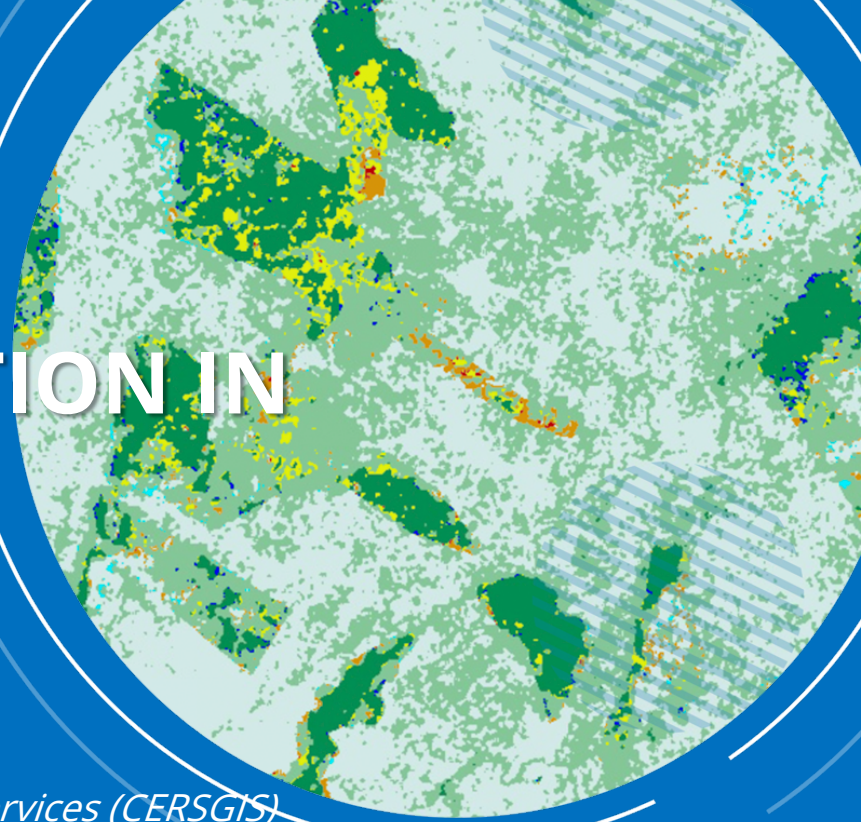
TIME SERIES AND USER INTERFACE CUSTOMISATION IN GOOGLE EARTH ENGINE



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Forestry Commission

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Graphical User Interface

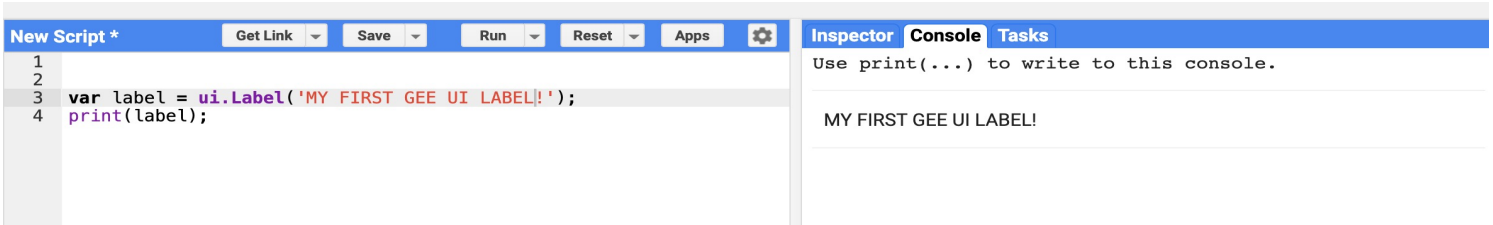
- The Google Earth Engine Code Editor is a Graphical User Interface (GUI) on its own
- While the base elements (map, task pane, etc.) cannot be altered new functionality can be added to the GUI
- Three different classes of elements can be added to the existing GUI:
  - Widgets
  - Panels
  - Events

Widgets

- Widgets include buttons, checkboxes, sliders, textboxes and selection menus
- There are a variety of widgets for building or customizing UIs.
- Widgets can only be added to a panel once

