



2023  
PNG  
UPDATE

Resilient and diverse development

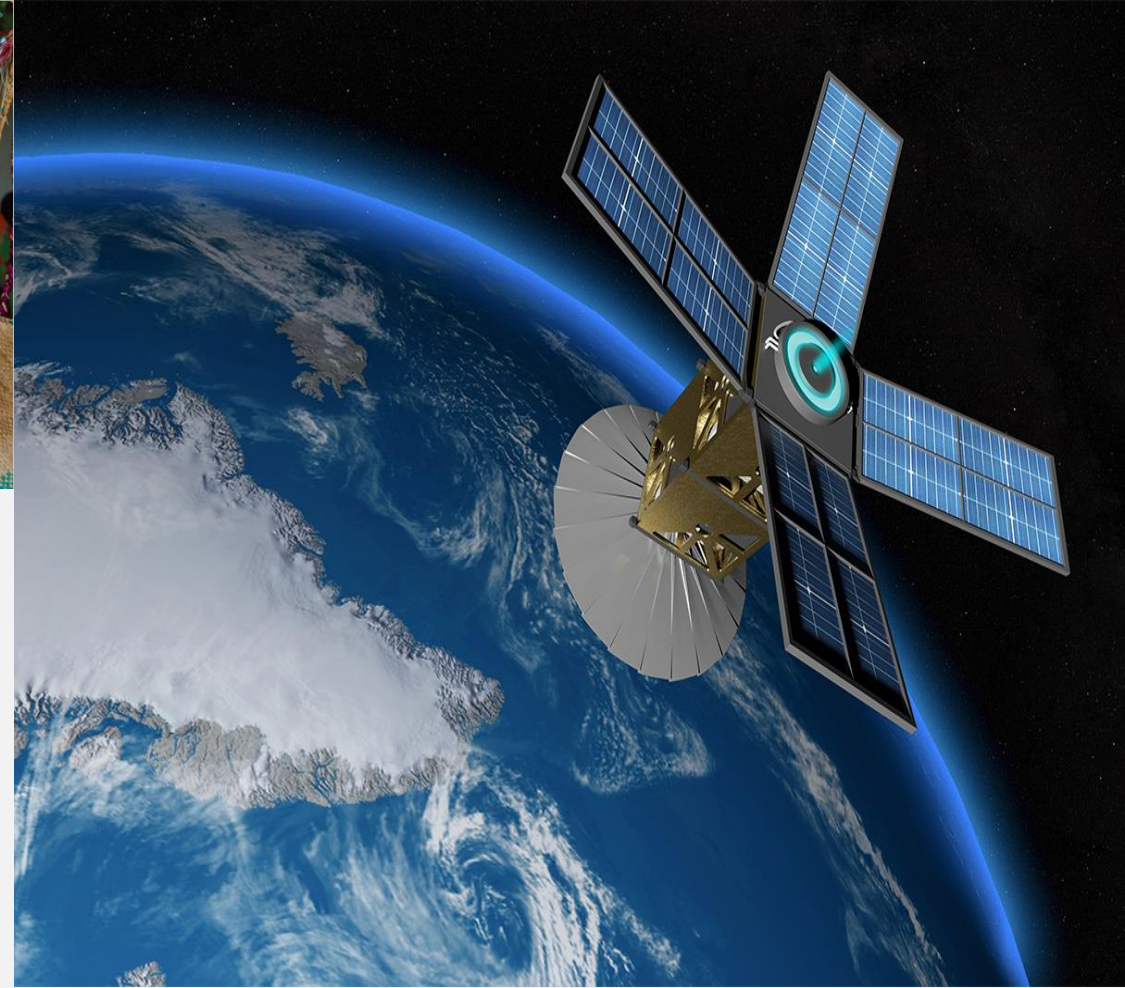
University of Papua New Guinea Waigani campus on 17–18 August.

# Assessment of surface runoff within the urban region

*A case study of Lae City, Papua New Guinea*

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Organized By;





## 1. INTRODUCTION



Source: Green Venture



Source: Lockheed, 2020

- Flood hazard is the most frequent occurring disaster that is happening all around the world today.
- 40% of the natural disaster is flood while 60% are other natural disaster ( World Flood Statistics, nd).
- Surface Runoff is the most serious contributing Factor to Flood (Vojtek & Vojtekova 2016).

## 1.1 PROBLEM STATEMENT

- Lae is an industrialized city known for its rainy season which leads to major runoff and clogged in drainage within the city (Gware, 2023).
- Lack of assessment of the pervious and impervious surfaces within the city is seen as a problem.



Source: <https://be-eco-friendly.blogspot.com/2010/10/nonpoint-source-pollution.html>

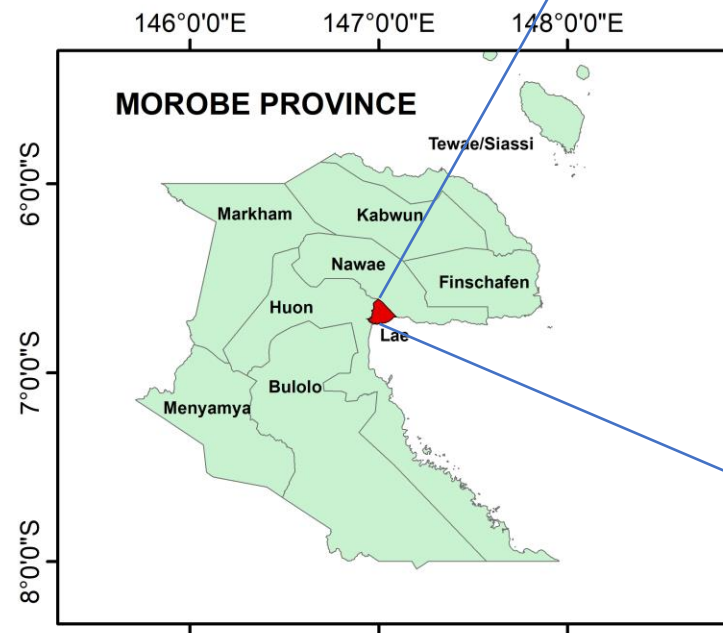
## 1.2 AIM & OBJECTIVES

- Applying Geospatial techniques to assess and investigate surface run-off mm/day within Lae city Urban zones.
- The main objectives are to assess;
  - ❑ The Land use and Landcover
  - ❑ The Soil Texture
  - ❑ The Curve Number Calculation
  - ❑ The daily rainfall in mm/day



