PDM - Reduction of future flood risk in the lower Kelani River basin

S.B.Weerakoon

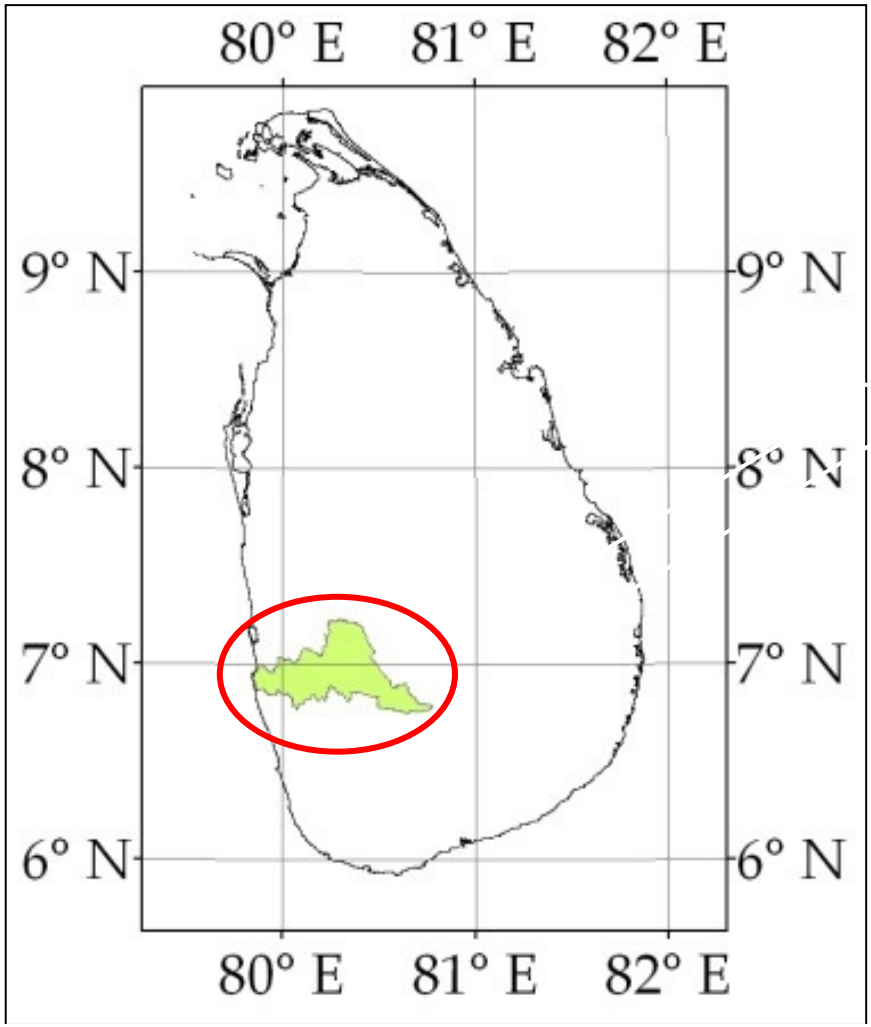
Faculty of Engineering, University of Peradeniya, Sri Lanka