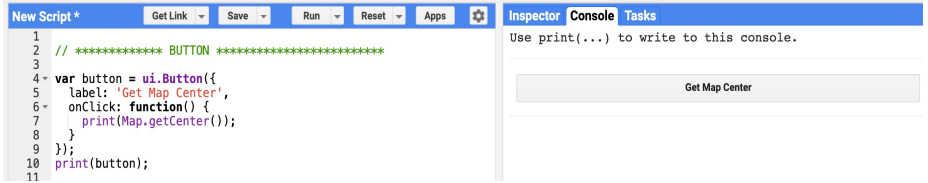
ui.Label

- Labels are simply areas in which text is displayed. For example, the following code prints a label:



ui.Button

- A button is an interactive UI widget that can be clicked. You can specify a function to be called when a user clicks the button




```
// ************* BUTTON ************************

var button = ui.Button({
  label: 'Get Map Center',
  onClick: function() {
    print(Map.getCenter());
  }
});
print(button);
```

ui.Slider

- A slider is a widget that lets a user adjust a slider to get a number within the slider range

Code Editor (JavaScript)

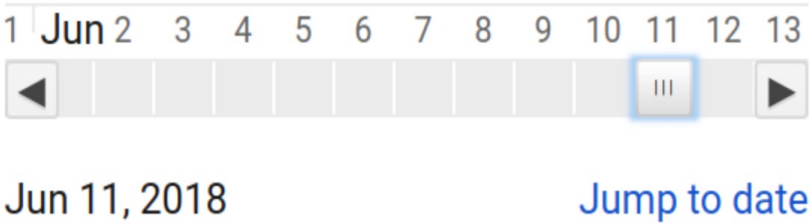
```
var slider = ui.Slider();

slider.setValue(0.9);  // Set a default value.
slider.onChange(function(value) {
  Map.layers().get(0).setOpacity(value);
});

Map.addLayer(ee.Image(255), {palette: 'blue'});
print(slider);
```

The slider should look something like:

Run Example

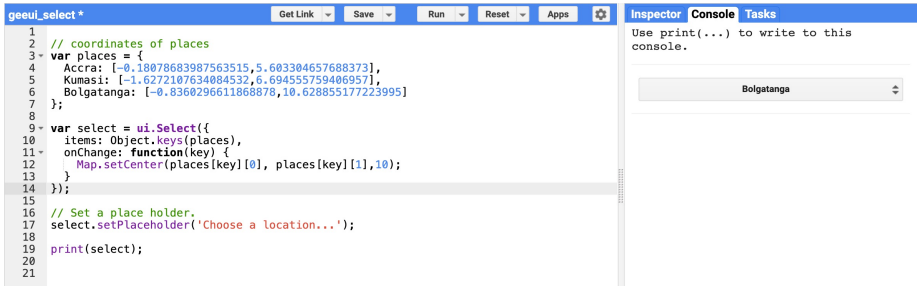
ui.DateSlider

- The DateSlider widget is like the Slider widget, but handles dates explicitly



ui.Select

- The select widget represents a drop-down menu of choices from which the user can choose one

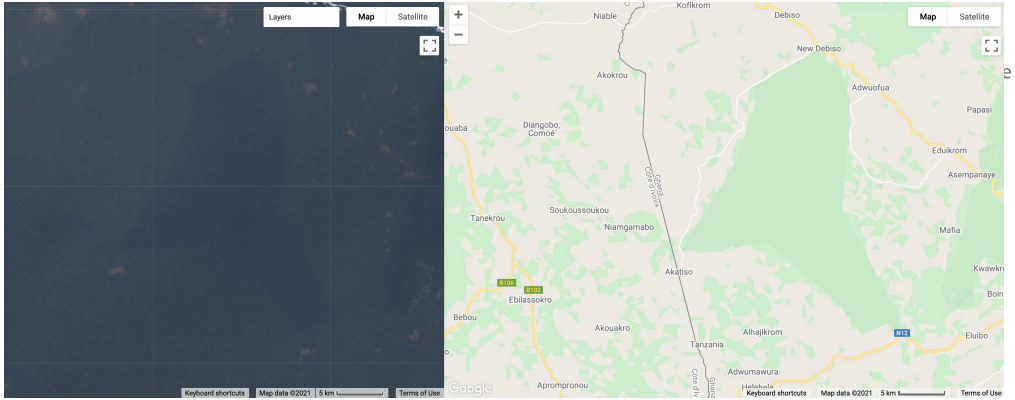


Run Example

ui.Map.Linker

- The linker is not a styleable widget. It is a behind-the-scenes utility that can be used to synchronize the movement of multiple ui.Map instances

