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Reservoir Operation and Management -Sri Lanka Experience

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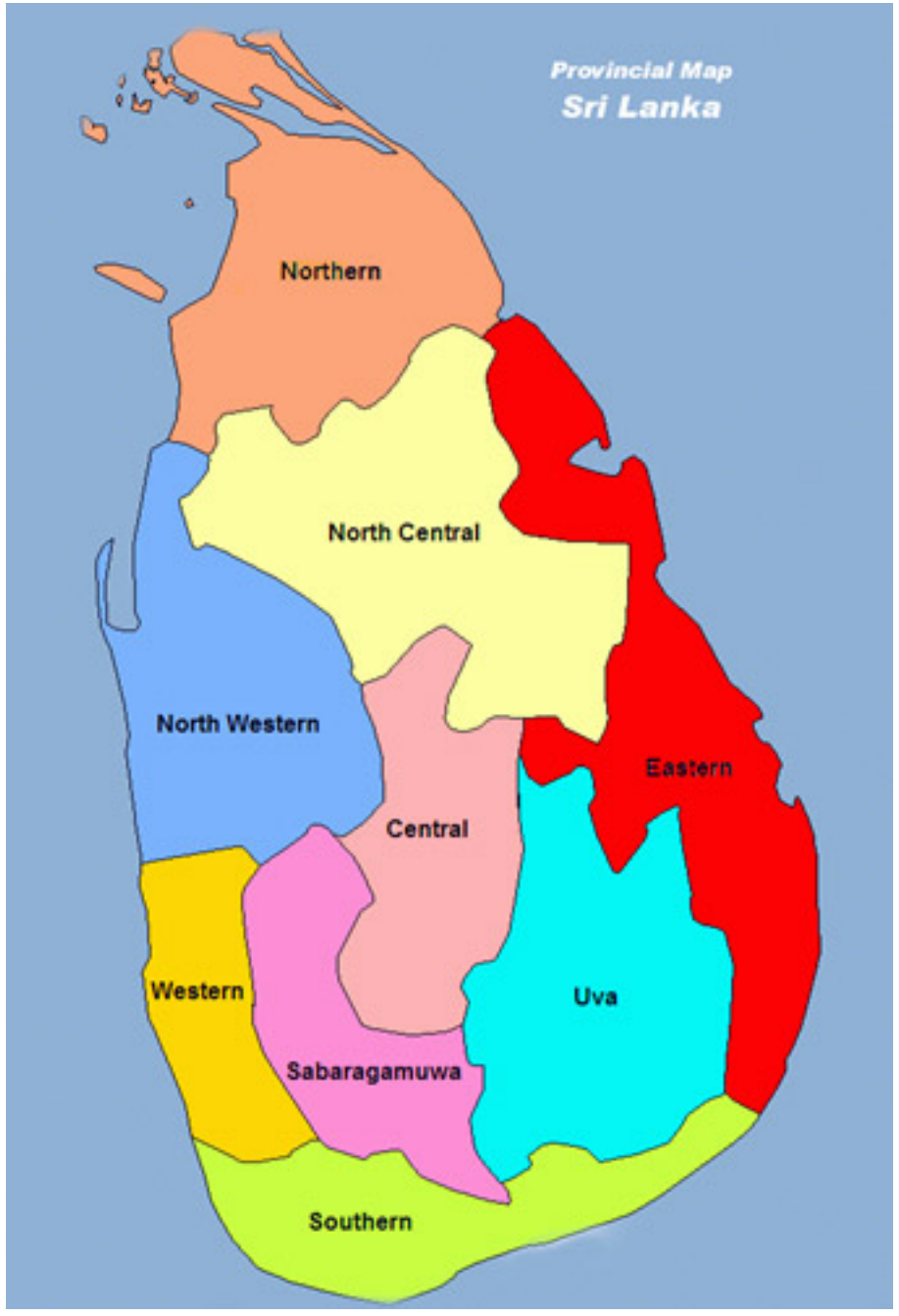
Background of the Project:

- Government of Canada funded, WMO/GFCS project

- RIMES, Department of Irrigation (DoI), Sri Lanka, Department of Meteorology (DoM), Sri Lanka and Indian Institute of Technology (IIT), Madras are the collaborators

Main Objective of the Project

To develop a pilot Decision Support System (DSS) connecting weather & seasonal climate information with irrigation and agriculture for Kirindi Oya Basin in Sri Lanka



Kirindi Oya Basin:

- The Kirindi Oya basin lies within dry zone of Sri Lanka and have a total catchment area of 1157 km2.