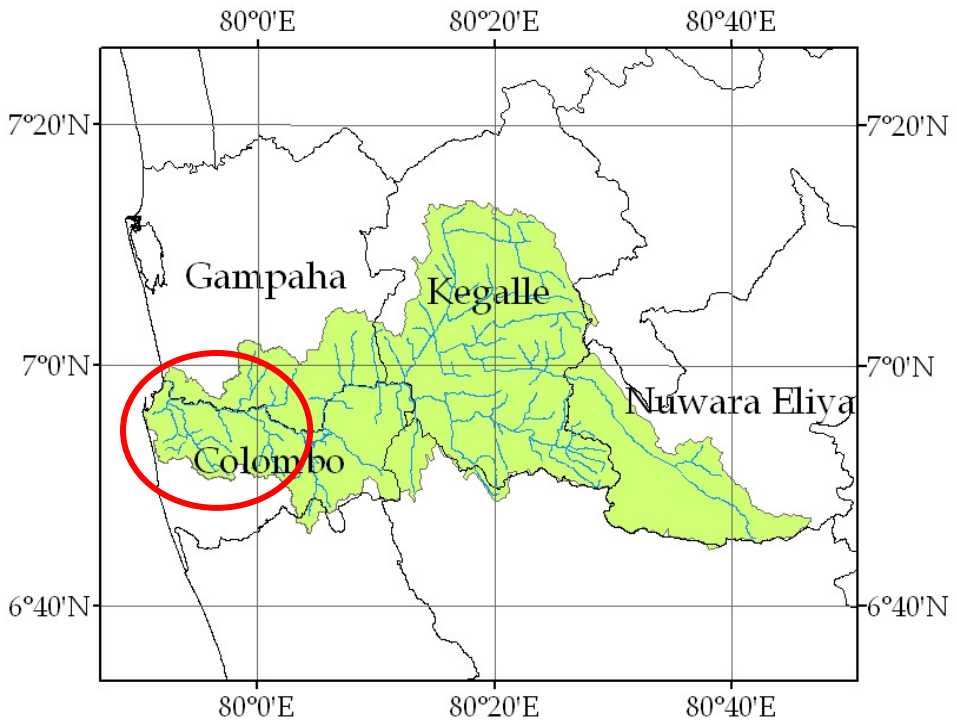
Acknowledgements-

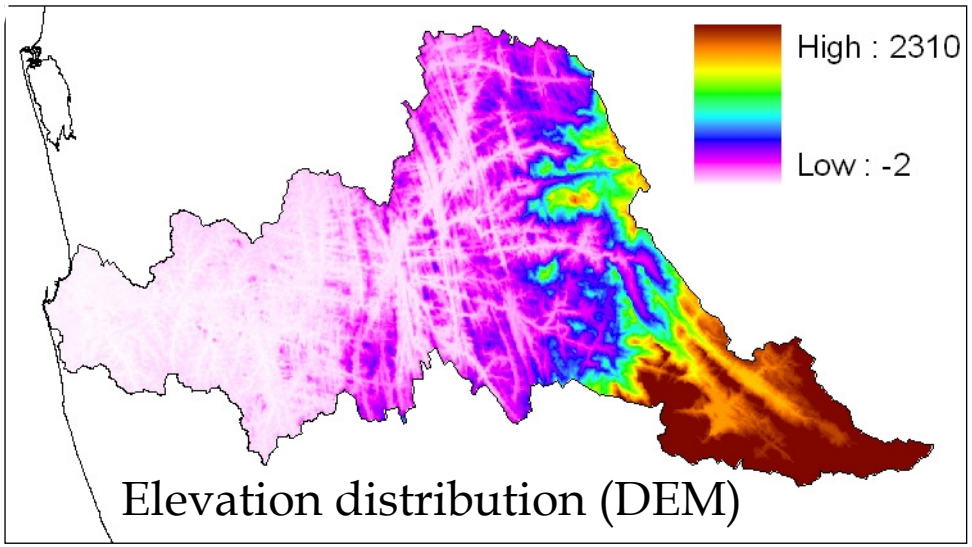
Technical Contents of this presentation are based on the postgraduate research study carried by Ms Gouri De Silva under the supervision of S.B.Weerakoon(UoP) and Srikantha Herath (UNU) with the support of CECAR Project of UNU in 2012

Background

Kelani basin







De Silva et al.

