# INTRODUCTION TO GIS
# & APPLICATION FOR
# ENVIRONMENTAL MANAGEMENT
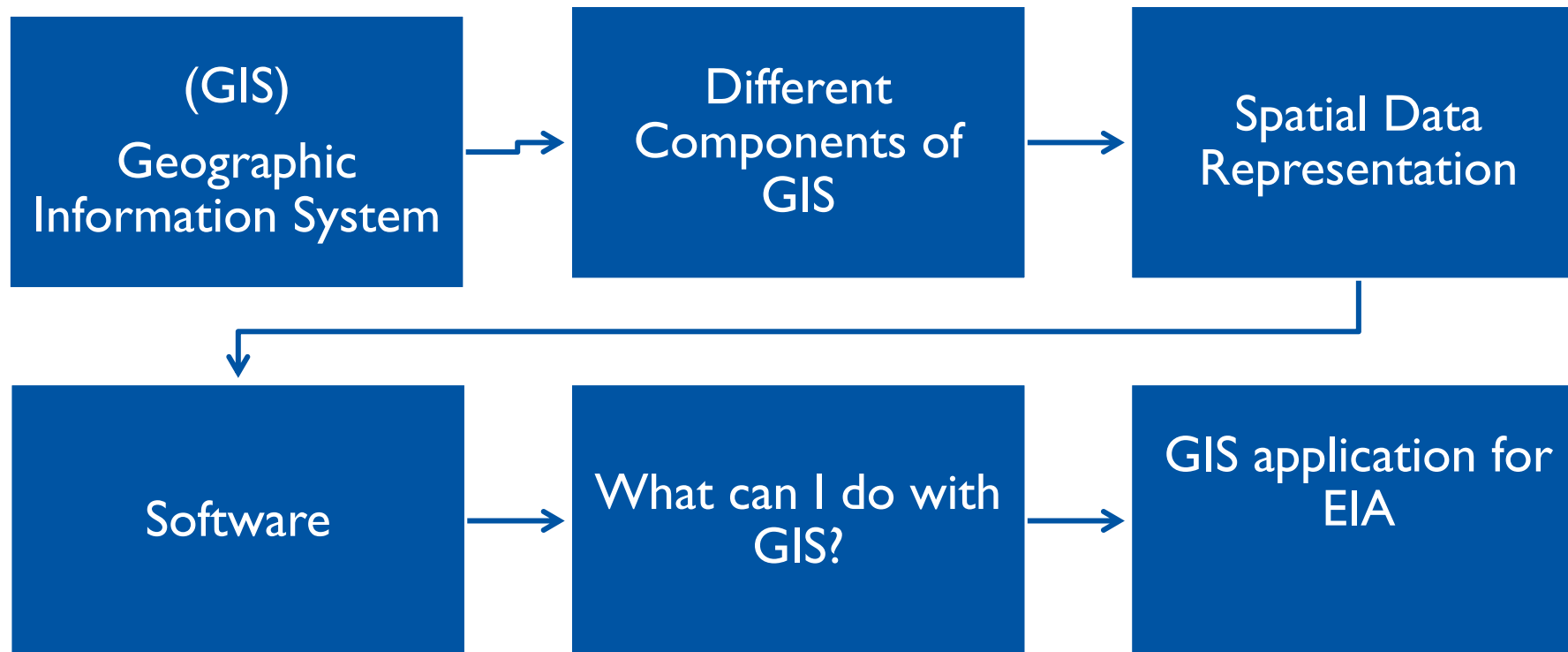
**KASAQA TORA**

**SPATIAL ANALYSIS SPECIALISTS PROTECTED AREAS**

**19  MARCH, 2024**

**HONIARA- SOLOMON ISLANDS**

# OVERVIEW

| (GIS) Geographic Information System | → | Different Components of GIS | → | Spatial Data Representation |
|---|---|---|---|---|

| Software | → | What can I do with GIS? | → | GIS application for EIA |
|---|---|---|---|---|

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# What is Geographical Information System (GIS)?