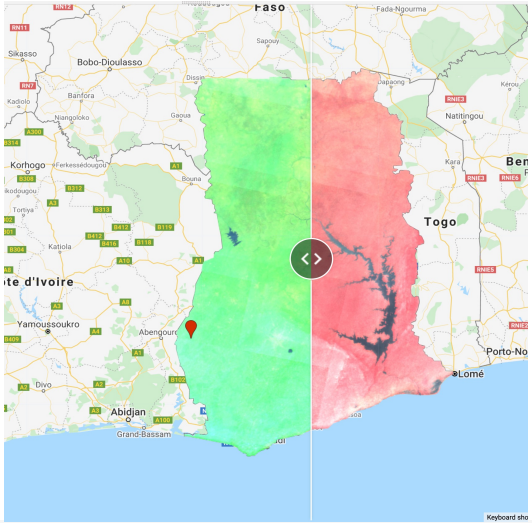
Run Example



ui.SplitPanel

- A ui.SplitPanel is useful for comparing things side-by-side. The advantage of a ui.SplitPanel over two ordinary panels is that a handle can be used to achieve a wipe transition between the panels in a ui.SplitPanel

Run Example



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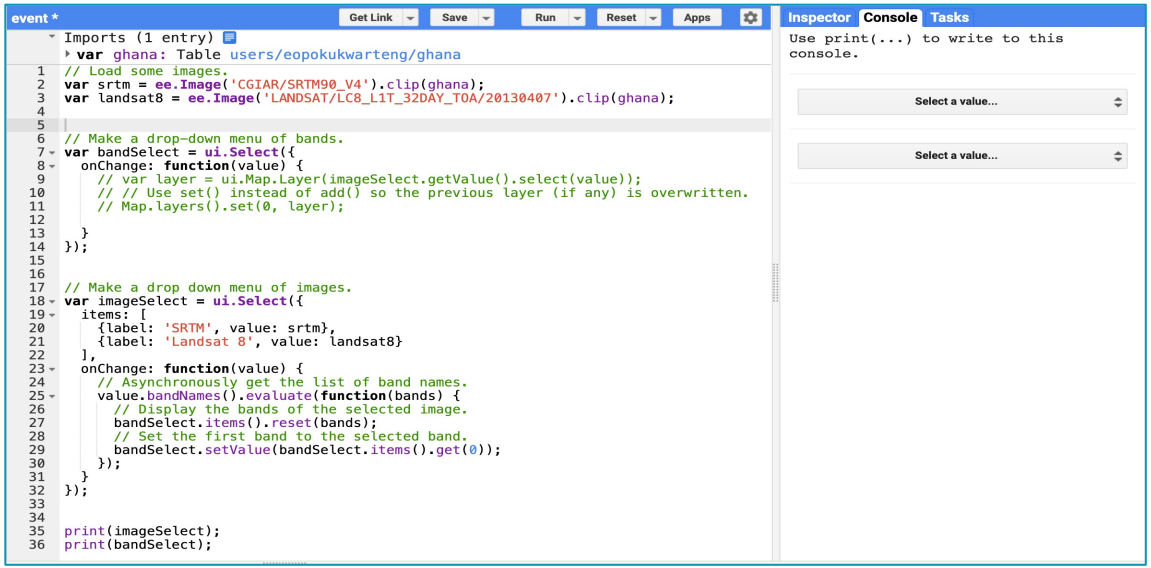
Events

- Events are fired by user interaction with a widget or a programmatic change to a widget. To do something when the event occurs, register a callback function on the widget with either onClick() (for ui.Map or ui.Button) or onChange() (everything else).




```
Imports (1 entry)
  var ghana: Table users/eopokukwarteng/ghana
// Load some images.
var srtm = ee.Image('CGIAR/SRTM90_V4').clip(ghana);
var landsat8 = ee.Image('LANDSAT/LC8_L1T_32DAY_TOA/20130407').clip(ghana);

// Make a drop-down menu of bands.
var bandSelect = ui.Select({
  onChange: function(value) {
    // var layer = ui.Map.Layer(imageSelect.getValue().select(value));
    // // Use set() instead of add() so the previous layer (if any) is overwritten.
    // Map.layers().set(0, layer);

  }
});


// Make a drop down menu of images.
var imageSelect = ui.Select({
  items: [
    {label: 'SRTM', value: srtm},
    {label: 'Landsat 8', value: landsat8}
  ],
  onChange: function(value) {
    // Asynchronously get the list of band names.
    value.bandNames().evaluate(function(bands) {
      // Display the bands of the selected image.
      bandSelect.items().reset(bands);
      // Set the first band to the selected band.
      bandSelect.setValue(bandSelect.items().get(0));
    });
  }
});


print(imageSelect);
print(bandSelect);
```

