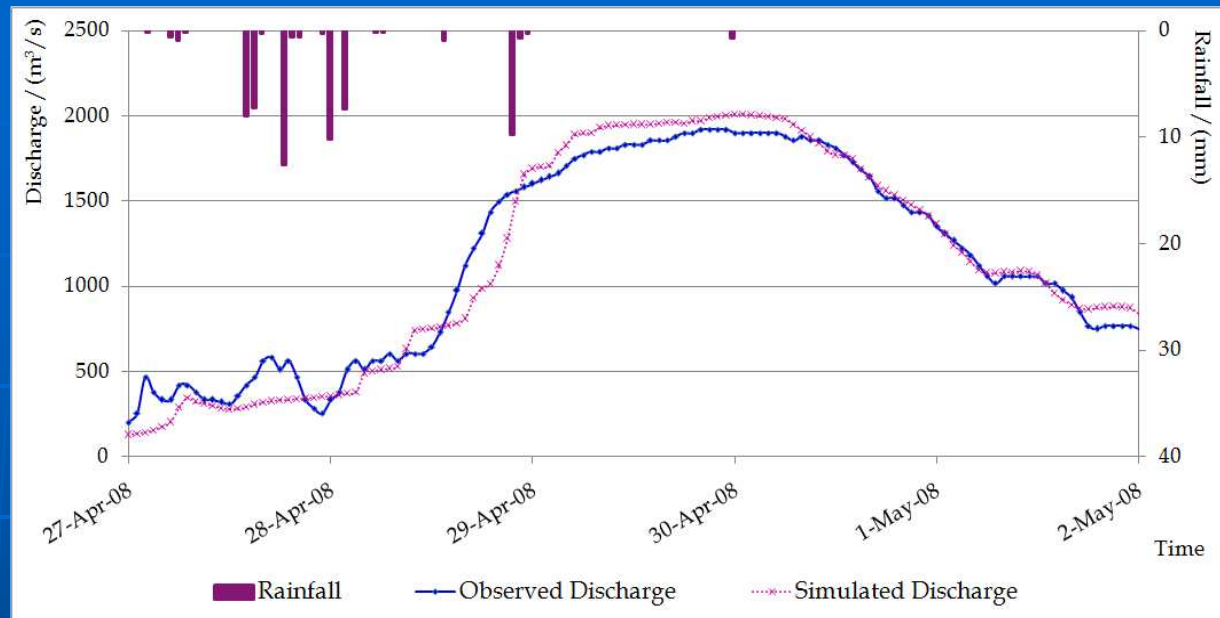
Flood modeling

FLO-2D model

- calibrated and

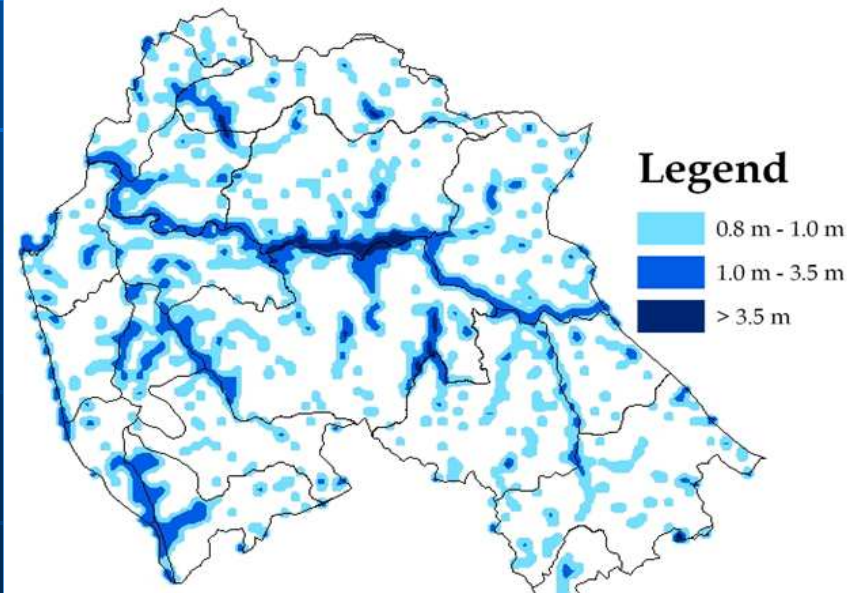
validated for