A computer-based tool for mapping and analyzing things that exist and events that happen on Earth
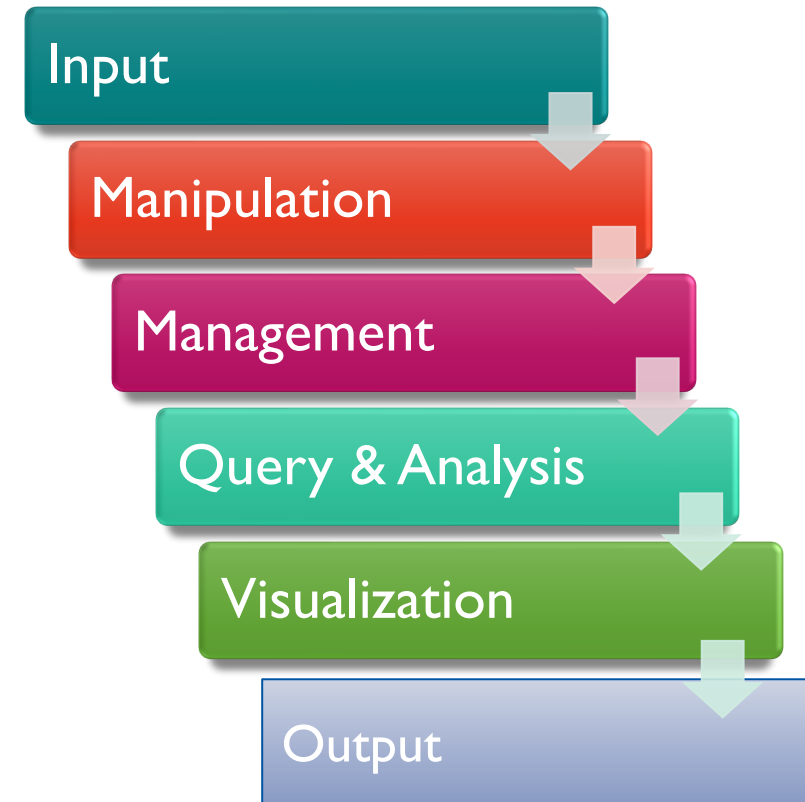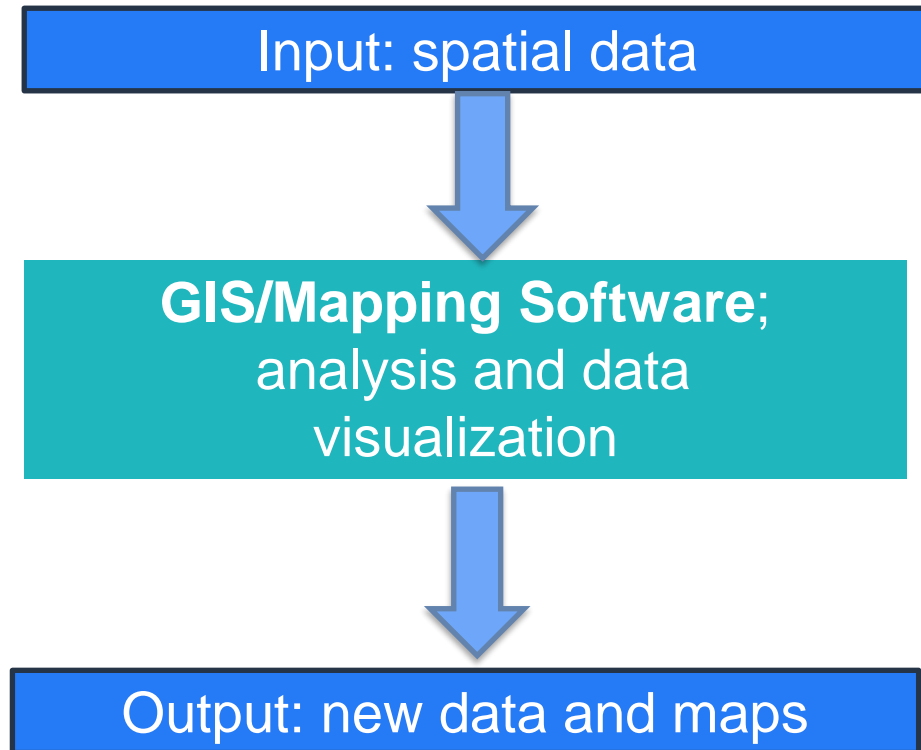
Integrates common database operations such as query and statistical analysis

These abilities distinguishes GIS from other information systems and make it valuable

Use by wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.



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# KEY TASKS PERFORMED USING GIS