### 1.3 CASE STUDY SITE





- 100 677 people
- 30 Manufacturing Companies
- PNG's Biggest Ports
- 5 Secondary schools
- 12 Primary & Community School
- 4 colleges and 1 university
- Many business houses
- 20 m/ 66 feet above sea level



### STUDY AREA

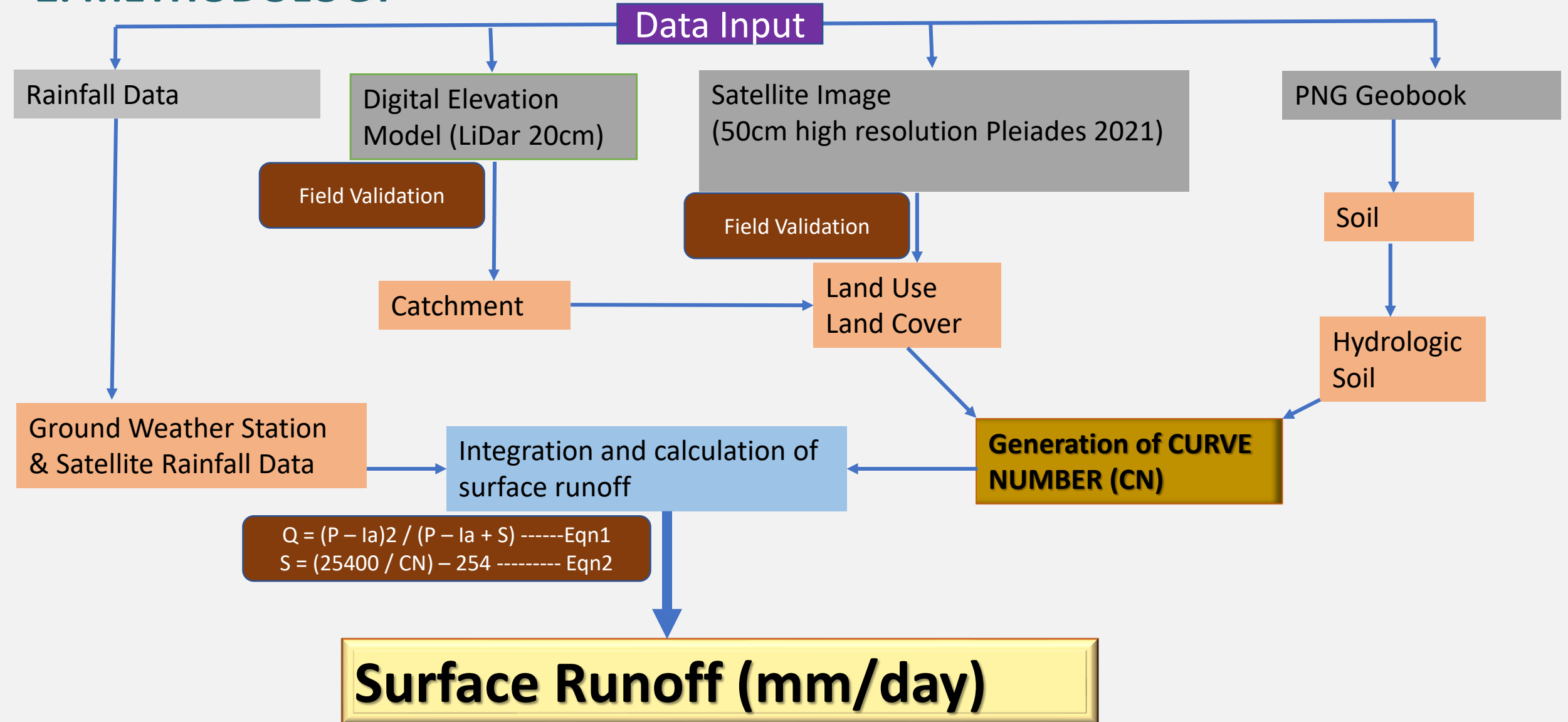


### Legend

- |  |  |
|--|--|
|  Papua New Guinea |  Lae City   |
|  Morobe District  |  Study Area |