2008 April-May floods



$F = 79\%$

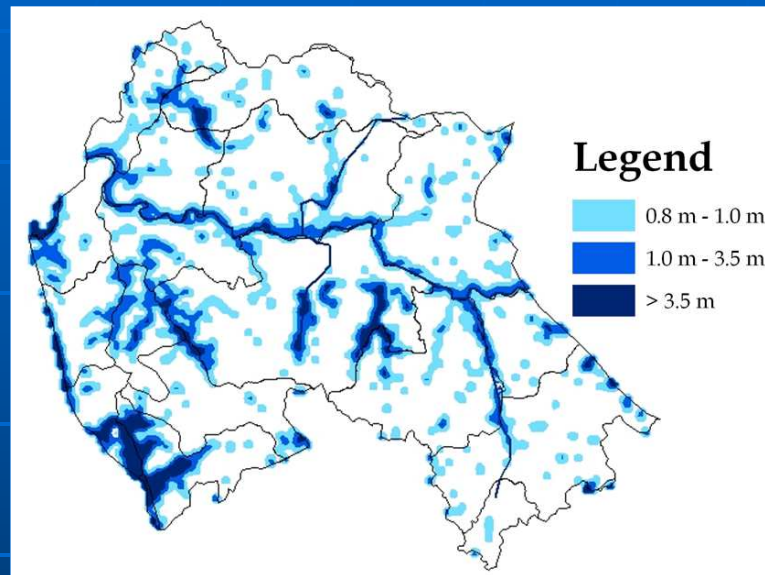
Observed Inundation extent (extract from ALOS/PALSAR satellite data)