Input: spatial data

↓

**GIS/Mapping Software**;
analysis and data
visualization

↓

Output: new data and maps

Input

Manipulation

Management

Query & Analysis

Visualization

Output

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# KEY COMPONENTS OF GIS

**Hardware** — Computer on which systems operates.

**Software** — GIS software provides the functions and tools needed to store, analyse, and display geographic

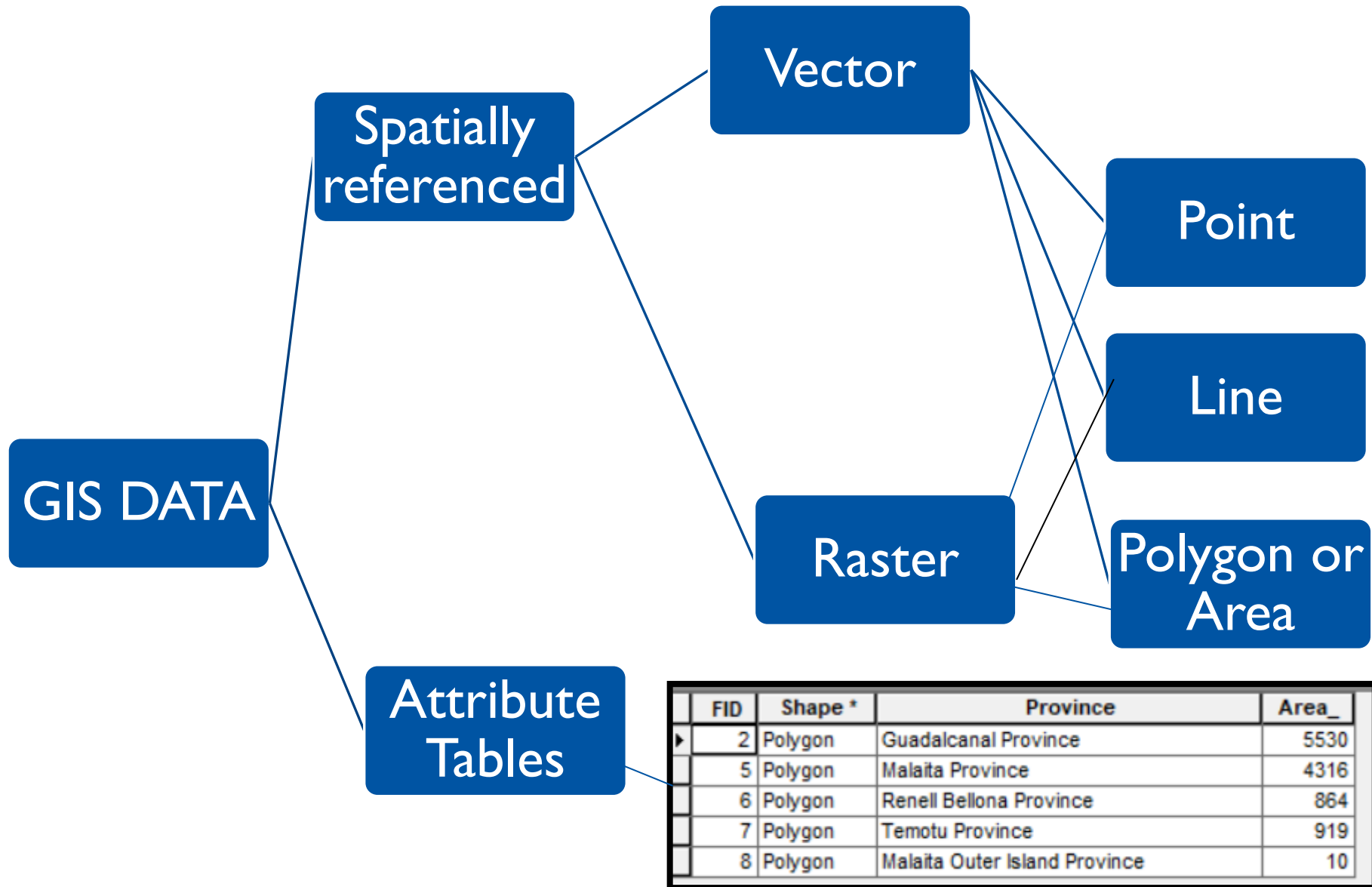**Data** — Possibly the most important component of a GIS.

**People** — People who manage the system and to develop plans for applying the system to address real world problems
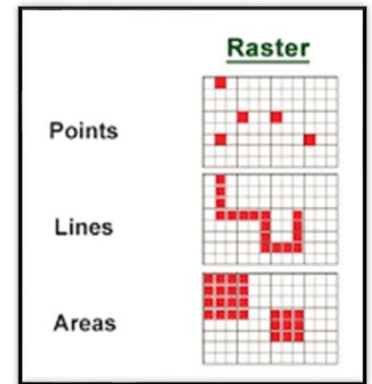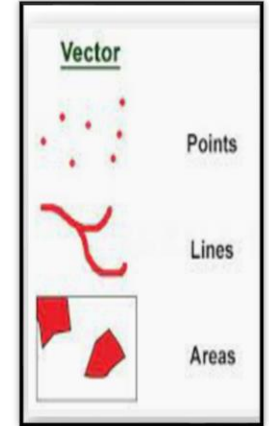
**Methods** — A well-designed plan and business rules unique to and organization, e.g., GIS workflows or model

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# WHAT TYPES OF GIS DATA ARE THERE?



GIS DATA

Spatially referenced

Vector

Point

Line

Polygon or Area

Raster

Attribute Tables

| FID | Shape * | Province | Area_ |
|---|---|---|---|
| 2 | Polygon | Guadalcanal Province | 5530 |
| 5 | Polygon | Malaita Province | 4316 |
| 6 | Polygon | Renell Bellona Province | 864 |
| 7 | Polygon | Temotu Province | 919 |
| 8 | Polygon | Malaita Outer Island Province | 10 |

Vector
Points
Lines
Areas

Raster
Points
Lines
Areas

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# VECTOR DATASET

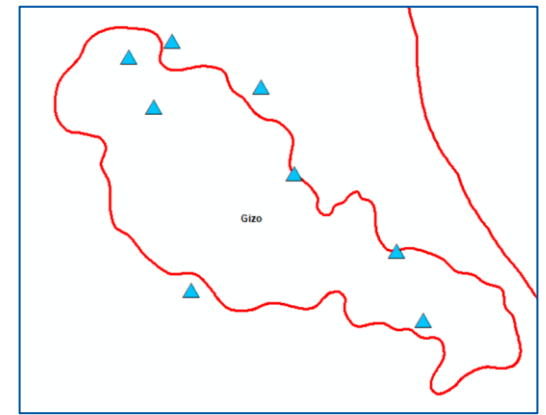What most people think of when they consider spatial data

Vector data is extremely useful for storing and representing data that has discrete boundaries,

Such as borders or building footprints, streets and other transport links, and location points

Vector data comprises of individual points stored as coordinate pairs that indicate a physical location

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# RASTER DATASET


Satellite Images


Aerial Photos


Scanned Topo Map

Raster data provides a representation of the world as a surface

Divided up into a regular grid array, or cells, where each of these cells has an associated value.
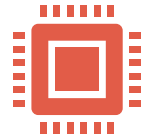
In an alternate sense, we can consider a digital photograph as an example of a raster dataset.