- Kirindi Oya basin spread within two districts which are belonging to Uva Province and Southern Province.Upstream of the basin belongs to Monaragala District and downstream of the basin belongs to Hambantota District.

- The Kirindi Oya catchment has undergone a rapid transition since the Lunugamwehera reservoir started operations in 1986.

- This basin is used for Agriculture, Domestic and Industrial activities in the area. Floods and droughts are the main challenges in this basin.

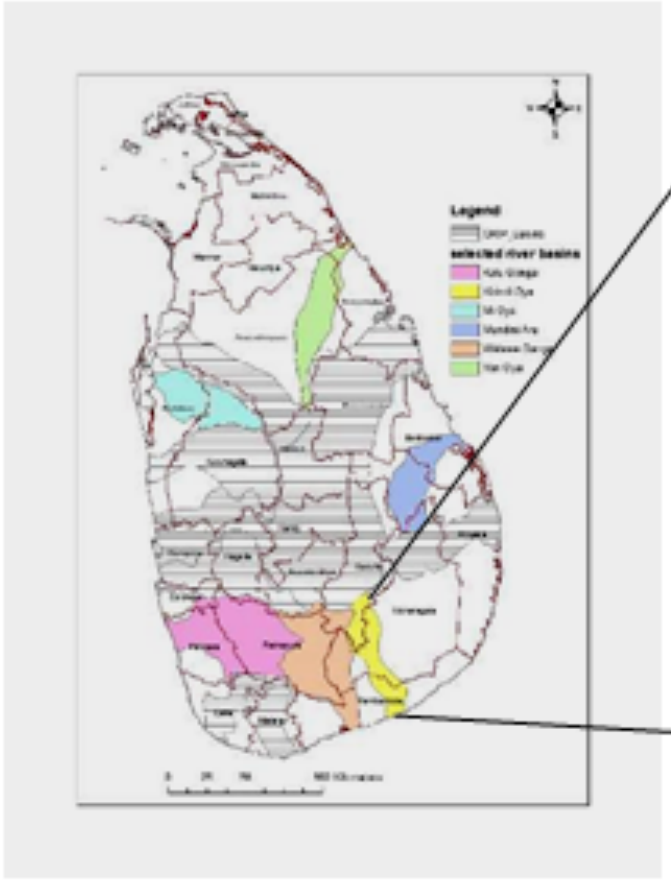
- Main mode of water supply:Lunugumwehera reservoir

