Coursework Coversheet

School of Geography. FACULTY OF ENVIRONMENT

GEOG5403 Creative Coding for Urban Problems

Student ID	201776183 Haoming Han 201790263 Shenghang Yuan 201704726 Xia Zhao 201788996 Zhihao Zhang 201704189 Yihan Wang 201413609 Mengzhu He	Mark Less deduction (state reason) Final Mark	
Group Number	Group 3		
Assignment title	LEEDS mixed development project proposal		
Marker			

To improve your work for next time:
1.
2.
3.

Additional comments:

LEEDS mixed development project proposal

LS2 7BF Opportunities and challenges within 250 meters

Background on the topic

Goals and objectives

The reason why we chose this project is as the name suggests. It is a comprehensive project integrating residential and commercial community development. It is a vibrant community project with multi-directional development potential.

Geographical location advantage

- Diverse and Accessible Public Transportation
- Rich Commercial and Entertainment Options
- Comprehensive Community Services
- Green Spaces
- Improved Infrastructure and Connectivity
- Strategic Location with Diverse Housing and Commercial Amenities

Data sources and introduction

OpenStreetMap API	▪ Leeds_Areas_Distance.csv
Lecture	▪ leeds_council_planning_apps_centroids_stx_y.csv
Additional environment information	▪ https://my.martello.app/shared/3992fb69-1ce1-42cc-8cd9-695237667155.json

Leeds_Areas_Distance.csv

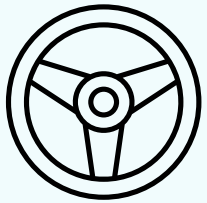
We take into account:

Shopping

Shop
Supermarket
Commercial street

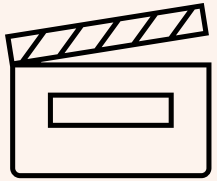
Traffic

Parking lots
Bus stop



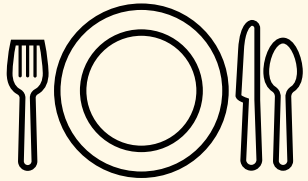
Entertainment

Sports centre
Theatre



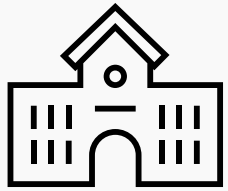
Food

Dining room
Cafe



Other

University
Government agency
Post office



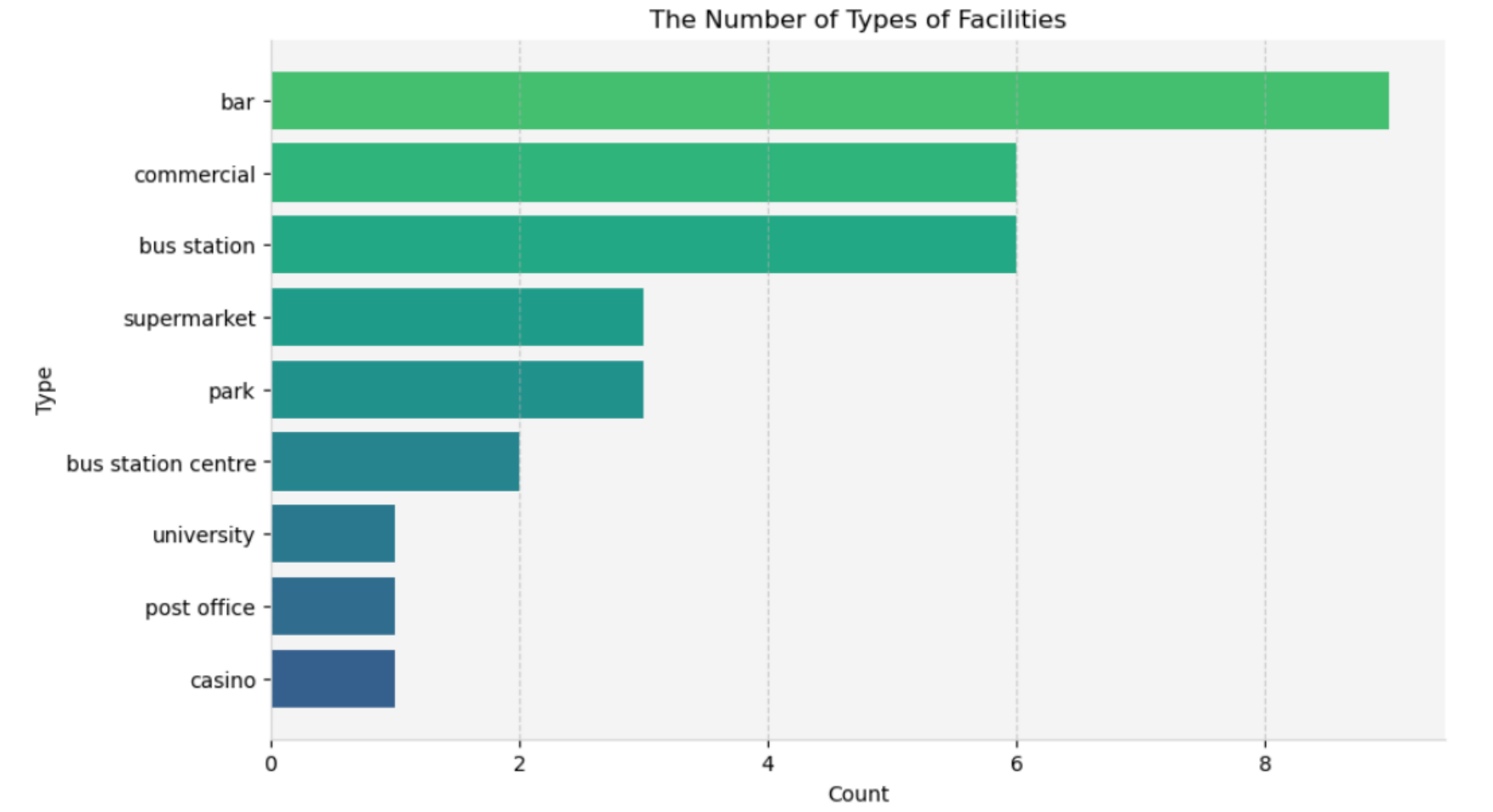
What are the main types chosen to judge project strengths and weaknesses?

Shopping convenience, transportation, recreational facilities, dining options and other social infrastructure such as universities, government agencies and post offices were taken into consideration when assessing the project's strengths and weaknesses.

Why consider these factors:

These factors jointly affect the quality of daily life of residents and the comprehensive development level of the region, providing a comprehensive and multi-dimensional evaluation basis for decision-making.

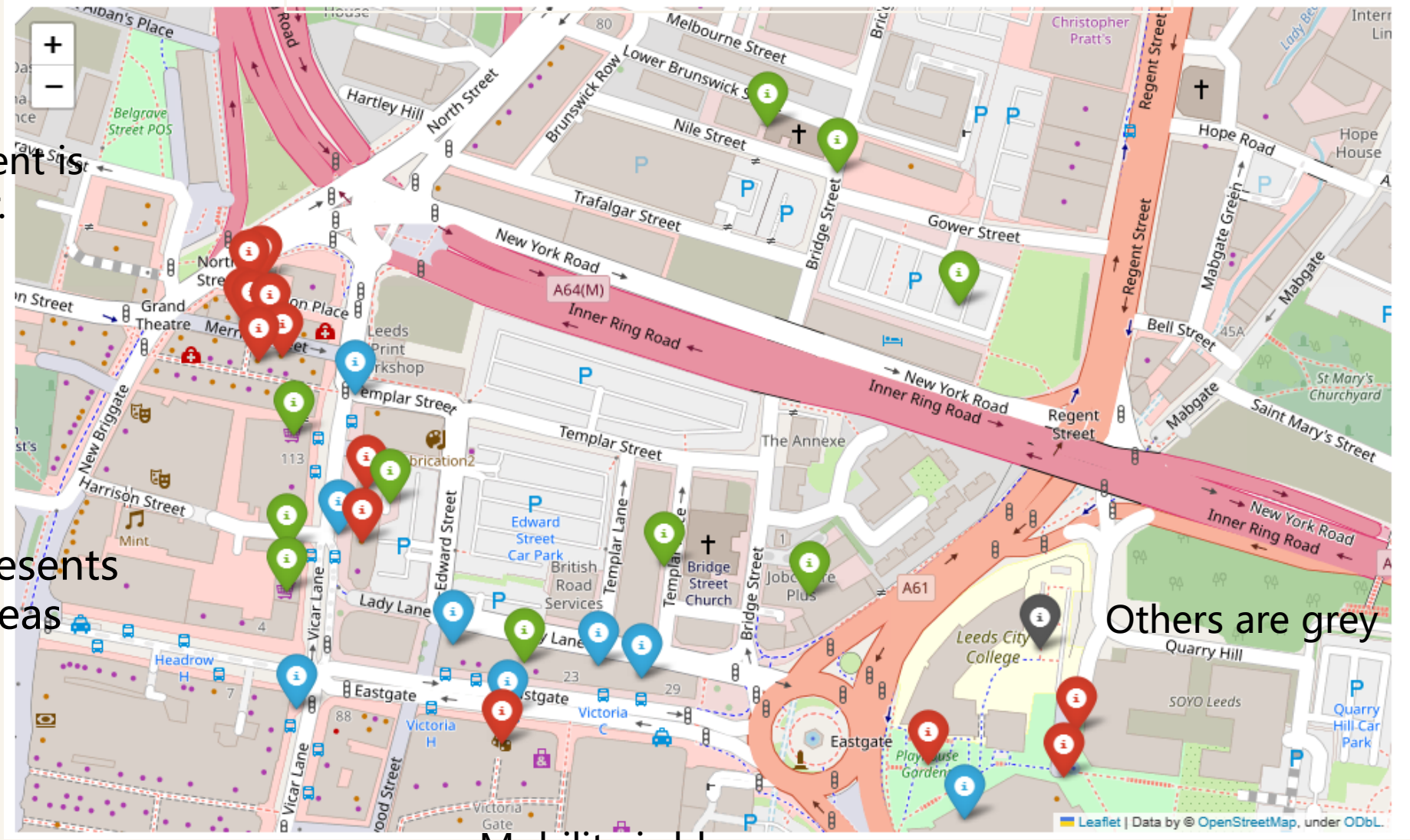
The Number of Types of Facilities



Existing supporting types/distribution within 250m

Entertainment is red, like bar.

