

# **Subject: (E3-4) Geo-informatics and Data Analysis for Climate Change Response**

**Topic: Applied GIS and Remote sensing**

Lecturer: Dr. Quang Nguyen

Date: April 12, 2019

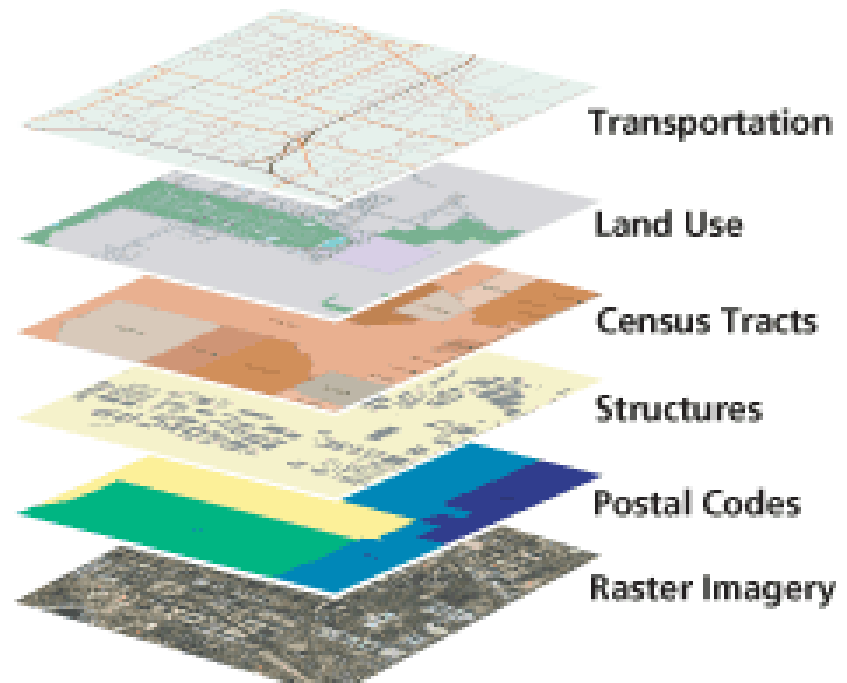
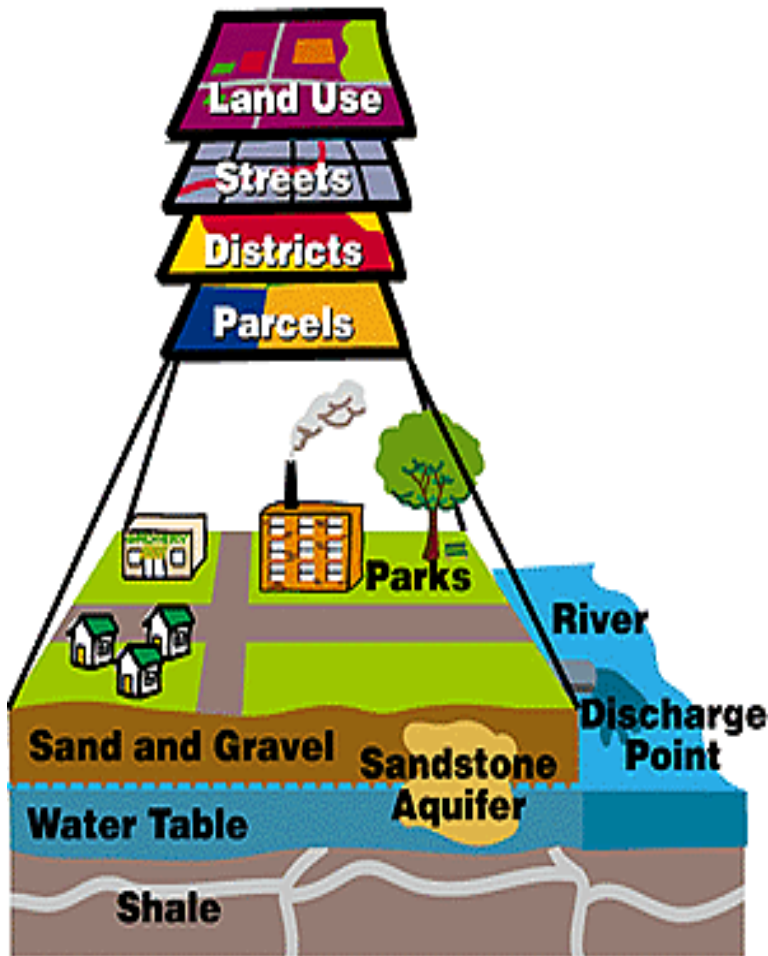
# Outline

- Introduction
- Working with Map Projections
- Working with Data
- Applied GIS and Remote sensing for Climate Change
- Discussion about Group project

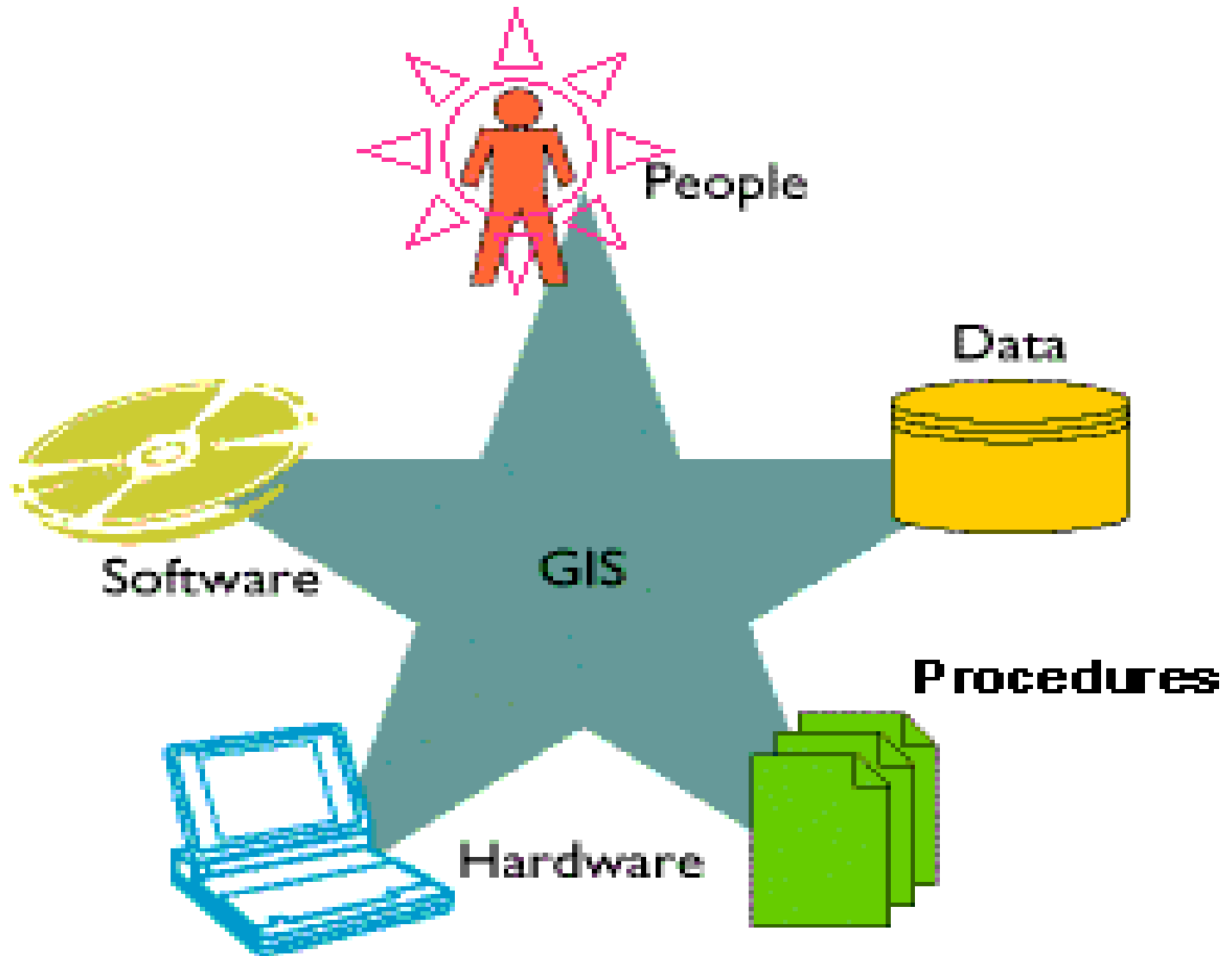
# What is GIS?

