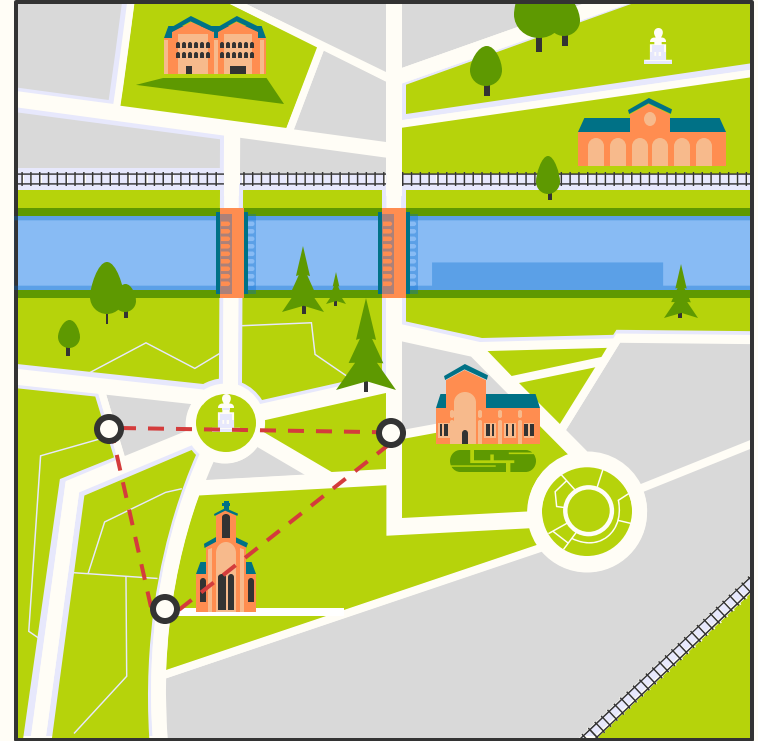




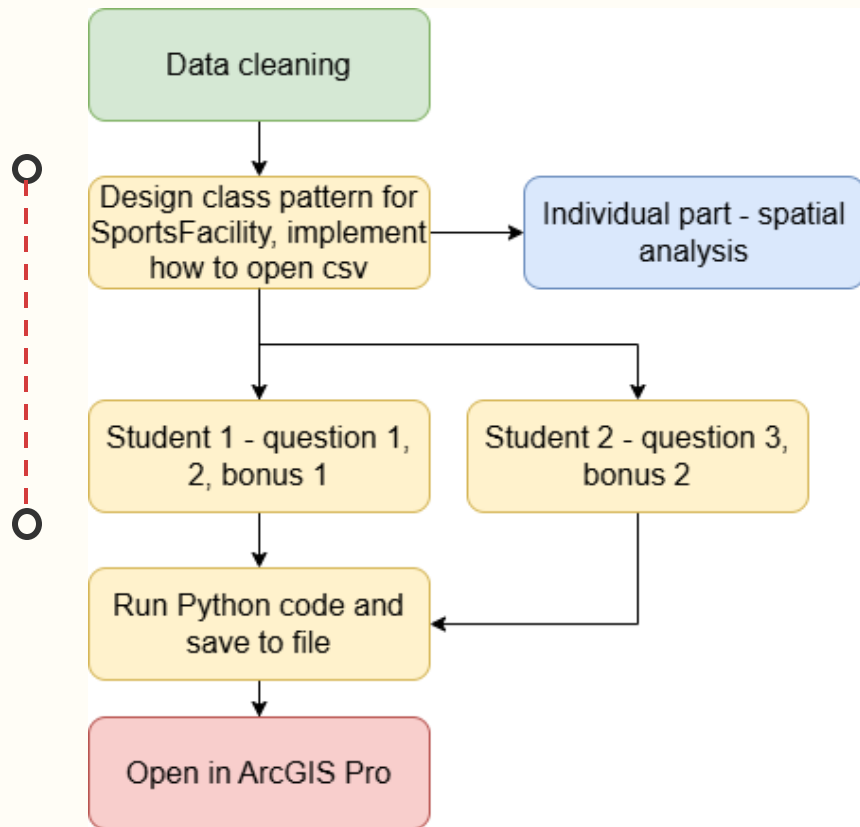
GIS Engineering

Group 1

██████████ 22 ████████ D (Student 1)
Waterdragen 24 ████████ D (Student 2)



Workflow



For data cleaning, we...