Here each cell, which in this instance is referred to as a pixel, corresponds to a particular colour value
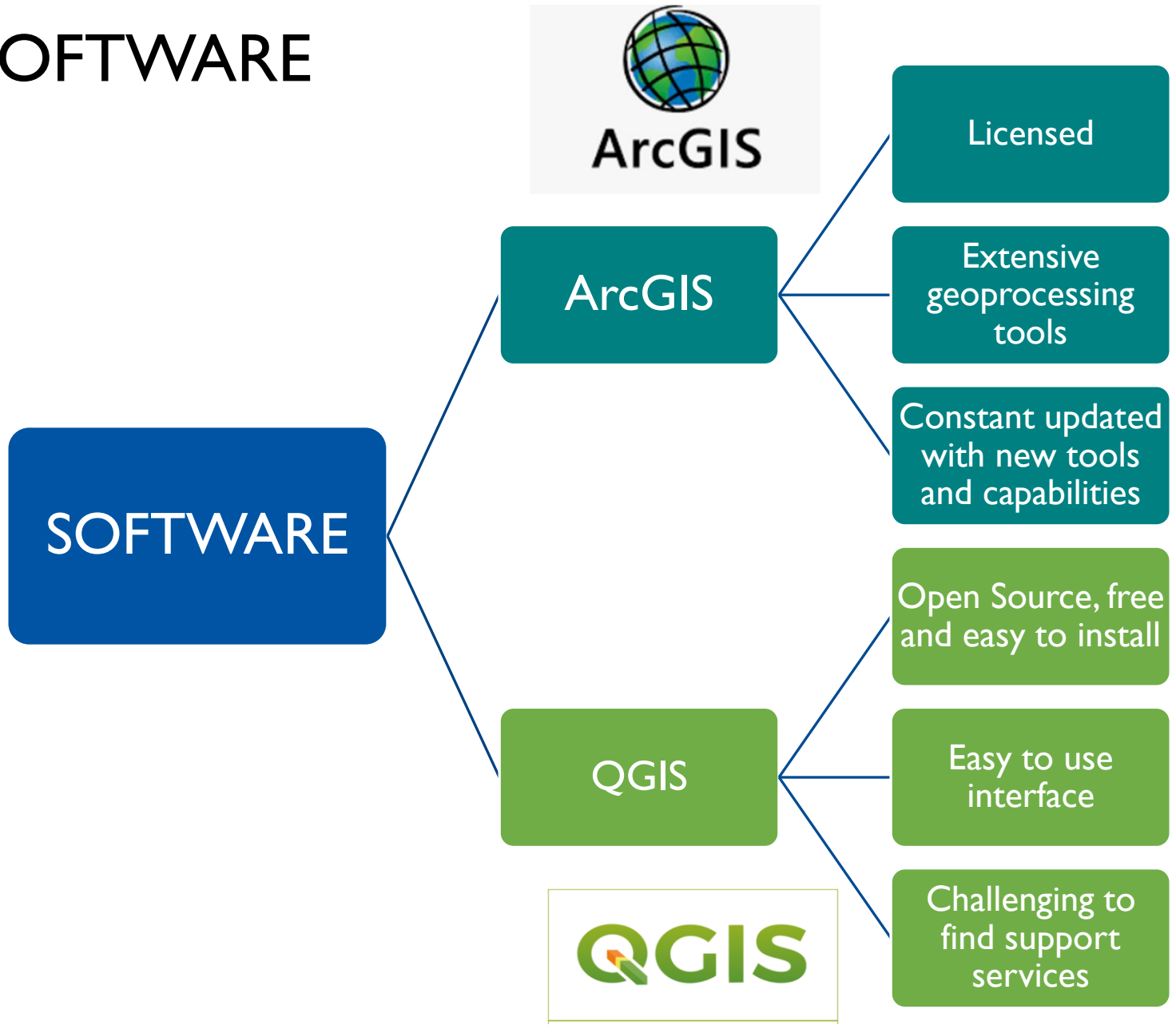

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# GIS SOFTWARE



**SOFTWARE**

**ArcGIS**
- Licensed
- Extensive geoprocessing tools
- Constant updated with new tools and capabilities

**QGIS**
- Open Source, free and easy to install
- Easy to use interface
- Challenging to find support services

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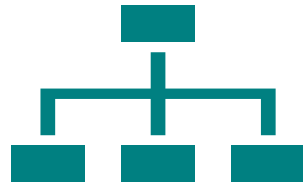Secretariat of the Pacific Regional
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# WHAT CAN GIS DO FOR YOU?

## Perform Geographic Queries and Analysis.

Find land suitable for development.

·Search for relationships among crops, soils, and climate.

·Locate the position of breaks in electrical circuits

## Improve Organizational Integration

Management of resources

Shared database collected by one department to benefit the whole organisation

Avoid redundancy through duplication of efforts.