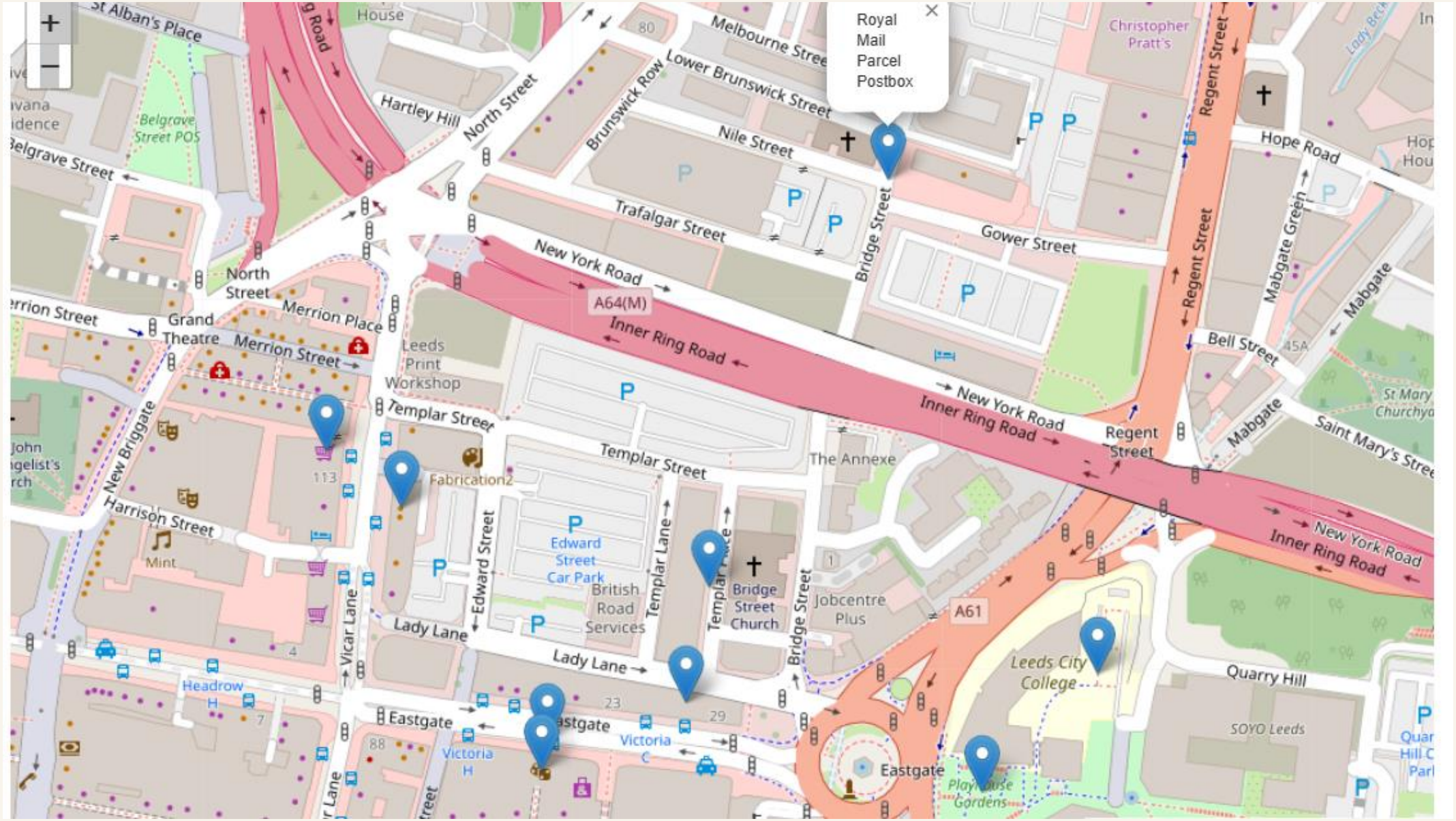
Green represents function areas



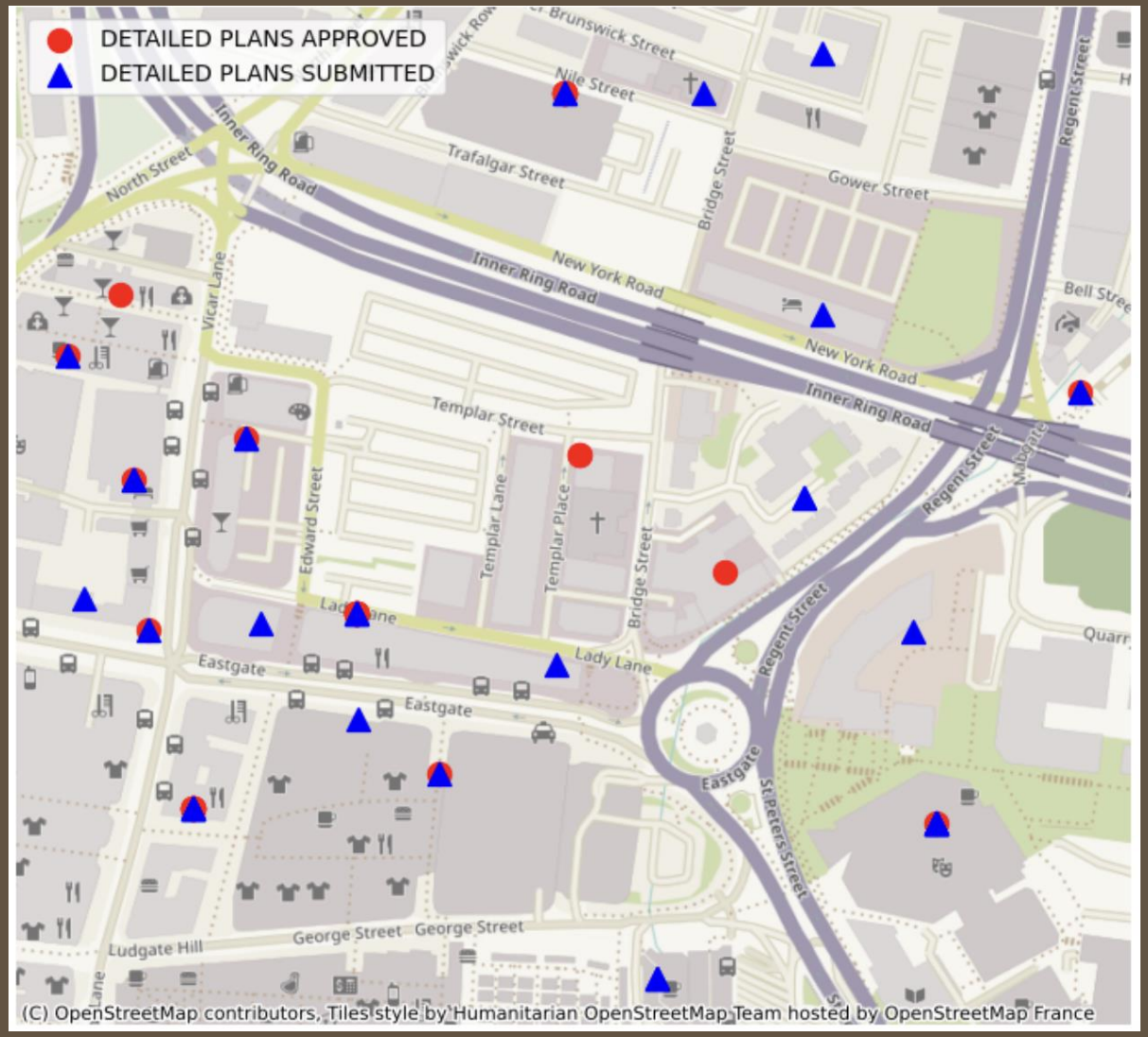
Others are grey

Mobility is blue, such as bus station 。

The nearest location and name for each category, such as the nearest post office



Type/distribution of proposed planned projects within 250m



Distribution of points

- **Approved Plans (Red Circles)**: These spots are ready for or already under development.
- **Submitted Plans (Blue Triangles)**: These areas are waiting for approval and are not yet in the development phase.
- **Infrastructure Focus**: Most activity is along main roads, indicating the use of existing infrastructure for development.
- **Phased Development**: The mix of different stages suggests development is planned in phases.
- **Public Amenities**: Open spaces on the map hint at plans for public amenities or green spaces.

Design concepts and strategies

- The proposed development consists of five residential towers, ranging from 13 to 31 storeys, with accompanying commercial space at ground level, including business units, business incubation space, cafes and retail space, as well as associated parking facilities. The project also includes extensive public and private open space, as well as other improvements to surrounding pedestrian and vehicular routes 。

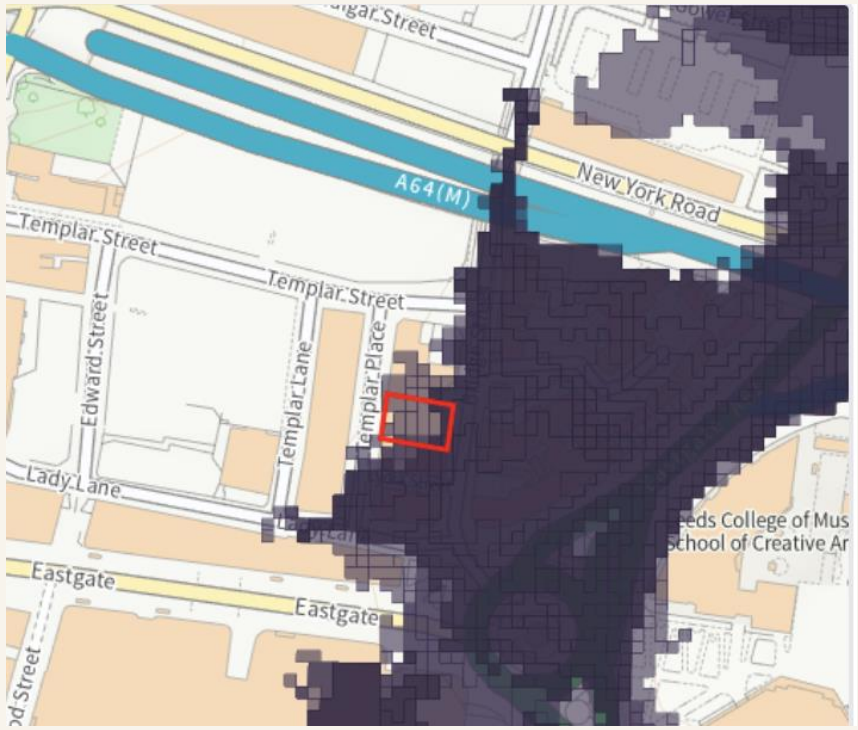
- The development offers a total of 678 residential units, including 883 square meters of ancillary amenity space, and 1,131 square meters of business/incubator units. In addition, there are 1,302 square meters of commercial units and 288 residential-only parking spaces, 61 of which have been reallocated from the Phase 1 hotel.

Site layout and floor plan

Environmental Considerations

Pluvial

Some flood hazards were identified which may present risk to property and possessions. Flood defences do not benefit this type of flooding.



Fluvial

Significant flood hazards were identified which may present serious risk to life, property and possesions.

Flood risk management and sustainable drainage systems(SuDS):

Foul Water Discharge: The development must not discharge foul water until a detailed foul drainage scheme, including future maintenance details, is implemented as approved by the Local Planning Authority. Confirmation from Yorkshire Water or another party for sewer access must be provided.

SuDS-based Drainage Scheme: Before development commences, a detailed Sustainable Urban Drainage System (SuDS) based on "The SUDS Manual (C753)" and local minimum standards must be approved. This includes design drawings, calculations, and investigative results that outline surface water drainage works, ensuring a maximum discharge rate and compliance with a previously outlined drainage strategy.

Interim and Temporary Drainage Measures: Details and a method statement for drainage measures during demolition and construction must be approved before development begins, including responsibility and maintenance of temporary systems to prevent off-site flooding and pollution.

Management of Non-Adopted Drainage Features: Prior to the first unit's occupation, details on the management, inspection, and maintenance of non-adopted drainage features must be provided, identifying responsible parties, funding, management, and a schedule for inspections and maintenance.

Methods

Q1-1

I am looking for a house suitable for me to live in. There is a project under planning and development in our city "Construction of five buildings ranging from 13 storeys to 31 storeys and consisting of up to 678 apartments (C3), residential amenity areas, commercial units (A1, A2, A3, A4, B1 and/or D2) and associated car parking; public realm and landscaping; access and servicing arrangements; and other associated works" The picture shows an introduction to this project

Q1-2

Lists in the txt file all ongoing planning projects within a 250m radius of the project planning scope. Please review the various planned projects in the txt file from the perspective of living life and convenience, etc., which are conducive to living conditions. Conduct analysis and summarize the existing advantages of infrastructure and potential residential pain points.

Q1-3

All existing supporting facilities within a 250m radius of the planning scope of this project are listed. Please analyse the various projects from the perspective of living and residence, and summarize the advantages in future life and residence.

Q1-4

Based on the introduction of the project, different types of planned projects within 250m, and the existing supporting facilities within 250m, please provide a detailed and fully considered publicity report to rental and sale buyers, and analyse the project advantages. benefits and potential risks,

Reports for renting/buying a house

Rooftop amusement park and landscaping design

Advantages of the Proposed Development:

Diverse Housing Options:
Commercial Amenities
Open Spaces and Recreational Facilities
Improved Infrastructure and Connectivity
Mix of Uses

Strategic Recommendations:

Differentiation Strategy
Risk Mitigation
Collaborative Partnerships
International Marketing

Potential Risks and Considerations:

Market Saturation
Environmental Challenges
Regulatory Hurdles

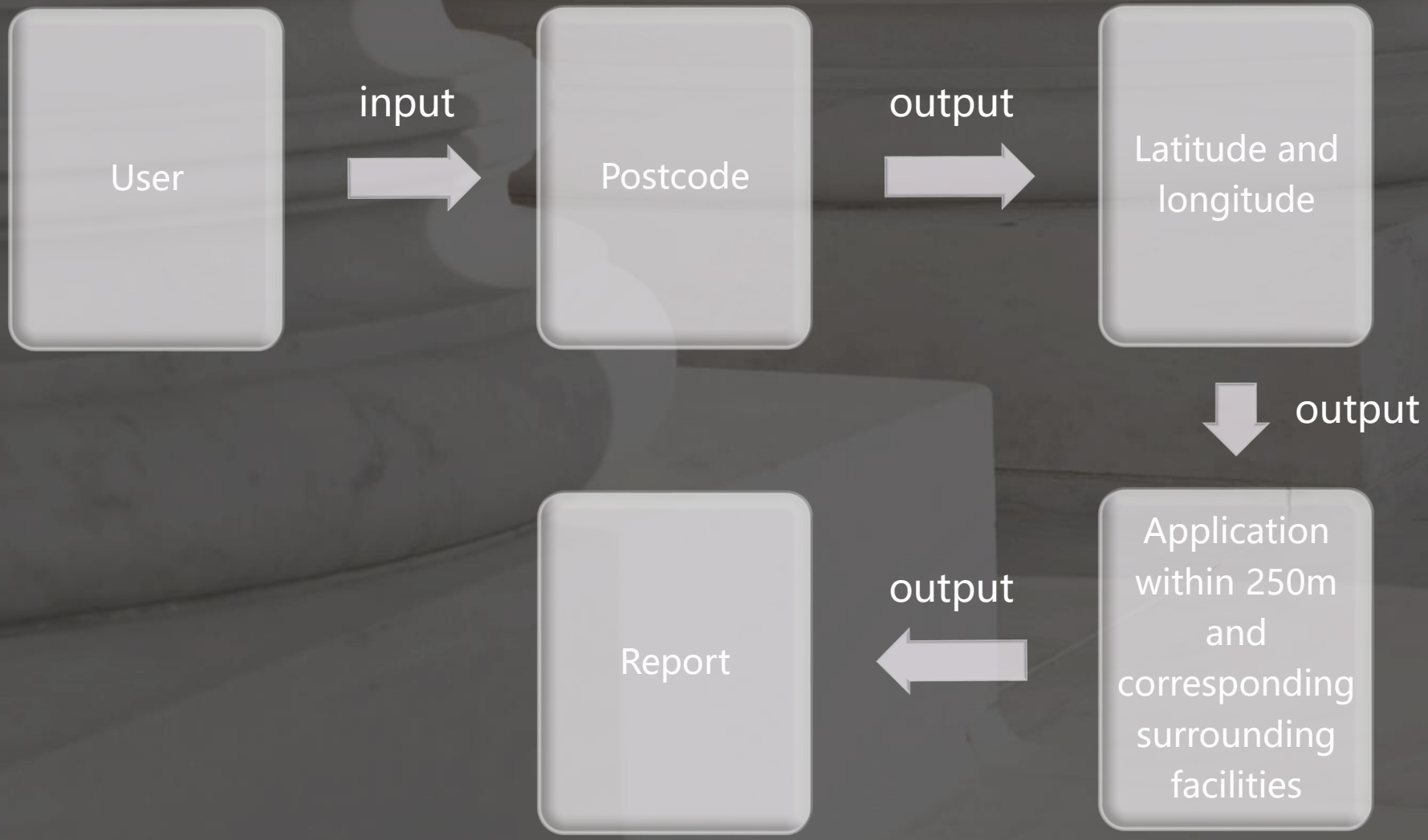
Benefits for Different Rental Buyer Groups:

Young Professionals
Families
Students

Reports for developers

- **Project implementation,:** Despite facing potential risks such as environmental pollution, flood risks, radon gas impacts and climate change, corresponding mitigation measures have been put in place to ensure project feasibility.
- **Project Location and Attraction:** Located in an area rich in facilities, it provides diverse residential and commercial space, emphasizing the advantages of convenient transportation, commercial and entertainment opportunities, basic services and green space, attracting different tenants and buyers.
- **Project feasibility and risk management:** Despite facing potential risks such as environmental pollution, flood risks, radon gas impacts and climate change, corresponding mitigation measures have been put in place to ensure project feasibility.
- **Strategic Recommendations and Objectives:** Recommendations include strengthening market positioning, flood protection, working with planning authorities, providing radon testing, and highlighting transportation and location advantages, with the aim of achieving commercial success and a positive contribution to the community environment.

Introduction to the optional search system



Limitation and future work

Future work:

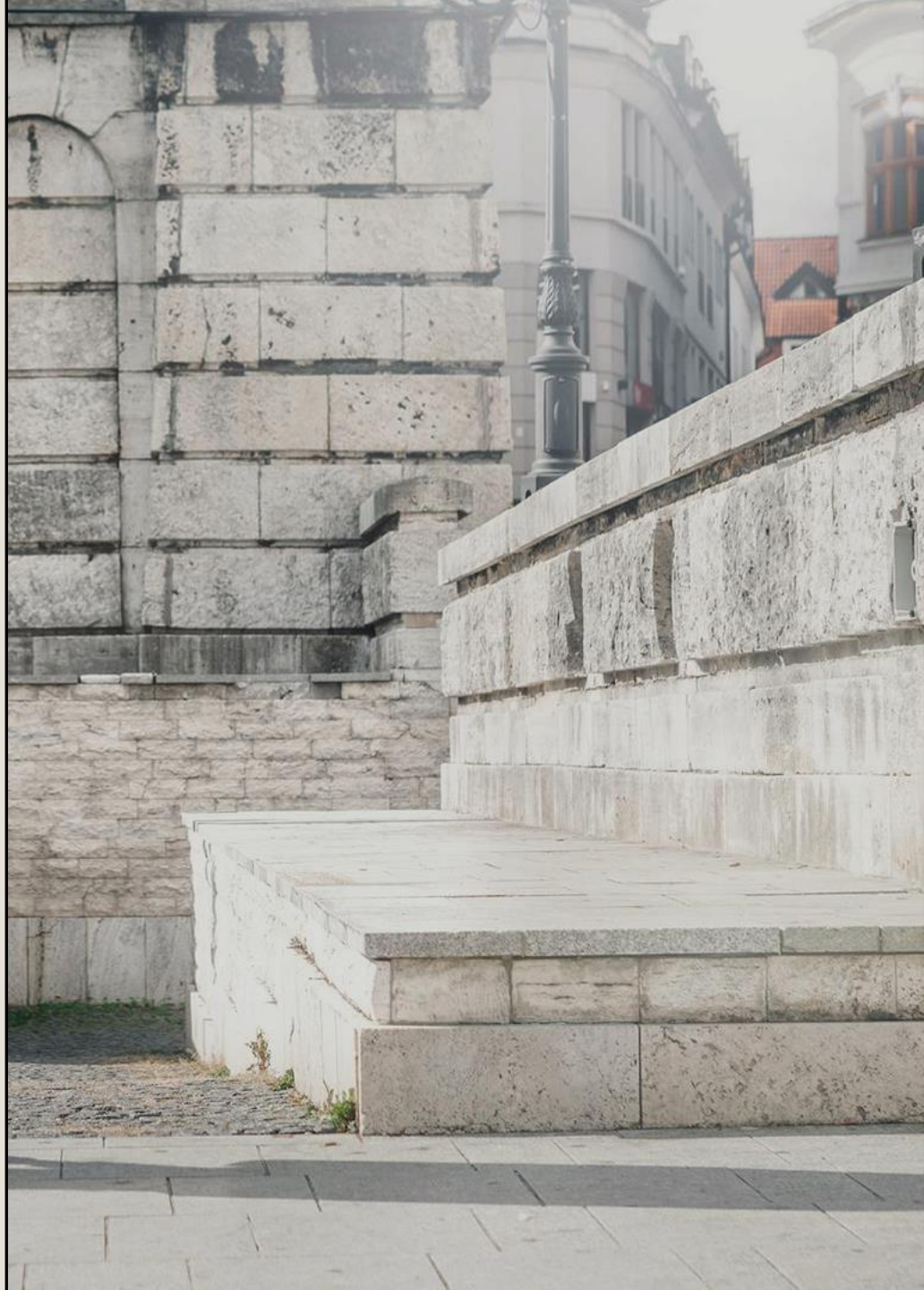
- In future work, we can add smart data to help the intermediary further analyze what type of people this place is suitable for, and then accurately market to this person.

Limitation:

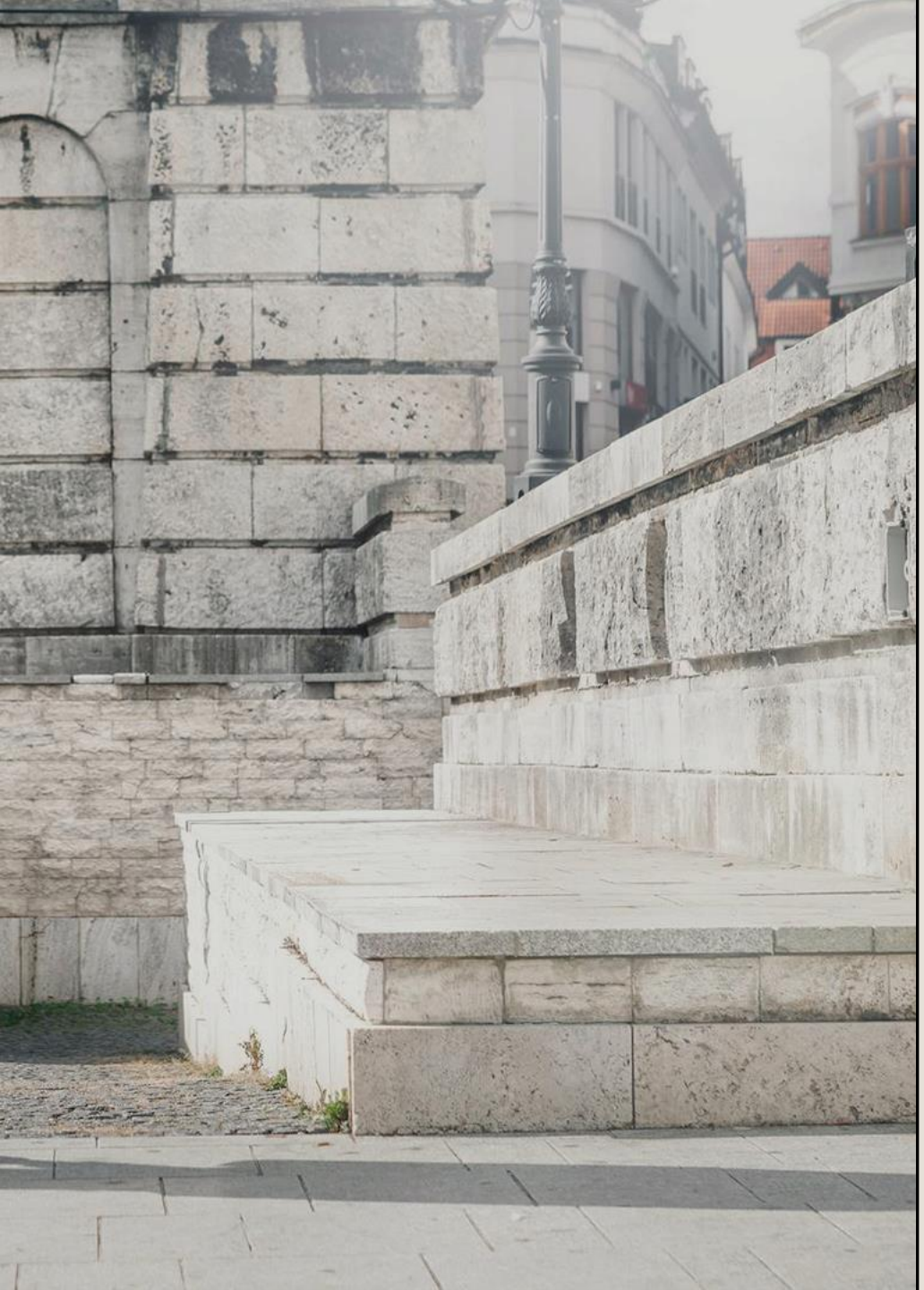
- Incomplete consideration of background data, such as population structure, age composition, and identity characteristics.
- The distance statistics of various facilities are relatively rough. We only used the coordinates from the center point to the center point to calculate the distance, but in fact the actual distance may not be accurate enough.

reference

- Mohda, T., Sirata, K.H., Saraf, M.H.M., Bazlina, I., Jumadia, N. and Rodib, W.N.W., 2014, May. Housing Rental Expenses of Non-Resident Students in UiTM. In *International Conference on Innovation and Technology for Sustainable Built Environment. Ipoh, Malaysia*.
- Surakhunthot, B. and Limpsurapong, C., 2019. The Factors Affecting The Decision to Rent Private Dormitory of Naresuan University, Thailand. In *INTERNATIONAL ACADEMIC MULTIDISCIPLINARY RESEARCH CONFERENCE IN SWITZERL AND 2019* (pp. 124-134).
- *Cohen, D., 2023. Preferences for rent control: Between political geography and political economy. Politische Vierteljahresschrift, 64(1), pp.183-205.*
- *Sobieraj, J., Bryx, M. and Metelski, D., 2023. Preferences of Young Polish Renters: Findings from the Mediation Analysis. Buildings, 13(4), p.920.*
- *https://www.tandfonline.com/doi/full/10.1080/09599910600800484?scroll=top&needAccess=true*
- *Peter Fisher & Simon Robson (2006) The Perception and Management of Risk in UK Office Property Development, Journal of Property Research, 23:2, 135-161, DOI: 10.1080/09599910600800484*
- *https://www.tandfonline.com/doi/full/10.1080/19498276.2022.2095699?src=recsys*
- *Stephen T. Buckman & Saeideh Sobhaninia (2022) The Impact of Sea-Level Flooding on the Real Estate Development Community in Charleston SC: Results of a ULI Member Survey, Journal of Sustainable Real Estate, 14:1, 4-20, DOI: 10.1080/19498276.2022.2095699*
- *https://www.tandfonline.com/doi/full/10.1080/02697450601173355?casa_token=ncUENy5IRM8AAAAA:-O3UlRguhv4O07LUeDXLoqL9_pOWdg4BCkqokTuyJ2lYzDHisL3Uw8sb-IPel1v-TBjo78fsAgv60J4&casa_token=HEUbDobjR18AAAAA:JVc2fhBHnJ-ggWg_Q_mfbYzwtfopSH3yKHx7UU-hno5pc4k8P5WOJTzuot7CzD9w97PtqkINJVyjgw0*



	Data collection	Read literature	Coding	Slide production	Report Production	Presentation
Mengzhu He	√	√	√		√	
Yihan Wang	√	√		√	√	
Shenghang Yuan	√	√	√		√	
Zhihao Zhang	√	√	√		√	
Haoming Han	√			√	√	√
Xia Zhao	√	√			√	√



THANK YOU!