- **Removed** columns with Chinese characters
- **Removed** the columns regarding time, contact information, or very long strings
- **Added** columns for District where necessary. For example, the country parks do not have districts.

Design class structure and how to open csv files

Purpose: for **synchronized** group collaboration

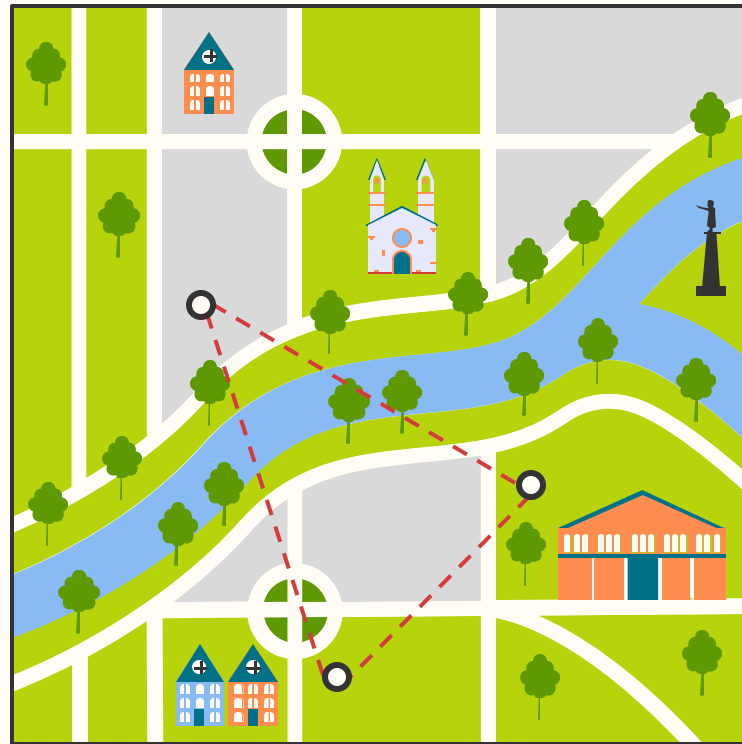
```
@dataclass
class SportFacility:
    gmid: str
    dataset: str
    dataset_type: int
    fac_name: str
    addr: str | None
    district: str | None
    northing: float
    easting: float
    lat: float
    lon: float
```

```
def read_all_csvs() -> list[SportFacility]:
    """
    :return: a list merging all the csv files in the directory
    """
    table = []
    for filename in FileNames:
        table.extend(read_csv(filename))
    return table

def read_csv(filename) -> list[SportFacility]:
    """
    :param filename: path to the csv
    :return: a list of csv rows
    """
    with open(filename, encoding='utf-8') as f:
        csv_reader = csv.reader(f)
        next(csv_reader) # skip the header
        return [SportFacility.from_csv_row(row) for row in csv_reader]
```

