



# *Geographic information system*

*Application of GIS in Environmental Engineering  
(Location optimization of wastewater treatment plant  
Using GIS: A case study in upper mahawelli catchment,  
Sri lanka)*

*CE 514 Term paper presentation*

*By*

*Abdullahi Usman*

*ID# 201201640*

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*Instructor: Dr. Bager Al-Ramadan*

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# ***OUTLINE***

- ▶ ***Background***
- ▶ ***Introduction***
- ▶ ***Case Study Area***
- ▶ ***Pilot study area***
- ▶ ***Methodology***
- ▶ ***Discussion***
- ▶ ***Conclusion***



*Good wastewater treatment facility location  
safeguard human health and the integrity of  
environment*



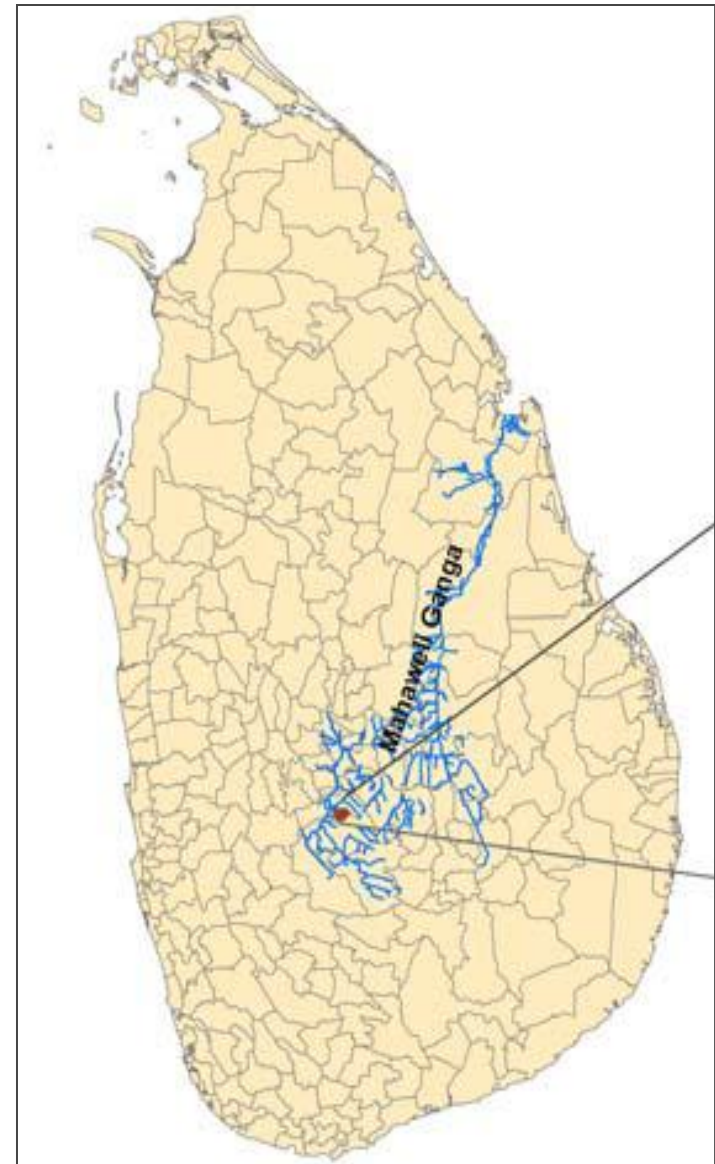
# *INTRODUCTION*

- ▶ *A good approach to siting wastewater treatment facility needs to be adopted in order to save the human health and environment.*
- ▶ *GIS has proven to be one of best spatial data analysis tool.*
- ▶ *It has been used successfully in many wastewater treatment systems in the literature.*
- ▶ *Upper mahawelli as a case study will be discussed here.*