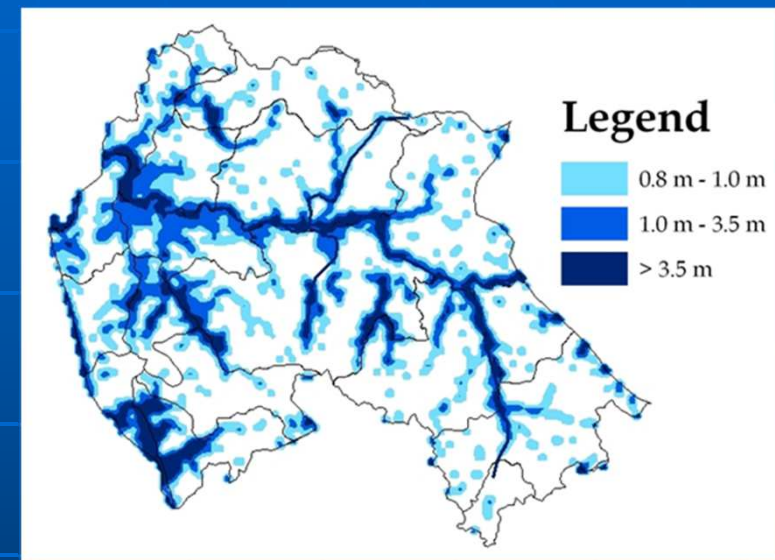
Simulated Inundation extent

Flood analysis

FLO-2D – for generate flood at lower catchment



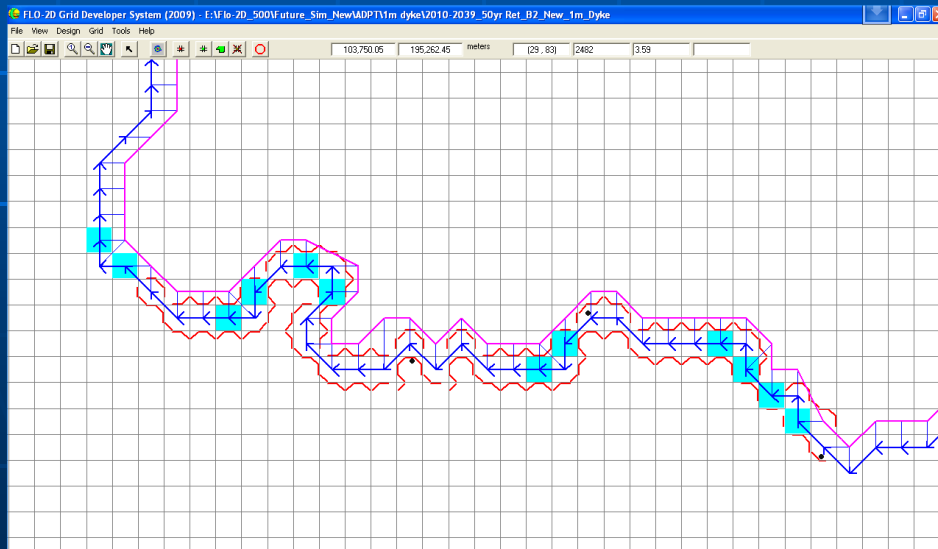
Inundation extents due to 50 year return period rainfall under A2 scenario



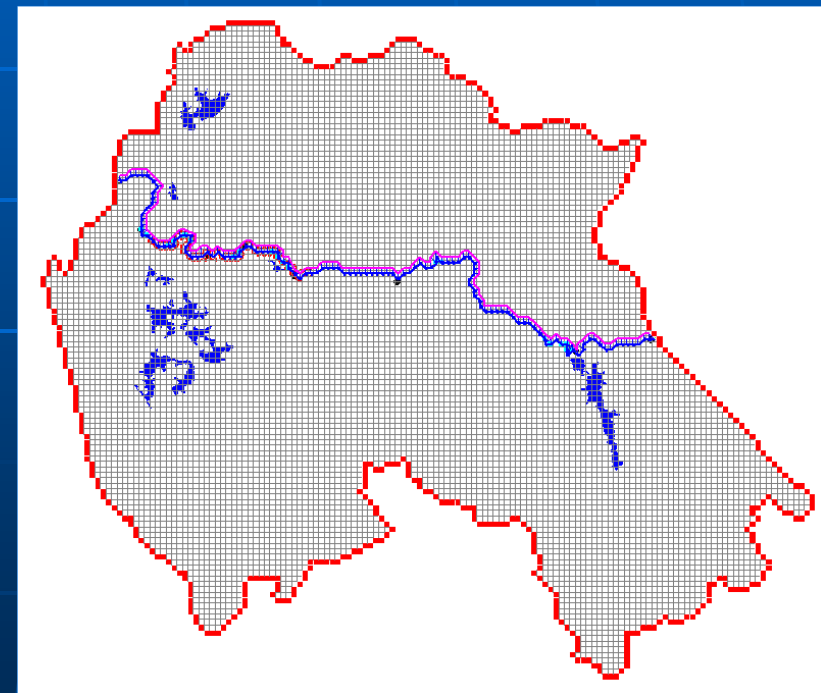
Inundation extents due to 100 year return period rainfall under A2 scenario

Adaptation strategies

- a) A levee of 1.0 m height and 10 m long from Ambathale to downstream
- b) Detention reservoirs; several marshy lands were identified from land use maps and converted in to detention reservoirs. (The water levels were decided according to the elevations of the surrounding grids in the GDS)
- c) Levee and detention basins,

