# NoR Sponsorship

Request ID: 3404XV
Project type: Research
Project Title: Monitoring of coastal water quality in the coastal region of Singapore
Name: Pak Hui Ying
Work category: Student
Email address: pakh0001@e.ntu.edu.sg
Project organisation: Nanyang Environment and Water Research Institute (NEWRI), Nanyang Technological University

The objective(s) of this project is/are to

- Monitor coastal turbidity in land reclamation sites around Singapore for Environmental Monitoring and Management Planning (EMMP), which is one of the measures to ensure that the coastal environment is protected from the destructive actions of land reclamation operations
- Create a coastal turbidity model to predict coastal turbidity from imagery using in-situ turbidity data and high-resolution PlanetScope imagery share the results with our stakeholders, the Maritime Ports Authority of Singapore (MPA), to better help with decision making and ensure that turbidity concentration are within permissible limits, and to avoid transboundary pollution

# Usage of Catalog API

```
start_date = "2022-11-21"
end_date = "2022-11-21"
json_request = {
    "input": {
    "bounds": {
      "bbox": bbox,
      'properties': {
          'crs': 'http://www.opengis.net/def/crs/OGC/1.3/CRS84'
      }
    },
    "data": [
      {
        "dataFilter": {
          "timeRange": {
            "from": f"{start_date}T00:00:00Z",
            "to": f"{end_date}T23:59:59Z"
          }
        },
        "type": "sentinel-2-l2a"
      }
    ]
  },
  "output": {
    "width": 512,
    "height": 200,
    "responses": [
      {
        "identifier": "default",
        "format": {
          "type": "image/jpeg"
        }
      }
    ]
  },
  "evalscript": evalscript
}
```

- Instructions to obtain *CLIENT_ID* and *CLIENT_SECRET* are clearly detailed in the documentation
- Python was used as the main platform for interacting with SentinelHub and accessing data
- Searching for available data was made convenient with Catalog API
- Properties such as datetime, platform, instruments, GSD, cloud cover, bands and bbox could be accessed
- Custom scripts can also be written with the evalscript parameter to perform fast computation on the required bands

# Acquisition of Sentinel-2 MSI with Sentinel Hub

- Using the Processing API, all the available scenes can be searched using the Catalog Service API
- Other search parameters can be specified such as time range
- An RGB image from Sentinel-2 was obtained for our study area, located in the western tip of Singapore

# In-situ measurements and image acquisition

- In-situ measurements of turbidity were conducted using a water quality parameter probe mounted on a vessel that traverse the study area, located at the western tip of Singapore
- The in-situ measurements will then be used to calibrate semi-analytical and machine learning algorithms for turbidity retrieval

# Future progress

- Multispectral and hyperspectral sensors were flown over the study site using Unmanned-Aerial Vehicles (UAVs) to acquire multispectral and hyperspectral high-resolution imagery
- Progress is still currently being made to additionally acquire PlanetScope imagery over the study site
- We aim to compare the imagery and cross-validate the reflectance products across multi-sensor and multi-platform, and assess the effectiveness of each product for turbidity retrieval
- No papers have been published yet from this endeavour, although the Catalogue API has been observed to provide a convenient tool for accessing satellite imagery
- We would like to thank the Network of Resources Initiative for sponsoring the cloud services via Sentinel-Hub, and we will reference NoR if there are any papers published using the data acquired through this sponsorship