- *A method to visualize, manipulate, analyze, and display spatial data.*

*“Smart Maps” linking a database to a map.*

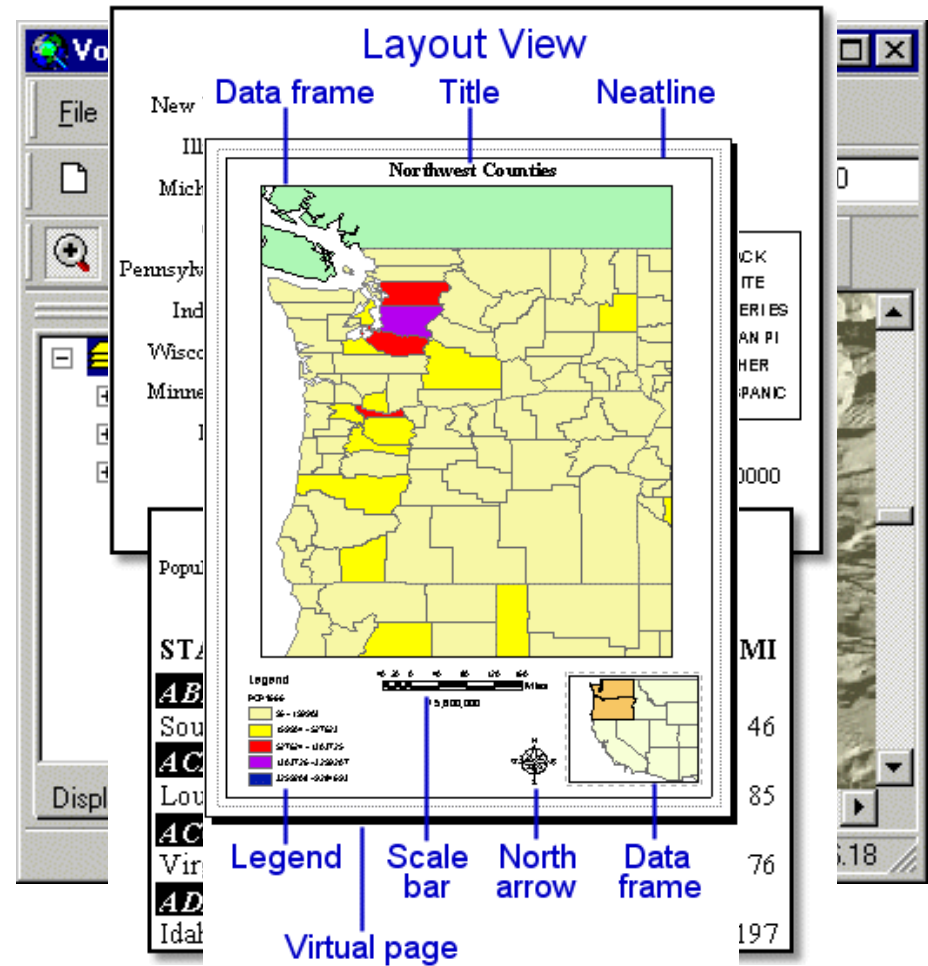


# What are the components of a GIS?



# GIS is a Tool!

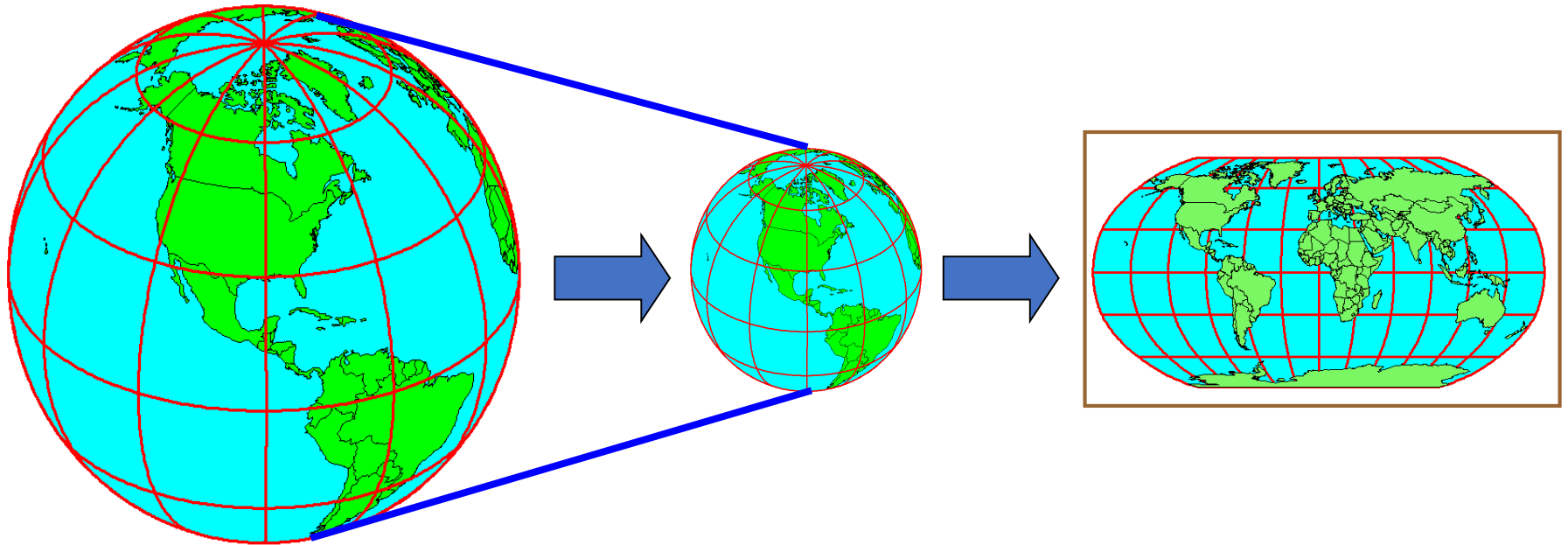
- ❖ Displaying and editing data
- ❖ Querying and analyzing data
- ❖ Charting and reporting data
- ❖ Creating layouts



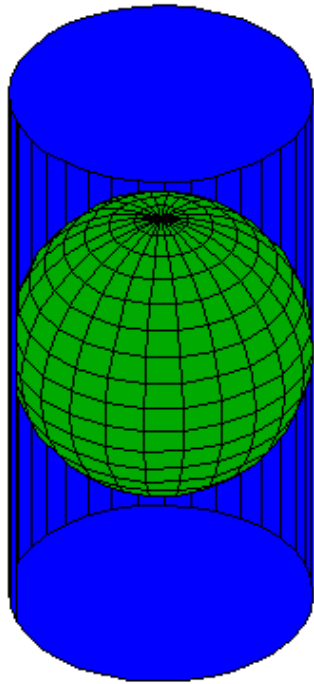
# **Working with Map Projections**

# Working with Map Projections

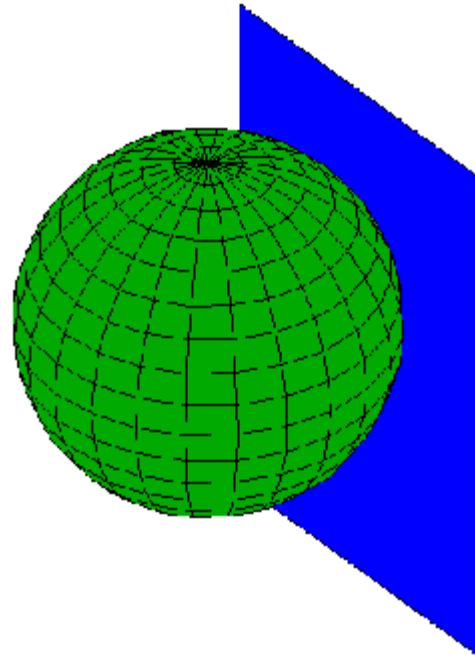
A map projection is a method for mapping spatial patterns on a curved surface (the Earth's surface) to a flat surface.