In [105]:
```
import os
import openai
import pandas as pd
from pyproj import Transformer
import geopandas as gpd
from shapely.geometry import Point
import osmnx as ox
import numpy as np
import matplotlib.pyplot as plt
from shapely import wkt
import contextily as ctx
import folium
import requests
import pandas as pd
import ipywidgets as widgets
from IPython.display import display, clear_output
from ipywidgets import Button, Layout
from geopandas import GeoDataFrame
```

In [2]:
```
# Configure OSMnx
ox.config(use_cache=True, log_console=True)

place = "Leeds, United Kingdom"

tags = { 'shop':'supermarket', # Market
        'landuse':'commercial', # Market
        'amenity':['university','college','school'], # Education
        'amenity':['restaurant'], # Foodservice
        'amenity':['cinema','theatre','bar','casino'],# Leisure
        'leisure':['park','fitness_centre']# Leisure
       }

areas = ox.geometries_from_place(place,tags)

areas['centroid'] = areas.centroid
areas['longitude'] = areas['centroid'].x
areas['latitude'] = areas['centroid'].y

areas.to_csv('Leeds_areas.csv')
```

```
C:\Users\111\AppData\Local\Temp\ipykernel_5804\1815599640.py:2: FutureWarning: The
`utils.config` function is deprecated and will be removed in the v2.0.0 release. I
nstead, use the `settings` module directly to configure a global setting's value.
For example, `ox.settings.log_console=True`.
  ox.config(use_cache=True, log_console=True)
C:\Users\111\AppData\Local\Temp\ipykernel_5804\1815599640.py:14: FutureWarning: Th
e `geometries` module and `geometries_from_X` functions have been renamed the `fea
tures` module and `features_from_X` functions. Use these instead. The `geometries`
module and function names are deprecated and will be removed in the v2.0.0 releas
e.
  areas = ox.geometries_from_place(place,tags)
C:\Users\111\AppData\Local\Temp\ipykernel_5804\1815599640.py:16: UserWarning: Geom
etry is in a geographic CRS. Results from 'centroid' are likely incorrect. Use 'Ge
oSeries.to_crs()' to re-project geometries to a projected CRS before this operatio
n.

  areas['centroid'] = areas.centroid
```

In [3]:
```
application=pd.read_csv('leeds_council_planning_apps_centroids_stx_y.csv')
```

In [4]:
```
application.head()
```

Out[4]:

	id	planning_id	reference	authority	proposal	stage	update_date	site
0	4705506	15794514	23/07592/FU	Leeds Council	Change of use from C3 Dwelling to C4 HMO use.	DETAILED PLANS SUBMITTED	2024-02-04 00:00:00.000	Cha
1	4705512	15794520	24/00386/CLP	Leeds Council	Certificate of Proposed Lawful Development for...	DETAILED PLANS SUBMITTED	2024-02-04 00:00:00.000	Cl
2	4705522	15794530	24/00401/FU	Leeds Council	Enlargement of bay window to front	DETAILED PLANS SUBMITTED	2024-02-04 00:00:00.000	Pu
3	4705528	15794536	24/00287/FU	Leeds Council	Dormer window to front	DETAILED PLANS SUBMITTED	2024-02-04 00:00:00.000	8 I
4	4705531	15794539	24/00001/FU	Leeds Council	Erection of residential development with assoc...	DETAILED PLANS SUBMITTED	2024-02-04 00:00:00.000	La S A6

5 rows × 21 columns

In [5]:
```
application.describe()
```

Out[5]:

	id	planning_id	mnb_end_date	easting	northing
count	2.572900e+04	2.572900e+04	0.0	25729.000000	25729.000000
mean	3.442382e+06	1.471738e+07	NaN	429739.679567	436317.203876
std	6.867421e+05	6.561250e+05	NaN	6915.341093	7683.837503
min	2.080754e+06	1.208832e+07	NaN	356777.914371	102715.200954
25%	2.906633e+06	1.421515e+07	NaN	424915.144227	433292.477187
50%	3.420154e+06	1.474030e+07	NaN	429595.810930	436418.814732
75%	3.945811e+06	1.526555e+07	NaN	433506.801082	439706.365531
max	4.769027e+06	1.582744e+07	NaN	615920.358704	557751.445841

In [6]:
```
application.groupby('stage').size()
```

Out[6]:
```
stage
DETAILED PLANS APPROVED     15369
DETAILED PLANS SUBMITTED     6823
OTHER                          45
OUTLINE PLANS APPROVED         57
OUTLINE PLANS SUBMITTED        19
REFUSED                      2289
WITHDRAWN                    1127
dtype: int64
```

In [7]:
```
# REFUSED; WITHDRAWN
application=application[['planning_id','proposal','stage','join_postcode','easting','

application = application[(application['stage'] != 'REFUSED') & (application['stage'

application=application[application['join_postcode'].str.len()>=7]

application = application.dropna()

application = application.drop_duplicates()

application.head()
```

Out[7]:

	planning_id	proposal	stage	join_postcode	easting	northing
0	15794514	Change of use from C3 Dwelling to C4 HMO use.	DETAILED PLANS SUBMITTED	LS7 4ED	431350.327551	435595.931623
1	15794520	Certificate of Proposed Lawful Development for...	DETAILED PLANS SUBMITTED	LS21 2BU	420508.402028	446606.189844
2	15794530	Enlargement of bay window to front	DETAILED PLANS SUBMITTED	LS28 5LT	422198.898723	435307.447869
3	15794536	Dormer window to front	DETAILED PLANS SUBMITTED	LS8 5NN	431612.340062	434916.609515
5	15794551	Single storey side/rear extension	DETAILED PLANS SUBMITTED	LS7 4JX	431256.709803	436924.645119

In [8]:
```
point_easting = 430604.421595 # Coordinates
point_northing = 433818.33619 # Coordinates

# Create a point with the given coordinates
point = Point(point_easting, point_northing)

# Convert DataFrame to GeoDataFrame
gdf = gpd.GeoDataFrame(application, geometry=gpd.points_from_xy(application.easting,

# Create a 250m buffer for the given point
buffer = point.buffer(250)

# Use a buffer to filter out rows that fall inside it
within_buffer = gdf[gdf.geometry.within(buffer)]

# Calculate the distance
within_buffer['distance'] = within_buffer.geometry.distance(point)

within_application = pd.DataFrame(within_buffer.drop(columns='geometry'))
within_application.head()
```

```
D:\Leeds\software\Lib\site-packages\geopandas\geodataframe.py:1543: SettingWithCop
yWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.o
rg/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  super().__setitem__(key, value)
```

Out[8]:

	planning_id	proposal	stage	join_postcode	easting	northing	dis
453	15821878	Change of use at units 102, 104 and 112 on Vic...	DETAILED PLANS SUBMITTED	LS2 7NL	430447.349218	433825.542210	157.2
697	15705779	Installation of new shopfront double entrance ...	DETAILED PLANS SUBMITTED	LS2 7AR	430501.105372	433693.711193	161.8
717	15789137	Listed building application for internal and e...	DETAILED PLANS SUBMITTED	LS1 7JH	430423.627484	433651.259364	246.1
744	15789055	Internal and external alterations including pa...	DETAILED PLANS SUBMITTED	LS1 7JH	430423.627484	433651.259364	246.1
810	13904208	Change of use of light industrial (B1c) to dwe...	DETAILED PLANS APPROVED	LS2 7PU	430596.229945	433988.353447	170.2

In [9]:
```
# Create a transformer to convert from OSNG (EPSG:27700) to WGS84 (EPSG:4326)
transformer = Transformer.from_crs("EPSG:27700", "EPSG:4326")

# Use the Transformer object to convert coordinates and store the results in new colu
within_application['latitude'], within_application['longitude'] = zip(*within_applica

# View the transformed DataFrame
within_application.to_csv('application.csv')
within_application.head()
```

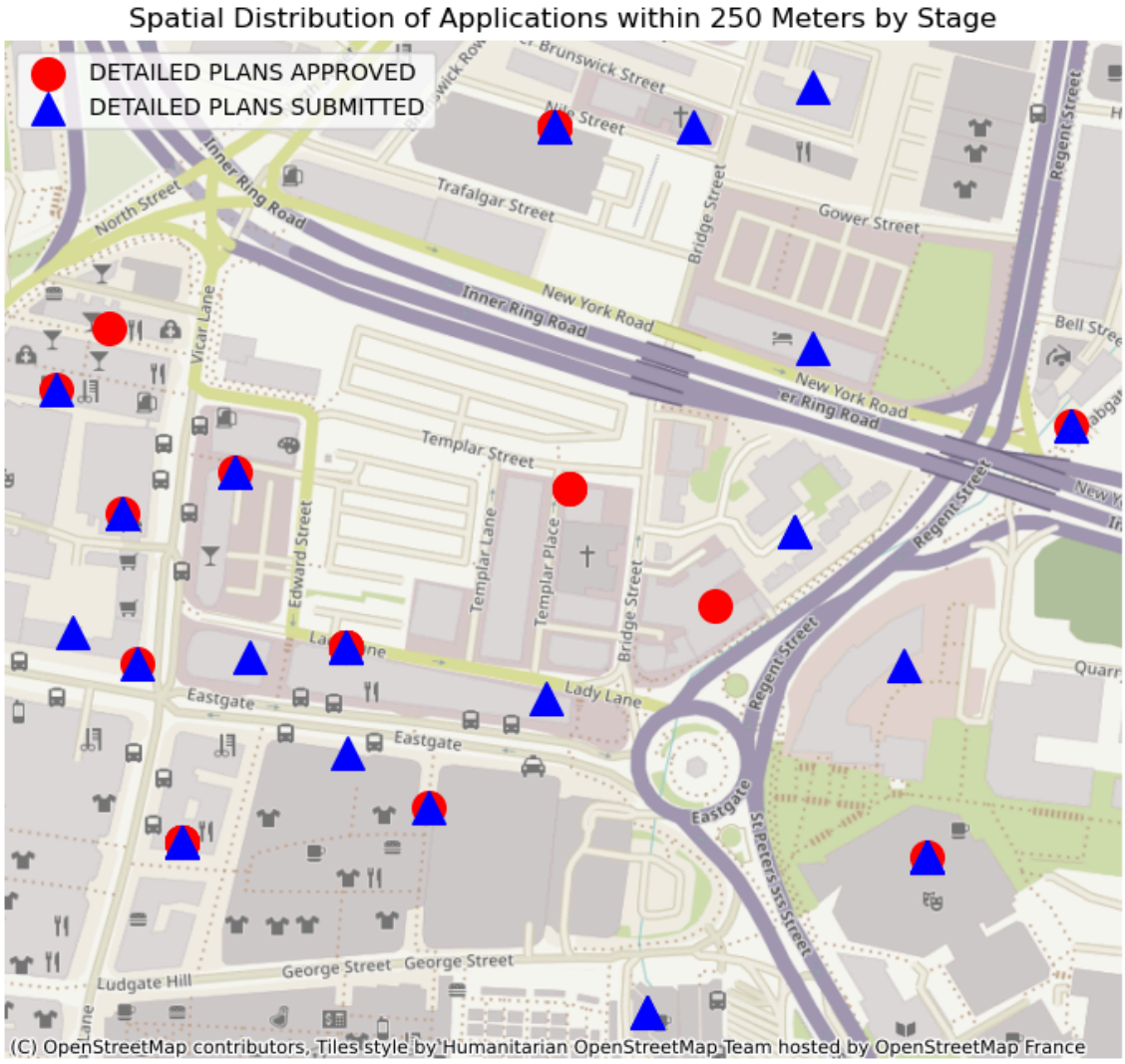
Out[9]:

	planning_id	proposal	stage	join_postcode	easting	northing	dis
453	15821878	Change of use at units 102, 104 and 112 on Vic...	DETAILED PLANS SUBMITTED	LS2 7NL	430447.349218	433825.542210	157.2
697	15705779	Installation of new shopfront double entrance ...	DETAILED PLANS SUBMITTED	LS2 7AR	430501.105372	433693.711193	161.8
717	15789137	Listed building application for internal and e...	DETAILED PLANS SUBMITTED	LS1 7JH	430423.627484	433651.259364	246.1
744	15789055	Internal and external alterations including pa...	DETAILED PLANS SUBMITTED	LS1 7JH	430423.627484	433651.259364	246.1
810	13904208	Change of use of light industrial (B1c) to dwe...	DETAILED PLANS APPROVED	LS2 7PU	430596.229945	433988.353447	170.2

In [10]:
```
within_application.groupby('stage').size()
```

Out[10]:
```
stage
DETAILED PLANS APPROVED     30
DETAILED PLANS SUBMITTED    38
dtype: int64
```