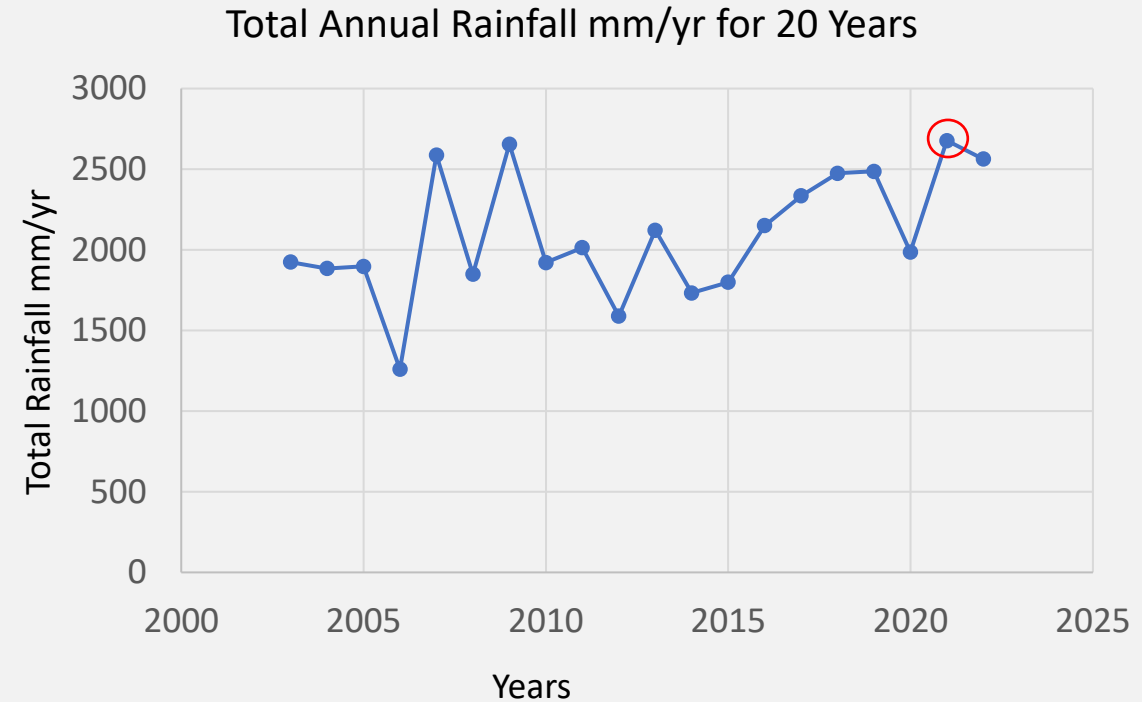
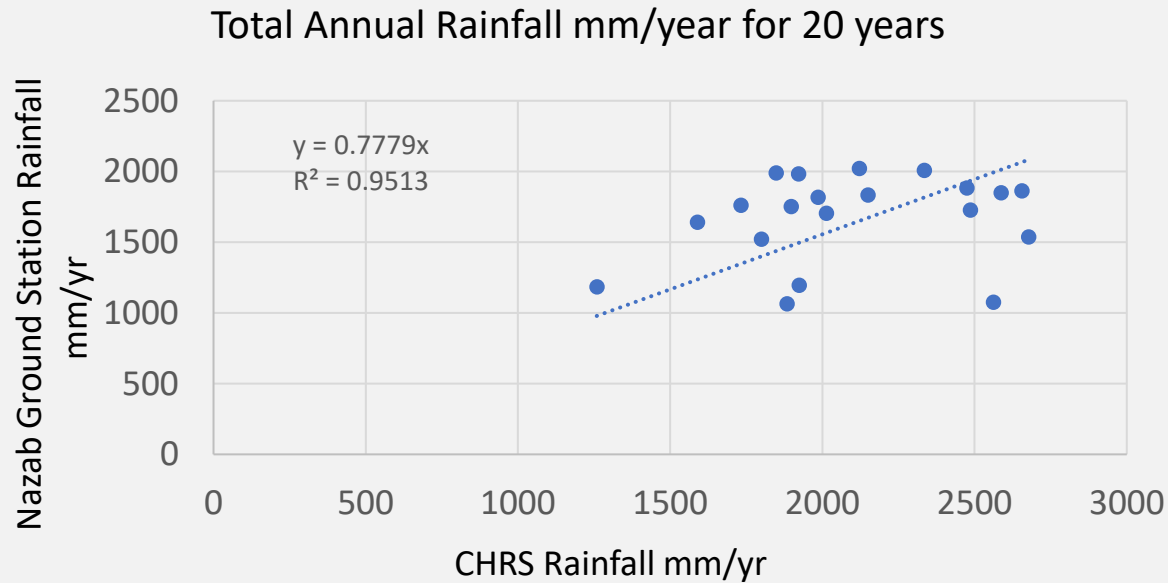
0 75 150 300 Kilometers