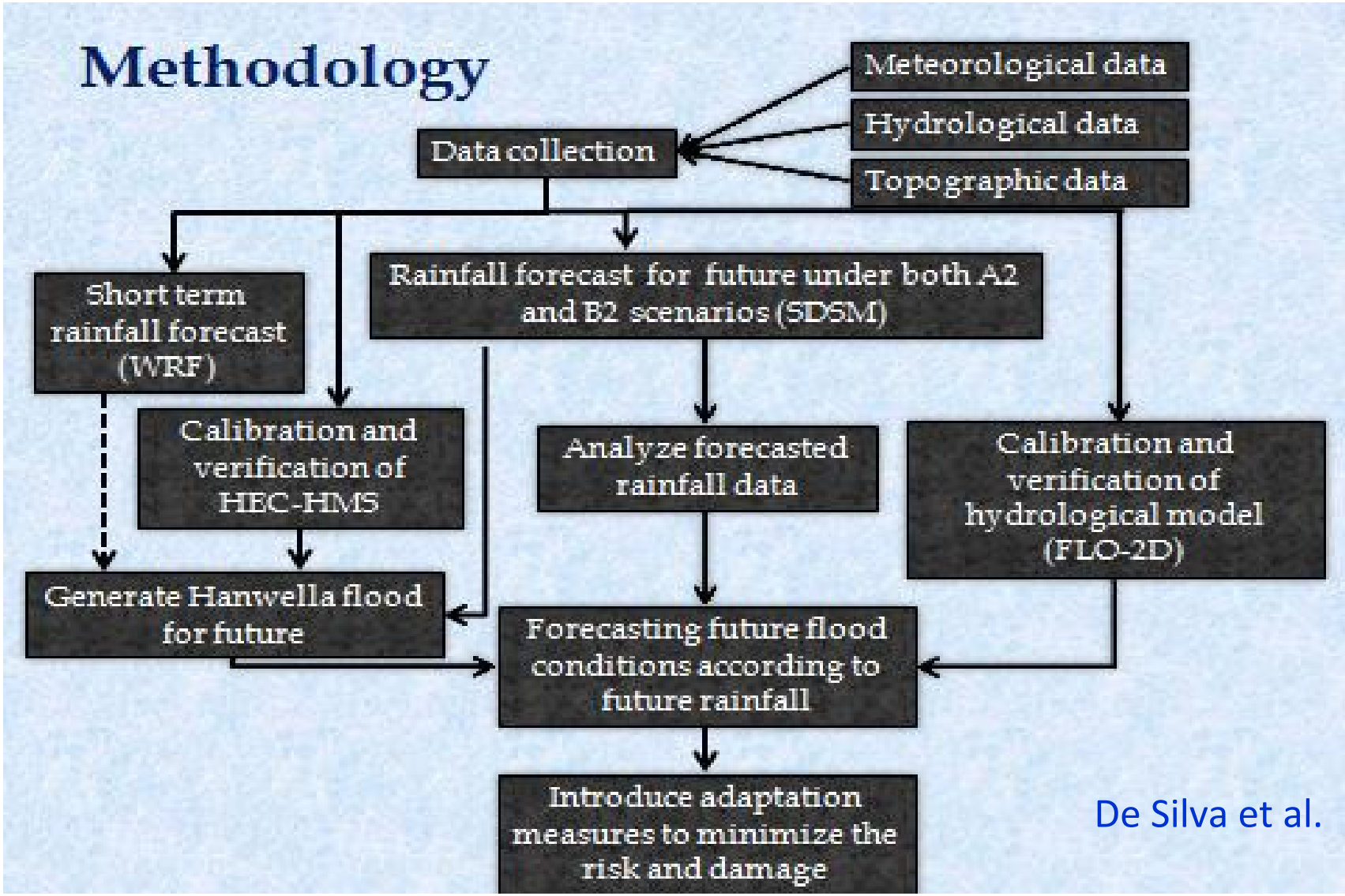
Background

The lower Kelani basin has a plain topography and high population, and also contains the Greater Colombo area of high economic input.

According to the past records flood inundation damages in the lower Kelani basin is significant. Rainfalls under climate change scenarios derived by downscaling from GCMs also show an increase trend in extreme rainfall events in the Kelani River basin