In [12]:
```
within_application['geometry'] = within_application.apply(lambda row: Point(row['lor
gdf = gpd.GeoDataFrame(within_application, geometry='geometry')
gdf.crs = "EPSG:4326"

# Separate the data based on the 'stage' value
submitted = gdf[gdf['stage'] == 'DETAILED PLANS SUBMITTED']
approved = gdf[gdf['stage'] == 'DETAILED PLANS APPROVED']

# Convert the coordinates of the dataset to Web Mercator
approved = approved.to_crs(epsg=3857)
submitted = submitted.to_crs(epsg=3857)

# Draw the spatial distribution
fig, ax = plt.subplots(figsize=(12, 8))
approved.plot(ax=ax, color='red', marker='o', label='DETAILED PLANS APPROVED',marker
submitted.plot(ax=ax, color='blue', marker='^', label='DETAILED PLANS SUBMITTED',mar

# Add a basemap
ctx.add_basemap(ax)

ax.set_title('Spatial Distribution of Applications within 250 Meters by Stage')
ax.legend()
ax.set_axis_off()
plt.show()
```



In [17]:
```
areas=pd.read_csv('Leeds_areas.csv')

areas[areas['addr:city']=='Leeds']
areas=areas[['addr:postcode','longitude','latitude','amenity','name','shop','leisure'

# List of conditions
conditions = [
areas['amenity'].notna(),
areas['shop'].notna(),
areas['leisure'].notna(),
areas['landuse'].notna()
]

# List of values corresponding to each condition
values = [
areas['amenity'],
areas['shop'],
areas['leisure'],
areas['landuse']
]

# Apply conditions and values using np.select
areas['type'] = np.select(conditions, values, default=np.nan)

# Step 1: Delete the rows with the 'type' column value 'yes'
areas = areas.loc[~areas['type'].isin(['yes', 'fuel', 'clinic','studio', 'cafe','hos
areas.loc[(areas['type'] == 'car_rental') | (areas['type'] == 'rental') | (areas['ty
areas.loc[(areas['type'] == 'pub')] = 'bar'
areas.loc[(areas['type'] == 'garden_centre')] = 'park'

areas=areas[['addr:postcode','longitude','latitude','type','name']]
areas.head()
```

```
C:\Users\111\AppData\Local\Temp\ipykernel_5804\667594875.py:27: FutureWarning: Set
ting an item of incompatible dtype is deprecated and will raise in a future error
of pandas. Value 'commercial' has dtype incompatible with float64, please explicit
ly cast to a compatible dtype first.
  areas.loc[(areas['type'] == 'car_rental') | (areas['type'] == 'rental') | (areas
['type'] == 'trade')] = 'commercial'
```

Out[17]:

	addr:postcode	longitude	latitude	type	name
0	LS1 6NU	-1.541087	53.800073	theatre	Leeds Grand Theatre
1	LS1 6LW	-1.542499	53.798943	theatre	Leeds City Varieties
2	LS21 1BG	-1.692444	53.906513	theatre	Otley Courthouse
3	LS6 2UE	-1.578083	53.821964	supermarket	Sainsbury's
4	LS12 3AQ	-1.587354	53.797862	supermarket	Polish Shop

In [18]:
```
data = [
    ["", 53.79887467058745, -1.5372455307680557, "bus station", "Victoria D"],
    ["", 53.798933283965006, -1.5375793388552477, "bus station", "Victoria C"],
    ["", 53.79902919658791, -1.5386980470393505, "bus station", "Victoria A"],
    ["", 53.799530070054786, -1.5395731655382054, "bus station", "Victoria O"],
    ["", 53.8001641459695, -1.5394468597754842, "bus station", "Victoria M"],
    ["", 53.79873799605498, -1.5398998619296902, "bus station", "Victoria I"],
    ["", 53.79907709897769, -1.5412586749001, "bus station", "Headrow E"],
    ["", 53.79935214711495, -1.5424261059016815, "bus station", "Headrow G"],
    ["", 53.799355914885105, -1.5427259379075524, "bus station", "Headrow H"],
    ["", 53.79518400054177, -1.5466727245992877, "bus station", "New Station St"],
    ["", 53.797217289849115, -1.5359649978954517, "bus station centre", "Leeds Bus St
    ["", 53.79823721560893, -1.5347720711855375, "bus station centre", "Leeds Playhou
    ["", 53.79871224875633, -1.5382799115114338, "bus station centre", "Victoria Gate
    ["", 53.799003124276474, -1.5341864587915577, "university", "Quarry Hill Campus L
    ["", 53.79754020022702, -1.5344229628517112, "university", "Leeds Conservatoire"]
    ["", 53.80297704713628, -1.5356125734431416, "university", "Leeds College of Buil
    ["", 53.79814753407776, -1.5304296805324151, "government", "Department of Health
    ["", 53.80117209696953, -1.5357464371084792, "post office", "Royal Mail Parcel Po
]

temp_areas = pd.DataFrame(data, columns=['addr:postcode', 'latitude', 'longitude', '
areas = pd.concat([areas, temp_areas], ignore_index=True)
areas.tail()
```

Out[18]:

	addr:postcode	longitude	latitude	type	name
1399		-1.534186	53.799003	university	Quarry Hill Campus Leeds City College
1400		-1.534423	53.79754	university	Leeds Conservatoire
1401		-1.535613	53.802977	university	Leeds College of Building
1402		-1.53043	53.798148	government	Department of Health and Social Care
1403		-1.535746	53.801172	post office	Royal Mail Parcel Postbox

In [19]:
```
# Create Coordinate converter: Convert from WGS84 to OSNG
transformer = Transformer.from_crs("EPSG:4326", "EPSG:27700")

areas['latitude'] = pd.to_numeric(areas['latitude'], errors='coerce')
areas['longitude'] = pd.to_numeric(areas['longitude'], errors='coerce')

# Transform the coordinates using Transformer objects and store the results in a new
areas['easting'], areas['northing'] = zip(*areas.apply(lambda row:  transformer.tran

# View the converted DataFrame
areas.head()
```

Out[19]:

	addr:postcode	longitude	latitude	type	name	easting	northing
0	LS1 6NU	-1.541087	53.800073	theatre	Leeds Grand Theatre	430323.872640	433849.79031
1	LS1 6LW	-1.542499	53.798943	theatre	Leeds City Varieties	430231.635222	433723.50091
2	LS21 1BG	-1.692444	53.906513	theatre	Otley Courthouse	420303.462889	445638.56989
3	LS6 2UE	-1.578083	53.821964	supermarket	Sainsbury's	427872.686229	436270.31845
4	LS12 3AQ	-1.587354	53.797862	supermarket	Polish Shop	427277.936819	433585.17060

In [20]:
```
easting = 430604.421595
northing = 433818.33619

# Calculate distance
areas['distance'] = np.sqrt((areas['easting'] - easting) ** 2 + (areas['northing'] -

# Display DataFrame with distance
areas.to_csv('Leeds_Areas_Distance.csv')
areas.head()
```

Out[20]:

	addr:postcode	longitude	latitude	type	name	easting	northing
0	LS1 6NU	-1.541087	53.800073	theatre	Leeds Grand Theatre	430323.872640	433849.79031
1	LS1 6LW	-1.542499	53.798943	theatre	Leeds City Varieties	430231.635222	433723.50091
2	LS21 1BG	-1.692444	53.906513	theatre	Otley Courthouse	420303.462889	445638.56989
3	LS6 2UE	-1.578083	53.821964	supermarket	Sainsbury's	427872.686229	436270.31845
4	LS12 3AQ	-1.587354	53.797862	supermarket	Polish Shop	427277.936819	433585.17060

In [21]:
```
within_areas=areas[areas['distance']<250]
within_areas.to_csv('Leeds_Areas_Distance_Within_250.csv')
within_areas.head()
```

Out[21]:

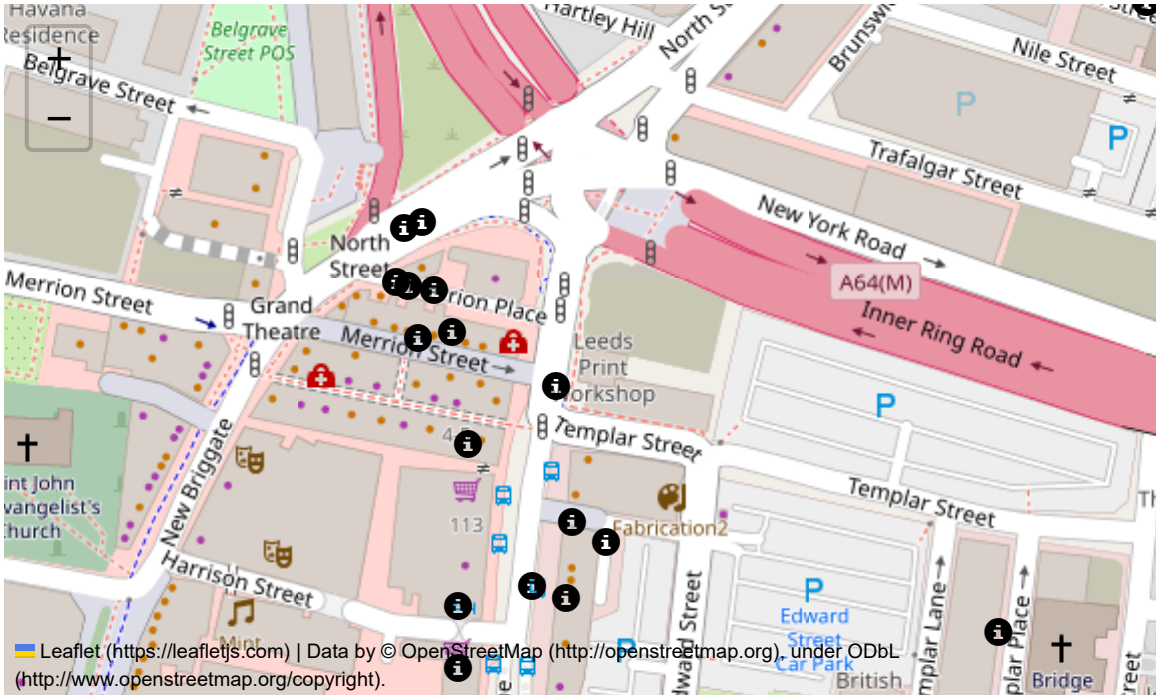
	addr:postcode	longitude	latitude	type	name	easting	north
50	LS1 6PJ	-1.539978	53.799469	supermarket	Regency Smart Supermarket	430397.298872	433783.061
51	LS1 6PJ	-1.539917	53.799980	supermarket	Hang Sing Hong	430400.994719	433839.919
53	LS1 6NU	-1.540267	53.800662	bar	Vice & Virtue	430377.457627	433915.648
57	LS1 6NU	-1.540163	53.800683	bar	Brew York - New Briggate	430384.259244	433918.051
90	LS1 6PQ	-1.540012	53.800335	bar	Loop	430394.494934	433879.387

In [22]:
```
within_areas.groupby('type').size()
```

Out[22]:
```
type
bar                  9
bus station          6
bus station centre   2
casino               1
commercial           6
park                 3
post office          1
supermarket          3
university           1
dtype: int64
```

In [23]:
```
if not within_areas.empty:
    m = folium.Map(location=[within_areas.iloc[0]['latitude'], within_areas.iloc[0]['
else:
    m = folium.Map(location=[53.79946, -1.53673], zoom_start=15)

def get_marker_color(marker_type):
    if marker_type == 'commercial' or marker_type == 'supermarket'or marker_type ==
        return 'green'
    elif marker_type == 'bus station' or marker_type == 'bus station centre': # Mob
        return 'blue'
    elif marker_type == 'bar' or marker_type == 'casino'or marker_type =='park': #
        return 'red'
    else:
        return 'gray'

for idx, row in within_areas.iterrows():
    folium.Marker(
        [row['latitude'], row['longitude']],
        icon=folium.Icon(color=get_marker_color(row['type']))
    ).add_to(m)

m
```

Out[23]:



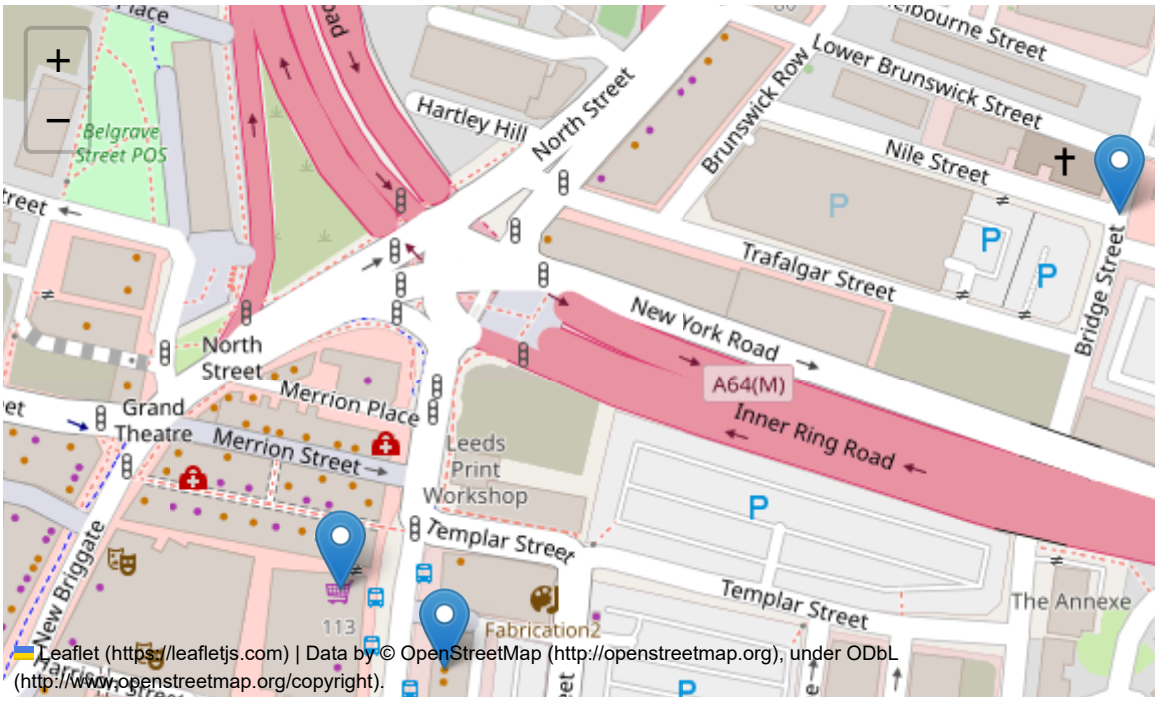
In [24]:
```
type_counts = within_areas.groupby('type').size().reset_index(name='count')
min_distances = within_areas.groupby('type')['distance'].min().reset_index(name='min_

# Merge number and minimum distance
temp_summary = pd.merge(type_counts, min_distances, on='type')

# Gets the coordinates and name of the nearest distance
closest_info = []
for _, row in temp_summary.iterrows():
    type = row['type']
    min_distance = row['min_distance']
    closest_entry = within_areas[(within_areas['type'] == type) & (within_areas['dis
    closest_info.append({
        'type': type,
        'longitude': closest_entry['longitude'],
        'latitude': closest_entry['latitude'],
        'name': closest_entry['name']
    })

closest_info_df = pd.DataFrame(closest_info)

summary = pd.merge(temp_summary, closest_info_df, on='type')
summary
```

Out[24]:

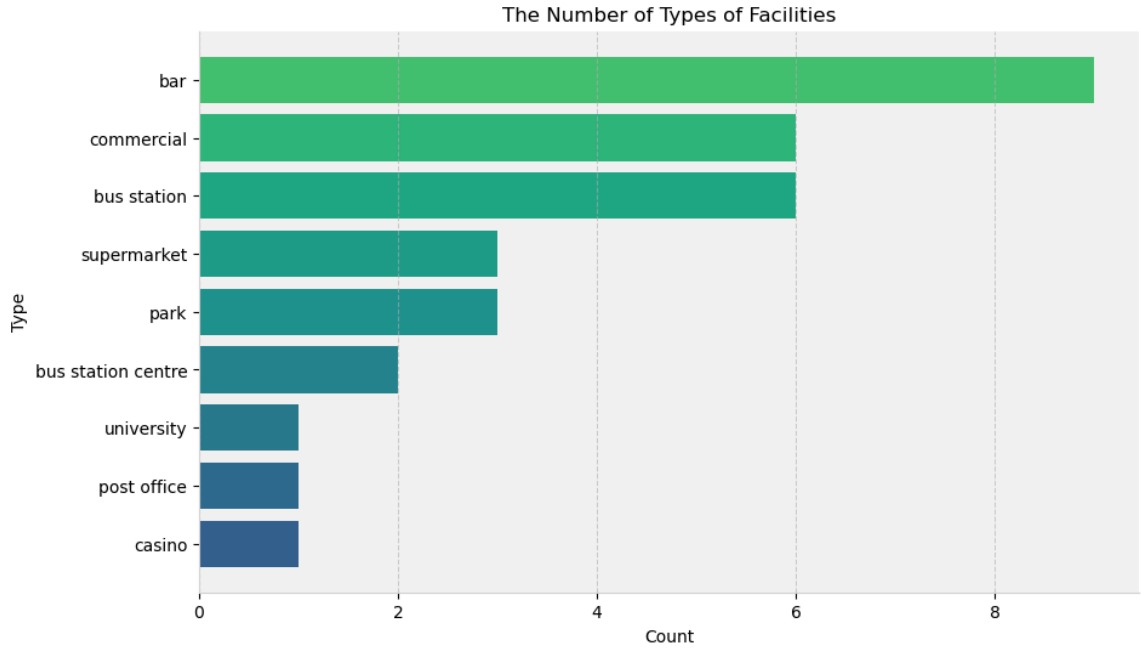
	type	count	min_distance	longitude	latitude	name
0	bar	9	166.697093	-1.539360	53.799733	Howl
1	bus station	6	103.699260	-1.537246	53.798875	Victoria D
2	bus station centre	2	151.863026	-1.538280	53.798712	Victoria Gate Casino
3	casino	1	165.512480	-1.538321	53.798576	Victoria Gate Casino
4	commercial	6	46.154127	-1.537075	53.799385	NaN
5	park	3	185.110458	-1.535053	53.798485	Playhouse Gardens
6	post office	1	171.185688	-1.535746	53.801172	Royal Mail Parcel Postbox
7	supermarket	3	204.568638	-1.539917	53.799980	Hang Sing Hong
8	university	1	194.117105	-1.534186	53.799003	Quarry Hill Campus Leeds City College

In [28]:
```
m = folium.Map(location=[53.799848,-1.539214], zoom_start=3)
for i in range(len(summary['name'])):
    folium.Marker(
        location=[summary['latitude'][i], summary['longitude'][i]],
        popup=summary['name'][i]
    ).add_to(m)

m
```

Out[28]:



In [26]:
```
summary = summary.sort_values('count')

plt.figure(figsize=(10, 6))
bars = plt.barh(summary['type'], summary['count'], color=plt.cm.viridis(np.linspace(0

plt.xlabel('Count')
plt.ylabel('Type')
plt.title('The Number of Types of Facilities')
plt.grid(axis='x', linestyle='--', alpha=0.6)

plt.gca().set_facecolor('#f4f4f4')
plt.gca().spines['top'].set_visible(False)
plt.gca().spines['right'].set_visible(False)
plt.gca().spines['left'].set_color('lightgrey')
plt.gca().spines['bottom'].set_color('lightgrey')

plt.show()
```



In [36]:
```
background= "This is the background of our project. The Proposed Development consists
```

In [31]:
```
descriptive = summary.apply(lambda row: f"{row['type']} has {row['count']}, the mini

descriptions_type=""

for string in descriptive:
    descriptions_type =descriptions_type+string

descriptions_facilities="This is information about nearly facilities: "+ description
descriptions_facilities
```

Out[31]:
```
'This is information about nearly facilities: casino has 1, the minimum distance i
s 165.51247982252846, the facility distance is Victoria Gate Casino;post office ha
s 1, the minimum distance is 171.1856875532766, the facility distance is Royal Mai
l Parcel Postbox;university has 1, the minimum distance is 194.11710459128457, the
facility distance is Quarry Hill Campus Leeds City College;bus station centre has
2, the minimum distance is 151.86302635013323, the facility distance is Victoria G
ate Casino;park has 3, the minimum distance is 185.1104578149438, the facility dis
tance is Playhouse Gardens;supermarket has 3, the minimum distance is 204.56863790
315919, the facility distance is Hang Sing Hong;bus station has 6, the minimum dis
tance is 103.6992596489516, the facility distance is Victoria D;commercial has 6,
the minimum distance is 46.154126587169095, the facility distance is nan;bar has
9, the minimum distance is 166.6970933503356, the facility distance is Howl;'
```

In [32]:
```
# Load JSON data
url = "https://my.martello.app/shared/3992fb69-1ce1-42cc-8cd9-695237667155.json"
response = requests.get(url)
data = response.json()
environment = data['summary']

descriptions = [f"The description of {item['data_category_name']} is {item['classific
descriptions = ' '.join(descriptions)
descriptions_env = "This is environment information: " + descriptions
descriptions_env
```

Out[32]:
```
'This is environment information: The description of Contaminated Land is possibly
_suitable; The description of Flood Risk is unsuitable; The description of Plannin
g Constraints is possibly_suitable; The description of Radon is possibly_suitable;
The description of Transportation is possibly_suitable; The description of Energy
and Infrastructure is suitable; The description of Ground Stability is suitable; T
he description of Climate Change is possibly_suitable;'
```

In [33]:
```
within_application['proposal'] = within_application['proposal'].astype(str)
within_application['stage'] = within_application['stage'].astype(str)
within_application['content'] = within_application['proposal']+"("+within_applicatio
descriptions_application = '; '.join(within_application['content'].tolist())
descriptions_application="This is information on nearly application: " + descriptions
descriptions_application
```

Out[33]: "This is information on nearly application: Change of use at units 102, 104 and 112 on Vicar Lane from use Class E to Pubs and Drinking Establishments (Sui Generis) (DETAILED PLANS SUBMITTED); Installation of new shopfront double entrance doors and installation of two new ventilation grilles(DETAILED PLANS SUBMITTED); Listed building application for internal and external alterations including partial demolition works to partially convert existing retail units into sixteen dwellings (Use Class C3); conversion of one existing floor retail unit and the erection of a four (DETAILED PLANS SUBMITTED); Internal and external alterations including partial demolition works to partially convert existing retail units into sixteen dwellings (Use Class C3); conversion of one existing floor retail unit and the erection of a four storey extension with mezzanine (DETAILED PLANS SUBMITTED); Change of use of light industrial (B1c) to dwelling (C3)(DETAILED PLANS APPROVED); Change of use from vacant offices to residential apartments (Use Class C3), and minor external alterations(DETAILED PLANS APPROVED); Demolition of existing office building 12,14 and 16 Lower Brunswick Street and redevelopment of the site to construct 8 dwellings of three storeys plus roof garden.(DETAILED PLANS SUBMITTED); Alterations involving changes to fenestration to front and rear elevations; erection of porches to front elevations; creation of residential amenity space to rear elevation including raised deck car port and terrace area, provision of car and cycle parkin(DETAILED PLANS SUBMITTED); Installation of two temporary buildings for a period of one year (DETAILED PLANS SUBMITTED); Installation of two wall mounted above ground pipes clad with galvanised panels(DETAILED PLANS SUBMITTED); Reserved matters application for appearance, scale and landscaping for Phase 3 development of Blocks B and C for 331 build to rent units and ancillary accommodation together with Class A1 and A3 use and the provision of public realm areas with the Phase 3(DETAILED PLANS APPROVED); Erection of 106 serviced apartments (Use Class C1) with ancillary facilities above existing hotel(DETAILED PLANS APPROVED); Replacement shop front(DETAILED PLANS SUBMITTED); New Entrance doors replaced like for like(DETAILED PLANS SUBMITTED); Listed building application for new shop front(DETAILED PLANS APPROVED); Change of use of first floor offices to 9No residential units(DETAILED PLANS APPROVED); External alterations(DETAILED PLANS SUBMITTED); Installation of a Communication Hub unit(DETAILED PLANS SUBMITTED); Change of Use application of vacant ground floor from C1 to E class(DETAILED PLANS SUBMITTED); Creation of external teaching space, erection of storage shed, relocation of existing trees and new landscaping(DETAILED PLANS SUBMITTED); Listed building application for internal alterations to existing unit to form a sushi and sake bar; new external signage to front(DETAILED PLANS APPROVED); Determination for telecommunications equipment comprising a telephone kiosk; remove existing telephone Kiosks(DETAILED PLANS SUBMITTED); External alterations including new entrances with associated cladding and remodelling of exterior access ramps and stairs at existing bus station(DETAILED PLANS SUBMITTED); Change of use from B1(a) offices to form 51 residential apartments (C3)(DETAILED PLANS APPROVED); Change the Use of 1st and 2nd floors of 7-25 Eastgate from office to non-residential institutions(DETAILED PLANS APPROVED); Listed building consent for change of use of vacant offices to residential apartments (Use Class C3), and minor external alterations(DETAILED PLANS APPROVED); Sub-division of ground floor commercial unit and associated external alterations to the ground floor(DETAILED PLANS APPROVED); Change of use of offices (B1(a)) to 42 apartments (C3)(DETAILED PLANS APPROVED); Listed Building Application for replacement windows on upper floors (2nd to 5th) of building(DETAILED PLANS APPROVED); Two digital 55-inch LCD display screen, one on each side of the InLink unit.(DETAILED PLANS SUBMITTED); Change of use from retail unit to dwelling (C3) with additional balcony to rear and alterations to windows(DETAILED PLANS APPROVED); Change of use of light industrial (B1c) to dwelling (C3)(DETAILED PLANS APPROVED); Change of use of light industrial (B1c) to dwelling (C3)(DETAILED PLANS APPROVED); Change of use to part of ground floor from C3 (dwelling houses) into a C2 use (residential institutions) Internal alterations including addition of a small office and emergency bedroom.(DETAILED PLANS SUBMITTED); Alterations consisting of external works involving reconfiguration around plant areas A and B, laying out of hardstanding and new condenser units and alterations to fencing(DETAILED PLANS SUBMITTED); Reserved Matters application relating to appearance, landscaping, layout and scale for B8 storage building pursuant to 18/04161/OT(DETAILED PLANS APPROVED); Change of use from offices (B1(a)) offices to fo