## Make Better Decision

"Better information leads to better decisions" is as true for GIS as it is for other

GIS is not automated decision-making system but a tool to query, analyse, and map data in support of the decision-making process

To help reach a decision about the location of a new housing that has minimal environmental impact,

## Make Maps

• Maps have a special place in GIS.

• The process of making maps with GIS is much more flexible

• than are traditional manual or automated cartography approaches.

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# APPLICATION OF GIS ENVIRONMENT IMPACT ASSESSMENT(EIA)

GIS facilitates the spatial analysis of environmental data, enabling better-informed decision-making during the EIA process.
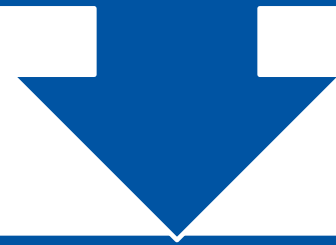
It helps in mapping sensitive ecosystems, identifying environmental risks, and assessing the spatial extent of potential impacts.

# ADVANTAGES OF USING GIS IN EIA

Enables spatial data integration from various sources, including satellite imagery, aerial photographs, and field surveys.

Provides tools for spatial analysis, such as overlay analysis, proximity analysis, and spatial statistics, to assess environmental impacts comprehensively.

Facilitates the visualization of complex spatial relationships and impact scenarios through maps, graphs, and interactive dashboards.

Enhances collaboration among multidisciplinary teams involved in the EIA process and promotes stakeholder participation.

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# EXAMPLES OF CASE STUDIES USING GIS APPLICATION

# THE IMPACT OF LAND SLIDE IN A PROTECTED AREA
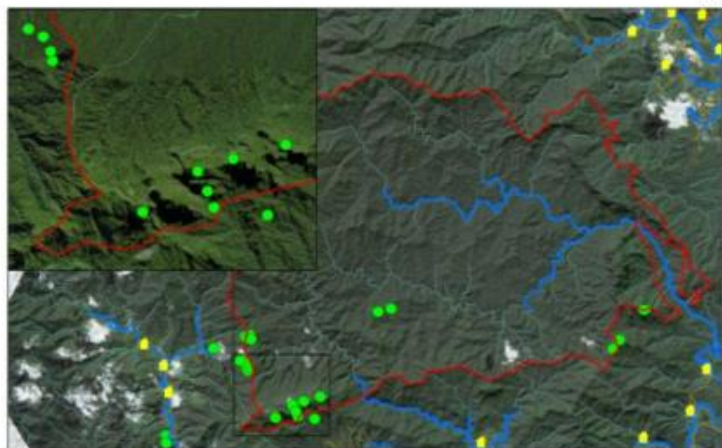
## Problem Statement

- To identify the landslide prone areas within the protected area, which could be a threat to endangered species of plants and animals,

- So that appropriate intervention could be identified with the communities and find ways to address the issue.

# INFORMATION DEMAND

## Data

- Landslide hazard zones

- Plant Species  information

- Species exposure to different hazard zones

- Protected Area Boundary

- Digital elevation model

- Soil type

- Rainfall

- Species distribution

- Forest cover

- Cultural and natural heritage sites

- Roads, Rivers, Villages, Creeks

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Unique Biodiversity

Output

Land slide categories

Landslide Prone Area
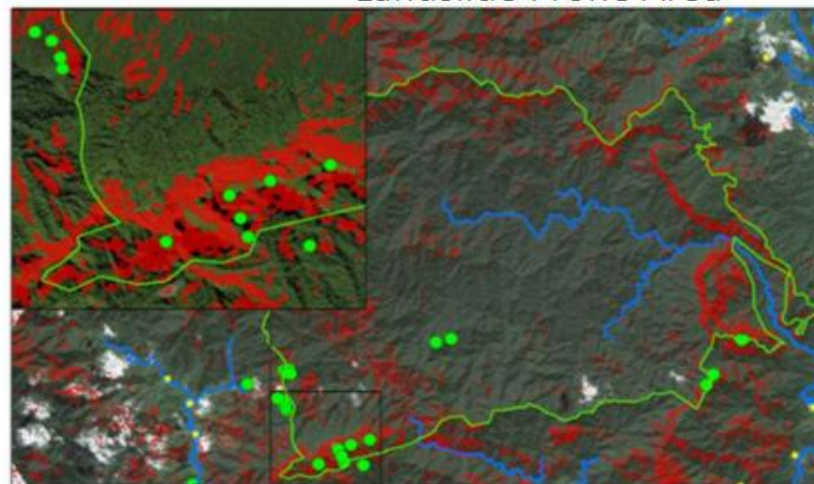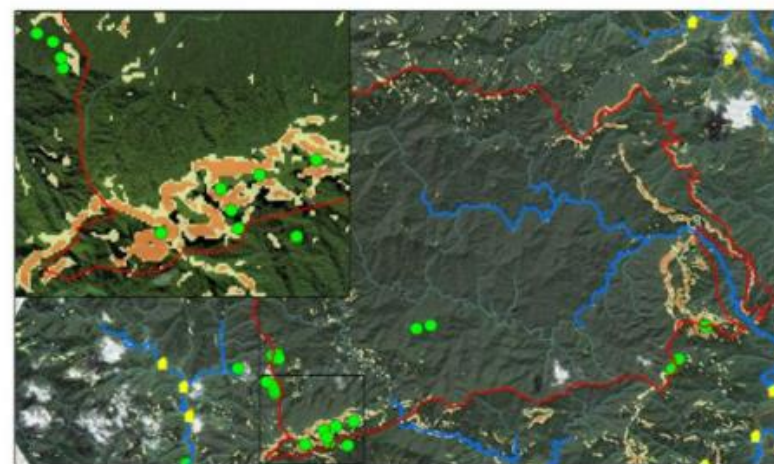
# ASSESSING RISKS AND VULNERABILITY OF HERITAGE BUILDINGS

## **Problem Statement**

- Heritage buildings are vulnerable to hazards given its location and rugged topography?