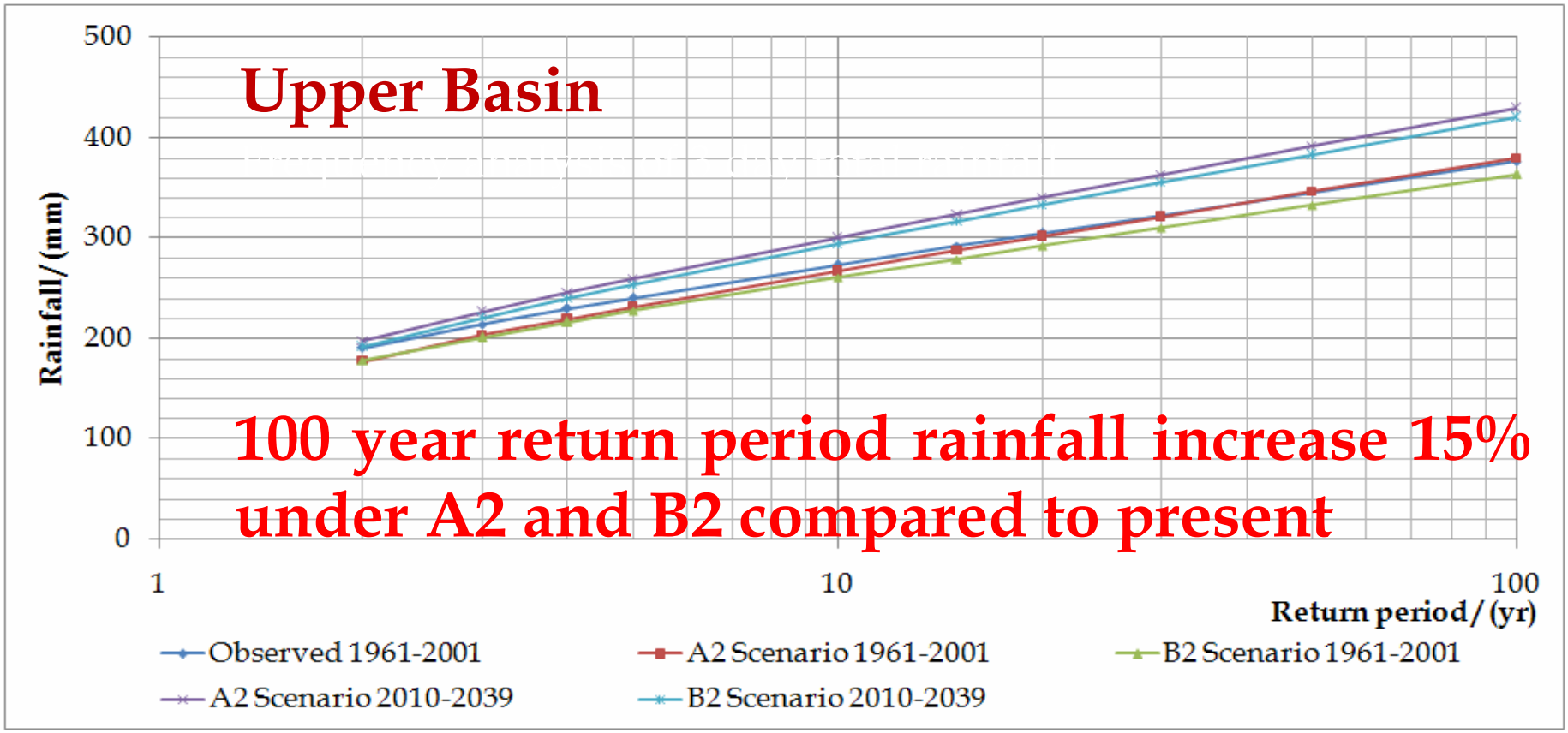
Background

Estimation of inundation under climate change scenarios



De Silva et al.