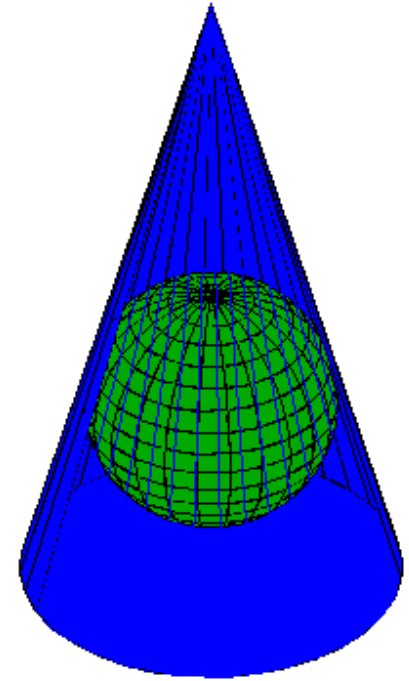
# Types of Projections



**Cylindrical Projection Surface**



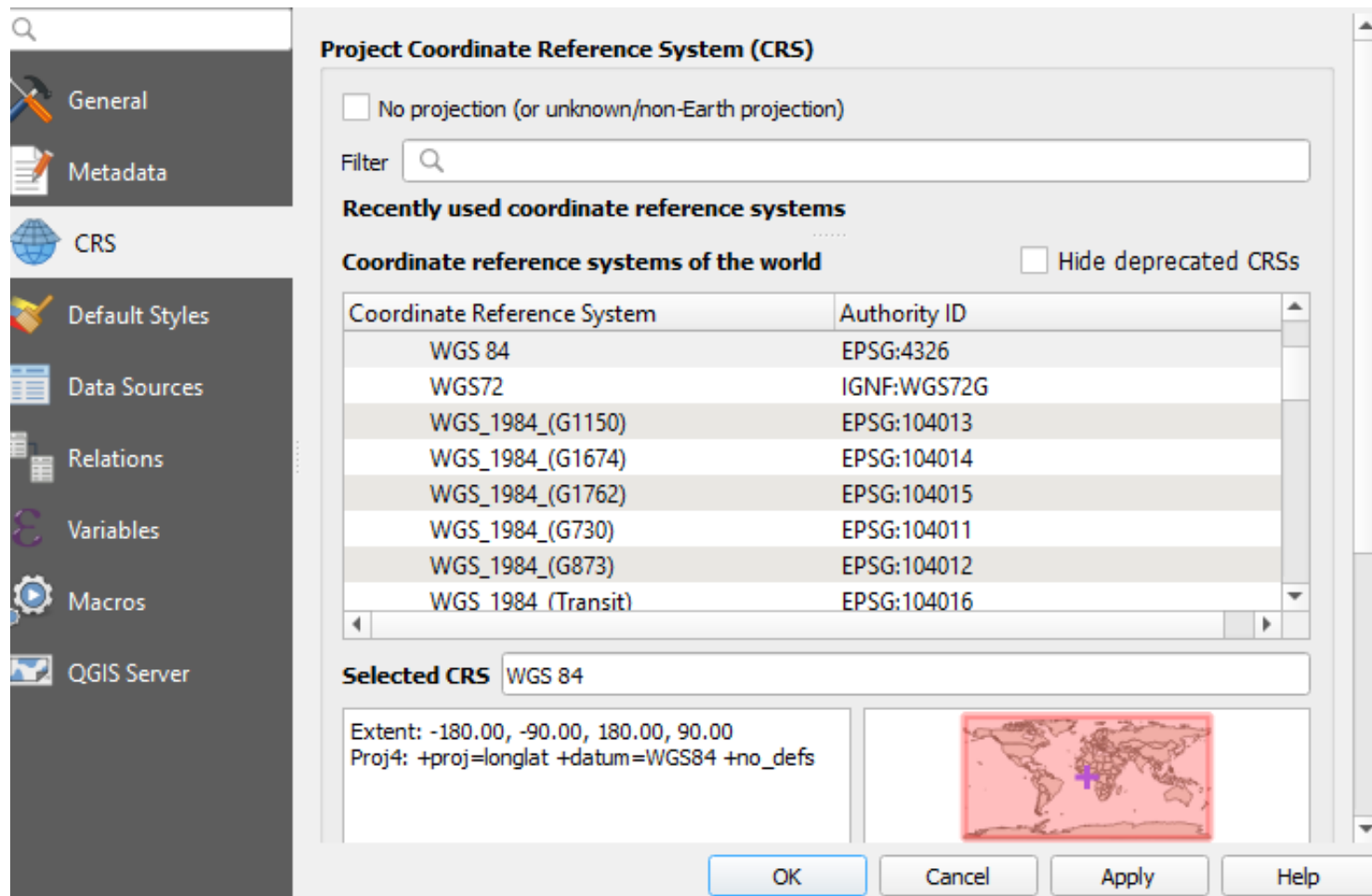
**Planar Projection Surface**



**Conical Projection Surface**



- ❖ QGIS has support for approximately 2,700 known coordinate reference systems (CRSs).
- ❖ You can define a custom CRS if QGIS does not provide the coordinate reference system you need.



# Coordinate reference systems are commonly used in Vietnam

Project Properties | CRS

Project Coordinate Reference System (CRS)

No projection (or unknown/non-Earth projection)

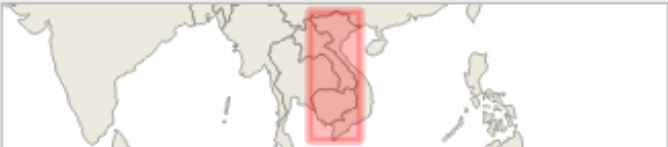
Filter

Recently used coordinate reference systems

Coordinate reference systems of the world  Hide deprecated CRSs

Coordinate Reference System	Authority ID
▼ <b>Geographic Coordinate Systems</b>	
VN-2000	EPSG:4756
▼ <b>Projected Coordinate Systems</b>	
▼ <i>Transverse Mercator</i>	
VN-2000 / TM-3 Da Nang zone	EPSG:6959
VN-2000 / TM-3 zone 481	EPSG:6956
VN-2000 / TM-3 zone 482	EPSG:6957
VN-2000 / TM-3 zone 491	EPSG:6958
▼ <i>Universal Transverse Mercator (UTM)</i>	
VN-2000 / UTM zone 48N	EPSG:3405
VN-2000 / UTM zone 49N	EPSG:3406

Selected CRS

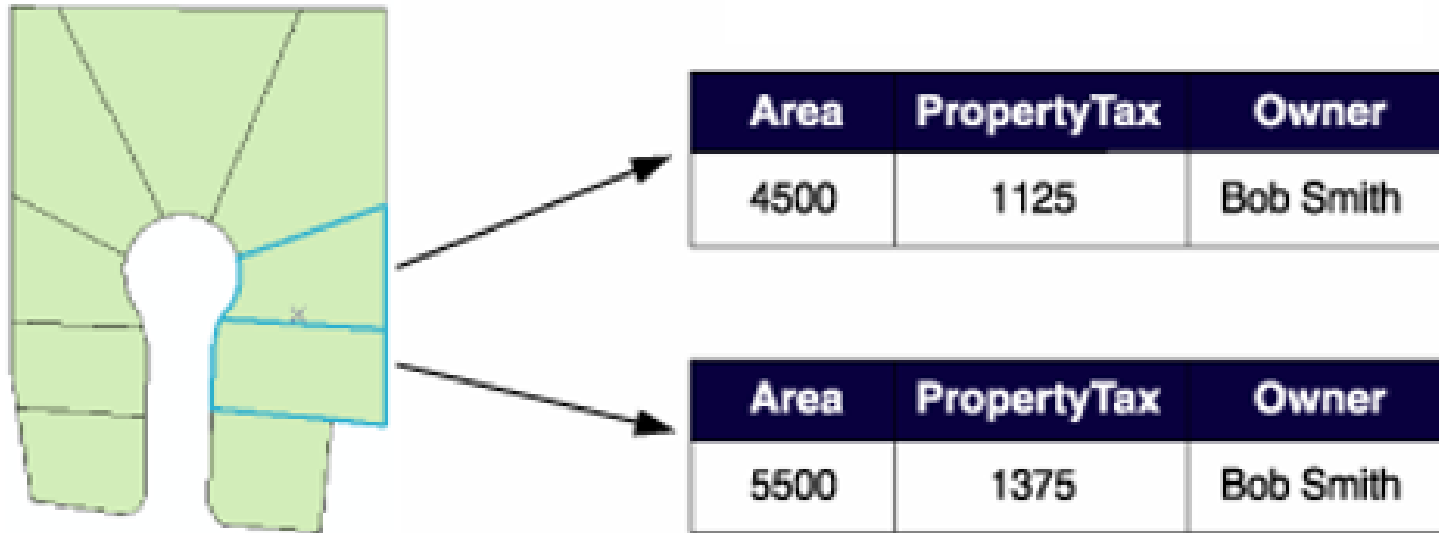


What are coordinate reference systems used in Myanmar and Nigeria?