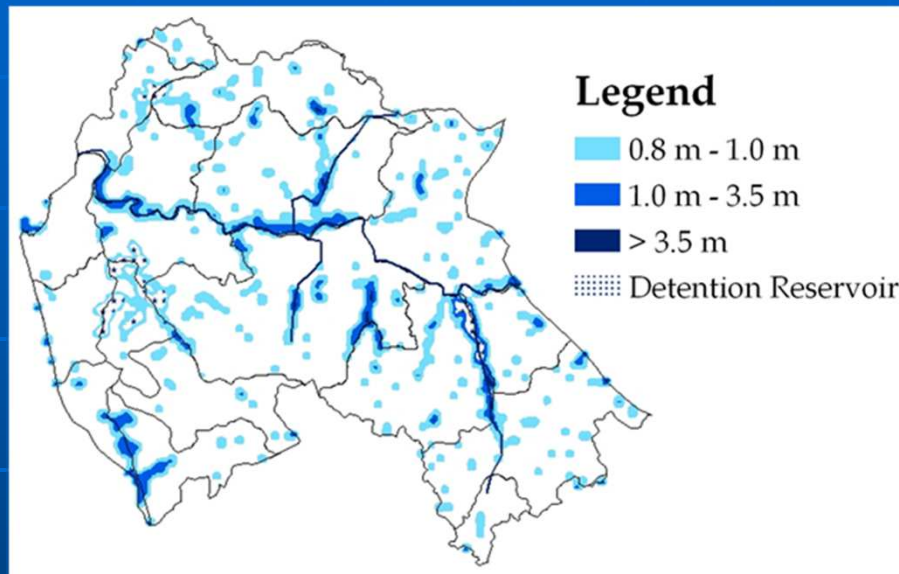


Arrangement of levee started from Ambatale

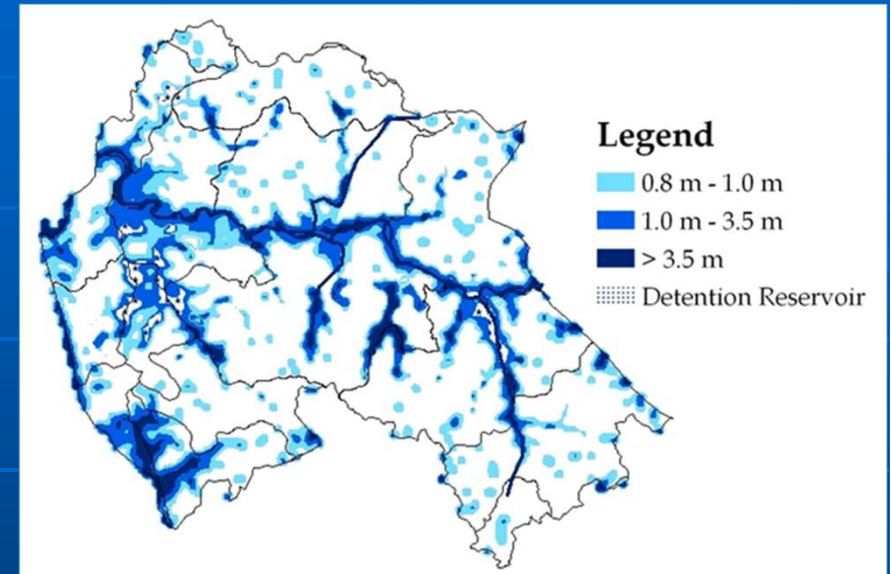


Developed marshy lands as detention reservoirs

Inundation extents case (c) - with levee and detention basin



50 year return period rainfall
under A2 scenario



100 year return period rainfall
under A2 scenario

Relative risk factor compared to no adaptation option

DS Division	50 yr flood	100 yr flood
Biyagama	74%	75%
Colombo	2%	81%
Dompe	31%	60%
Hanwella	70%	60%
Homagama	68%	63%
Kaduwela	23%	75%
Kelaniya	44%	67%
Kesbewa	10%	66%
Kolonnawa	28%	95%
Mahara	54%	50%
Maharagama	12%	57%
Padukka	53%	58%
Sri Jayawardanapura	35%	87%
Thimbirigasyaya	7%	76%
Wattala	21%	56%