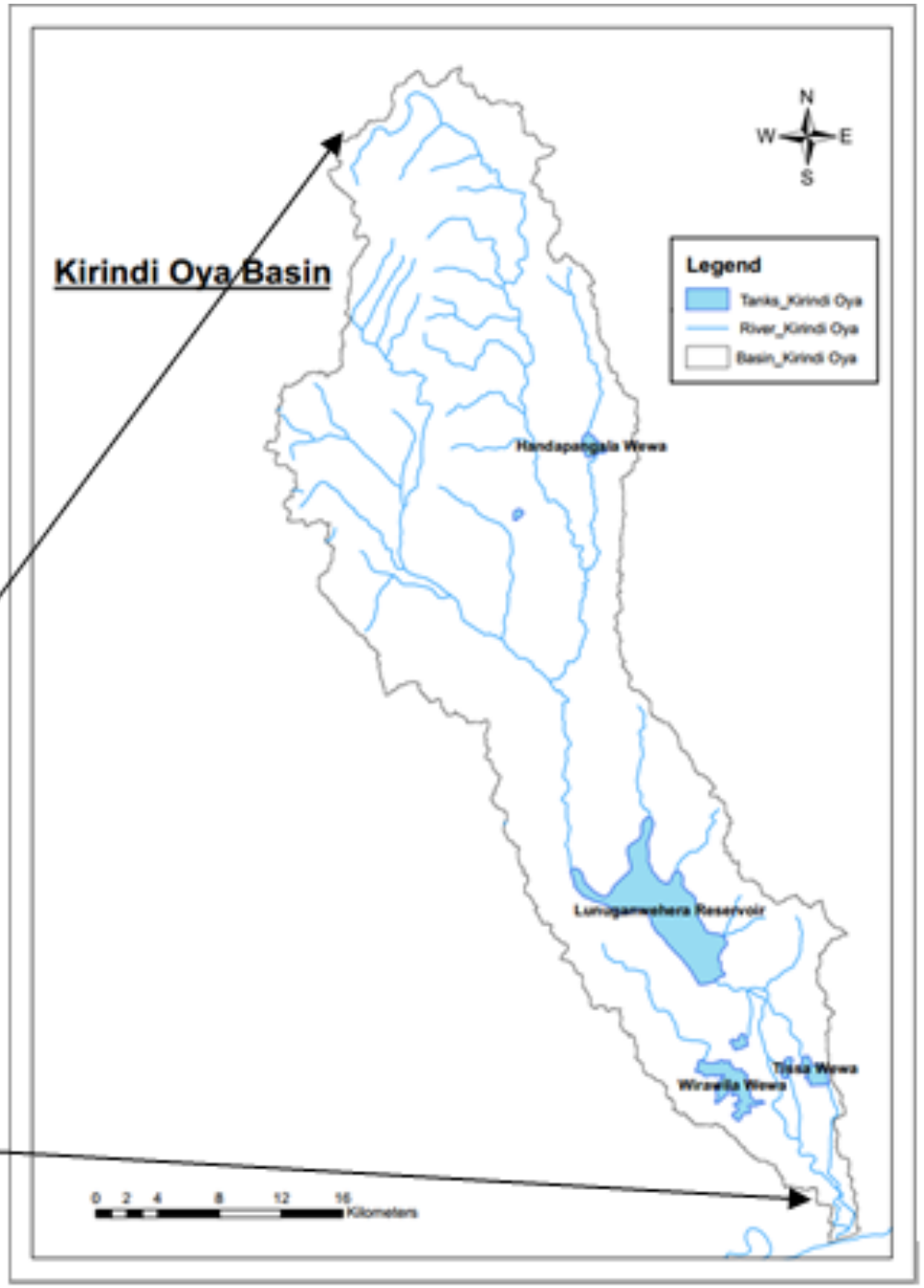
- Inflows to the reservoir are vital in deciding the water management of the basin

- The uncertainty in rainfall makes it difficult for the irrigation/ water resources manager to predict the reservoir inflows and manage the irrigation releases,as variability in annual and monthly rainfall is very high in the basin.

- Hence, development of a decision support system which is capable of predicting the reservoir inflows will assist in managing the operations of the reservoir in an efficient and improved manner