rm 17 dwellings (C3)(DETAILED PLANS APPROVED); Three illuminted signs(DETAILED PLANS SUBMITTED); Installation of plant equipment positioned on the roof (9th floor) (DETAILED PLANS SUBMITTED); Installation of new roof mounted ventilation(DETAILED PLANS SUBMITTED); External alterations to allow for installation of air duct, five condensers and four extract louvres to rear elevation(DETAILED PLANS SUBMITTED); Installation of cell comprising a 6m high pole hosting 1no. antenna with a wrapped-around cabinet at its base(DETAILED PLANS SUBMITTED); Installation of louvred panel into existing shopfront(DETAILED PLANS SUBMITTED); Change of use of vacant bank to 23 flats with a flexible mix use (commercial or residential) on part of the ground floor and alterations including extension(DETAILED PLANS APPROVED); Certificate of Proposed Lawful Development for Change of Use to restaurant (class E)(DETAILED PLANS APPROVED); Replace existing door with new glass door and glazed fanlight to existing fire escape stair and to use as the principal means of access to the new apartments at first floor level(DETAILED PLANS SUBMITTED); Listed Building application to replace existing door with new glass door and glazed fanlight to existing fire escape stair and to use as the principal means of access to the new apartments at first floor level(DETAILED PLANS APPROVED); One non-illuminated fascia sign to front.(DETAILED PLANS SUBMITTED); Certificate of Proposed Lawful Development for use of second and third floor within Class 'E' of the GPDO (2020)(DETAILED PLANS APPROVED); Listed building application for Change of use of first floor offices to 9No residential units(DETAILED PLANS APPROVED); Change of Use of basement, ground and first floors to Restaurant/Bar (class use A3/A4) and second floor to form one Apartment (class use C3), including alterations to front elevation(DETAILED PLANS APPROVED); Determination for installation of 5G 15m high phase 8 street pole mounted on new root foundation, wrap around cabinet built around base of street pole, Bowler cabinet, RBS6130 equipment cabinet, AC/ Transmission cabinet, GPS module to be installed on prop(DETAILED PLANS SUBMITTED); Change of use of units to open A1 - A5 uses(DETAILED PLANS APPROVED); Change of use of light industrial (B1c) to dwelling (C3)(DETAILED PLANS APPROVED); Construction of five buildings ranging from 13 storeys to 31 storeys and consisting of 678 apartments (C3), residential amenity areas, commercial units (A1, A2, A3, A4, B1 and / or D2) and associated car parking, public realm and landscaping, access and s(DETAILED PLANS APPROVED); Installation of two sculptures to garden area(DETAILED PLANS SUBMITTED); Listed building application for installation of louvred panel into existing shopfront(DETAILED PLANS APPROVED); Determination for telecommunications equipment comprising a telephone kiosk; remove existing telephone Kiosks(DETAILED PLANS SUBMITTED); Determination for telecommunications equipment comprising a telephone kiosk; remove existing telephone Kiosks(DETAILED PLANS SUBMITTED); Landscaping works to external areas including covered canopy; alterations to access and car parking; installation of solar panels to roof and wind turbine to rear;(DETAILED PLANS SUBMITTED); Determination for Telecommunications Equipment(DETAILED PLANS SUBMITTED); Change of use of lower floors of 90-94 Vicar Lane to communal space serving approved residential use (Use Class C3) and reconfiguration of basement level of 1-5 Eastgate.(DETAILED PLANS SUBMITTED); Replacement windows on upper floors (2nd to 5th) of building(DETAILED PLANS SUBMITTED); Change of use of offices to artist, workshop and studio spaces and alterations including extension to rear(DETAILED PLANS APPROVED); Listed building application for internal alterations to lower floors of 90-94 Vicar Lane to form communal space serving approved residential use (Use Class C3) and reconfiguration of basement level of 1-5 Eastgate(DETAILED PLANS APPROVED); Erection of garden office room(DETAILED PLANS SUBMITTED); Listed building application for two wall mounted signs(DETAILED PLANS SUBMITTED); Alterations to front elevation windows and doors to relocate main entrance to provide full DDA access(DETAILED PLANS SUBMITTED)"

In [34]:
```
openai.api_key='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'
def open_ai(question):
    response = openai.ChatCompletion.create(
        model="gpt-3.5-turbo",
        messages=[
            {"role":"system","content":"You are a helpful assistant."},
            {"role":"user","content":question}
        ],
        temperature=0.7,
        max_tokens=1000,
        top_p=1,
        frequency_penalty=0,
        presence_penalty=0
    )
    return response['choices'][0]['message']['content']
```

In [51]:
```
question_application= background+descriptions_application+' '+' For all the ongoing
answer_application=open_ai(question_application)
answer_application
```

Out[51]:
'It seems like you have provided a detailed list of ongoing planning projects with in the 250m radius of your proposed development. Analyzing these projects from the perspective of a developer, here is a summary of the future investment opportuniti es, operational directions, and advantages in foreign leasing and sales:\n\n1. **F uture Investment Opportunities:**\n - The concentration of various projects in t he area indicates a growing demand for residential, commercial, and mixed-use spac es.\n - Developers can explore opportunities to invest in diverse property types such as residential units, business units, incubator spaces, cafes, retail spaces, and car parking facilities.\n - The presence of public and private open spaces s uggests potential for creating attractive and vibrant environments, which can attr act investors looking for well-designed urban spaces.\n\n2. **Operational Directio ns:**\n - Developers can focus on creating a mix of residential units, commercia l spaces, and amenities to cater to the diverse needs of potential tenants and buy ers.\n - Emphasizing sustainability and green features in the design and operati on of the projects can enhance their appeal to environmentally conscious investor s.\n - Collaboration with local businesses and institutions for the development of ancillary amenities and services can create a sustainable ecosystem within the projects.\n\n3. **Advantages in Foreign Leasing and Sales:**\n - The variety of projects, including residential towers, commercial units, and public spaces, can a ttract foreign investors looking for diverse investment portfolios.\n - Strategi c marketing efforts highlighting the proximity to amenities, transportation hubs, and potential rental yields can make the projects appealing to foreign investors s eeking real estate opportunities.\n - Leveraging the international appeal of the developments, developers can target foreign buyers interested in investing in a mi x of residential and commercial properties in a well-planned urban setting.\n\nOve rall, the ongoing planning projects within the 250m radius present promising oppor tunities for developers to invest in a mix of residential, commercial, and mixed-u se developments, with a focus on sustainability, diverse amenities, and internatio nal appeal to attract foreign investors.'

In [52]:
```
question_application_ad= background+descriptions_application+' '+' Do all the planne
answer_application_ad=open_ai(question_application_ad)
answer_application_ad
```

Out[52]: "Based on the information provided, it appears that there are numerous constructio
n and development projects in progress within the 250m radius of the Proposed Deve
lopment. These projects include a mix of residential, commercial, and mixed-use de
velopments, as well as alterations and conversions of existing buildings.\n\nThe p
roximity of these projects may have both positive and negative impacts on the deve
loper's future investment, operational direction, and existing advantages in forei
gn leasing and sales. Here are some potential considerations:\n\n1. **Competition:
** The high number of development projects in the area could increase competition
for tenants, buyers, and investors. This may affect the developer's ability to att
ract occupants to their residential towers and commercial spaces.\n\n2. **Market S
aturation:** The saturation of similar types of developments in the vicinity could
lead to oversupply, potentially impacting rental rates, sales prices, and overall
demand for properties in the area.\n\n3. **Amenities and Infrastructure:** The add
ition of new public and private open spaces, improvements to pedestrian and vehicu
lar routes, and other enhancements in the neighborhood could increase the overall
attractiveness of the area, benefiting the developer's investment in the long ter
m.\n\n4. **Regulatory Environment:** Changes in planning regulations, zoning restr
ictions, or building codes as a result of these projects could impact future devel
opment plans and operational strategies for the developer.\n\n5. **Foreign Leasing
and Sales:** The completion of multiple new developments nearby could either enhan
ce or detract from the appeal of the developer's properties to foreign investors o
r tenants. Factors such as building quality, amenities, location, and market condi
tions will play a significant role in maintaining the developer's competitive edge
in foreign leasing and sales.\n\nIn summary, while the presence of multiple develo
pment projects in the area may introduce challenges and opportunities for the deve
loper, it is essential for them to closely monitor market dynamics, adapt their st
rategies accordingly, and leverage the unique advantages of their properties to re
main competitive in the local and foreign real estate market."

In [53]:
```
question_facilities= background+descriptions_facilities+' '+' According to all exist
answer_facilities=open_ai(question_facilities)
answer_facilities
```

Out[53]: "Based on the information provided, here is an analysis of various types of projects within the 250m radius of the planning scope from the perspective of the developer:\n\n1. Residential Towers: With 678 residential units and ancillary commercial space, the developer can focus on attracting residents looking for a mix of urban living and amenities. Future investments can include enhancing the residential units with modern features and technologies to attract tenants and buyers. Operation direction could involve efficient property management to ensure a high occupancy rate and resident satisfaction. Advantages in foreign leasing and sales could include marketing the development as a vibrant community with convenient access to commercial and recreational facilities.\n\n2. Business/Incubator Units: The presence of 1,131m2 of business and incubator units provides an opportunity for the developer to attract startups and small businesses. Future investment may involve creating a collaborative workspace environment and providing support services for entrepreneurs. Operation direction could focus on fostering a dynamic business community and promoting networking opportunities. Advantages in foreign leasing and sales could include offering flexible lease terms and a supportive ecosystem for international businesses looking to establish a presence in the area.\n\n3. Commercial Units: With 1,302m2 of commercial space, the developer can target retailers and service providers seeking a prime location with high foot traffic. Future investments may include upgrading the commercial units to attract premium brands and enhancing the overall shopping experience. Operation direction could involve curating a diverse mix of tenants to cater to different consumer preferences. Advantages in foreign leasing and sales could include highlighting the development's central location and proximity to other amenities.\n\nOverall, the developer has the opportunity to create a vibrant mixed-use development that caters to residents, businesses, and visitors alike. By strategically investing in and managing the various components of the project, the developer can position the development as an attractive destination for both local and international audiences, thereby maximizing leasing and sales opportunities."