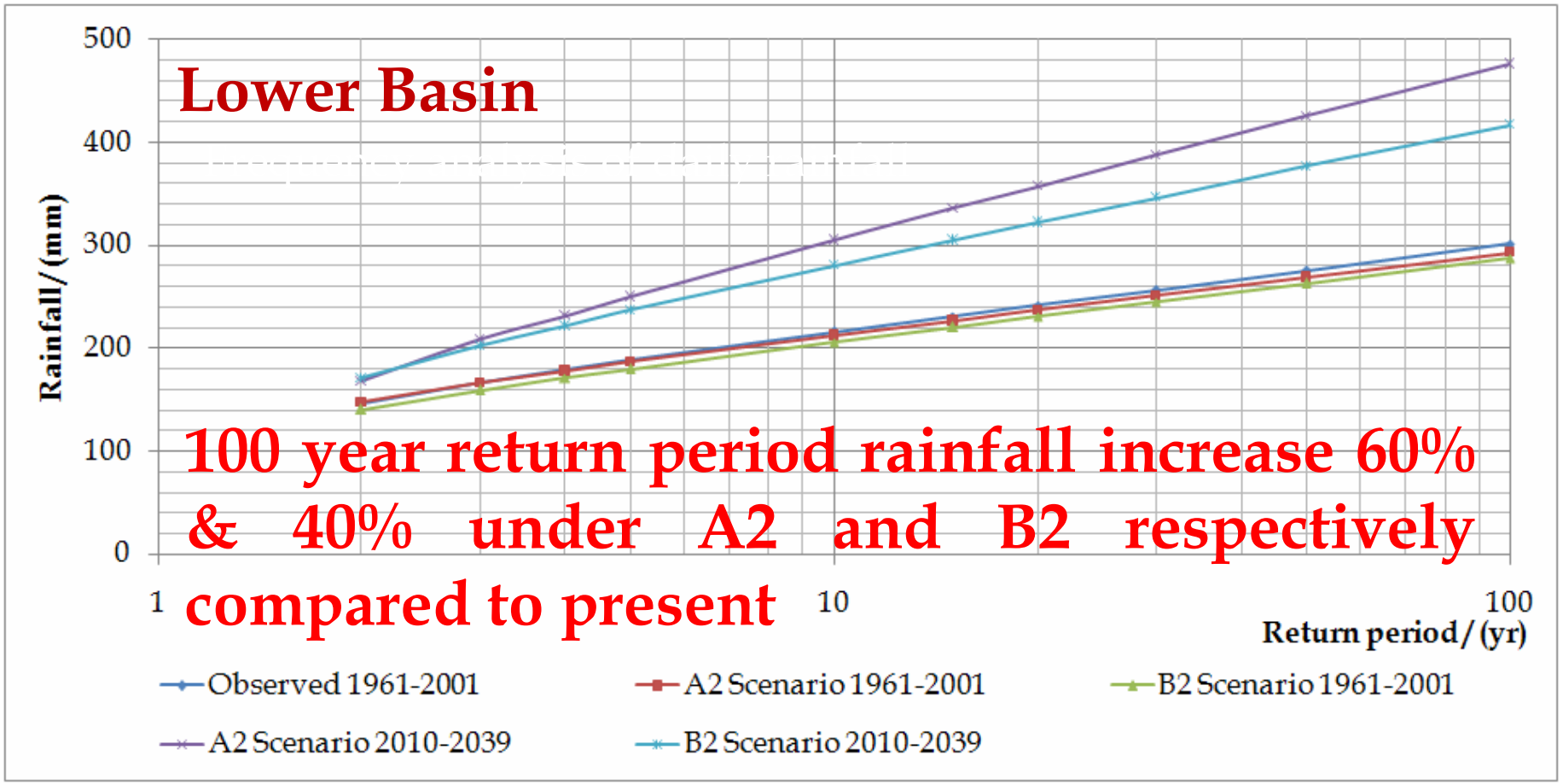
Background Rainfall under CC



De Silva et al.

Background

Rainfall under CC



De Silva et al.

Background

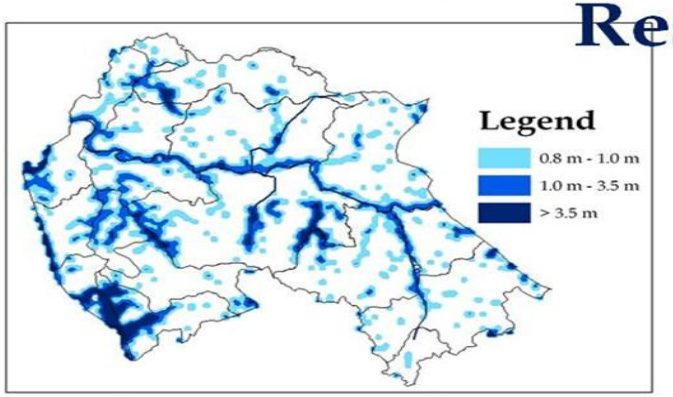
Flood analysis

FLO-2D was used to compute flood inundation at lower basin (below Hanwella). Flow from upper basin was modelled by HEC HMS and was an input at Hanwella for the lower basin.

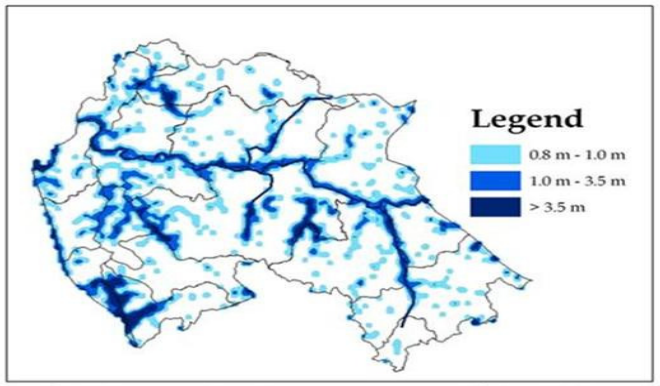
Events selected;