# **Working with Data**

## Geographical features can be recognized by two types of data:

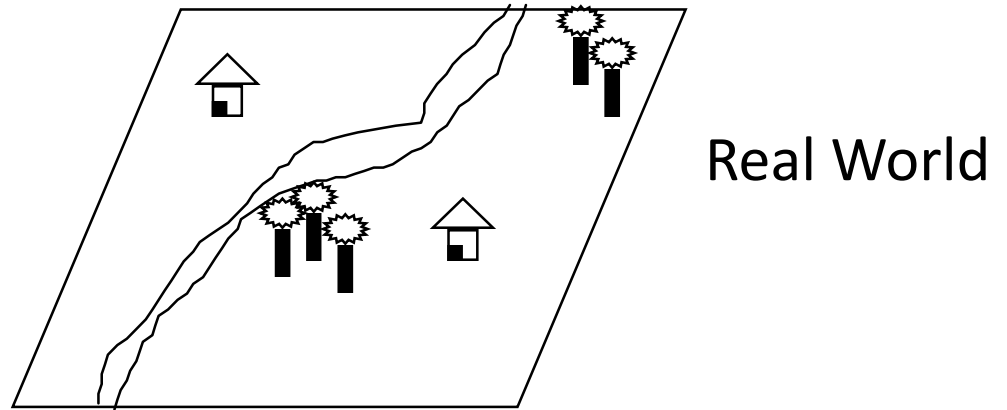
- **Spatial data** which describes location (where)
- **Attribute data** which specifies characteristics at that location (what, how much, and when)



## GIS data structures:

- **vector** data model: represents geography via coordinates
- **raster** data model: represents geography via grid cells

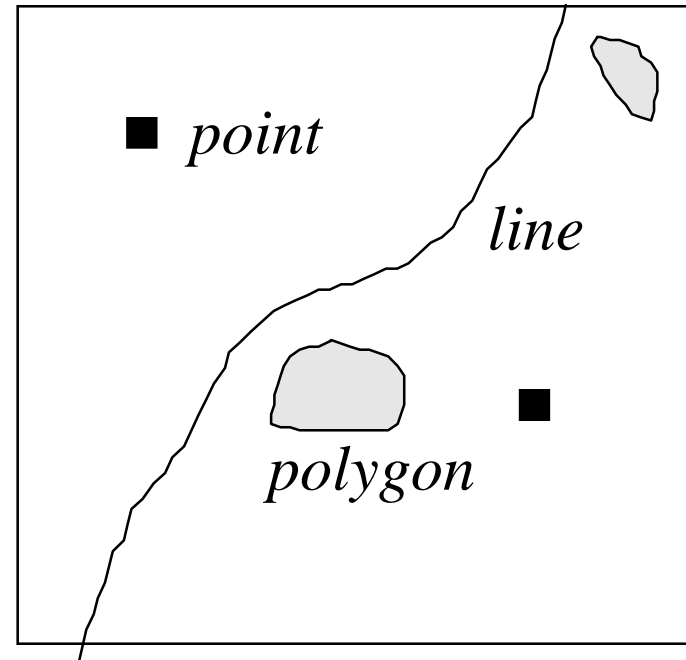
# Concept of Vector and Raster



## Raster Representation

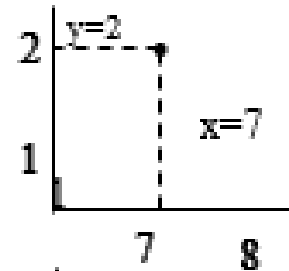
	0	1	2	3	4	5	6	7	8	9
0								R	T	
1							R			T
2		H					R			
3							R			
4					R	R				
5				R						
6			R		T	T		H		
7			R		T	T				
8		R								
9		R								

## Vector Representation

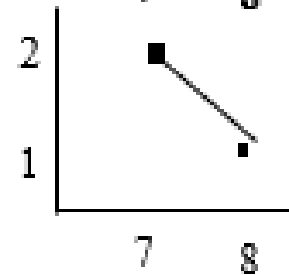


# Vector Data Model

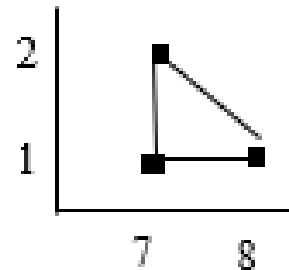
- point (node): 0-dimension
  - single x,y coordinate pair
  - tree, oil well
- line : 1-dimension
  - two (or more) connected x,y coordinates
  - road, stream
- polygon : 2-dimensions
  - four or more ordered and connected x,y coordinates
  - census tracts, county, lake



Point: 7,2



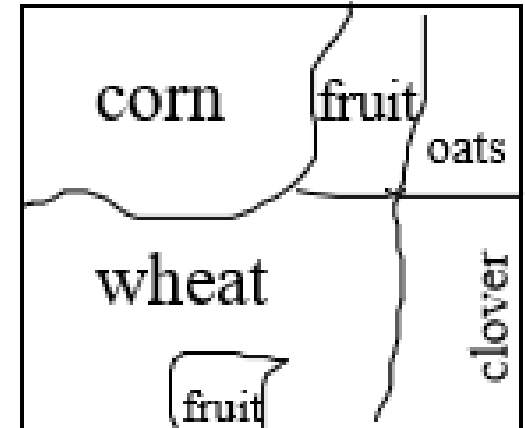
Line: 7,2 8,1



Polygon: 7,2 8,1 7,1 7,2

# Raster Data Model

- area is covered by grid with (usually) equal-sized cells
- cells often called *pixels* (picture elements); raster data often called *image* data
- attributes are recorded by assigning each cell a single value based on the majority feature (attribute) in the cell, such as land use type.



	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	4	4	5	5	5
1	1	1	1	1	1	4	4	5	5	5
2	1	1	1	1	1	4	4	5	5	5
3	1	1	1	1	1	4	4	5	5	5
4	1	1	1	1	1	4	4	5	5	5
5	2	2	2	2	2	2	2	3	3	3
6	2	2	2	2	2	2	2	3	3	3
7	2	2	2	2	2	2	2	3	3	3
8	2	2	4	4	2	2	2	3	3	3
9	2	2	4	4	2	2	2	3	3	3

# QGIS can work with different types of data:

- Vector data formats include ESRI formats (Shapefile, Geodatabase. . . ), MapInfo and MicroStation file formats, AutoCAD DWG/DXF, GeoPackage, GeoJSON, GRASS, GPX, KML
- Raster data formats include ArcInfo Binary Grid, ArcInfo ASCII Grid, JPEG, GeoTIFF, ERDAS IMAGINE
- Others



User guide of QGIS can be found from:

[https://docs.qgis.org/testing/en/docs/user\\_manual/index.html](https://docs.qgis.org/testing/en/docs/user_manual/index.html)