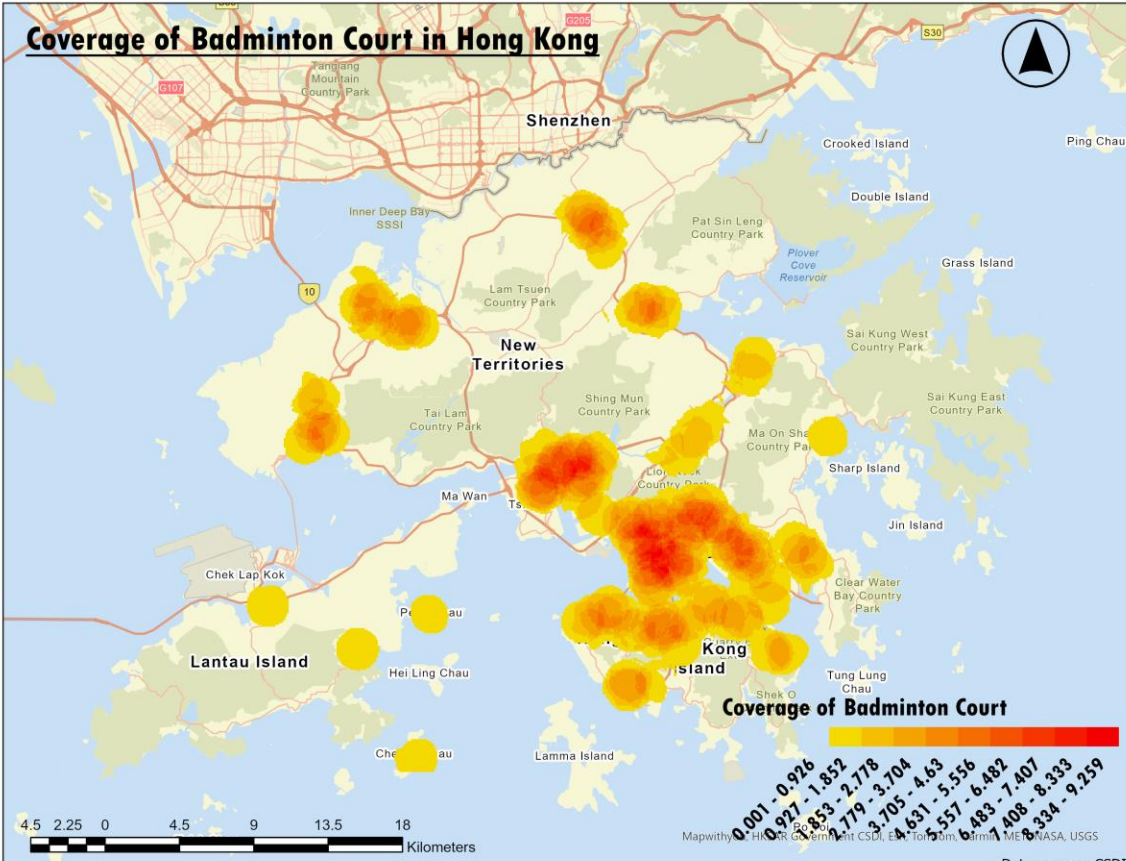


Questions





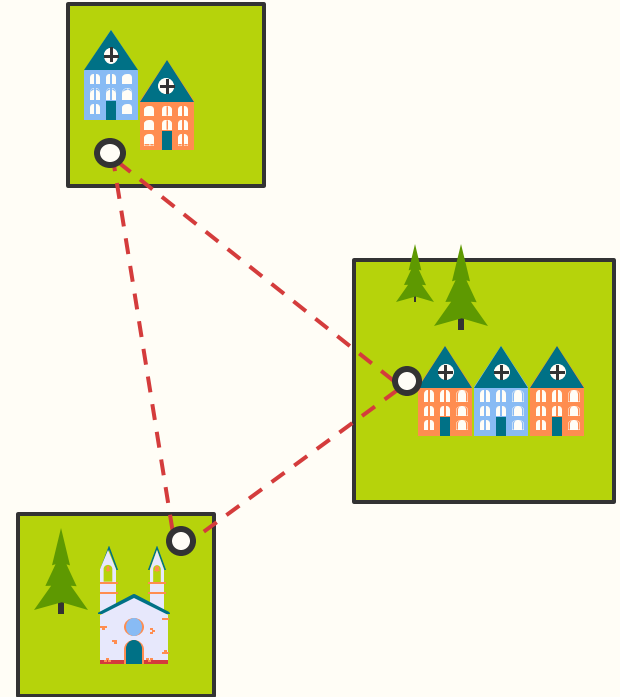
Question 1 – Areas in HK with good coverage of different facilities