Run in Code Editor

Panels and Layouts

Google Earth Engine

ui. Panel

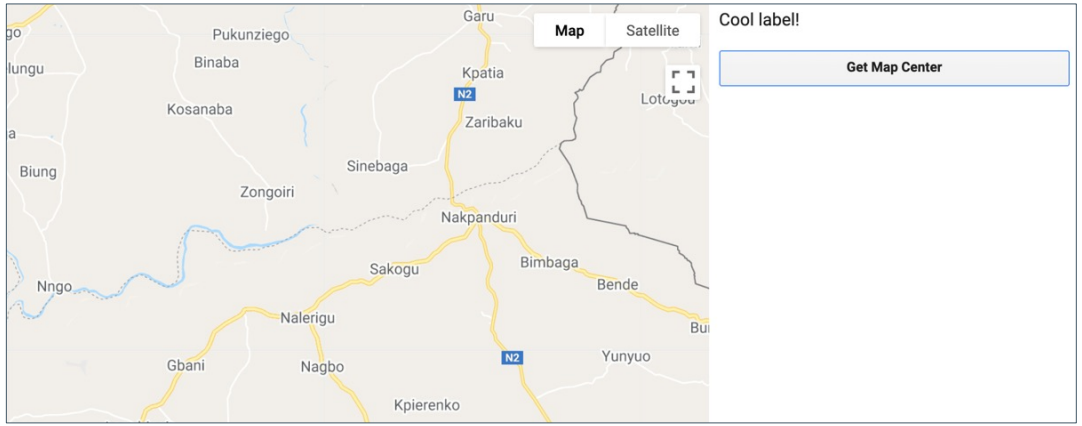
- A ui.Panel is an upper-level UI container in which to arrange widgets
- Each ui.Panel has a ui.Panel.Layout object that controls how its widgets are arranged on the screen

Layouts

- Layouts control how widgets in a panel are arranged for display

Panels and Layouts

```
// Create a panel with vertical flow layout.
var panel = ui.Panel({
  layout: ui.Panel.Layout.flow('vertical'),
  style: {width: '300px'}
});


panel.add( ui.Label('Cool label!'))


// Add a bunch of buttons.

var button = ui.Button({
  label: 'Get Map Center',
  style: {stretch: 'horizontal'},
  onClick: function() {
    print(Map.getCenter());
  }
});

panel.add(button);

// ui.root.clear();
ui.root.add(panel);
```



[Run in Code Editor]

Time-Series Charts

- Earth Engine API supports charting functions based on the Google Chart API
- Use the ui.Chart.image.series() function to create a time-series chart.

We will apply all the knowledge in the following ;

- filter
- map
- reduce
- cloud-masking

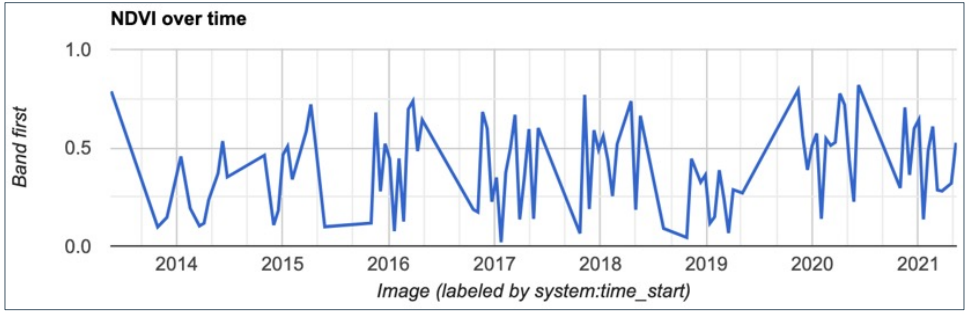
Exercise

- Create a chart of average NDVI values for a given farm over 1 year.