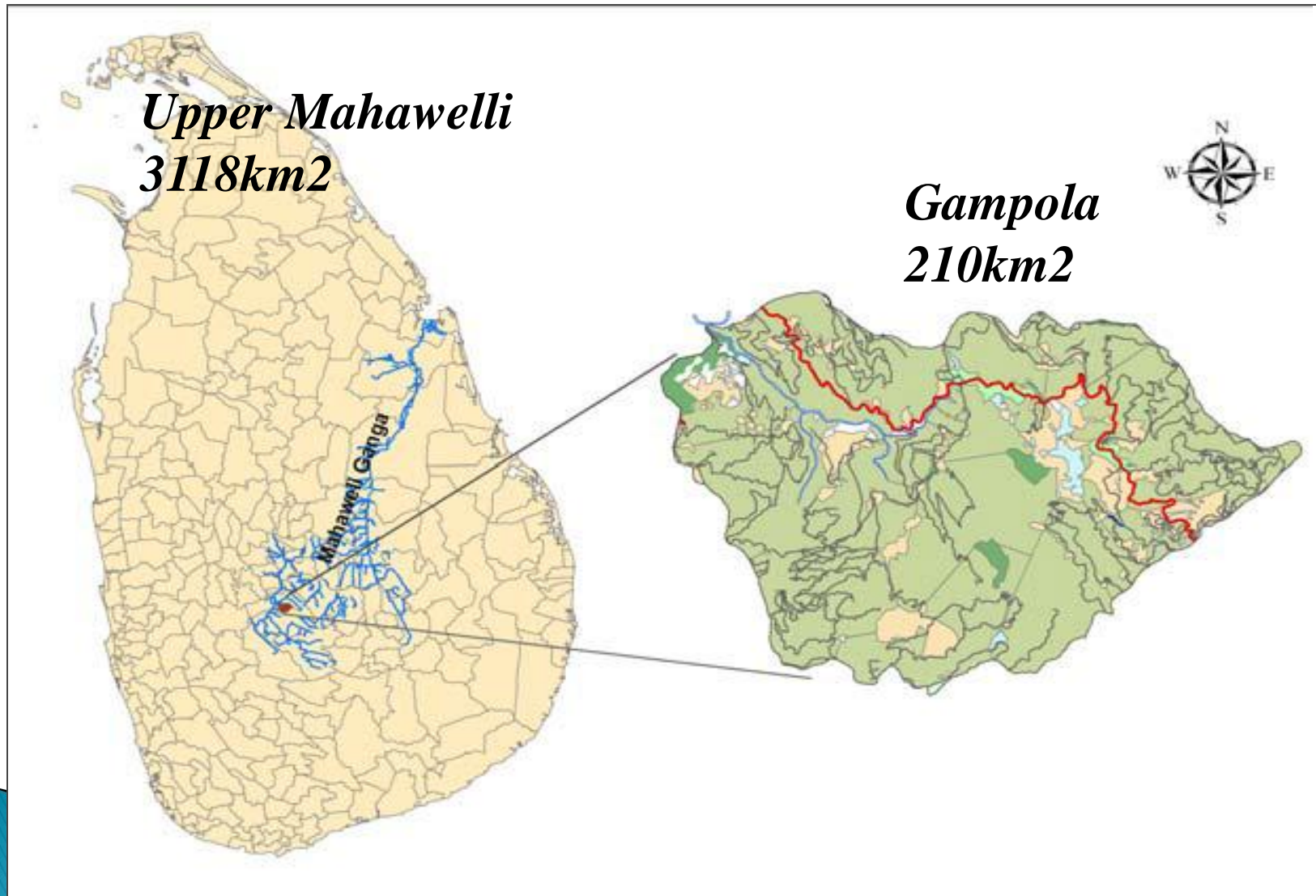


## *Case Study: Upper Mahawelli Sri lanka*

- ▶ *Total area: 3118km<sup>2</sup>*
- ▶ *Four Dams exist contributing to*
  - *60% to electricity supply*
  - *irrigation*
  - *drinking water*
- ▶ *Altitude terrain varies between 520m to 1400m*
- ▶ *Tea plantation and vegetables*
- ▶ *Medium and small scale industries*