DOCUMENTATION QGIS TESTING

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What's new in QGIS testing

Getting Started

QGIS GUI

QGIS Configuration

Working with Projections

General Tools

Managing Data Source

Working with Vector Data

Working with Raster Data

Working with Mesh Data

Laying out the maps

Working with OGC Data

Working with GPS Data

Authentication System

GRASS GIS Integration

QGIS processing framework

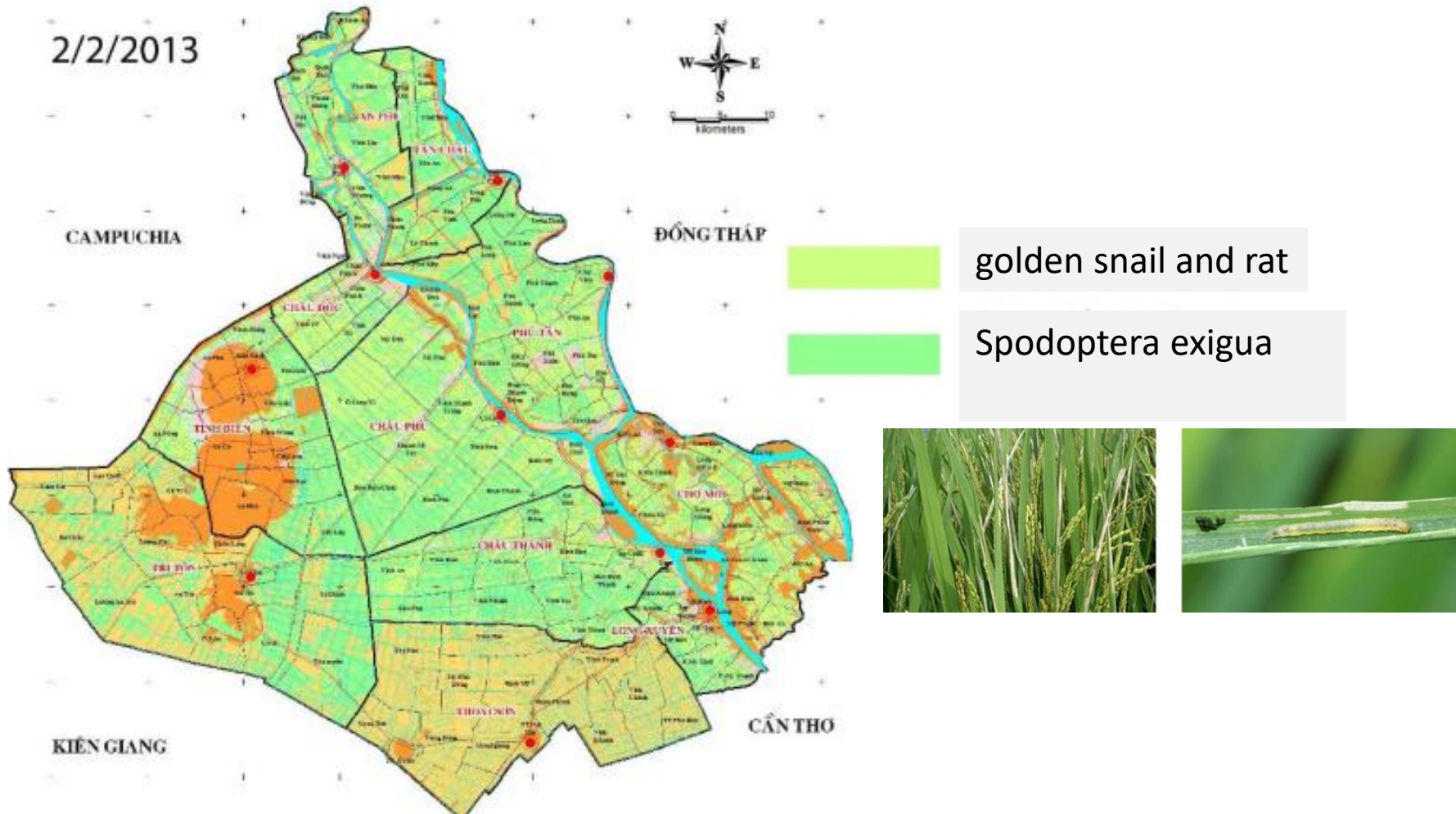
Processing providers and algorithms

## QGIS User Guide

- Preamble
- Foreword
- Conventions
  - GUI Conventions
  - Text or Keyboard Conventions
  - Platform-specific instructions
- Features
  - View data
  - Explore data and compose maps
  - Create, edit, manage and export data
  - Analyze data
  - Publish maps on the Internet
  - Extend QGIS functionality through plugins
  - Python Console
  - Known Issues

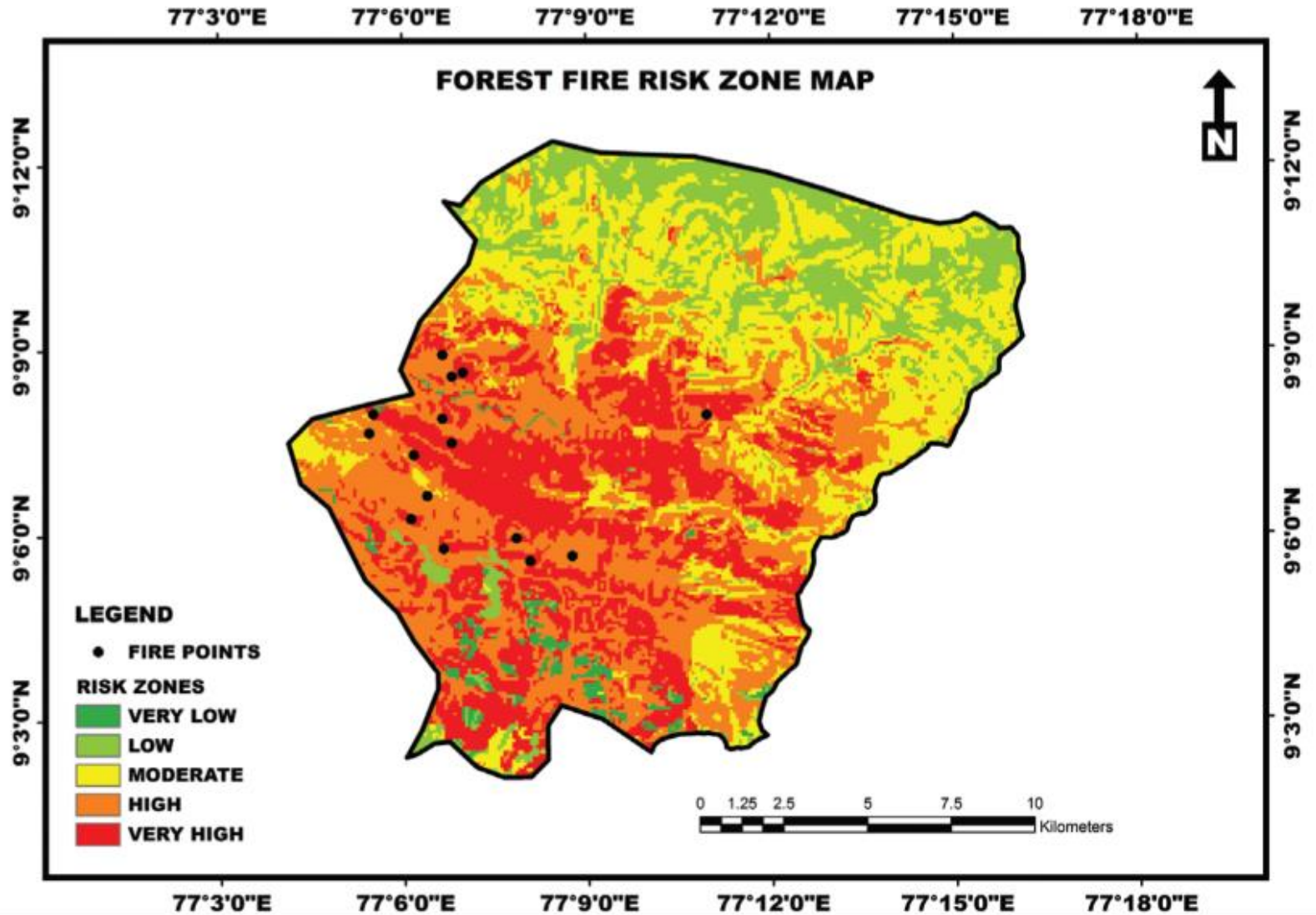
# **Applied GIS and Remote sensing for Climate Change**