## 2. METHODOLOGY



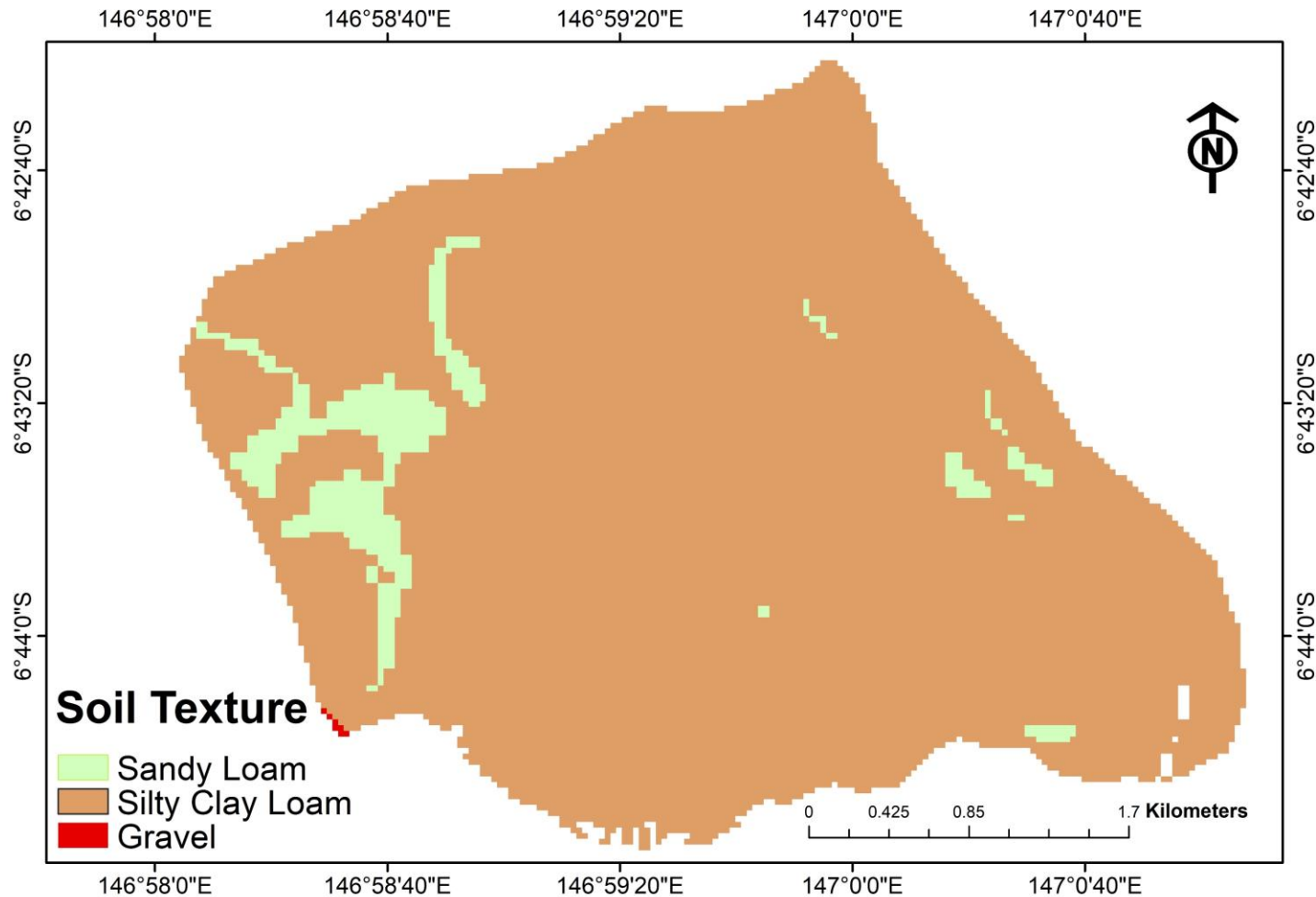
## 3. RESULTS

### 3.1 Rainfall Validation of Ground and Satellite Data



- Correlation Graph showing year ranging from 2003 to 2022
- Nazab weather station and rainfall data downloaded from Center for Hydrometeorology & Remote Sensing (CHRS).
- The rainfall data was very high resolution ( $0.04^\circ \times 0.04^\circ$ )
- Positive correlation
- CHRS Rainfall Data for 20 Year Period
- The maximum rainfall was recorded in 2022 February **16 to 24**.

## 3.2 Soil Texture

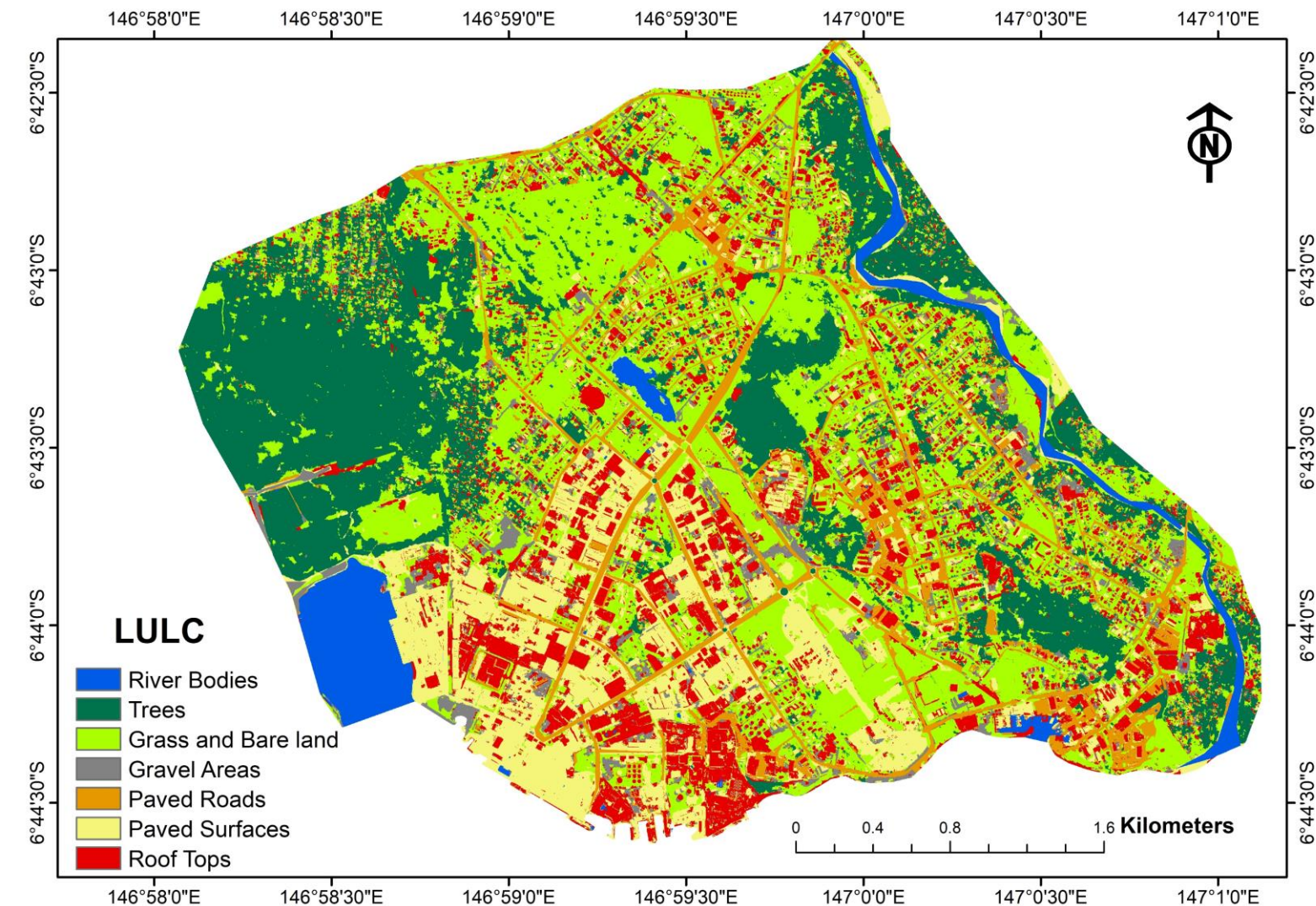


Soil Texture	Hydrologic al Soil Group	Area in square meters	Percentage of Land Covered
Sandy Loam	A	778.50	5.19
Silty Clay Loam	D	14, 215.50	94.77
Gravel	A	6	0.04