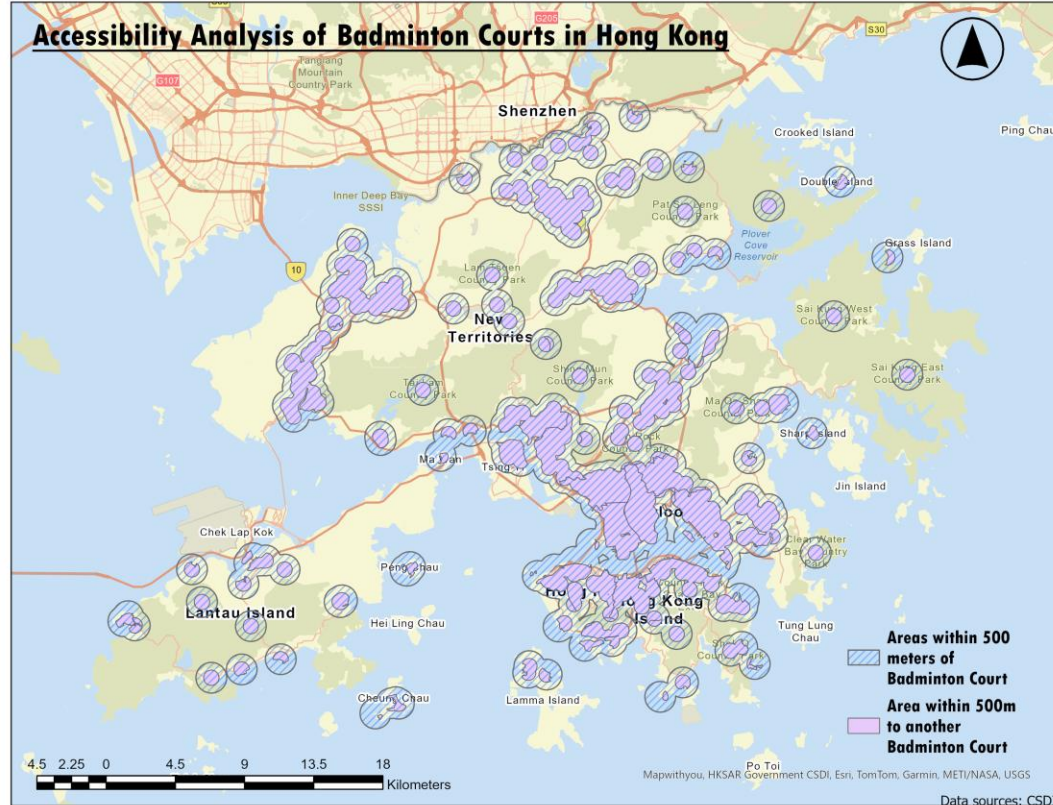
Question 1- Areas in HK with good coverage of different facilities