# Analysis of Pest and Disease in Rice Fields in Mekong Delta using MODIS Remote Sensing



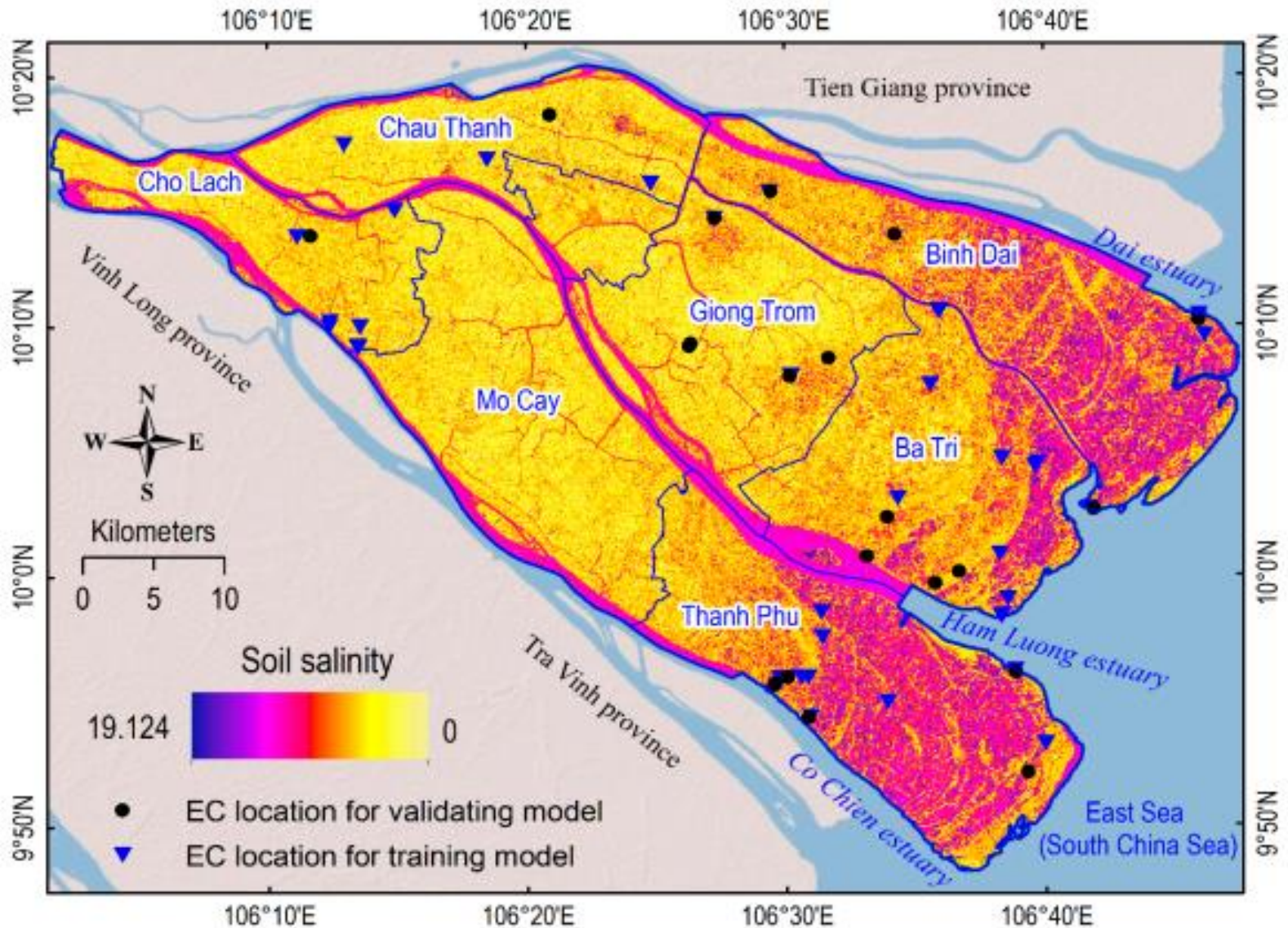
Source: <https://sj.ctu.edu.vn/ql/docgia/tacgia-5385/baibao-13537/doi-ctu.jsi.2014.103.html>