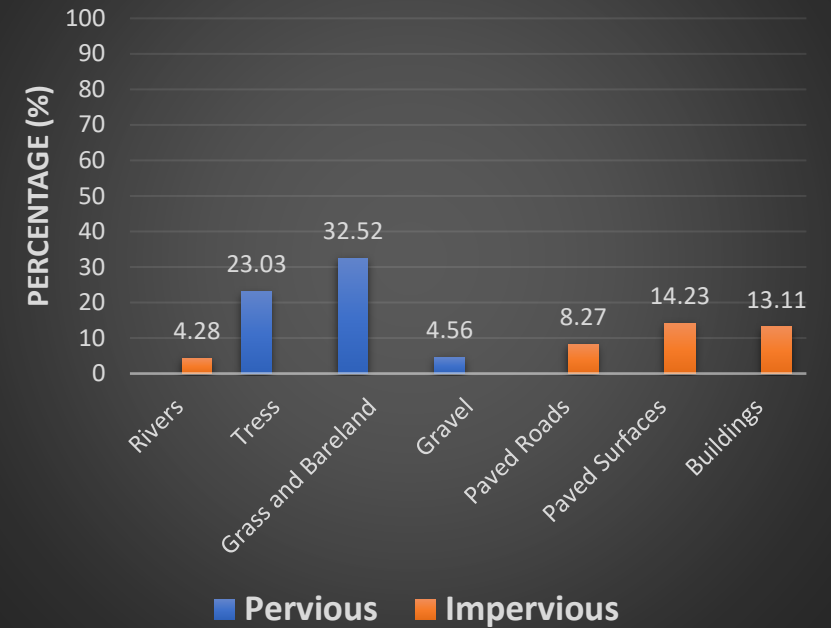
- Three main soil texture.
- They were grouped into two main hydrological soil group.
- Soils in group A have low runoff potential whereas soils in group D have high runoff potential.



## 3.3 Landuse Landcover

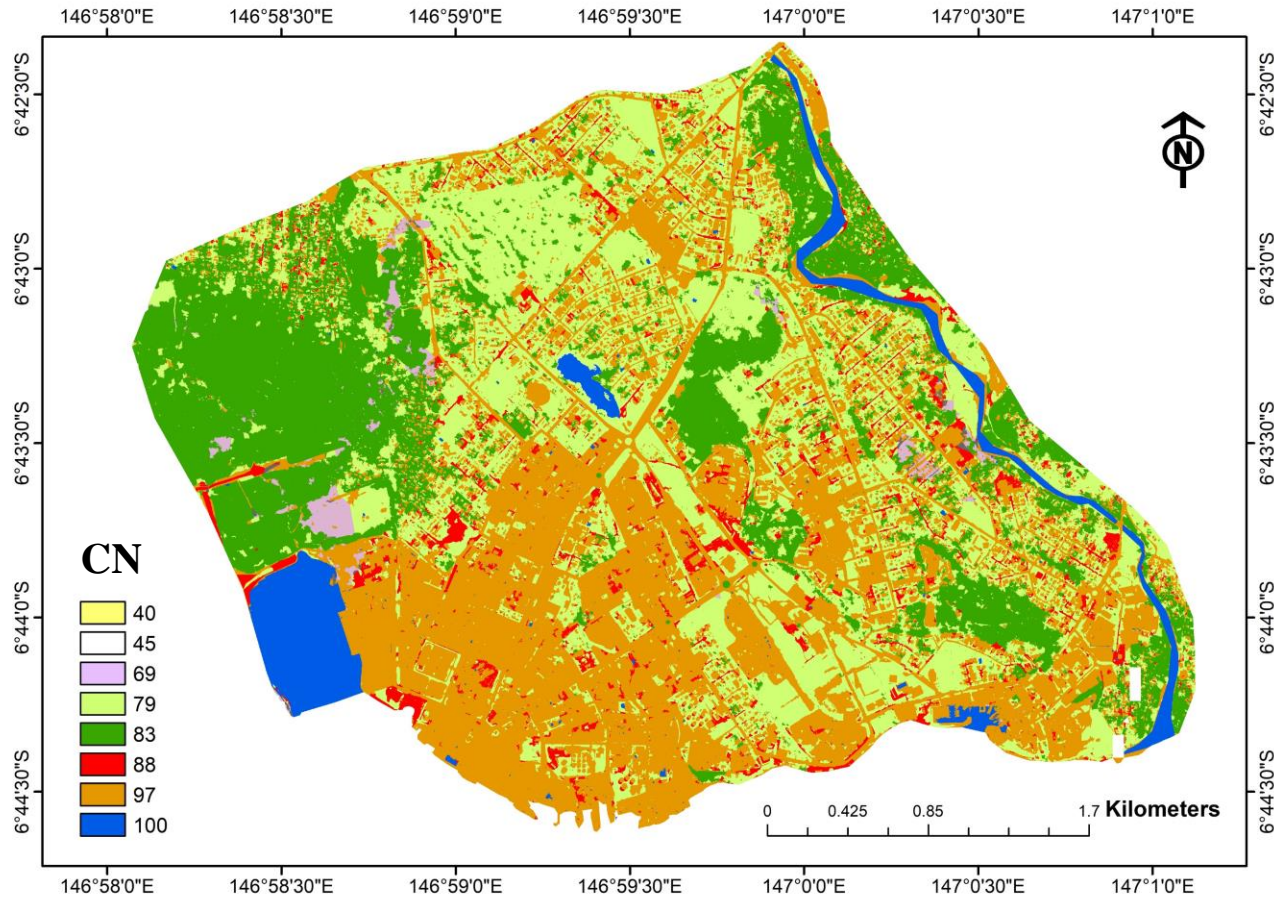


### PERCENTAGE OF PERVIOUS AND IMPERVIOUS SURFACES



- Seven main classes were found in the city.
- They were grouped into pervious and impervious surfaces.
- High runoff potential in impervious surfaces whereas low runoff potential in pervious surfaces.