Basic Time Series Analysis

Google Earth Engine

```
// Import the Landsat 8 TOA image collection.
var l8 = ee.ImageCollection('LANDSAT/LC08/C01/T1_TOA');

// Map a function over the Landsat 8 TOA collection to add an NDVI band.
var withNDVI = l8.map(function(image) {
  var ndvi = image.normalizedDifference(['B5', 'B4']).rename('NDVI');
  return image.addBands(ndvi);
})

// Create a chart.
var chart = ui.Chart.image.series({
  imageCollection: withNDVI.select('NDVI'),
  region: roi,
  reducer: ee.Reducer.first(),
  scale: 30
}).setOptions({title: 'NDVI over time'});

// Display the chart in the console.
print(chart);
```



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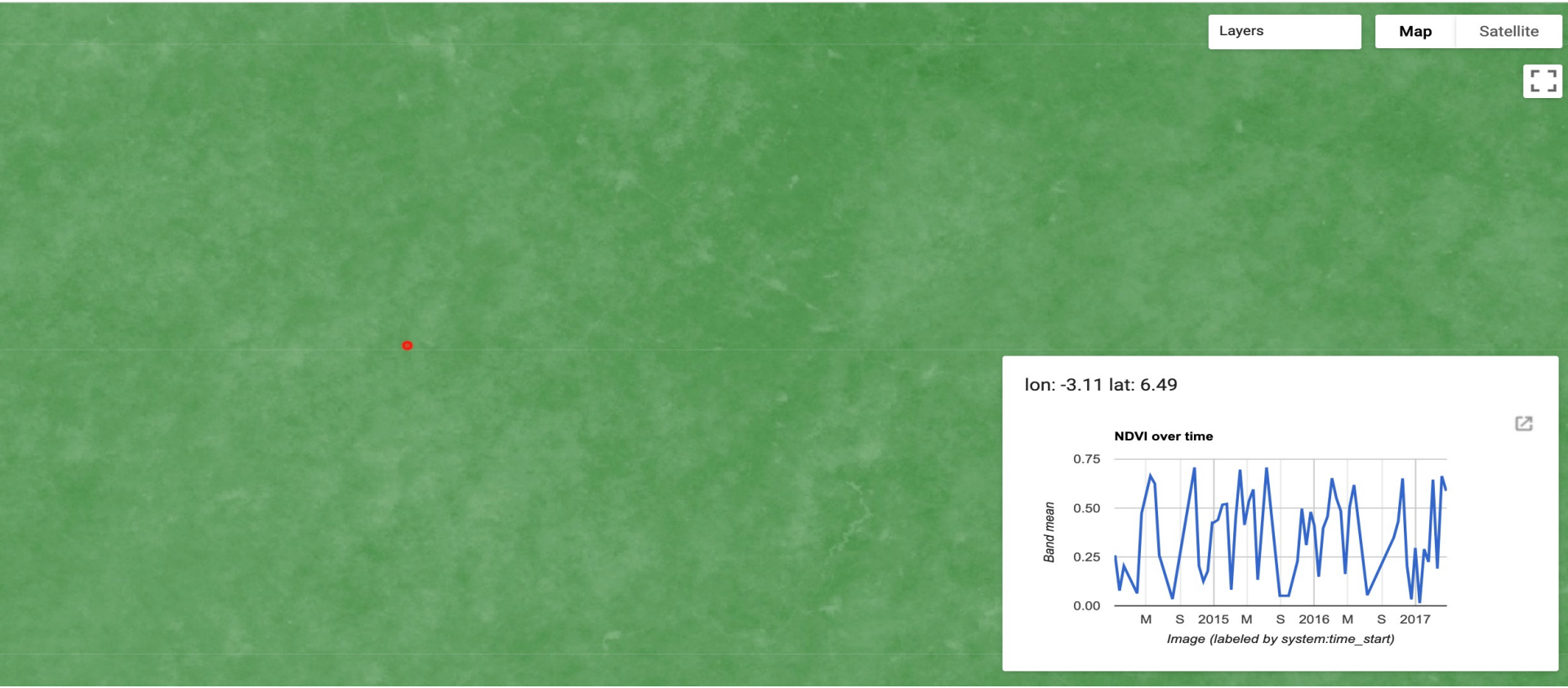
Creating an Interactive Time Series App