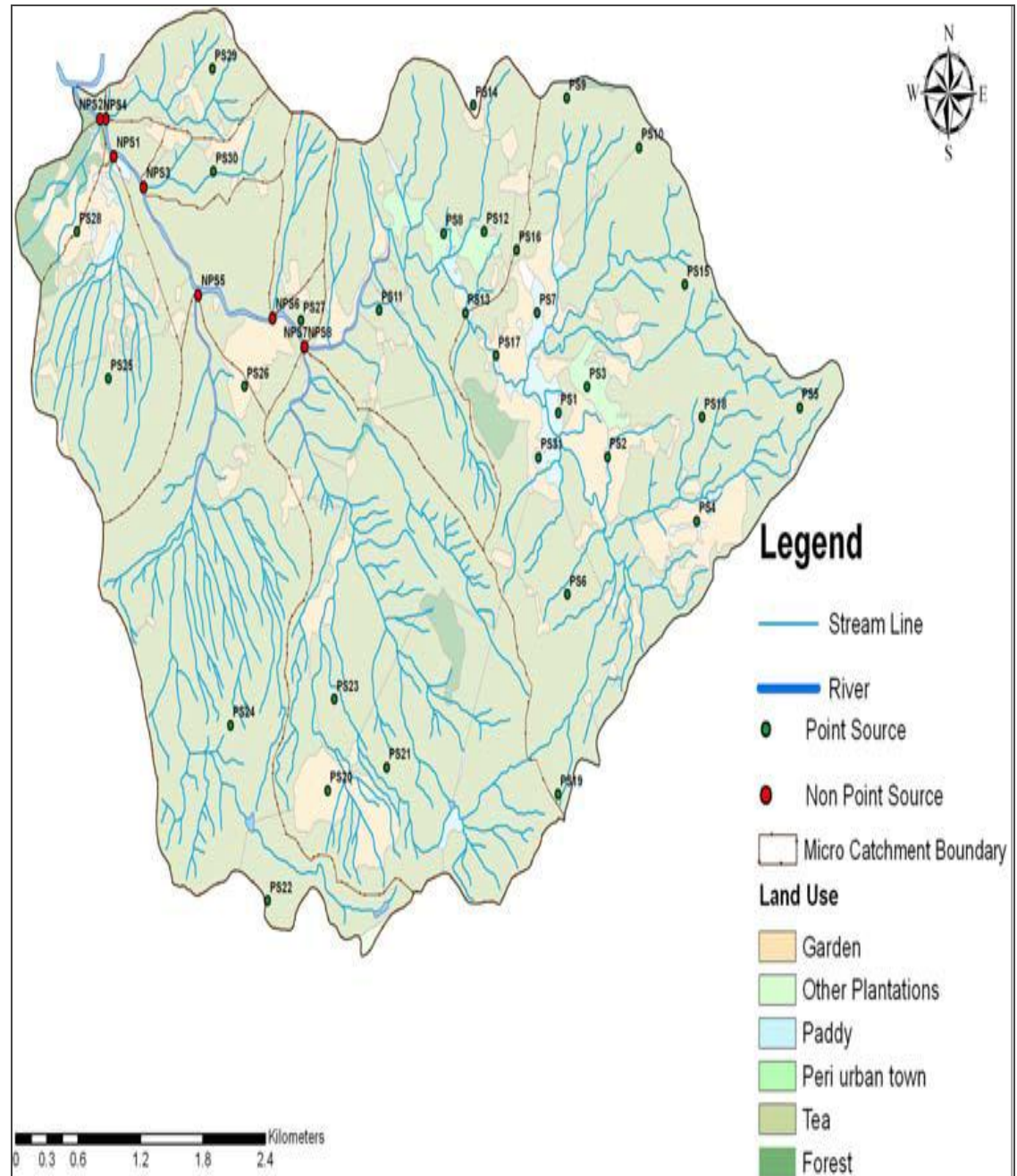


# *Pilot scale study at Gampola (Portion of Upper mahawelli)*



# Methodology

- 1. Identification and mapping pollutant sources**
  - **Point sources:**
    - *Transect walk*
    - *Use of GPS for coordinates*
    - *Use of ArcGIS for conversion to point layers*
    - *Point were able to located with the geo-referenced map prepaid.*
  - **Non-point Sources:**
    - *Identified Using DTM (Digital Terrain Mapping)*





## *2. Selection criteria and their defined limits*

- ▶ *Technical: Slope should be less than 15%*
- ▶ *Environmental : Forest and protecting areas and potential flood zones to excluded*
- ▶ *Social: minimum of 300m to be maintained from settlements to avoid odors and mosquito problems*



### 3. *GIS spatial data Preparation*

- ▶ Slopes were determined from DEM produced by Digitizing 1:10000 contour maps
- ▶ Polygon was created for slope less than 15% as shown below