- Develop DRM plan to guide the protection of this significant Town.

# LAYER TO BE ASSESSED

Main layer to be assessed. Prioritized based on

- Vulnerability from damages sustained during TC Winston.
- Potential impact that may arise from future disasters.



**REHABILITATION CATEGORIES**

**Critical Buildings**
- 🔴 Immediate need to rectify damages preventing further detereoration.

**Medium Range**
- 🟠 Important but not as critical as above.

**Minor Issues**
- 🟢 Require minor repairs.
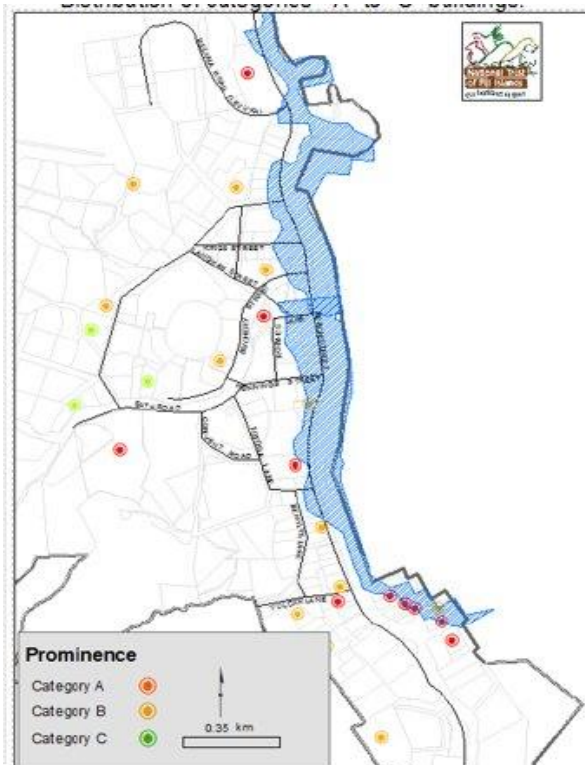
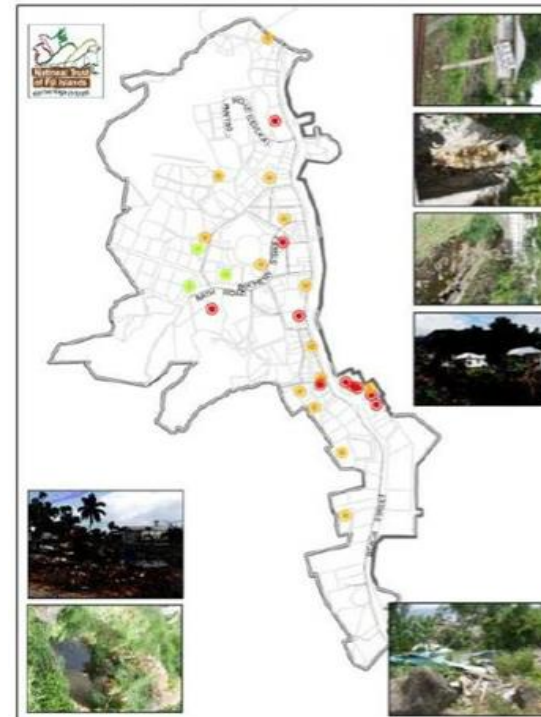0    0.175    0.35    0.7 Kilometers

# RISK DATA

Landslides

Flooding

Inundation from Storm Surges.