Google Earth Engine



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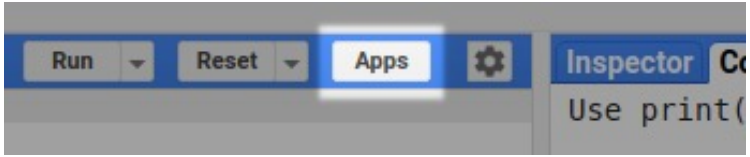
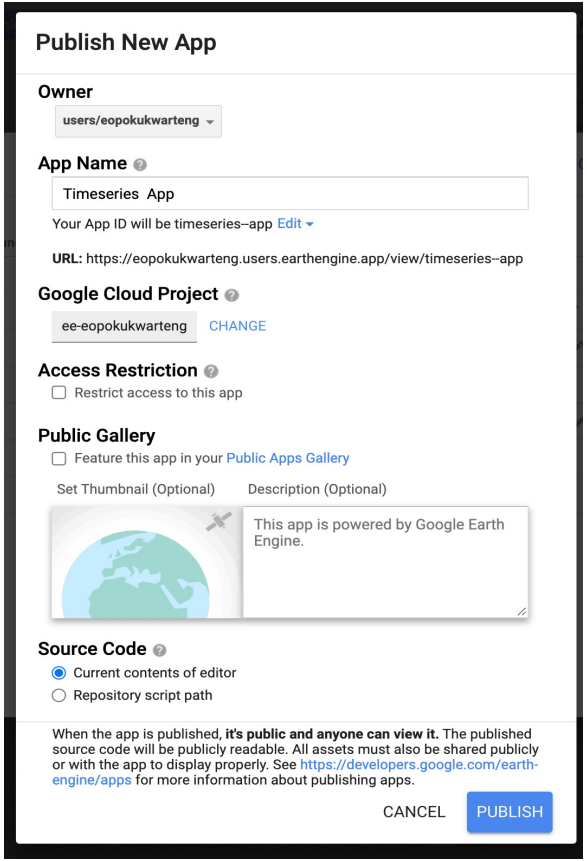
Publishing your App - 1

- To publish an App from the Code Editor:
  - First load the script that you want to make into an App
  - Open the App Management panel, which you can access by clicking the **Apps** button above the script section in the Code Editor
  - Click on the **NEW APP** button
  - In the dialog, choose an App name, select a Google Cloud Project, and specify the location of the App's source code



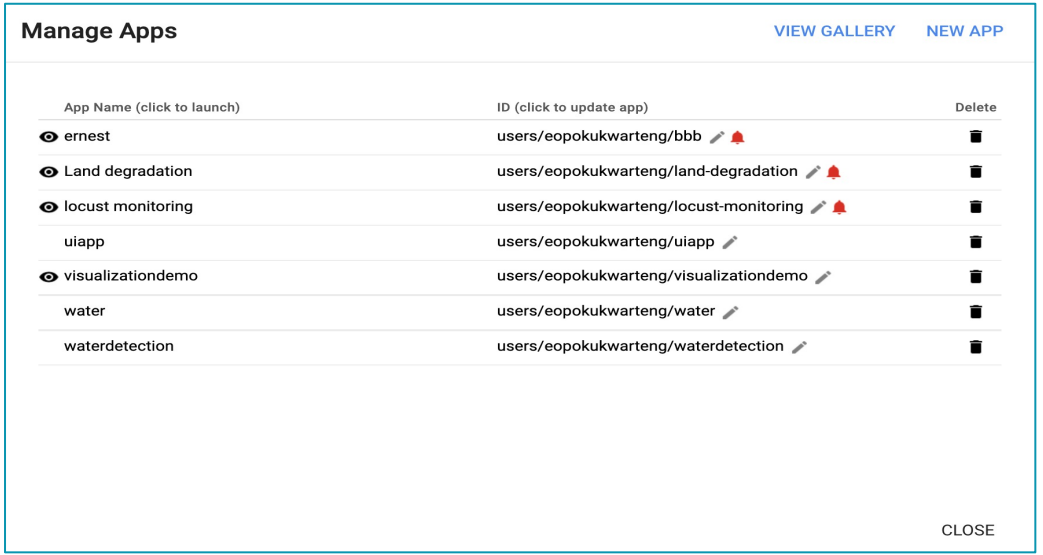
Publishing your App - 2

- When all fields are filled out and validated, the PUBLISH button will be enabled
- Click the button to complete publishing



Managing your Apps

- To manage an App from the Code Editor:
  - Open the App Management panel by clicking the Apps button above the script section in the Code Editor.
  - Update the App's configuration
  - Or delete the App



Google Earth Engine

Thank You

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Accra, Ghana
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