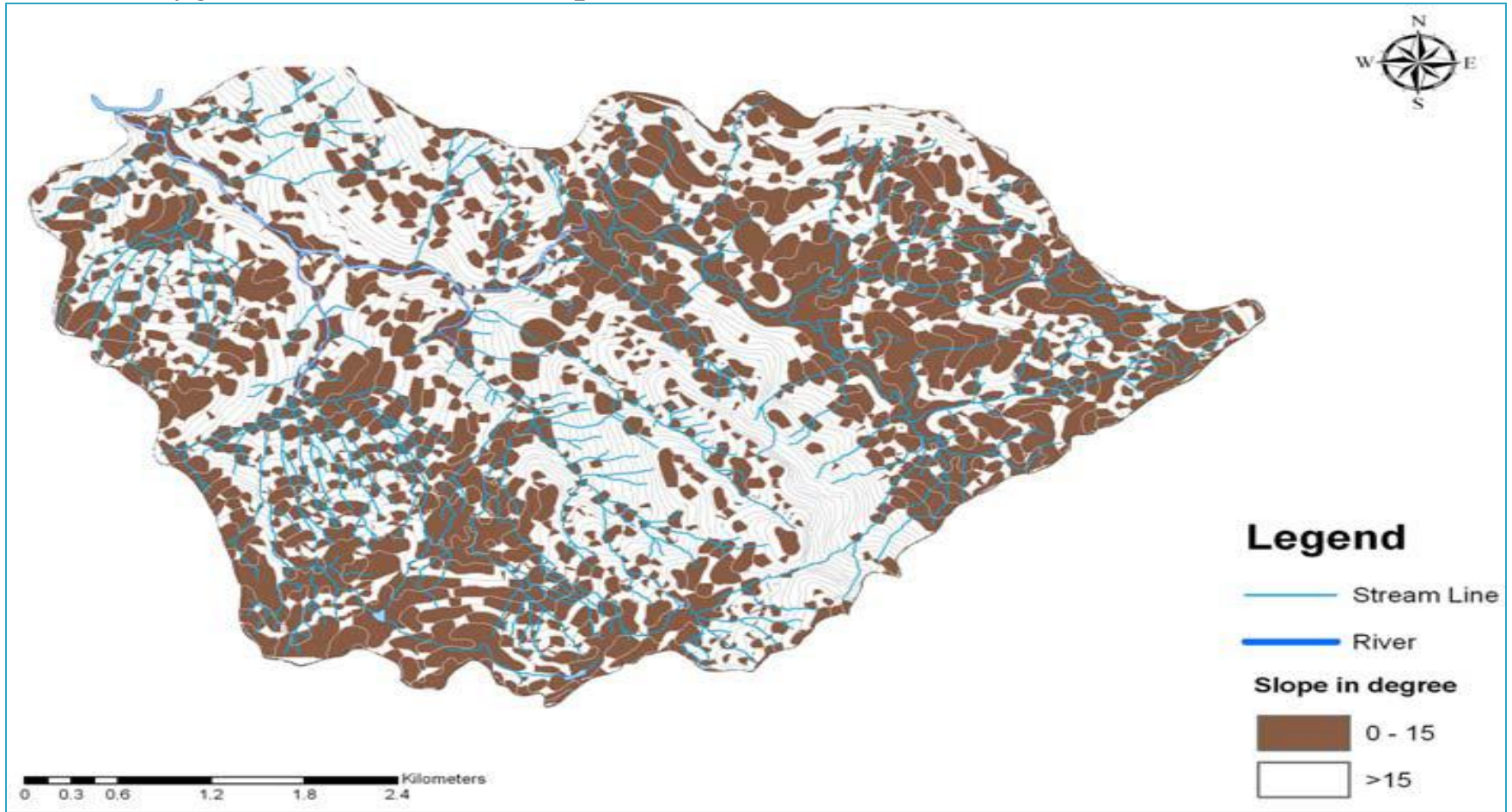


Fig. 3: Land area where slope is suitable for construction WWT plants

### 3. *GIS spatial data Preparation*

- ▶ Land use map help in creating forest cover polygon
- ▶ GIS participation during transect walk help in creating flood zone
- ▶ ArcGIS vector analysis help in creating buffer zones