2. Some other activities

a) Climate Change Impacts on Rice Production and Adaptation Strategies

SDSM for climate down scaling
DSSAT crop model

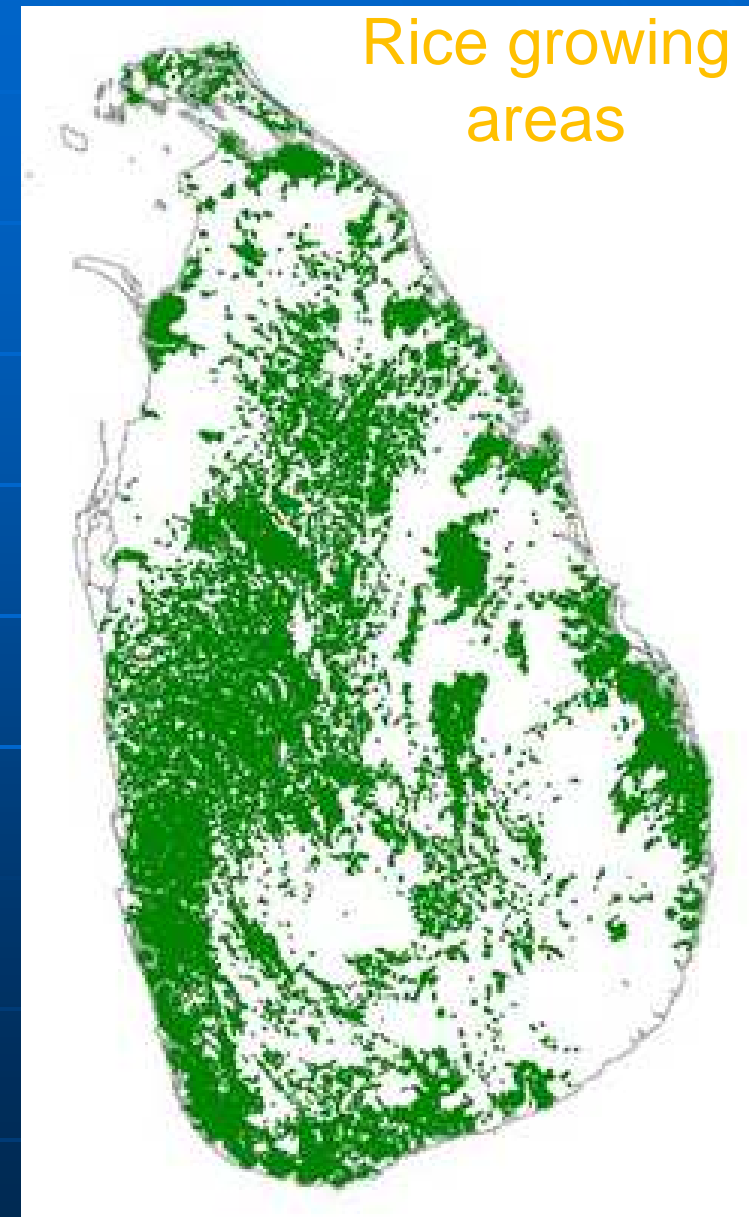
-Advancing rice planting date by one month as an adaptation

Growing environments

Major irrigation (55 %)

Minor irrigation (25%)

Rainfed (20%)