# Forest Fire Risk Zone Map

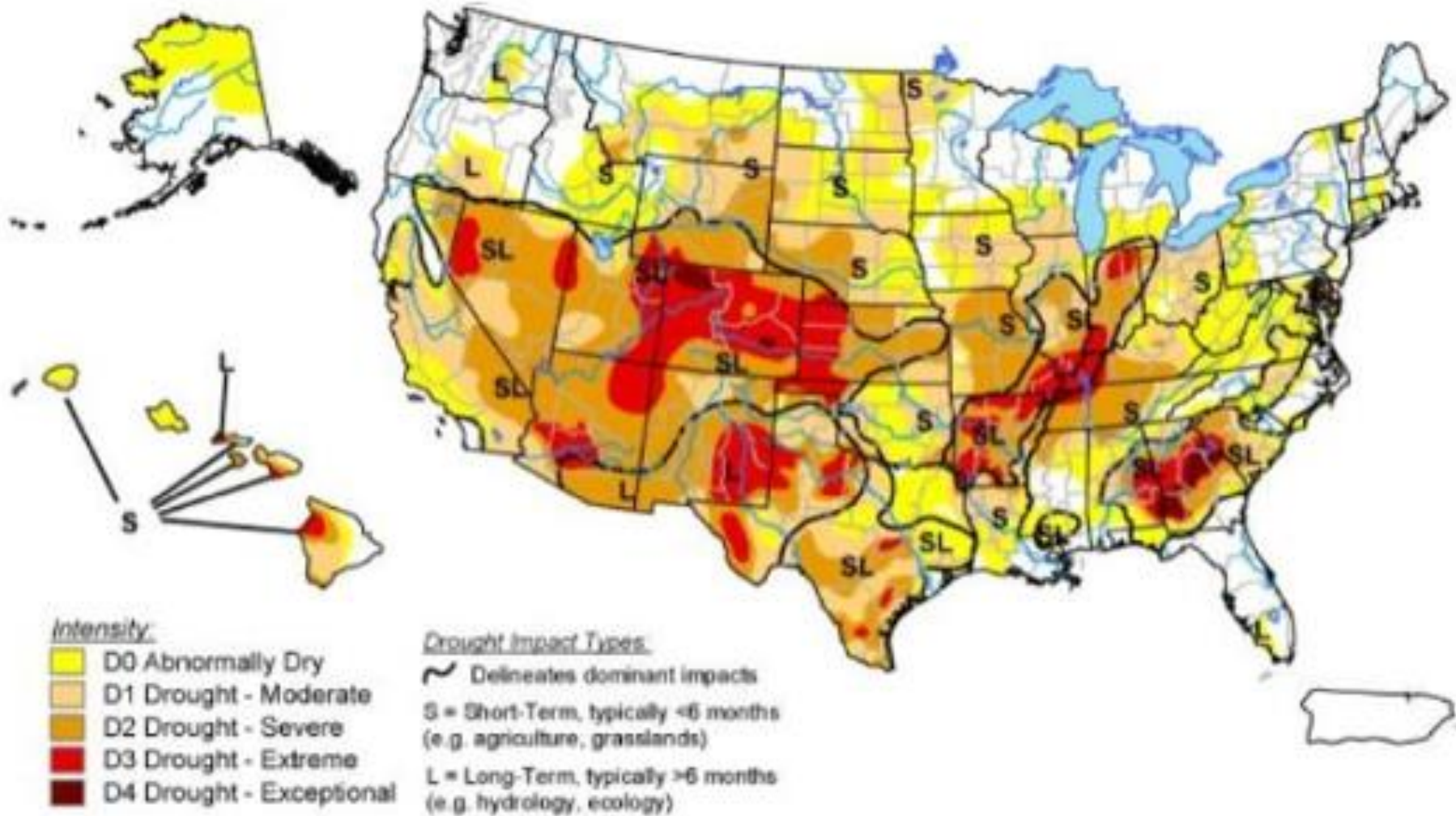




# Soil Salinity Map for the Ben Tre Province



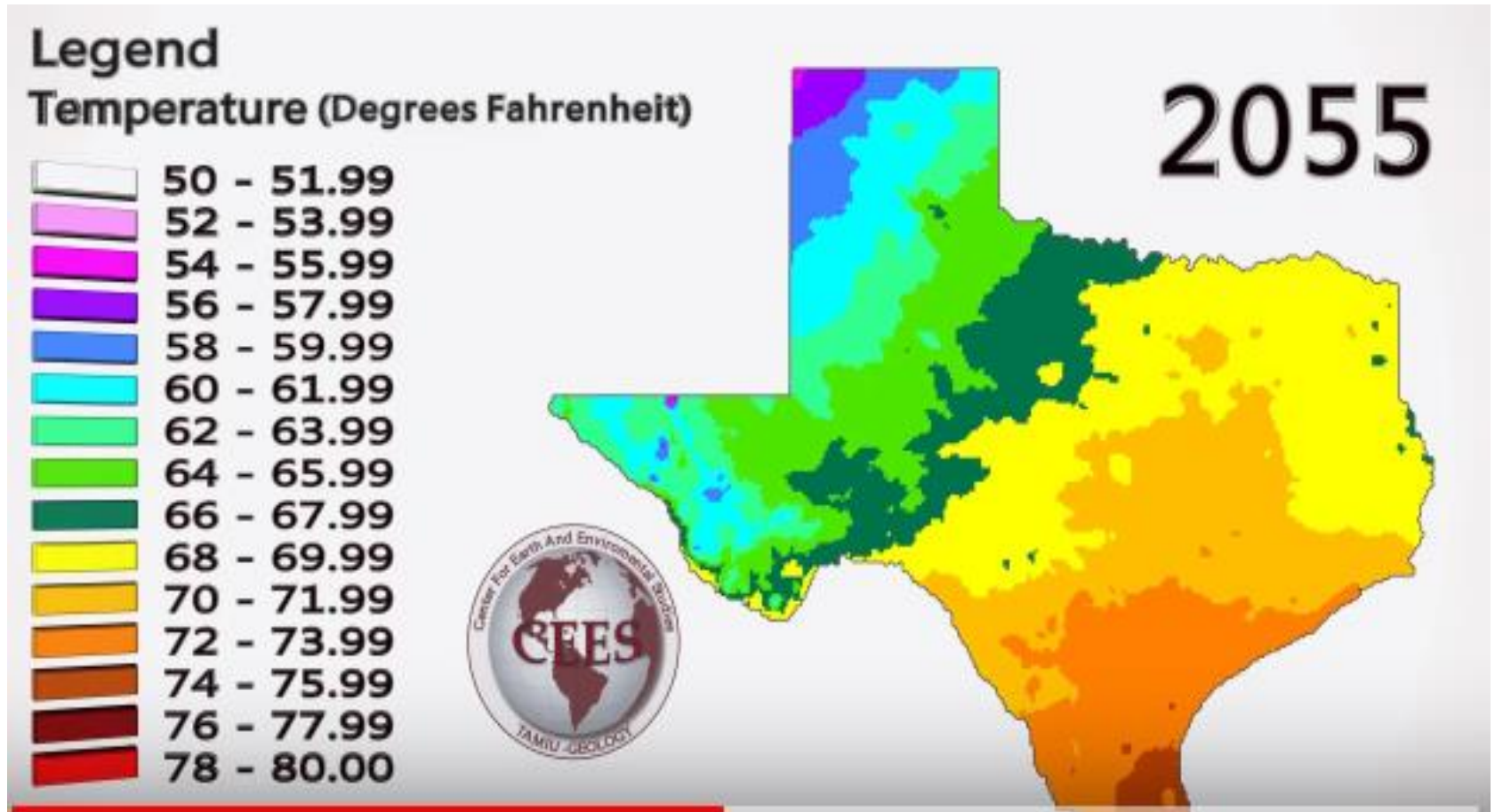
# U.S. Drought Monitor



Source: <https://www.sciencedaily.com/releases/2012/07/120705194136.htm>

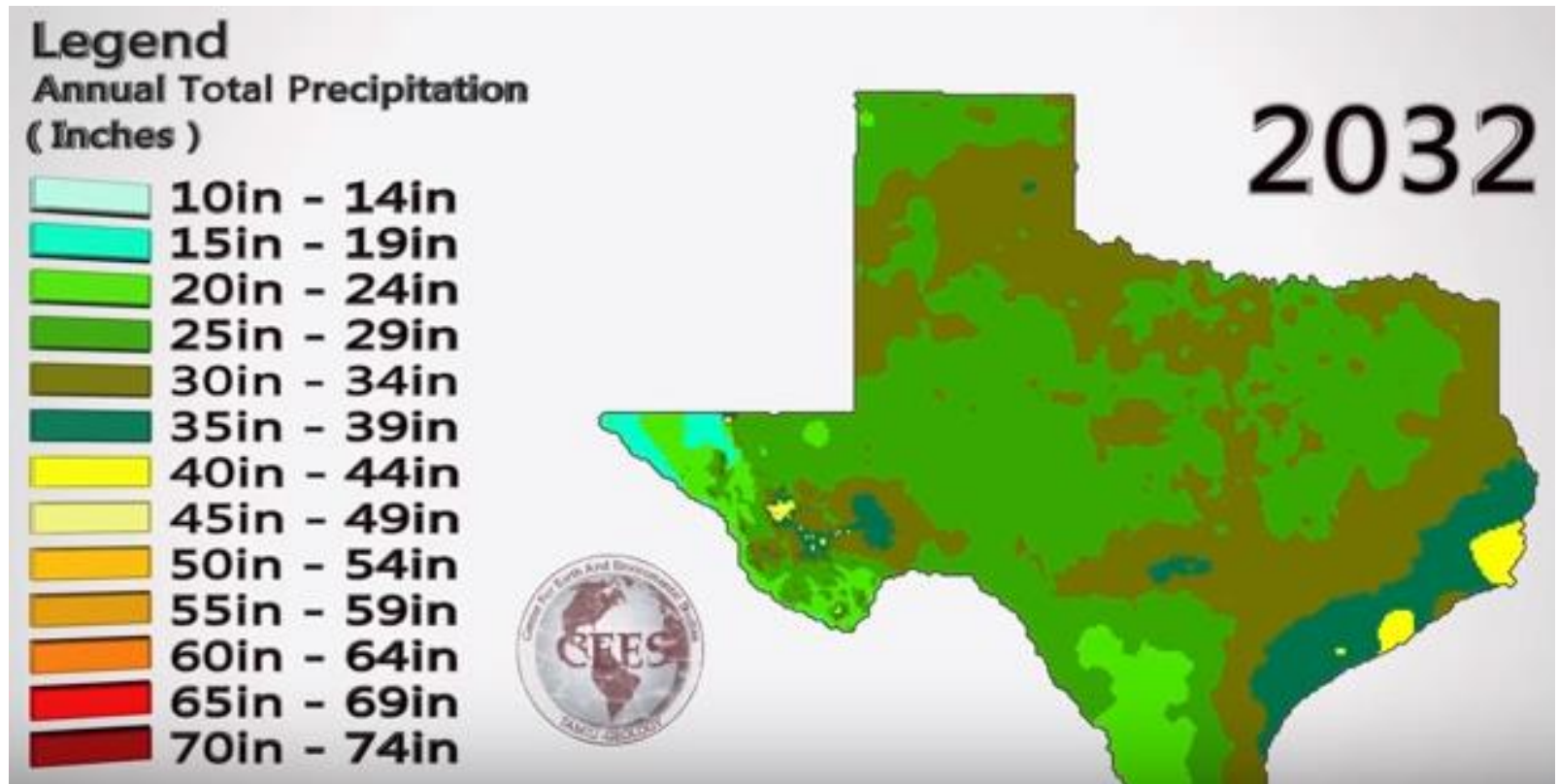


# Scenarios Annual Average Temperature 2020 - 2099



Source: <https://www.youtube.com/watch?v=ma21HI3KF3k>

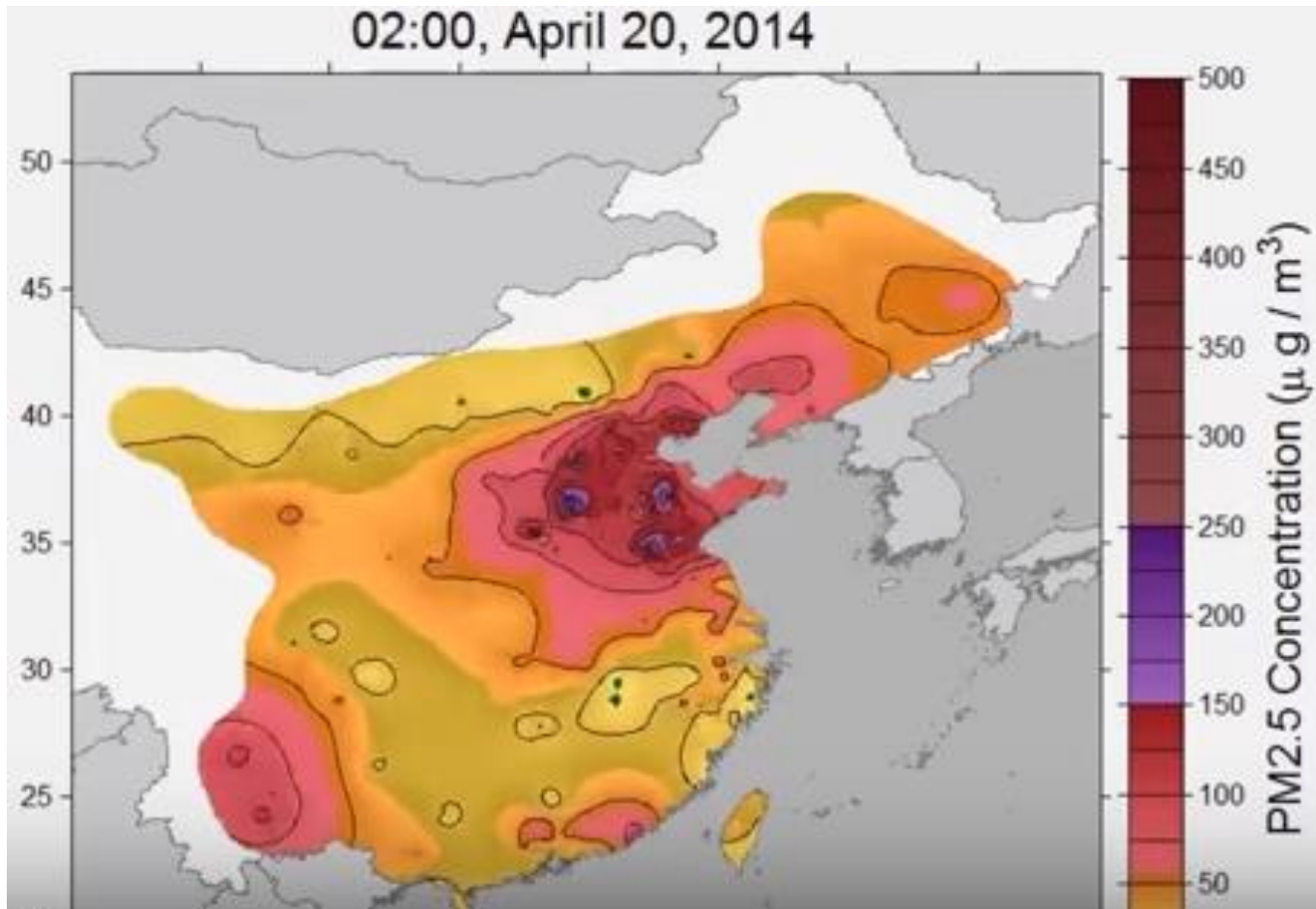
# Climate Change Scenarios Annual Total Precipitation 2020 - 2099



Source: <https://www.youtube.com/watch?v=uPR7cn6bVQs>

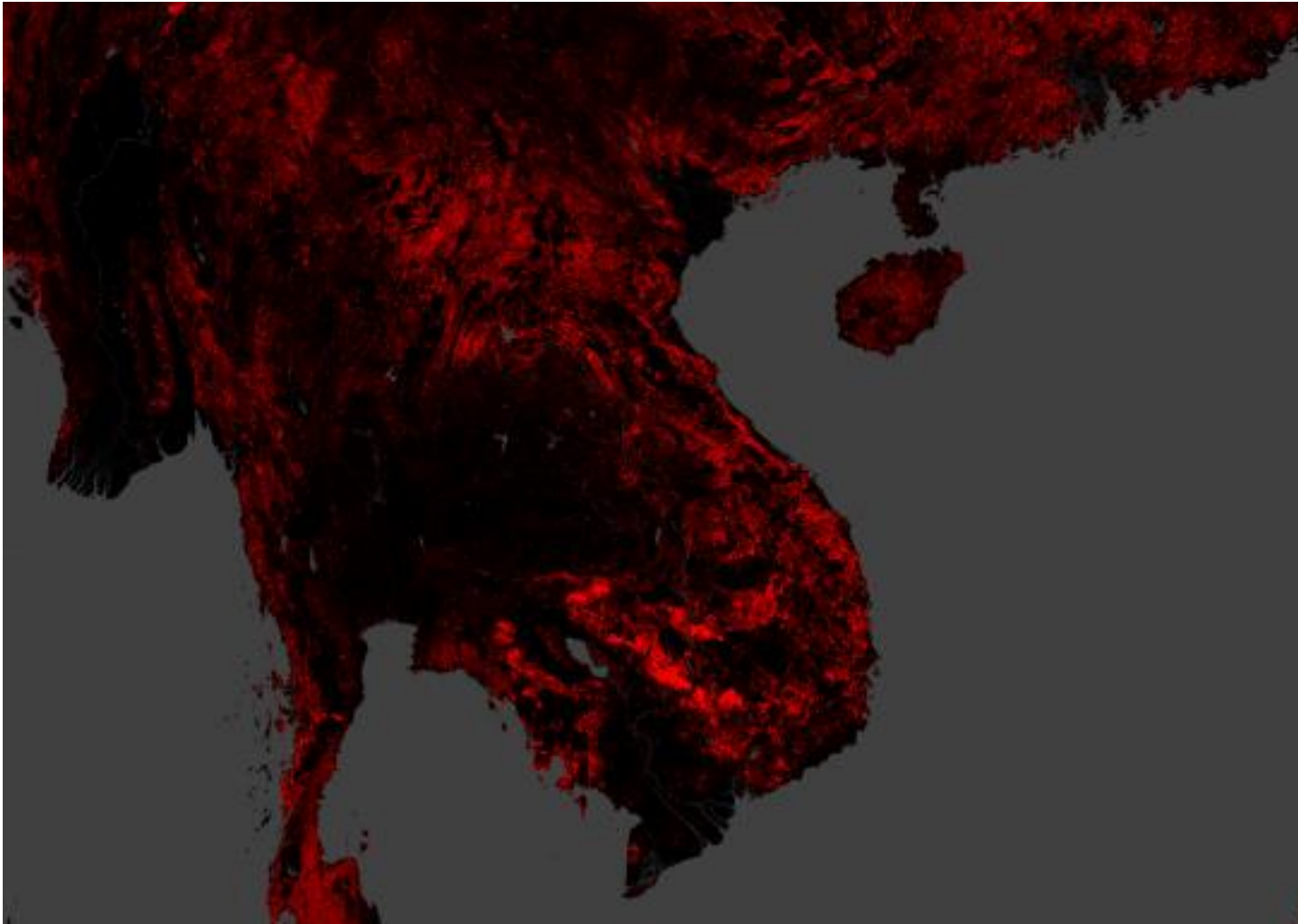


# Air Pollution in China



Source: <https://www.youtube.com/watch?v=sSrh9RoLjg0>

# Global Forest Change



Source: <https://earthenginepartners.appspot.com/science-2013-global-forest>

# Global Warming



Source: <https://www.youtube.com/watch?v=oJAbATJCugs>

# Your Ideas for Group project and Discussion

## **Sub theme 1: Map creation for the fieldwork**

### **-For Social science students-**

- Land use survey: Once upon a time in Hanoi
- Geo-marketing survey: Vinmart in Hanoi
- Fieldwork map: POI (point of interesting)

## **Sub theme 2: Data visualization and analysis**

### **-For Environmental science students-**

- CO2 Emissions by Country
- Climate in Vietnam
- PM 2.5 Air Pollution by Country
- Forest Cover By Province in Vietnam