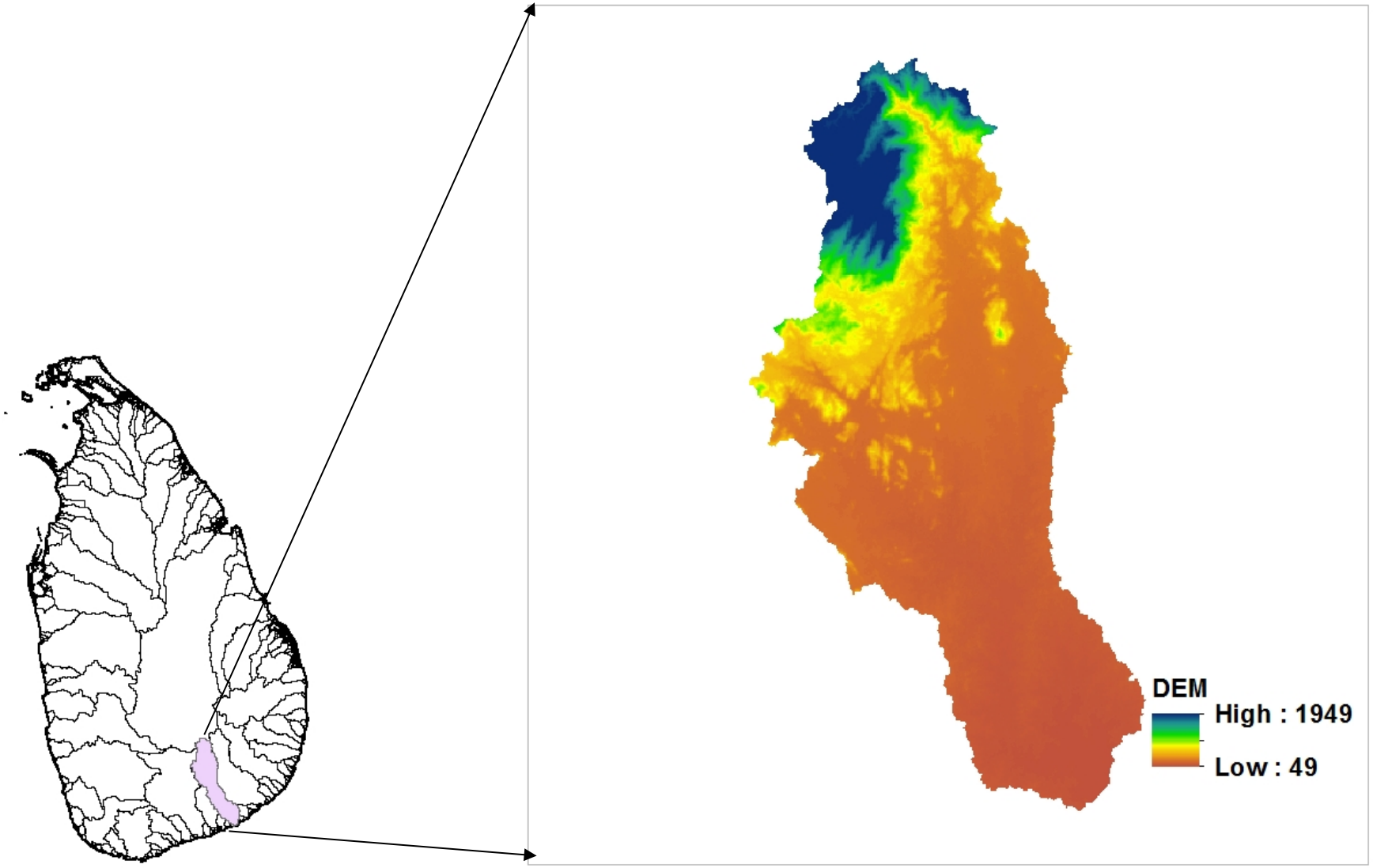
Kirindi Oya Basin



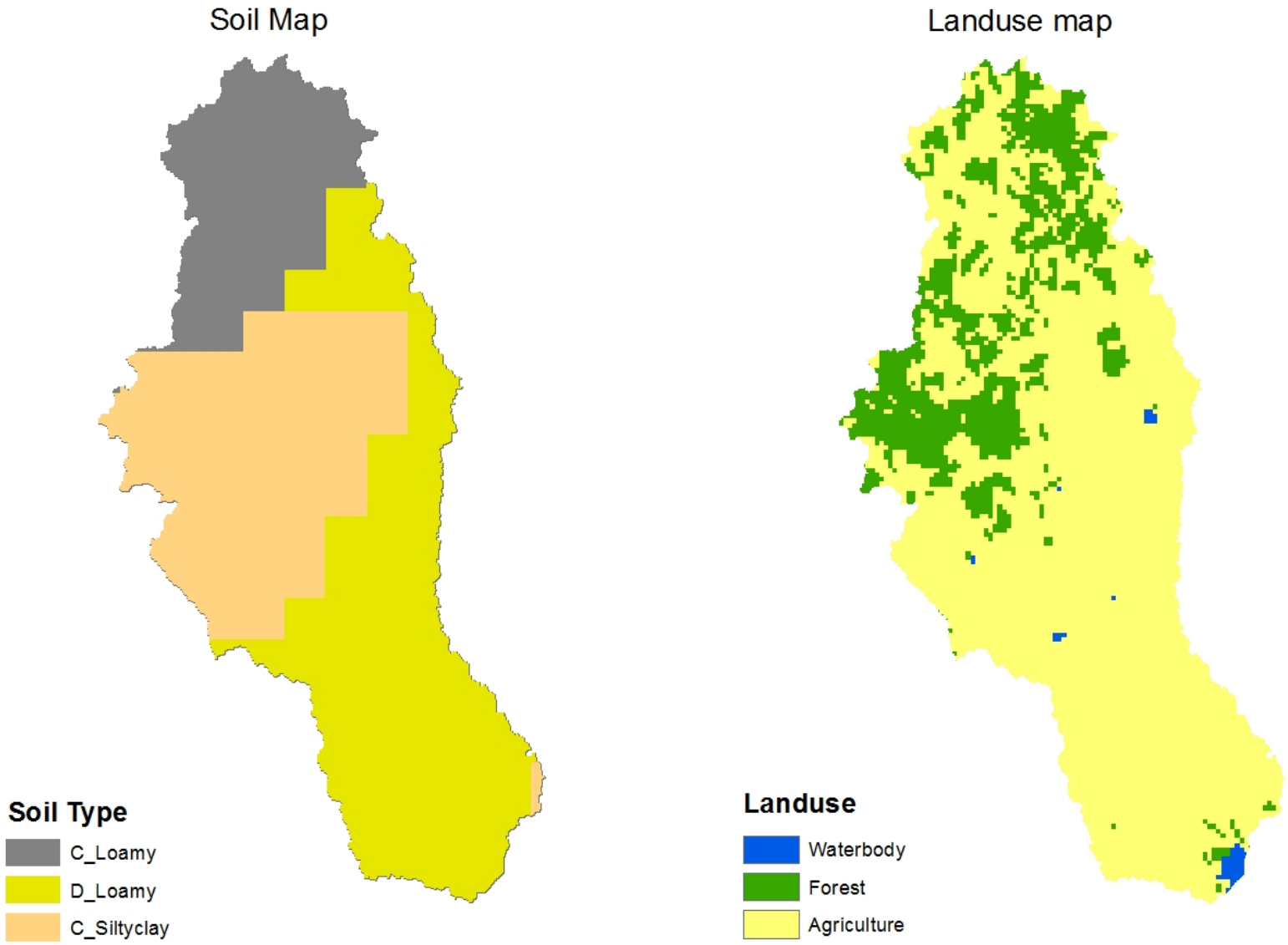


Kirindi Oya Basin

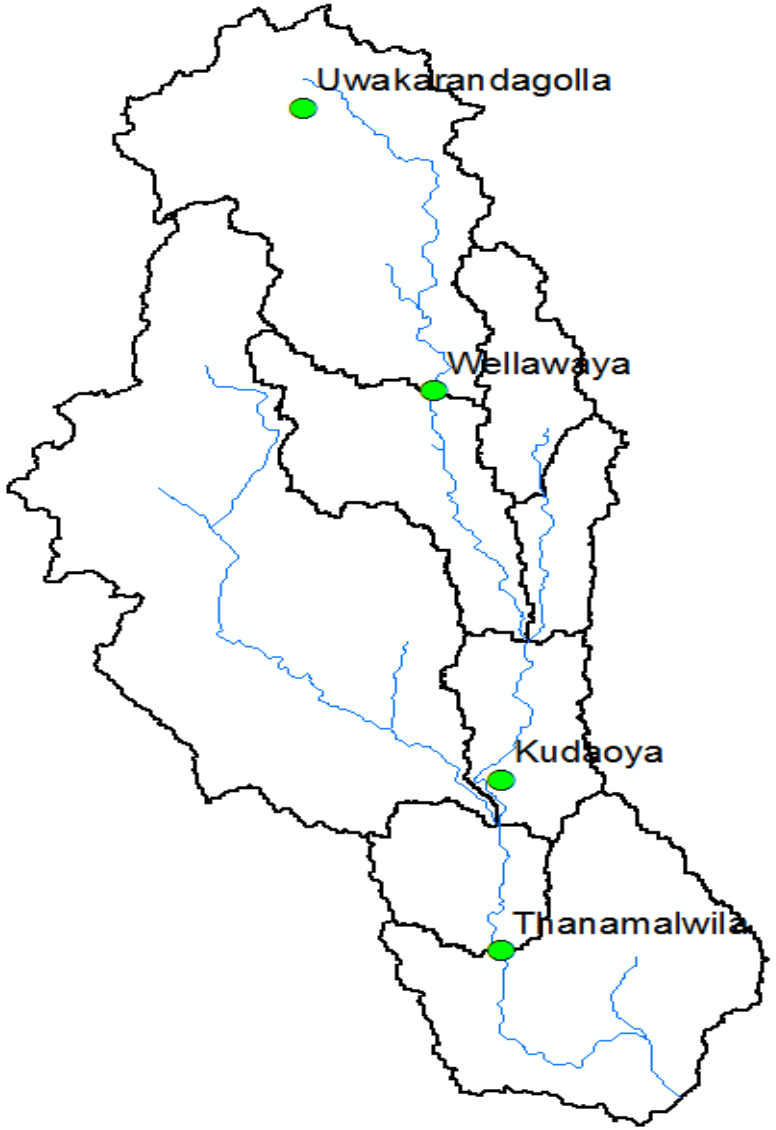
Kirindi Oya Basin-Topography



Soil Map and Land Use Map

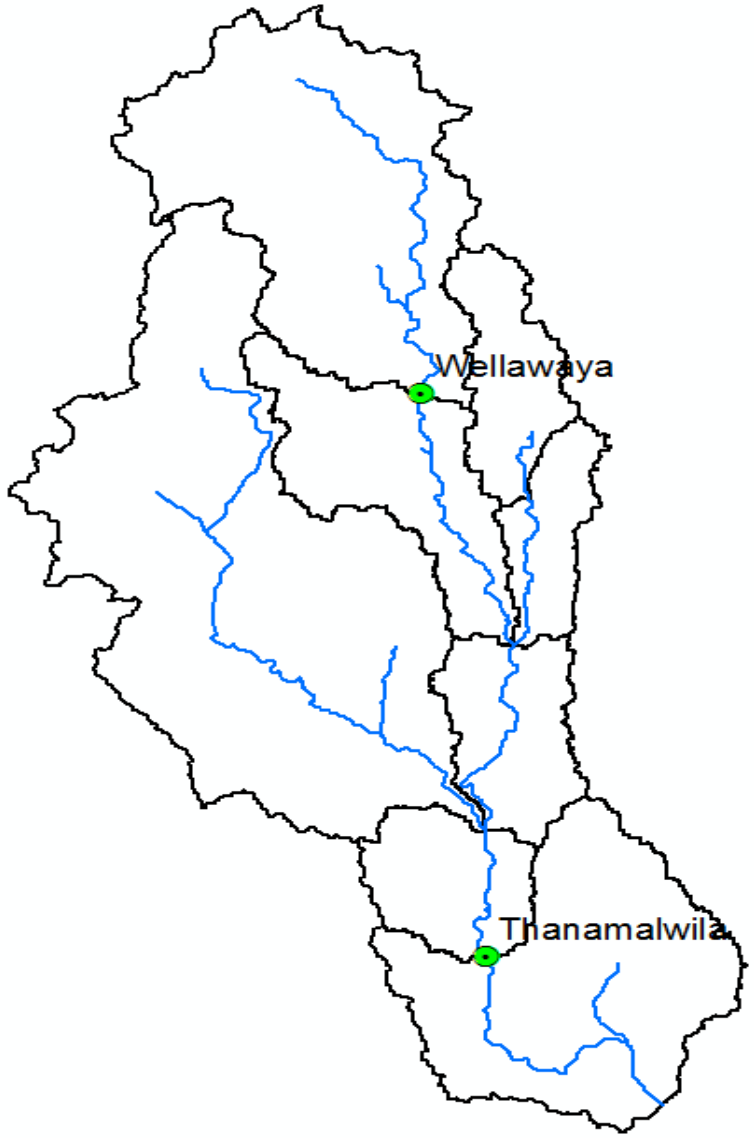


Weather Stations Used in HEC-HMS Model Setup



- Uwakarandagolla (2006-2014)
- Wellawaya (1989-2014)
- Kudaoya (1989-2014)
- Thanamalwila (1989-2014)

Gauging Stations Used in HEC-HMS Model Set up



- Wellawaya (1980 – 2010)
- Thanamalwila (1987 – 2013)

The specific focus of the study :

- Development of a reservoir inflow forecast system (web based system for generation of basin discharge and river level forecasts) based on weather forecast, hydrologic and reservoir models and real time observations.

- Improvement of reservoir operation and management plans to mitigate the impact of floods with minimal impact to water available for productive uses.

and Finally

Develop and implement a integrated Decision Support System (DSS) to manage the operations at Lunugumvehera,