### 3.4 Curve Number



Land Use/ Land Cover	Hydrologic Soil Group	Curve Number (CN)
Water Bodies	A	100
	D	100
Low Dense Forest	A	45
	D	83
Open Space Fair condition (grass cover 50% to 75%)	A	40
	D	79
Gravel Streets and Roads	A	69
	D	88
Paved Roads	A	97
	D	97
Paved Areas	A	97
	D	97
Roof Tops	A	97
	D	97

Source: Natural Resources Conservation Service (NRCS)/Agricultural Research Service (ARS)

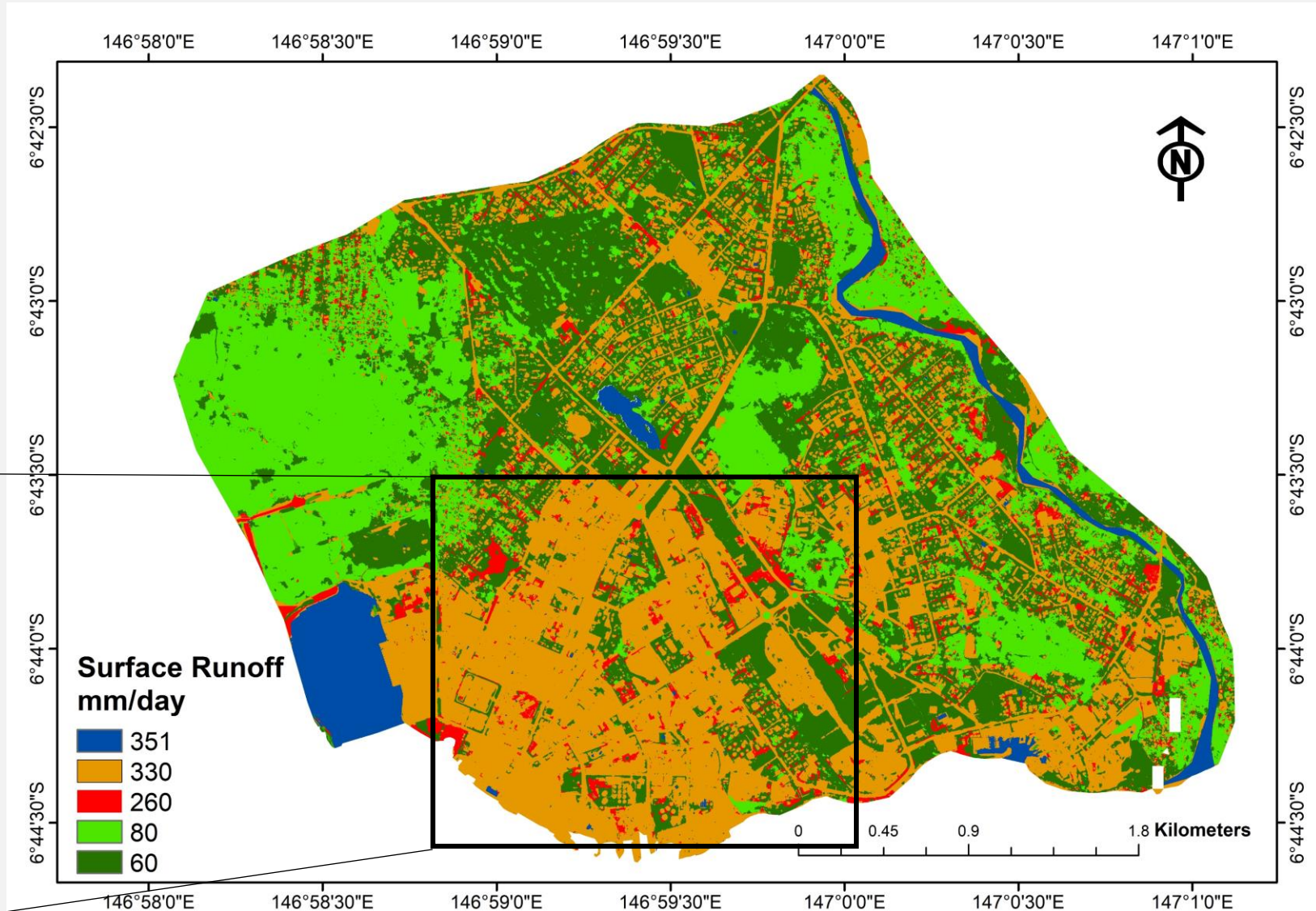
- CN is the combination of Landuse Landcover and Hydrological Soil group.
- The CN indicates the direct runoff or infiltration from rainfall excess.
- A higher CN indicates a higher runoff potential and vise versa.