Spatial analysis used

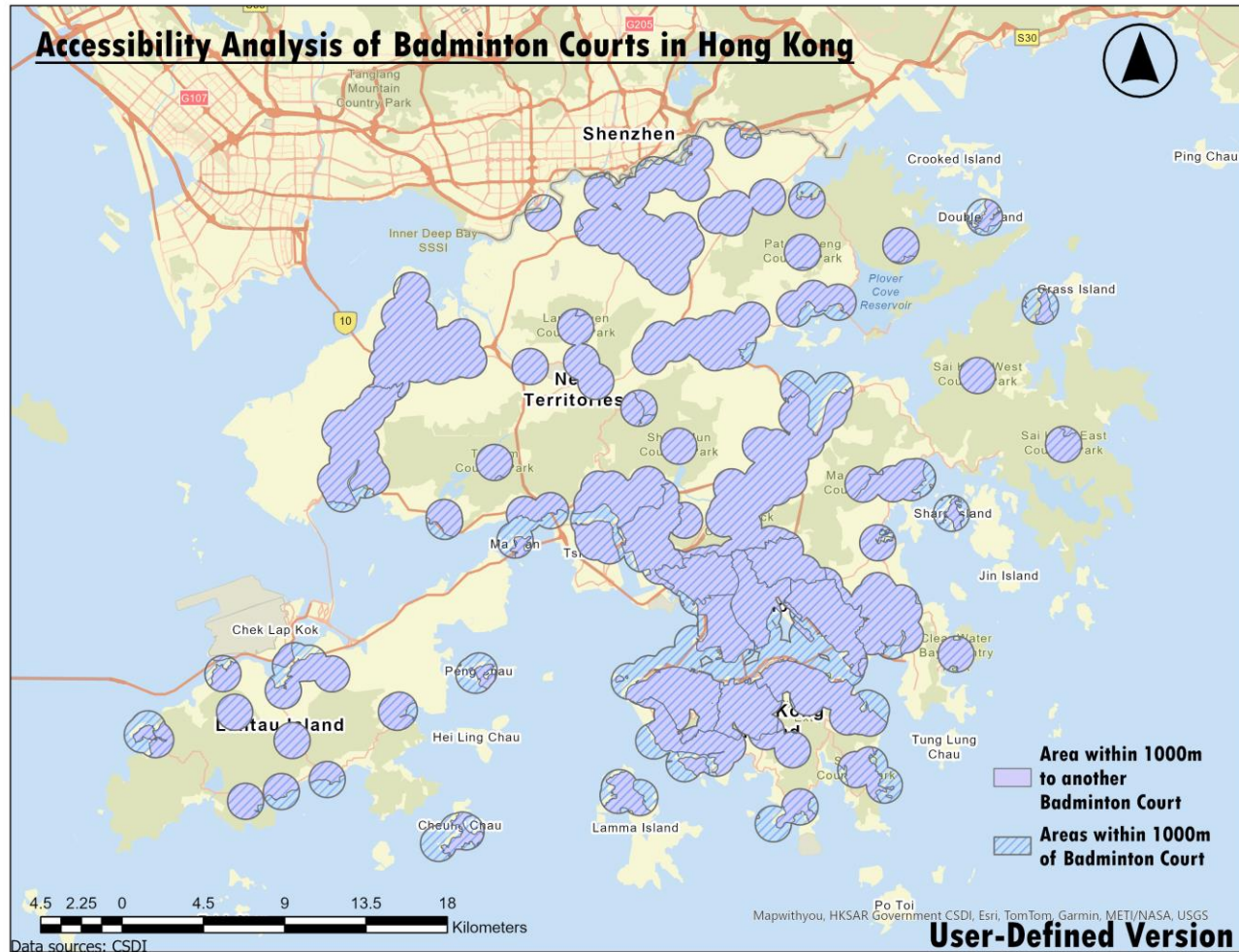
- **Point_Density** to calculate the density of point features (sports facilities)
- **arcpy.management**
- To filter the input feature class to include only points matching a specific facility



Question 2 – Areas in HK to a facility type within walking distance



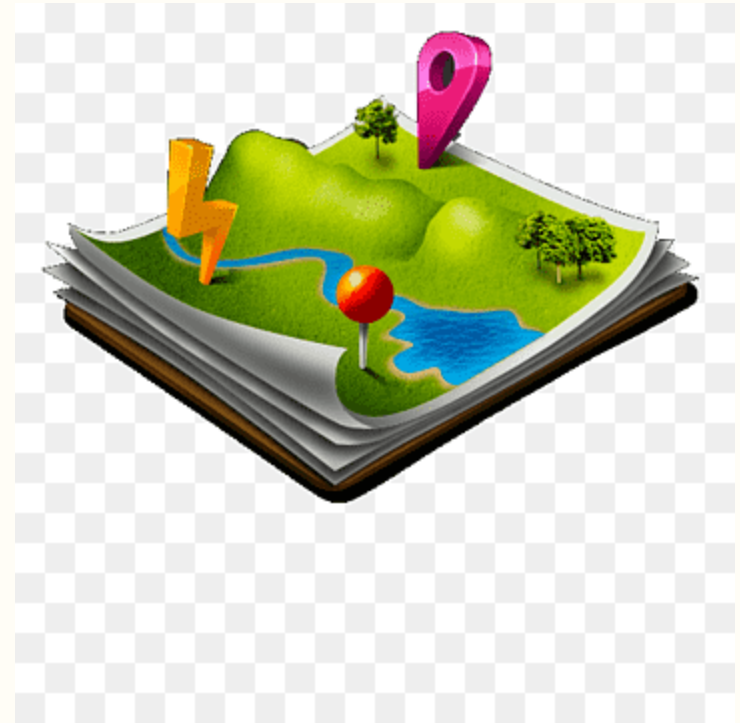
Accessibility Analysis of Badminton Courts in Hong Kong