Milestones

- RIMES team visited the pilot site in August, 2016 and a consultation meeting was held with DoI and DoM officials to define the objectives and tasks.

- Workshop was held in December, 2016 at the office of DoI, Hambantota to have an assessment of the overall project framework, drafted methodology, datasets required for developing the system.

- Technical workshop was held during 10-12 July, 2017 in order to demonstrate the Decision Support System (DSS) and Reservoir Simulation Model developed by RIMES/IIT, Madras to support the operational staff of DoI to make release decisions from Lunugumwehera reservoir based on the inflow forecasts, and provide access to the system to the DoI officials

The technical workshop was designed for technical officers (hydrologists and reservoir managers) who have responsibilities in inflow forecasting and reservoir operations, and focused on,

- lectures
- hands-on training
- discussions

that covered the various aspects of

- hydrologic modelling,
- modelling tools,
- developing of Decision Support System and Reservoir Management / Operation systems.

Following topics related to Model Developing were discussed:

- Preparation of input datasets for setting up of the hydrologic model
- Watershed Delineation
- Hydrological model development using HEC-HMS (HMS is a Hydrologic Modeling System that is designed to describe the physical properties of river basins, the meteorology that occurs on them, and the resulting runoff and streamflow that are produced.)
- Hydrological model setup and calibration
- Meteorological forecast products and input data preparation
- Decision Support System
- Reservoir model development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The technical training program was appreciated by the participants from the DoI,and accepted that it improves their knowledge in managing the irrigation and reservoir system in a sustainable way so as to prevent/ manage extreme events of drought or floods.

Focal points were also identified from the officials who will be responsible in handling the developed system, updating the information related to observed water levels.

Follow up meeting for the training programme was held in Colombo with other higher relevant officials of DoI and DoM on 14th July 2017 to discuss

- Project activities and Progress
- Tools developed
- Feedback received from the officials in Hambantota
- Steps to be taken in terms of data for further refinement of the proposed system
- Plans to carry it forward in the form of similar systems for basins across Sri Lanka

Issues need to be addressed :Hydrologic model

- Incorporating more rain gauge information to address the spatial variability in rainfall and updating
- Updating of flow data available at the gauging sites
- Improving soil map at finer resolution (will improve the calibration of the hydrologic model)
- Use measured Evapotranspiration data (Currently using monthly average, incorporation of measured ET data will improve the model performance)

THANK YOU