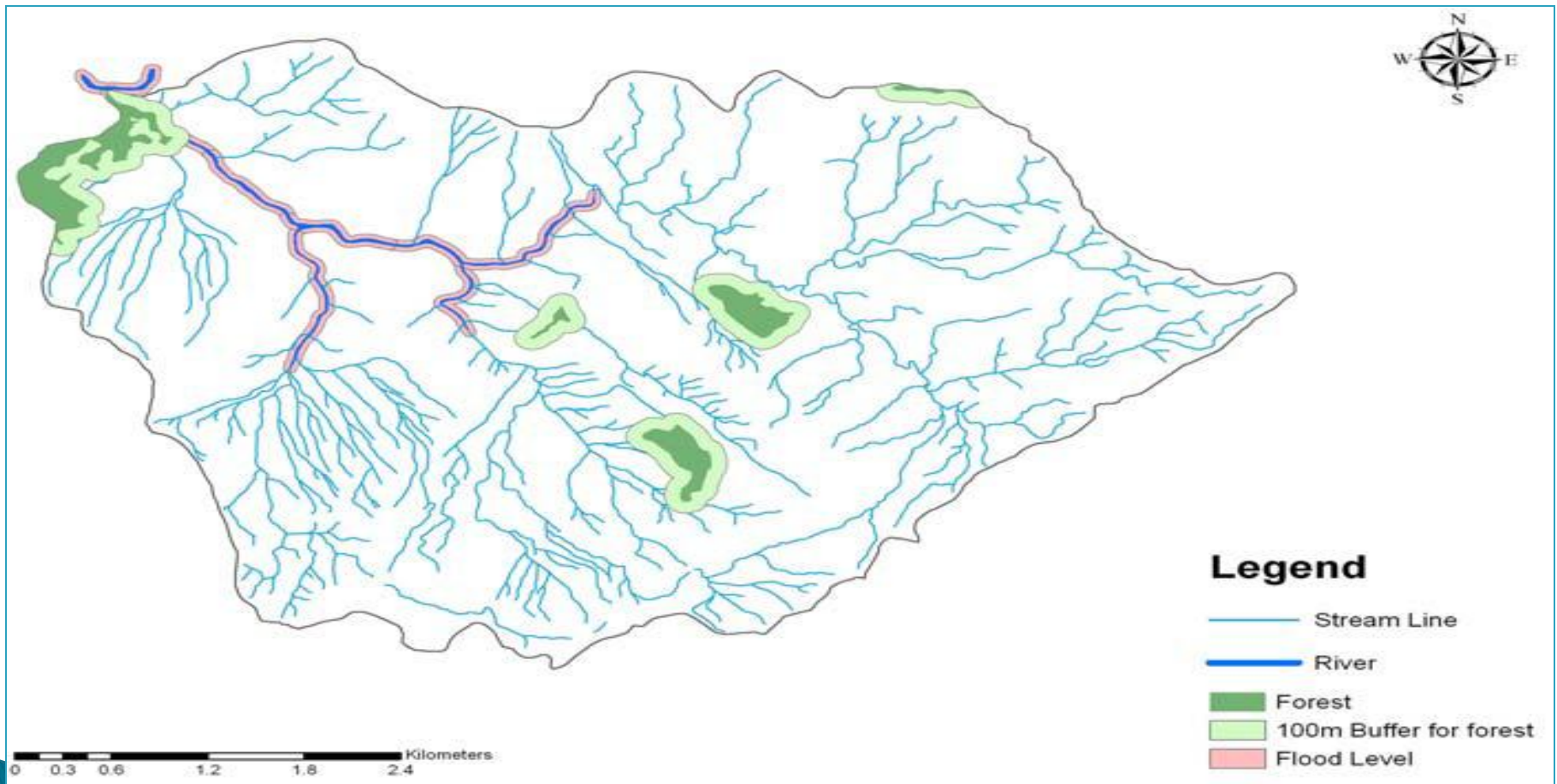


Fig.4: Forest area with buffer and flood level map



# 3. GIS spatial data Preparation

- ▶ Settlements areas where obtained from 1:50000 land use map

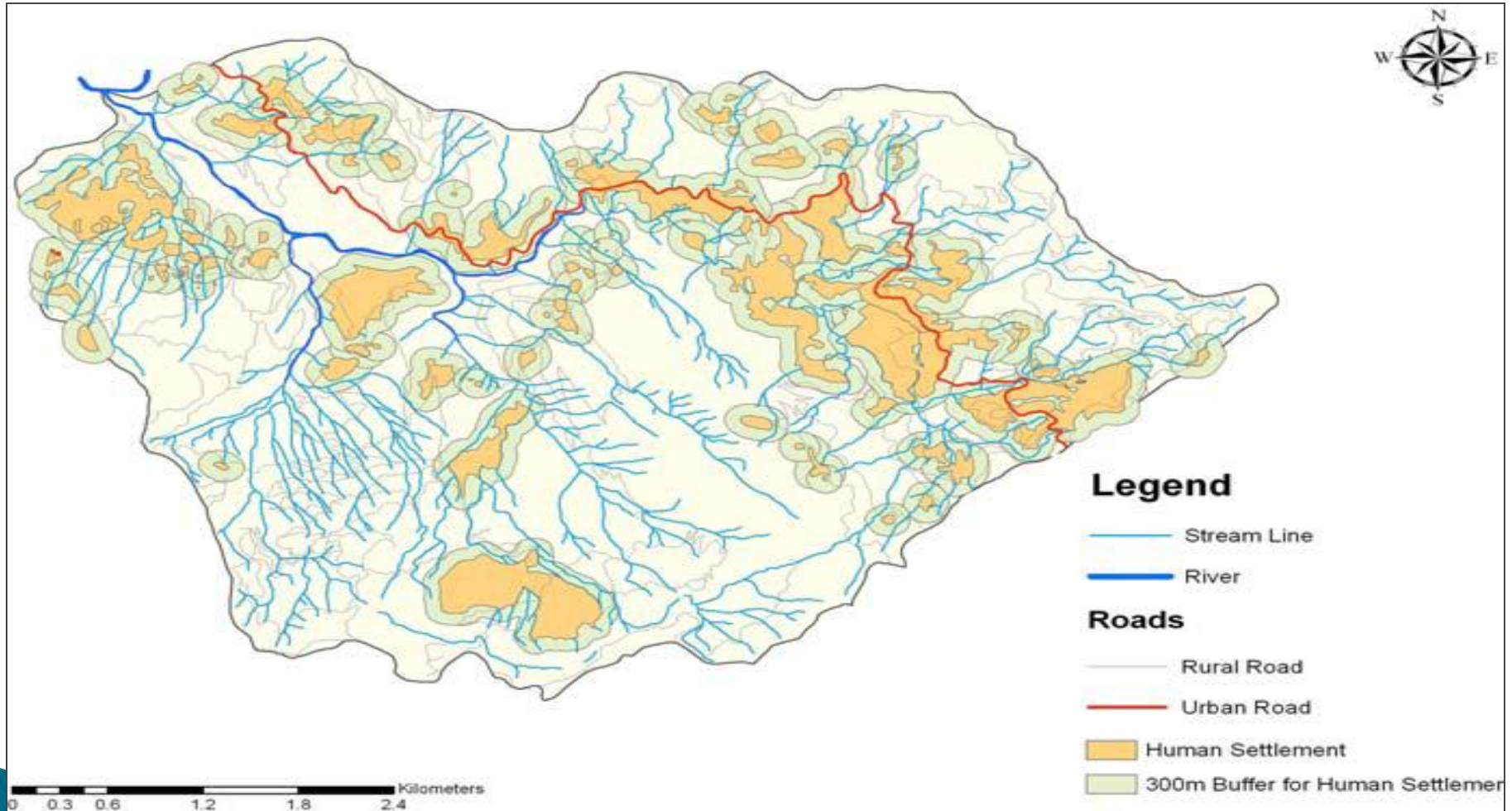


Fig. 5: Human settlements and 300 m buffer zone.



## 4. *Boolean Maps analysis for each criteria Using GIS tools*

- ▶ Here: Unsuitable criteria were merged and excluded from the study area using overlay tool in ArcGIS.