## 3.5 Surface Runoff in Lae City

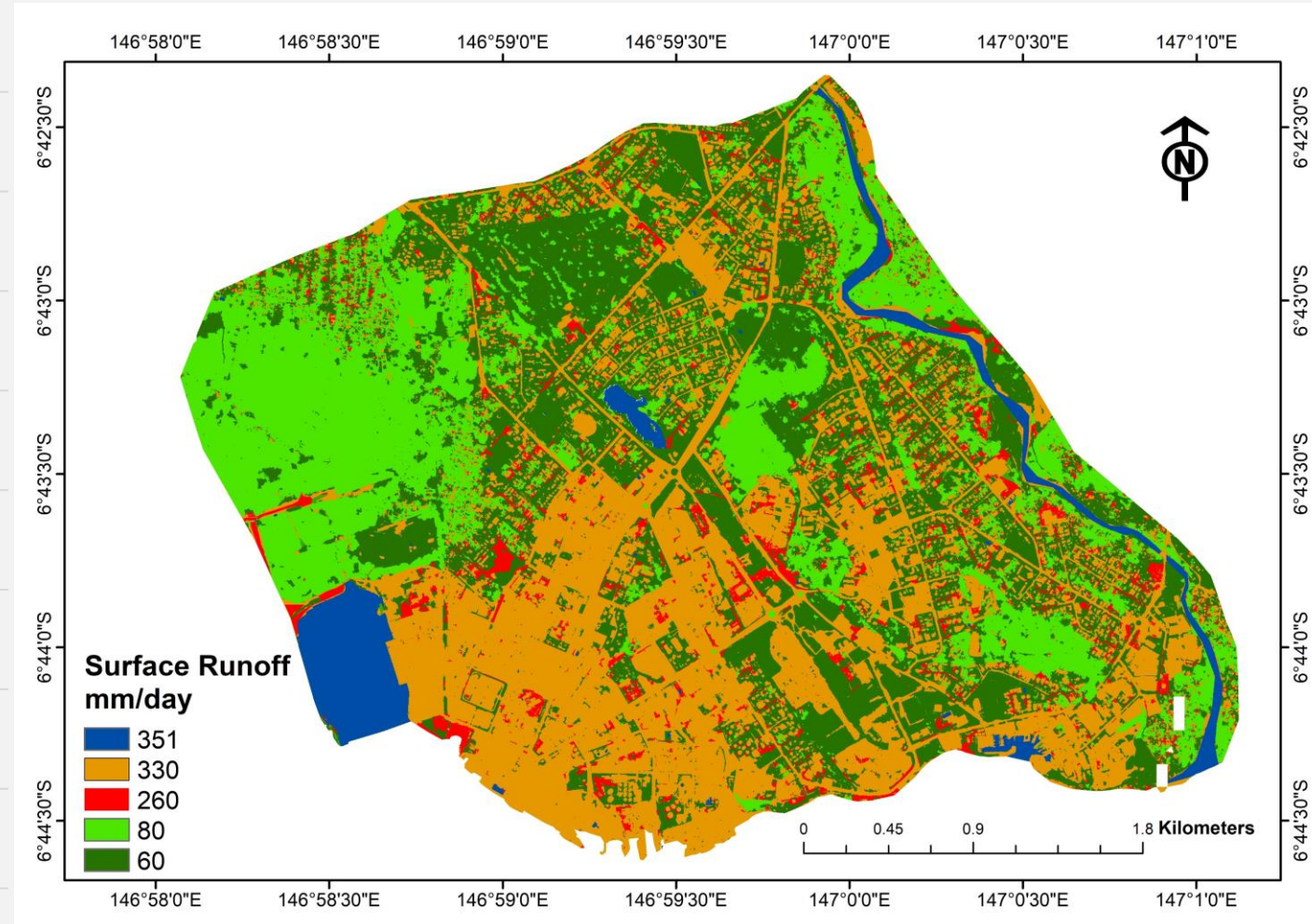
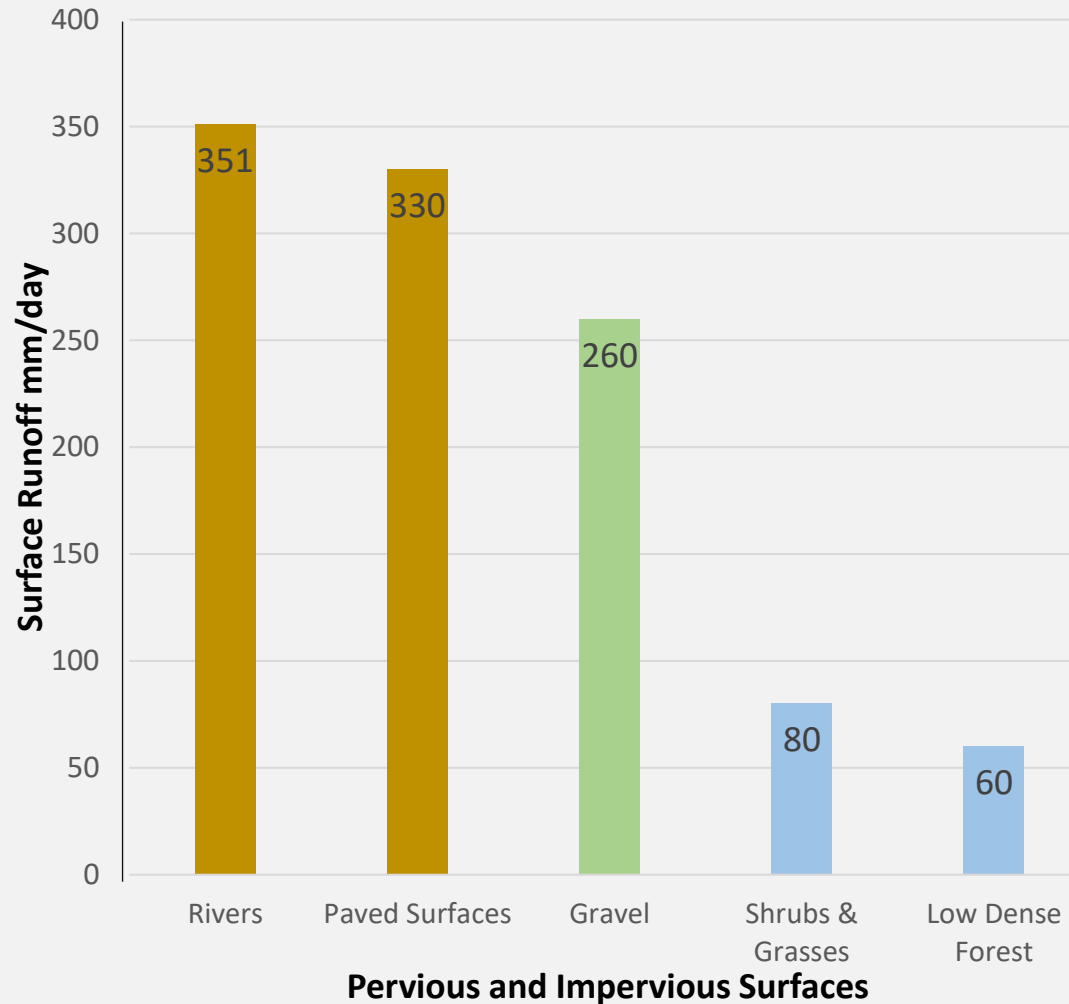
- Surface Runoff from highest to lowest