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# AFFECTED AREAS
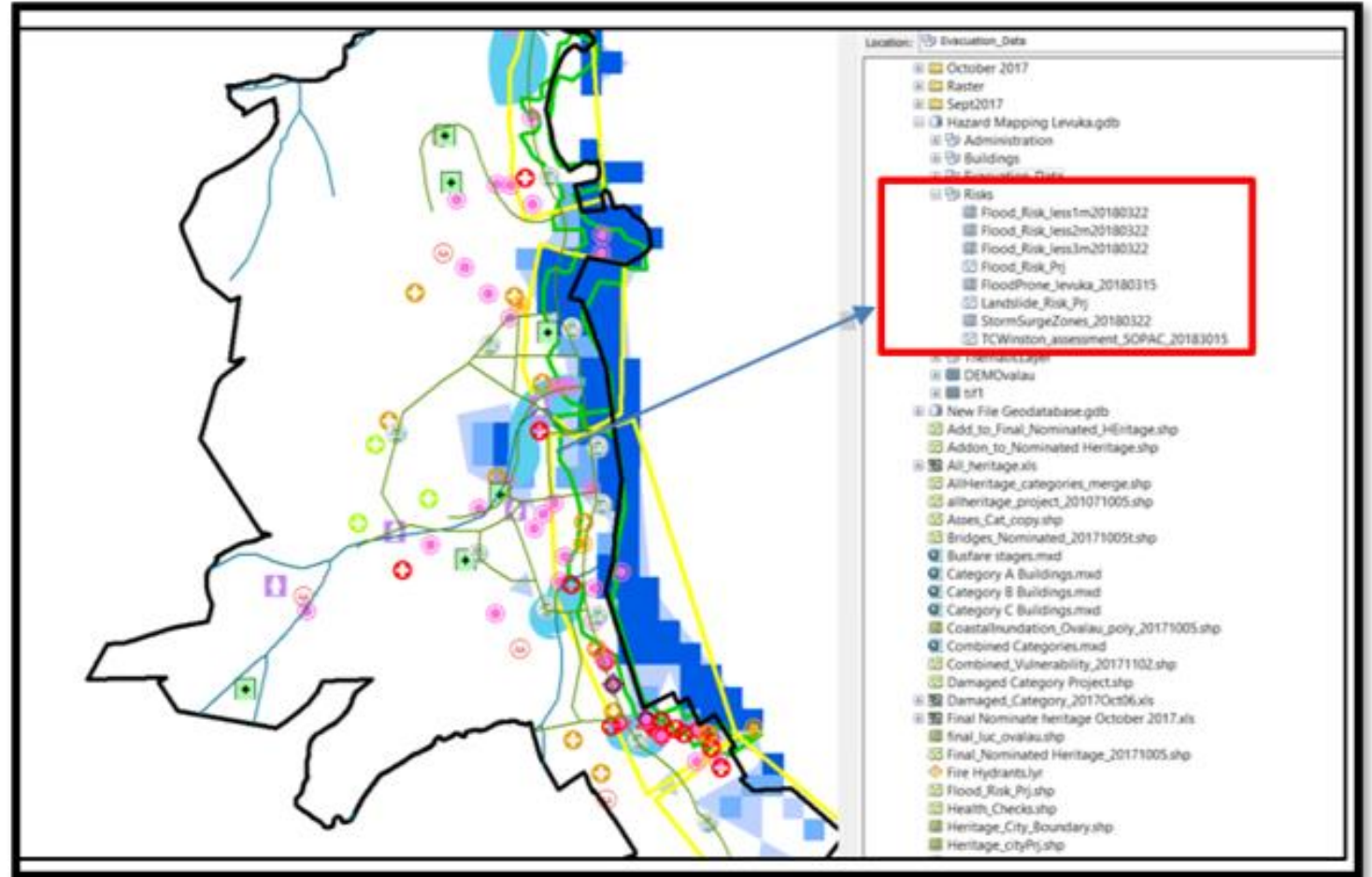
- **Inundation from storm surges**



- **Environmental Hazards**

# RISK PRONE AREAS

- Layers from different sources. i.e: LTC – hazard mapping.
- The inundation extent is the distance that the wave travel inland.,
- Other layers derived through GIS modelling.

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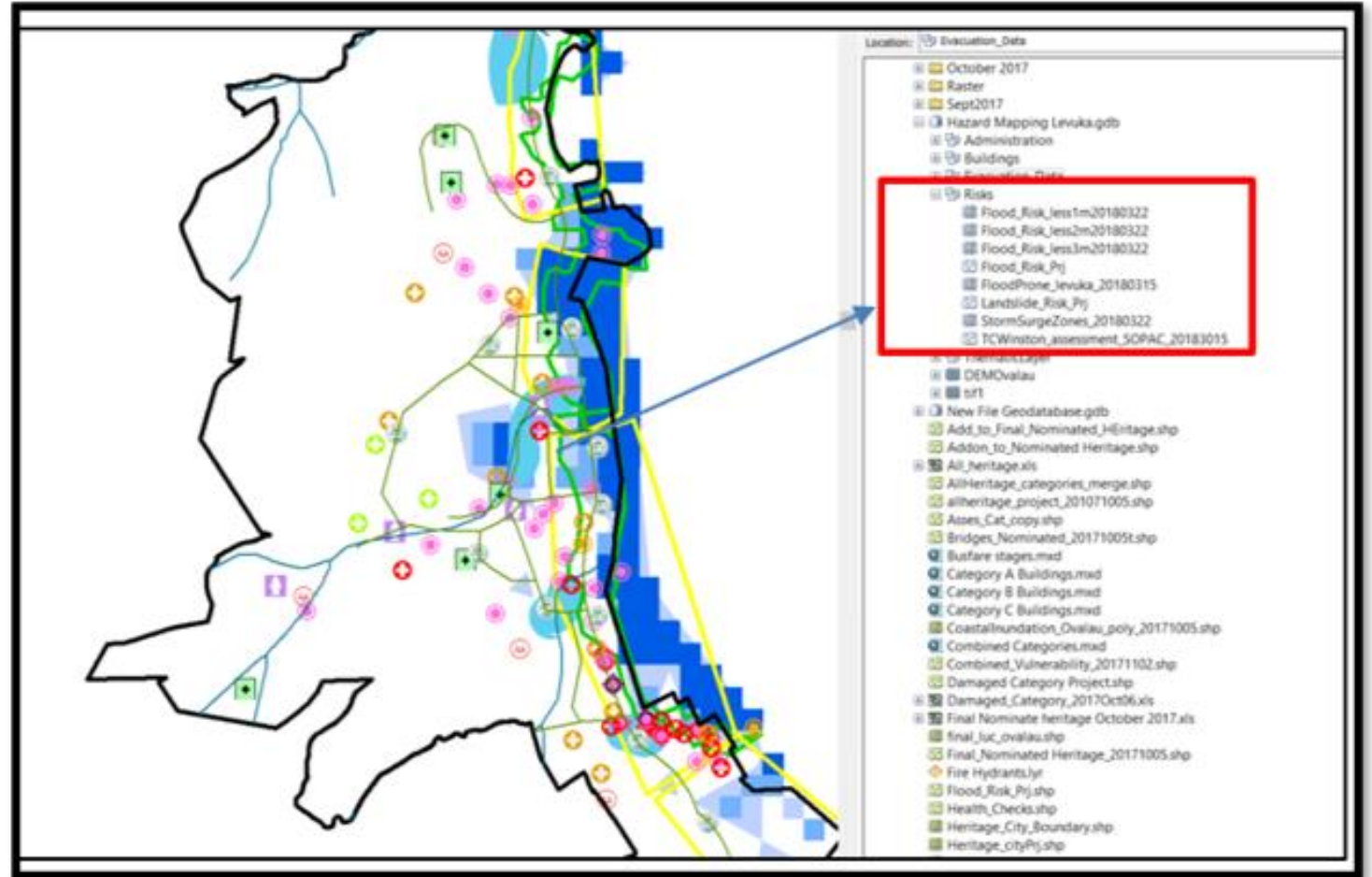
# HAZARD MAP

