# Conception And Software Developments On A Data Retrieval, Visualization And Time Series Analysis Platform To Support Climate Change Resilient Energy System Planning On Southeast Asian Islands

## Introduction

Climate change has given rise to warmer temperatures, changing weather patterns and disruptions in nature balance. SEA is one of the areas greatly affected by climate risks. A web-map tool was developed for the cartographic visualization of various islands in SEA region.

## Objective

This research focuses on a timeseries analysis and designing of an interactive web mapping application/tool for:

- Cartographic visualization of various climate risks of islands in SEA.
- Statistical visualization of climate change risks for comparison purposes.
- Recommended adaptation measures for resilient energy systems based on climate change risk profile of specific islands.
- Retrieval of the information by users.

## Data

The database of the Global Administrative Areas (GADM) was used to create the island polygons.

- Temperature

$$t_{ave} = \frac{t_{max} + tmi_n}{2}$$

- Flood and Drought

$$HFDI = \frac{precipitation}{EtA}$$

- Sea-Level Rise

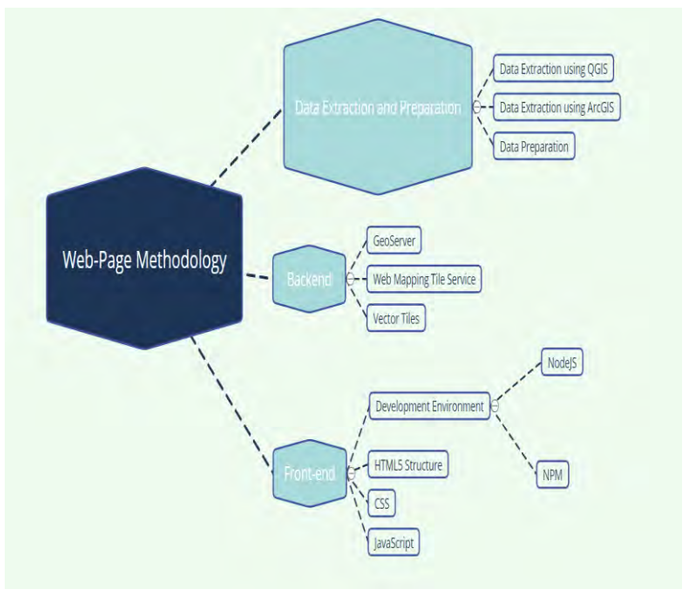
$$area_{l126} = \frac{area_{df26}}{area_{islnd}} * 100\%$$

- Cyclone
- Risk Cluster (1-3)
- Adaptation Measure

| Interview group | Stakeholders |
|---|---|
| Expert Interviews | Governmental organisation, Research institution, Finance & Insurance, Policy maker |
| Technology Provider | Technology provider, Utility, Project developer, |
| Island community | Thai island community, Philippines island community, Indonesian island community |

## Implementation

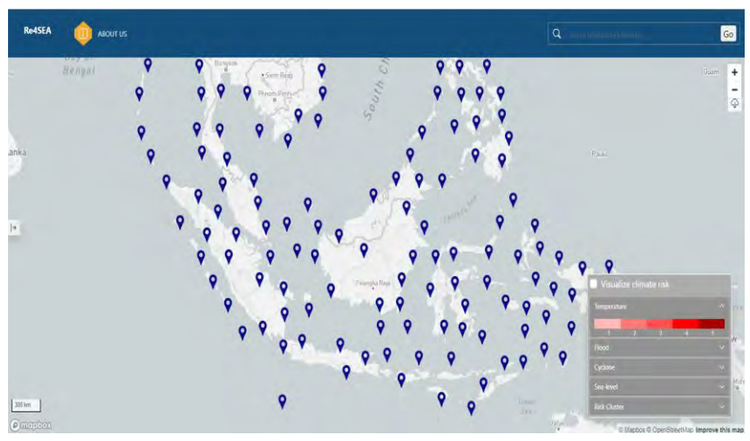
A web-map tool was developed for the cartographic visualization of various islands in the South East Atlantic region. The coordinates of these islands had to be extracted using QGIS and Pro software.

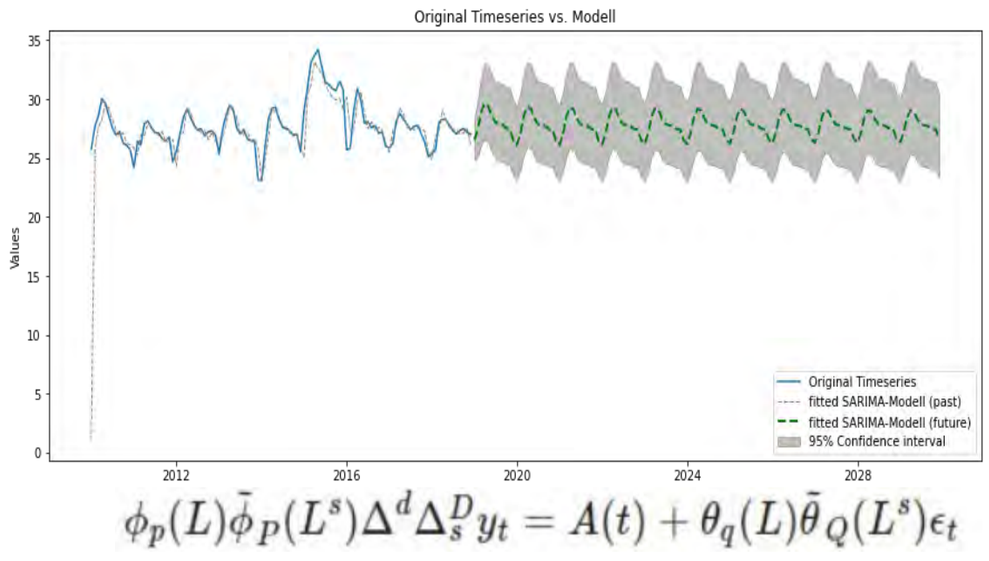



A colour range had to be applied to the intensity level of the risks after the shapefiles have been read from GeoServer.

Geoserver was used to render the ArcGIS data on the webpage as vector tiles. NodeJS was used as the run-time environment. Mapbox GL JS API was used to incorporate the basemap into the web-map, this required a token which can be gotten from a mapbox account.

The result on load of the webpage showed the basemap, points representing the islands and a legend in which you can switch between various risks




$$\phi_p(L)\tilde{\phi}_P(L^s)\Delta^d\Delta_s^D y_t = A(t) + \theta_q(L)\tilde{\theta}_Q(L^s)\epsilon_t$$

Temperature data for one of the countries in the region was analyzed and predicted in order to get an approximation of what to expect in the 10 years.

Using the SARIMA model for this prediction.

## Evaluation

The study determined that a way of visualization to emphasize the climate conditions these locations are most prone to is significant. The future should take precedence over short-term concerns, as such, this strategy could be seen as a development that will stand the test of time.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