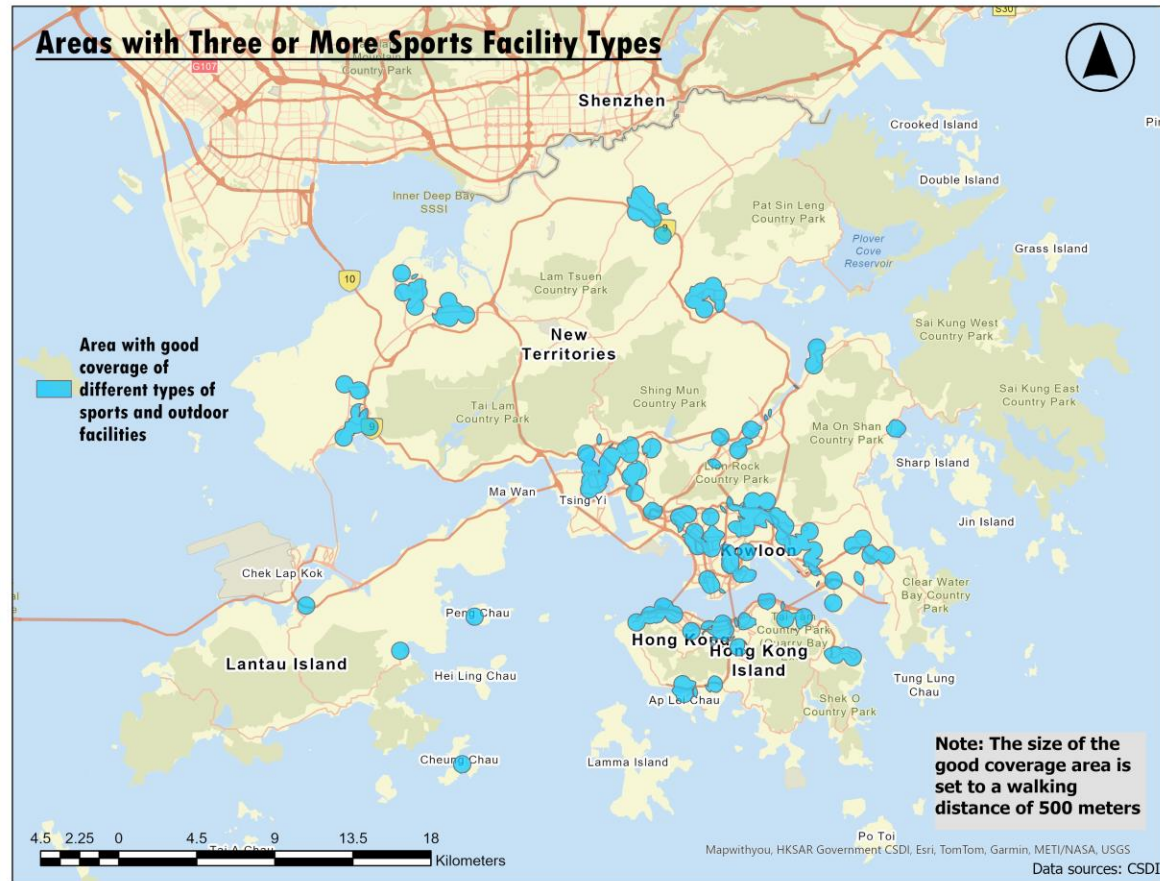
Question 2- Areas in HK to a facility type within walking distance

Spatial analysis used

- **Buffer** to create buffer polygons around point features (sports facilities) to represent areas within a specified distance
- **Intersect**
 - To calculate how much of each district is covered by facility buffers to each other