- Hotspots/for landslides, flooding and storm surges.
- The land slide hotspots are sites with very steep slope degrees of greater than 25.
- The moderately steep soil types and non-arable classes, makes it more vulnerable to impacts of landslides.

# TAKE HOME MESSAGE…..
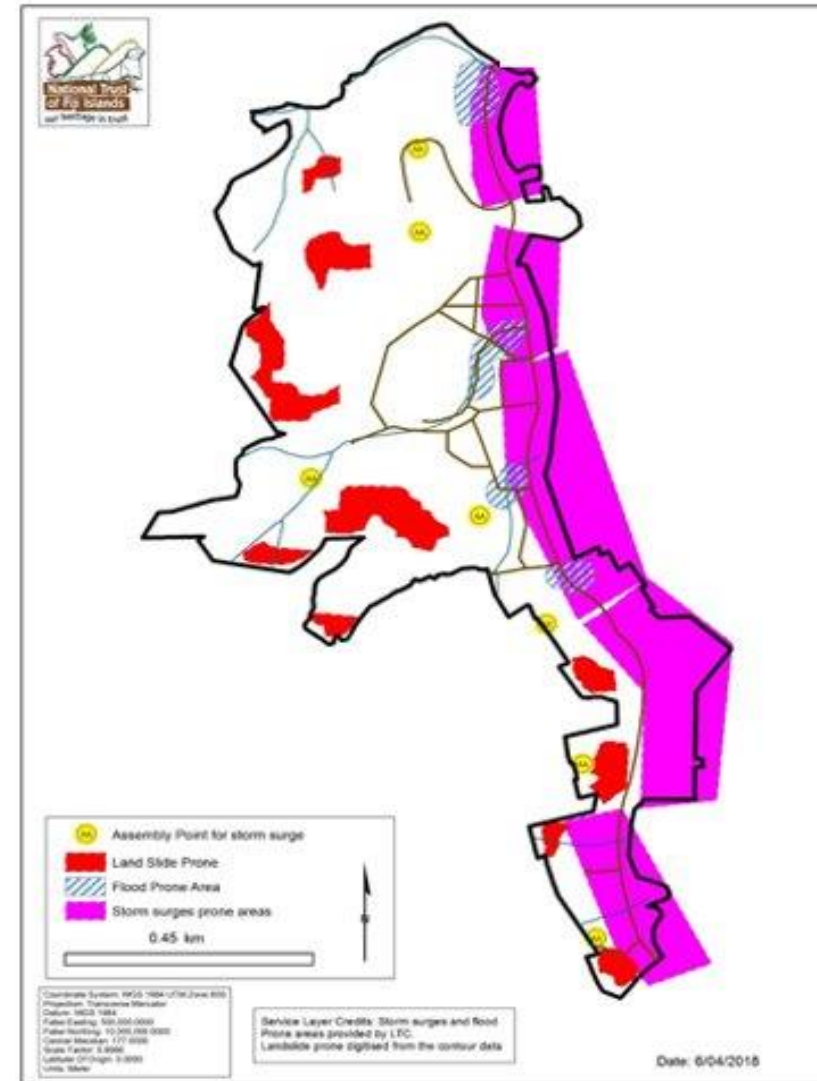
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GIS is a powerful tool.

Data is an important component, if properly analyzed can produced useful output.

That can assist and support in project planning, management and decision making.

Would greatly assist in your work in terms of processing data that you may already have to make informed environmental decisions.

# Vinaka, Tagio Tumas, Thank You !!