**Annual
Rainfall**
1,900 - 2,500
mm / year

**South –
West
Monsoon**

***Yala
Season***

*(May to
September
)*



**RAINFALL IN SRI
LANKA**

**North – East
Monsoon**

***Maha
Season***

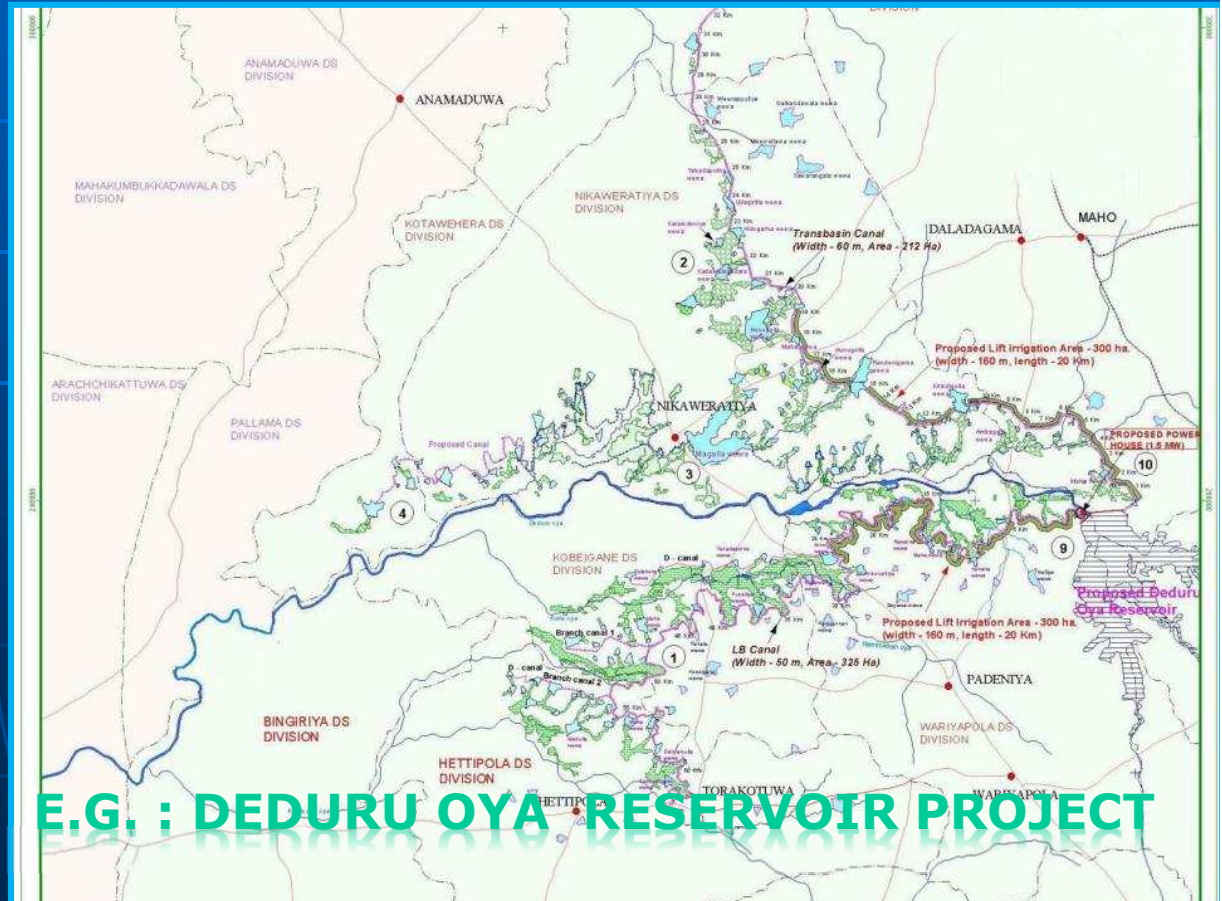
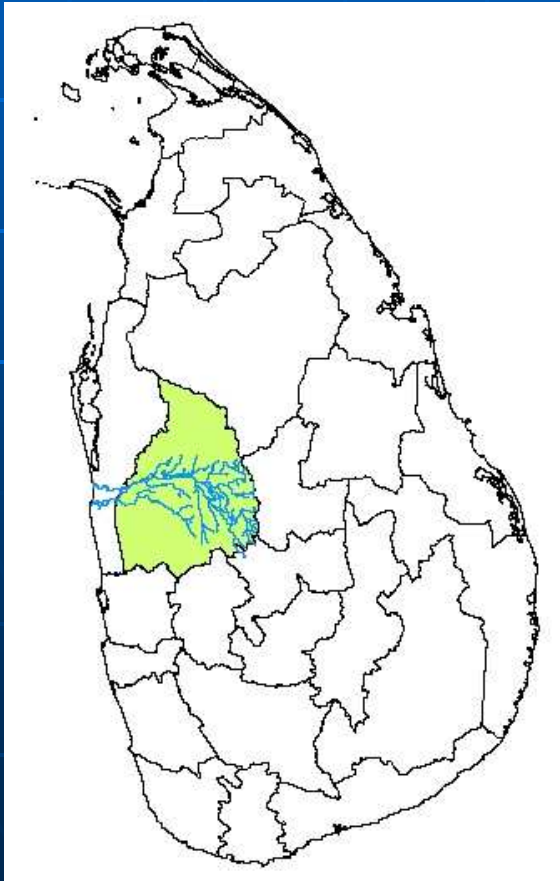
*(November to
February)*

Heavy Rains

2. Some other activities Contd

Climate Change Impacts on irrigated agriculture and adaptation

- Transbasin river diversions, increase of storages for irrigation for resilience



E.G. : DEDURU OYA RESERVOIR PROJECT



Thank you

Thank You