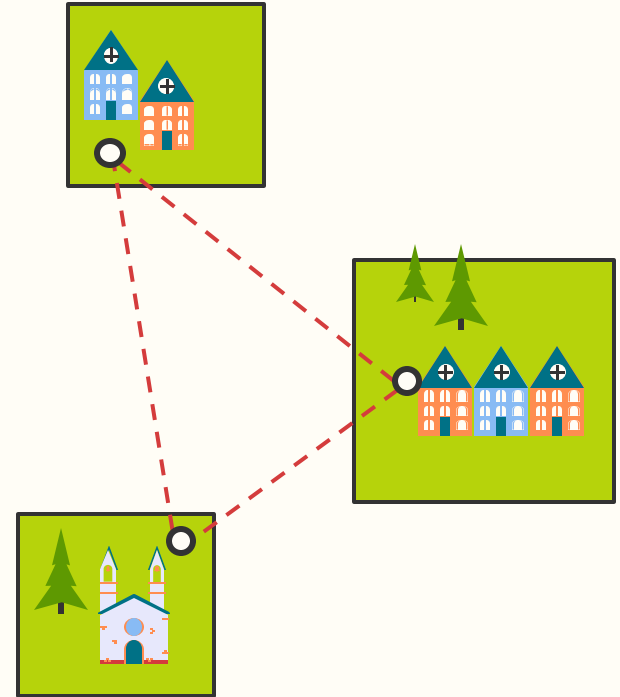
Question 3 - Areas with 3 types of sport facilities (walkable distance 500m)



Question 3 - Areas with 3 types of sport facilities

Spatial analysis used

- **Buffer_analysis** for each point
- **Intersect_analysis** for each 3 combination
- **Merge** into one shape
- **Dissolve** sub-shapes into one shape



Question 3 - Areas with 3 types of sport facilities

Algorithm and others

- Used **multiprocessing** to process combinations of **Intersect_analysis**
- Set the walkable distance (buffer distance) = **500m**