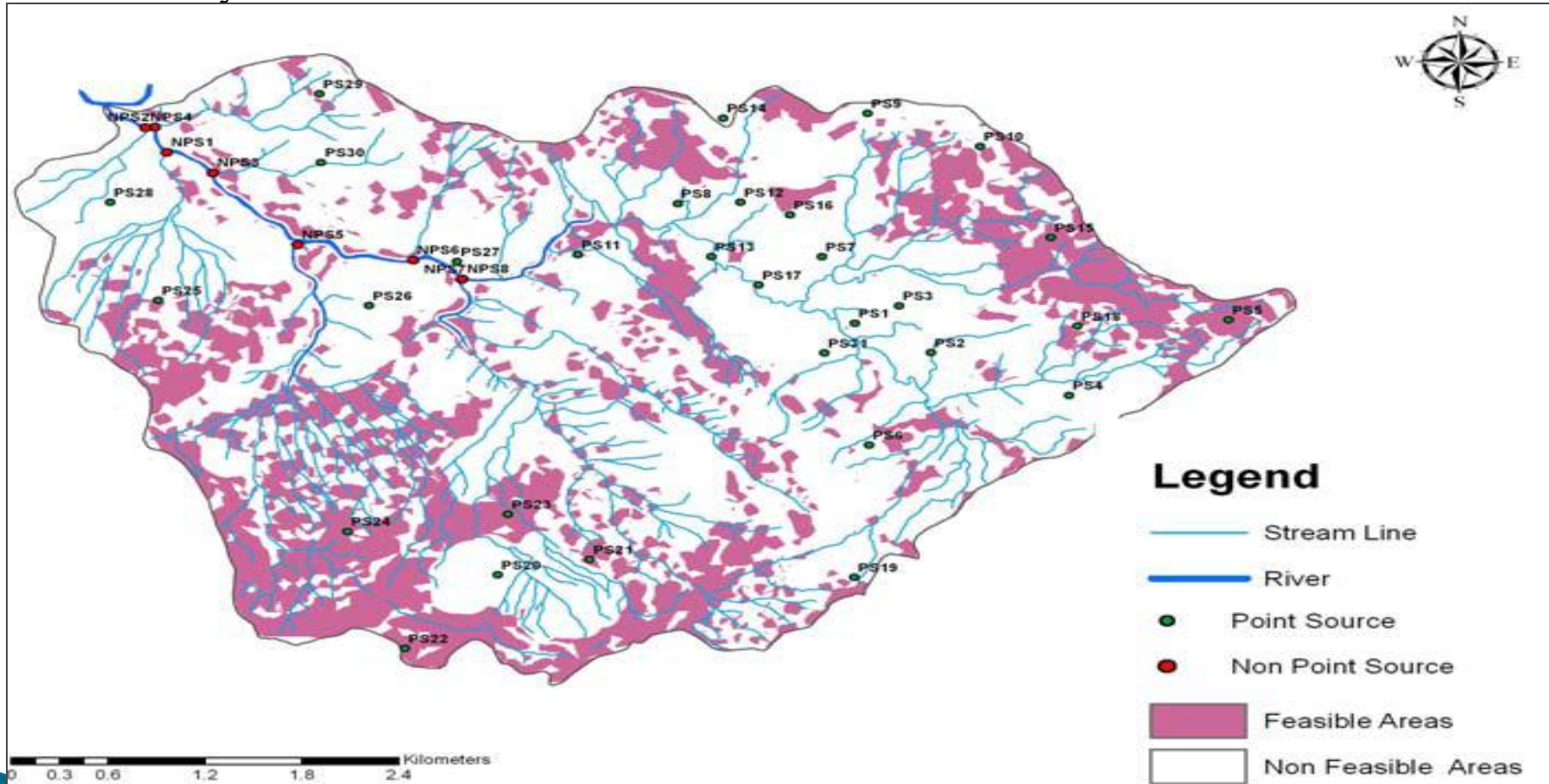


Fig. 6: Suitable areas for locating wastewater treatment systems

## *Discussion*

- ▶ The GIS concept with ArcGIS as the supporting software helped to produced suitable area of about 23% (48km<sup>2</sup>) of the study area (210km<sup>2</sup>)
- ▶ Non-point sources treatment plant should be located close to streams where most feasible areas are available

# *Conclusion*

- ▶ *The optimum site for wastewater treatment systems were successfully identified in this study.*
- ▶ *GIS has proven to be useful tool in capturing storing, manipulating and visualizing spatial data*
- ▶ *Thus, the use of GIS in siting wastewater treatment facilities and other environmental engineering structures can not be over-emphasized*



***THANKS FOR  
LISTENING***