- 50 year return period under A2 & B2 scenarios
- 100 year return period under A2 & B2 scenarios

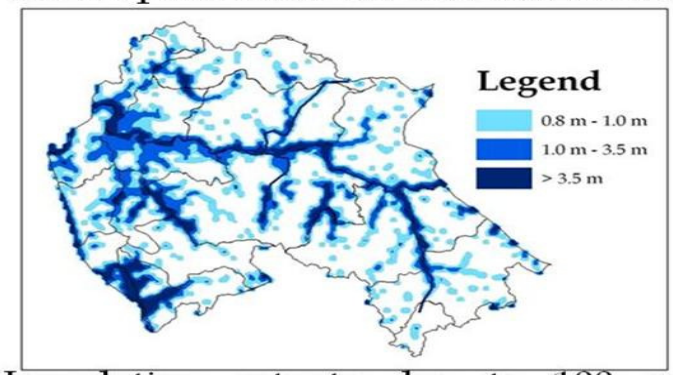
Results



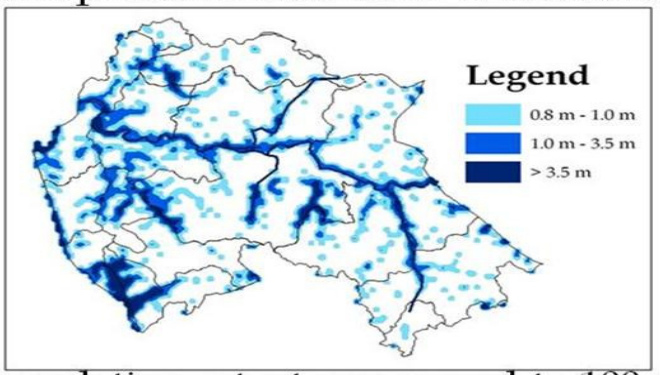
Inundation extents due to 50 year return period rainfall under A2 scenario



Inundation extent correspond to 50 year return period rainfall under B2 scenario



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

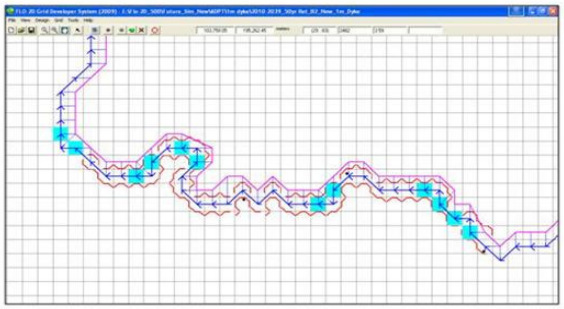


Inundation extent correspond to 100 year return period rainfall under B2 scenario

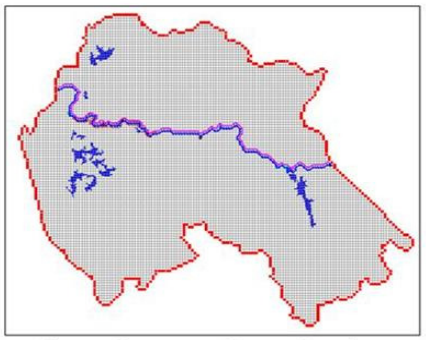
De Silva et al.

Background

Adaptation strategies- Levee and detention basins (c)