Bonus question 1- facilities near PolyU



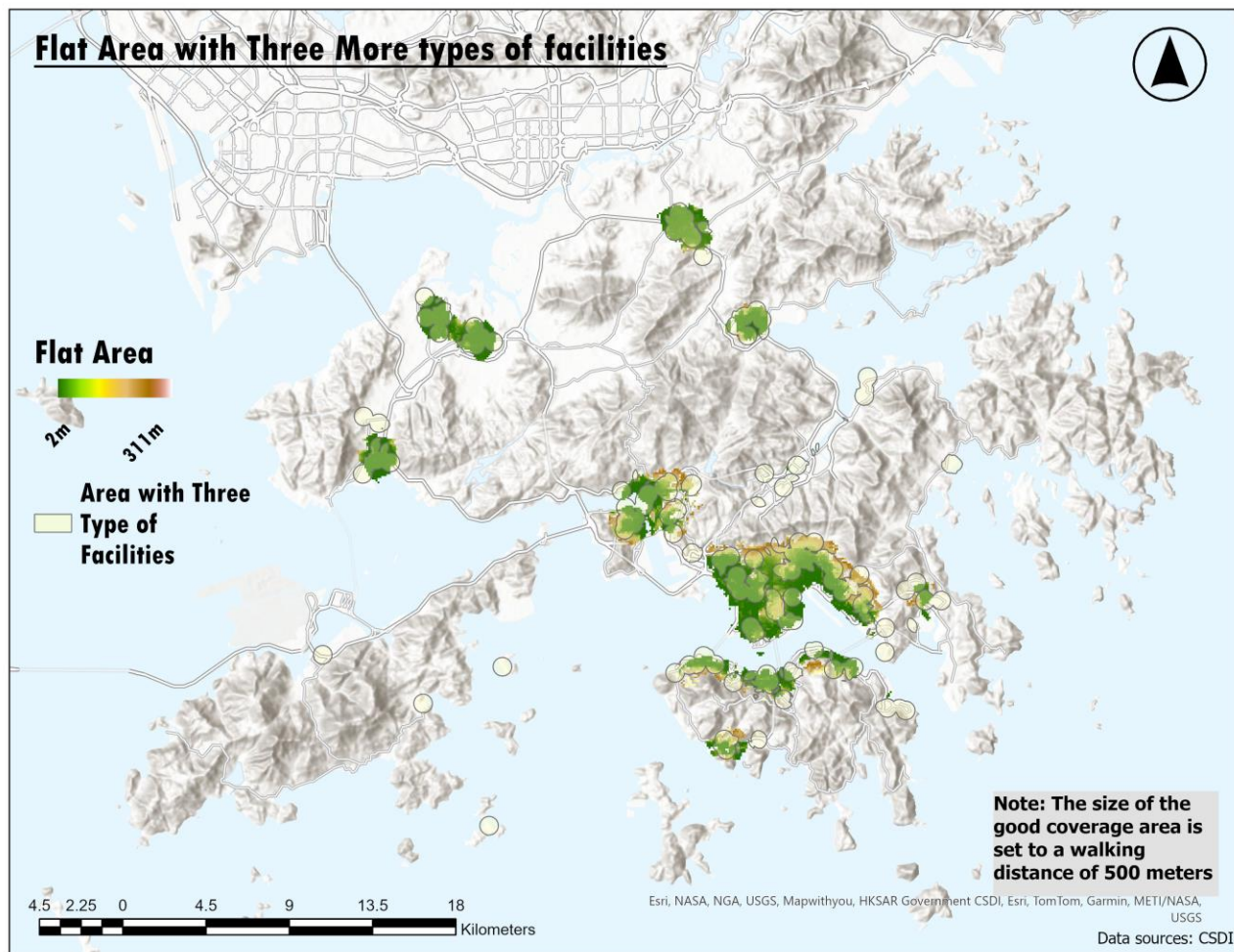
Bonus question 1- facilities near PolyU

Spatial analysis used

- **Geopy.distance.geodesic**
for finding sports facilities within
a walkable distance
- -calculating the geodesic
distance between PolyU's
coordinate and each facility's
coordinates.



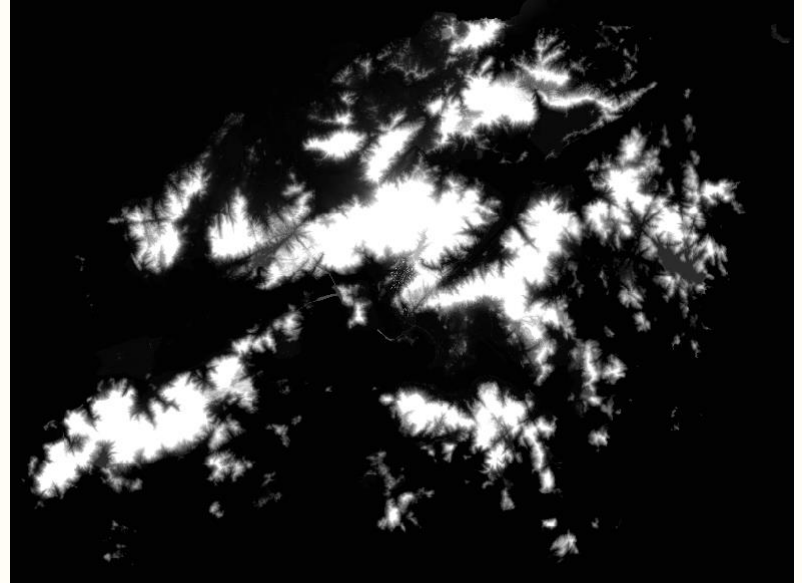
Bonus question 2 – flat land with >3 types of facilities



Bonus Question 2: Flat land with 4 types of facilities

Data source

- CSDI Portal – Whole Hong Kong DTM
- Elevation of Hong Kong



Bonus Question 2: Flat land with 4 types of facilities

Spatial analysis

- **NbrCircle** for sampling SD elevation within 100m
- **PointDensity** for heatmap
- **Con** for both $SD < 20$ meters and density (facilities) > 3



Challenges

- 2 people one drive ok, more people → might need Github
- ArcGIS pro takes **long time** to run and can fail, reducing productivity (mitigation in Q3: multiprocessing)
- Cannot visualize **intermediate results** (mitigation method: use Jupiter Notebook or save temporary files and view in ArcGIS)

Our findings

- Correlation between flat land, density of facilities, and urban areas/new towns
 - o e.g. Kowloon, Hong Kong Island North, Tsuen Wan

○

Thanks!

Do you have any questions?