- ☐ Rivers
- ☐ Paved Areas
- ☐ Mixture of Paved and Not Paved
- ☐ Grass & Bare land
- ☐ Low Dese Forest





## 3.5 Surface Runoff in Lae City



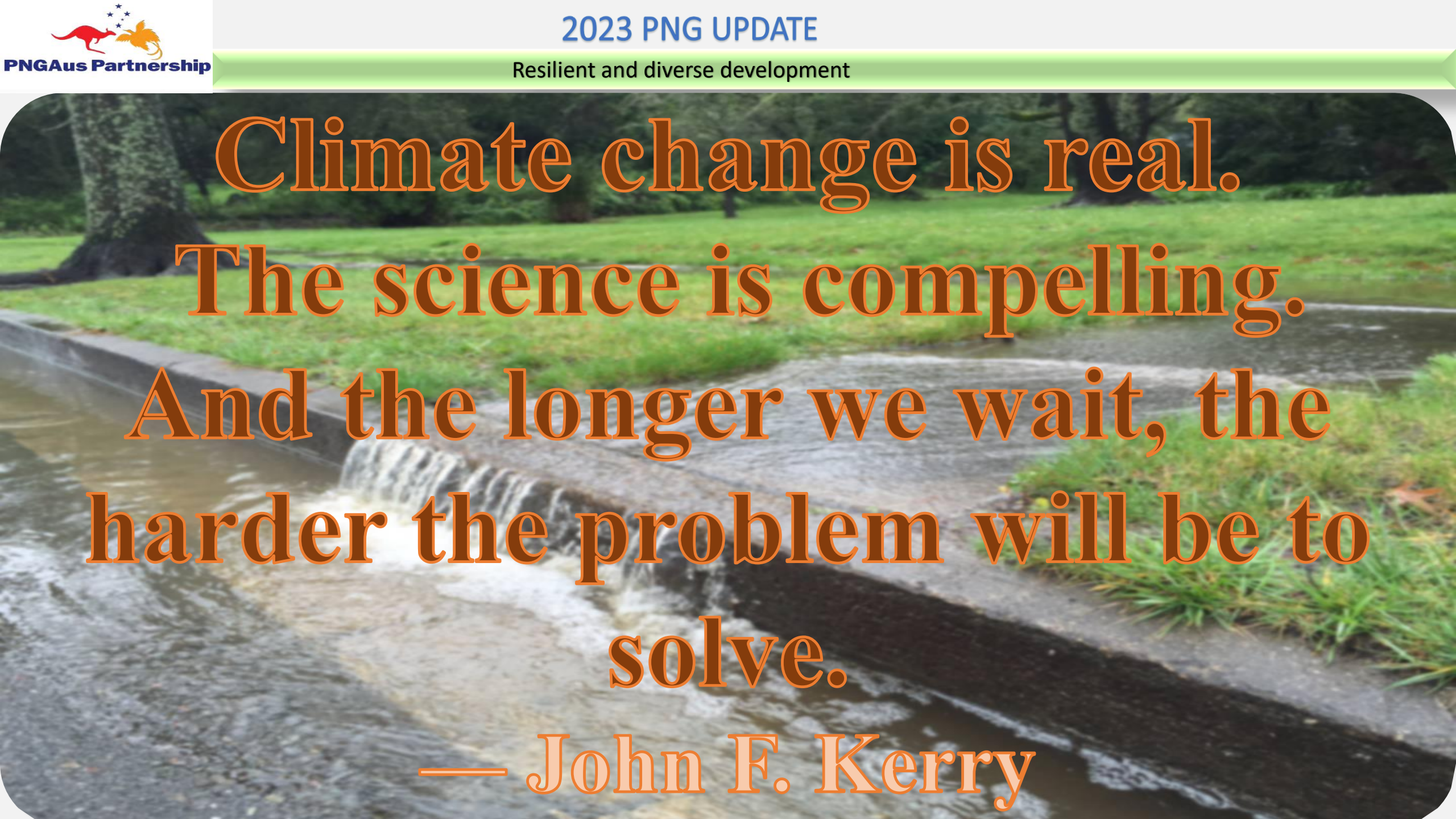
## CONCLUSION AND RECOMMENDATIONS

- ❑ The results shows that higher a city is paved and is becoming more industrialized, the more surface runoff will occur which causes the city to experience more flash floods.
- ❑ Using Geospatial tools ease the assessment of surface runoff and also helps better planning for the city.
- ❑ The results assist urban developers and city planners for effective and sustainable urban planning that can reduce surface runoff and water clogged in the city by creating innovative solutions for proper drainage systems and other urban development mitigation strategies.
- ❖ While choosing materials to develop urban areas specific materials must be used for different surfaces like; road networks, roofs and open space.
- ❖ Green roof can be practiced in order to slow the urban surface runoff.

# ACKNOWLEDGEMENT

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- Supervisor; : Dr. Tingneyuc Sekac & Dr. Sujoy Jana
- Post Graduate School and Department of Surveying and Lands Studies PNG Unitech





Climate change is real.  
The science is compelling.  
And the longer we wait, the  
harder the problem will be to  
solve.

— John F. Kerry



THANK YOU !!!

ANY QUESTION???