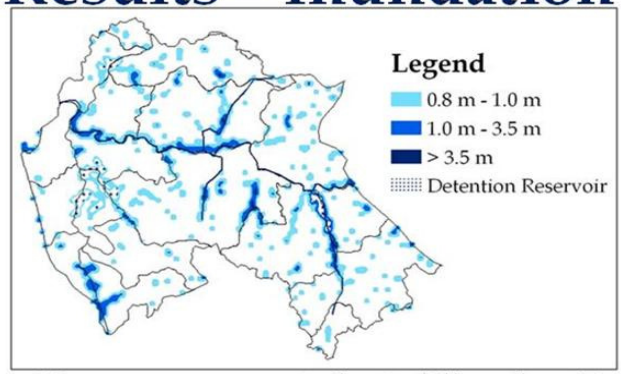


Arrangement of levee started from Ambatale

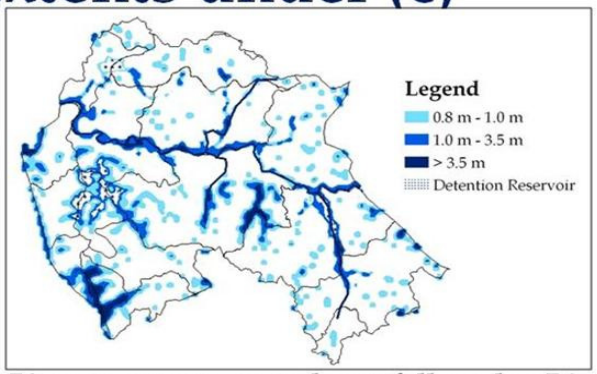


Developed marshy lands as detention reservoirs

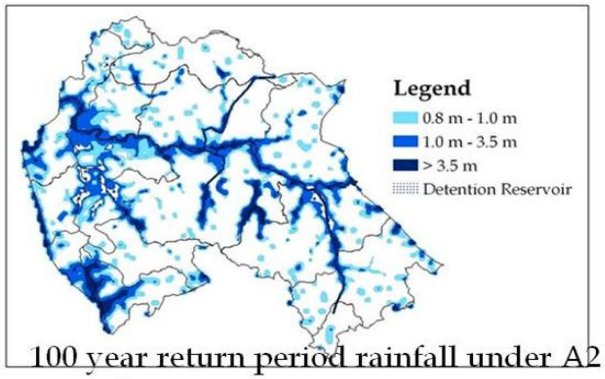
Results – Inundation extents under (c)



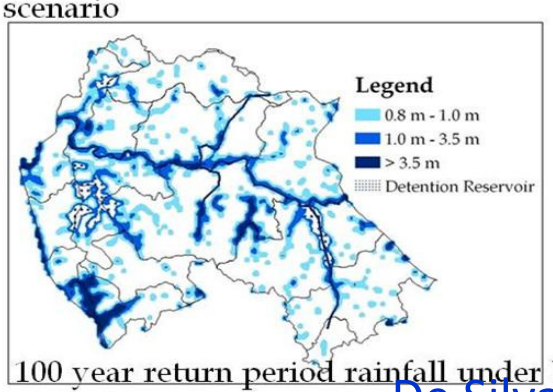
50 year return period rainfall under A2 scenario



50 year return period rainfall under B2 scenario



100 year return period rainfall under A2 scenario



100 year return period rainfall under B2 scenario

De Silva et al.

Background

Conclusion:

Downscaled GCM data of future A2 and B2 scenarios shows increased extreme rainfalls in the basin. HMS model inputs to Flow2D model has simulated the inundation areas.

Mitigation measures are required to reduce flood inundation risk.

Levee construction and detention basin are potential candidature projects. However, alternative adaptation measures including transbasin diversion need to be thoroughly investigated and the most appropriate proposal need to be implemented.

Outputs from the Proposed Project

- Critical assessment of CC impacts using recent advancements of GCM data and downscaling techniques
- Incorporation/mainstreaming of non-structural measures to design and construction practices to reduce disasters/flood damage
- Identification and implementation of structural measures to reduce disasters/flood damage.

  e.g: levees, detention reservoirs, transbasin diversion

Activities and Key Leaders and Collaborators

GCM downscaled data by using recent advancement of model outputs and downscaling tools.

- *DIAS, JAXA, AWCI*

Development of topographic, land use, a socio-economic data base of the low lying areas of the basin

GCM downscaled data by using recent advancement of model outputs and downscaling tools.

- *JAXA, Local government and Line agencies of Sri Lanka, UN Organizations*

Refined two-dimensional flood modeling for identification of vulnerable areas and risk factors

- *AWCI, UTokyo, Line Ministry and agencies in SL*

Awareness programmes to stake holders on potential increased risk

- *ADPC, DMC of SL,*

Short term solutions for disaster reduction - Warning systems based on real-time weather predictions and flood modeling

- *JAXA, DIAS, ISPRO(India), Meteorology Dept of SL,ADB*

Long term solutions for disaster reduction-

Introduction of non-structural measures through planning agencies

Planning and implementation of structural measures- alternative proposal and evaluation

- *Line Ministry and Irrigation Dept of SL, River basin Consultant Organizations , JICA,ADB, WB*