In [54]:
```
question_env= background+descriptions_env+' '+' This is about the assessment of the
answer_env=open_ai(question_env)
answer_env
```

Out[54]:
```
"Based on the assessment of the environmental conditions surrounding the project,
there are both advantages and potential risks for the developer in the project dev
elopment and operation management.\n\nAdvantages:\n1. Energy and Infrastructure su
itability indicates that the project can benefit from existing infrastructure and
energy resources, potentially reducing costs and streamlining development.\n2. Gro
und Stability suitability suggests that the project site is stable and suitable fo
r construction, reducing the risk of foundation issues and associated costs.\n3. P
lanning Constraints possibly suitable status indicates that there may be manageabl
e restrictions in place, allowing for smoother planning and development processe
s.\n\nPotential Risks:\n1. Flood Risk unsuitability poses a potential risk of floo
ding, which could impact the project's infrastructure, safety, and overall viabili
ty.\n2. Climate Change possibly suitable status suggests that the project may be v
ulnerable to future climate-related challenges, such as extreme weather events or
sea level rise, which could lead to increased costs and operational challenges.\n
3. Contaminated Land possibly suitable status indicates potential environmental ha
zards that may require remediation, leading to additional costs and delays in the
project development.\n\nIt is crucial for the developer to carefully consider and
address these environmental assessment results to mitigate risks, ensure complianc
e with regulations, and optimize the project's sustainability and long-term succes
s. Engaging with environmental experts and incorporating sustainable design practi
ces can help the developer navigate these challenges and capitalize on the projec
t's advantages."
```

In [55]:
```
question_total= background+answer_application+'.'+'\n'+answer_application_ad+'.'+'\r
answer_total=open_ai(question_total)
answer_total
```

Out[55]:
"**Consulting Report on Proposed Development Project**\n\n*Introduction:*\nThe Proposed Development project entails the construction of five residential towers, ranging from 13 to 31 storeys, with ancillary commercial spaces at ground level. The development includes residential units, business and incubator units, commercial spaces, and car parking facilities. Additionally, it features public and private open spaces and improvements to pedestrian and vehicular routes.\n\n*Feasibility Analysis:*\n1. **Market Demand:** The concentration of various projects in the vicinity indicates a growing demand for residential and commercial spaces, presenting a favorable market environment for the Proposed Development.\n2. **Competition:** The high number of ongoing projects poses a challenge in terms of competition for tenants, buyers, and investors. Strategies to differentiate the development will be crucial.\n3. **Regulatory Environment:** Changes in planning regulations and zoning restrictions may impact the project's development process and operational strategies, necessitating thorough compliance and adaptation.\n4. **Environmental Assessment:** Advantages such as energy and infrastructure suitability and ground stability are positive factors, while flood risk and climate change vulnerabilities require careful mitigation strategies.\n\n*Potential Risks:*\n1. **Market Saturation:** The saturation of similar developments in the area may lead to oversupply and affect rental rates and demand.\n2. **Environmental Challenges:** Risks such as flood potential and climate change vulnerabilities could impact the project's long-term sustainability and operational viability.\n3. **Regulatory Hurdles:** Navigating through evolving planning regulations and potential constraints may pose challenges to the project's progress.\n\n*Opportunities:*\n1. **Diverse Investment Portfolio:** The mix of residential, commercial, and mixed-use spaces presents opportunities to cater to various investor preferences and capitalize on the growing market demand.\n2. **Sustainable Development:** Emphasizing sustainability and green features in design and operations can enhance the project's appeal and long-term value.\n3. **International Appeal:** Leveraging the development's unique features and amenities can attract foreign investors and buyers seeking diversified real estate opportunities.\n\n*Strategic Recommendations:*\n1. **Differentiation Strategy:** Focus on creating a unique value proposition to stand out in a competitive market, such as offering innovative amenities or sustainable design features.\n2. **Risk Mitigation:** Develop comprehensive risk management plans to address potential market saturation, environmental challenges, and regulatory uncertainties.\n3. **Collaborative Partnerships:** Establish partnerships with local businesses and institutions to enhance amenities, foster a vibrant community, and attract a diverse tenant and buyer base.\n4. **International Marketing:** Highlight the development's international appeal through targeted marketing efforts, emphasizing its proximity to amenities, transportation hubs, and potential rental yields.\n\nIn conclusion, while the Proposed Development project offers promising opportunities for investment and growth, it is essential to address potential risks, navigate market challenges, and leverage strategic advantages to ensure its success. By adopting a comprehensive and adaptive approach to development, the developer can position the project as a desirable and sustainable investment in the dynamic real estate landscape."

In [58]:
```
question_application_buy= background+descriptions_application+' '+' Now suppose you
answer_application_buy=open_ai(question_application_buy)
answer_application_buy
```

Out[58]: 'As a real estate agent in the LS2 7BF area, it is important to highlight the ongoing planning projects within the 250m radius to potential buyers or investors. The detailed list of ongoing projects provided indicates a significant amount of development and improvement in the area. Here are some advantages of living in this area based on the information provided:\n\n1. **Residential Towers**: The presence of five residential towers ranging from 13 to 31 storeys will offer a variety of housing options for residents, including 678 residential units with ancillary amenity spaces. This indicates a diverse range of living options within close proximity.\n\n2. **Commercial Space**: The inclusion of ancillary commercial space with business units, cafes, and retail spaces at ground floor level provides convenience and opportunities for local businesses and residents.\n\n3. **Public and Private Open Spaces**: The proposed development includes significant areas of public and private open spaces, enhancing the quality of life for residents with access to outdoor areas for recreation and relaxation.\n\n4. **Improvements to Surrounding Routes**: The proposed improvements to surrounding pedestrian and vehicular routes indicate a focus on enhancing connectivity and accessibility, making it easier for residents to travel within the area.\n\n5. **Mix of Uses**: The mix of uses in the ongoing projects, including residential, commercial, and public spaces, contributes to a vibrant and dynamic neighborhood with a blend of amenities and services.\n\n6. **Infrastructure Upgrades**: The various alterations and installations planned, such as new entrances, ventilation systems, and landscaping works, suggest a focus on modernizing and improving the infrastructure in the area.\n\nOverall, living in the LS2 7BF area within the 250m radius of these ongoing projects offers a promising mix of residential options, commercial amenities, open spaces, improved infrastructure, and convenient access to transportation and services. This can appeal to potential residents looking for a well-rounded and vibrant neighborhood with diverse opportunities for living, working, and enjoying leisure activities.'

In [60]:
```
question_env_buy= background+descriptions_env+' '+' Now suppose you are a real estat
answer_env_buy=open_ai(question_env_buy)
answer_env_buy
```

Out[60]:
```
'Based on the information provided about the Proposed Development and the surround
ing environmental conditions, there are several potential advantages that can be h
ighlighted in a promotional report:\n\n1. **Contaminated Land**: The description o
f Contaminated Land being possibly suitable is a positive aspect as it indicates t
hat the land may not pose significant risks in terms of contamination. This can be
emphasized as a selling point for potential buyers looking for a safe and clean en
vironment to live in.\n\n2. **Planning Constraints**: The description of Planning
Constraints being possibly suitable suggests that there are no major restrictions
or obstacles in the way of the development project. This can be highlighted as a b
enefit, ensuring a smooth and efficient development process.\n\n3. **Ground Stabil
ity**: The description of Ground Stability being suitable is a key advantage as it
indicates that the land is stable and suitable for construction. This can be empha
sized to reassure buyers about the durability and longevity of the residential tow
ers.\n\n4. **Energy and Infrastructure**: The description of Energy and Infrastruc
ture being suitable is a significant advantage as it suggests that the area has we
ll-developed infrastructure and access to essential services. This can be promoted
as a convenience factor for residents, ensuring a comfortable and efficient living
experience.\n\n5. **Climate Change**: The description of Climate Change being poss
ibly suitable can be seen as an opportunity for the development to incorporate sus
tainable and environmentally friendly features. This can be highlighted as a forwa
rd-thinking approach, appealing to environmentally conscious buyers.\n\n6. **Trans
portation**: The description of Transportation being possibly suitable indicates t
hat the area has good transportation links, which can be promoted as a convenience
for residents commuting to work or accessing amenities in the surrounding area.\n
\nIn summary, the Proposed Development offers a range of advantages including a cl
ean and safe environment, ease of development, stable ground conditions, access to
energy and infrastructure, potential for sustainable features, and good transporta
tion links. These factors can be emphasized in a promotional report to attract pot
ential buyers looking for a modern and convenient living space in LS2 7BF.'
```

In [59]:
```
question_facilities_buy= background+descriptions_facilities+' '+' Now suppose you ar
answer_facilities_buy=open_ai(question_facilities_buy)
answer_facilities_buy
```

Out[59]: 'Based on the information provided, here is an analysis of the proposed development project and the existing supporting facilities within the 250m radius of LS2 7BF:\n\n1. Proposed Development:\n- Five residential towers ranging from 13 to 31 storeys with a mix of residential units, commercial space, and amenities.\n- Total of 678 residential units with ancillary amenity space.\n- Business and incubator units, as well as commercial units, providing opportunities for work and business activities.\n- Significant public and private open spaces for recreation and relaxation.\n- Improvements to pedestrian and vehicular routes for enhanced accessibility.\n- Adequate car parking spaces for residents.\n\n2. Existing Supporting Facilities within 250m Radius:\n- Casino: Victoria Gate Casino\n- Post Office: Royal Mail Parcel Postbox\n- University: Quarry Hill Campus Leeds City College\n- Bus Station: Victoria Gate Casino\n- Park: Playhouse Gardens\n- Supermarket: Hang Sing Hong\n- Bus Station: Victoria D\n- Bar: Howl\n\nBased on the above information, the advantages of living in the future development for different living groups are as follows:\n\n1. Young Professionals:\n- Proximity to business and incubator spaces for potential work opportunities.\n- Access to cafes and retail spaces for convenience.\n- Public open spaces and recreational facilities for relaxation.\n- Close to bars and entertainment venues for socializing.\n\n2. Families:\n- Residential towers offering various types of units to suit different family sizes.\n- Ancillary amenity spaces for families to enjoy.\n- Nearby parks for children to play and families to relax.\n- Access to supermarkets for convenient grocery shopping.\n\n3. Students:\n- Close proximity to the university for easy access to education.\n- Adequate transport options with nearby bus stations.\n- Business and incubator spaces for potential internships or work opportunities.\n- Recreational spaces for leisure activities.\n\nOverall, the proposed development offers a diverse range of amenities and facilities that cater to different living groups, providing a vibrant and convenient living environment in LS2 7BF.'

In [70]:
```
question_total_buy= background+answer_application_buy+'.'+'\n'+answer_facilities_buy
answer_total_buy=open_ai(question_total_buy)
answer_total_buy
```

Out[70]:
```
'**Marketing Report for Rental Buyers in LS2 7BF Area**\n\nAs an intermediary repr
esenting rental buyers in the LS2 7BF area, it is essential to provide a comprehen
sive marketing report that analyzes the advantages, benefits, and potential risks
associated with the Proposed Development project and the surrounding environmental
conditions. This report aims to assist rental buyers in making informed decisions
based on the analysis provided.\n\n**Advantages of the Proposed Development:**\n\n
1. **Diverse Housing Options**: The presence of five residential towers ranging fr
om 13 to 31 storeys offers a variety of housing options suitable for different pre
ferences and lifestyles. Rental buyers can choose from a range of unit sizes and l
ayouts to meet their individual needs.\n\n2. **Commercial Amenities**: The inclusi
on of ancillary commercial space with business units, cafes, and retail spaces at
ground floor level provides convenience and accessibility for residents. Rental bu
yers can enjoy the convenience of having essential services and amenities within c
lose proximity.\n\n3. **Open Spaces and Recreational Facilities**: The significant
areas of public and private open spaces within the development offer opportunities
for relaxation and recreation. Rental buyers can benefit from access to outdoor sp
aces for leisure activities and social gatherings.\n\n4. **Improved Infrastructure
and Connectivity**: The proposed improvements to surrounding pedestrian and vehicu
lar routes enhance accessibility and connectivity within the area. Rental buyers c
an enjoy easy access to transportation options and nearby amenities, making daily
commutes and errands more convenient.\n\n5. **Mix of Uses**: The mix of residentia
l, commercial, and public spaces in the development creates a vibrant and dynamic
neighborhood with a range of amenities and services. Rental buyers can experience
a well-rounded living environment with diverse opportunities for living, working,
and socializing.\n\n**Benefits for Different Rental Buyer Groups:**\n\n1. **Young
Professionals**: Proximity to business and incubator spaces offers potential work
opportunities, while cafes and retail spaces provide convenience. Open spaces and
recreational facilities cater to relaxation, and nearby bars offer socializing opp
ortunities.\n\n2. **Families**: Various types of residential units cater to differ
ent family sizes, with amenity spaces for family enjoyment. Nearby parks provide p
lay areas for children, and supermarkets offer convenient grocery shopping option
s.\n\n3. **Students**: Close proximity to the university facilitates easy access t
o education, while nearby bus stations ensure adequate transportation options. Bus
iness and incubator spaces present potential internship or work opportunities, and
recreational spaces offer leisure activities.\n\n**Potential Risks and Considerati
ons:**\n\n1. **Contaminated Land**: While the land is possibly suitable, rental bu
yers may want to conduct further investigations to ensure there are no risks assoc
iated with contamination that could impact health or property value.\n\n2. **Clima
te Change**: The possibility of climate change considerations being suitable indic
ates an opportunity for sustainable features, but rental buyers should inquire abo
ut specific measures in place to address environmental concerns.\n\n3. **Transport
ation**: Although transportation is possibly suitable, rental buyers should verify
the accessibility and reliability of transportation options to ensure convenient c
ommuting and travel experiences.\n\nIn conclusion, the Proposed Development in LS2
7BF offers rental buyers a range of advantages including diverse housing options,
commercial amenities, open spaces, improved infrastructure, and a mix of uses. By
considering the benefits and potential risks highlighted in this marketing report,
rental buyers can make informed decisions when exploring rental opportunities in t
his dynamic and evolving neighborhood.'
```

In [42]:
```
def text_to_html(text):
    lines = text.split('\n')

    html_content = '<html><head><title>Project Report</title></head><body>'

    current_heading = ""
    for line in lines:
        if line.startswith('**') and line.endswith('**'):
            if current_heading:
                html_content += '</p>'
            current_heading = line.strip('**')
            html_content += f'<h2>{current_heading}</h2>'
            html_content += '<p>'
        else:
            html_content += line + '<br>'

    html_content += '</p></body></html>'

    return html_content
```

In [56]:
```
html_content = text_to_html(answer_total)

with open("report.html", "w", encoding="utf-8") as file:
        file.write(html_content)
```

In [71]:
```
html_content_buy = text_to_html(answer_total_buy)

with open("report_buy.html", "w", encoding="utf-8") as file:
        file.write(html_content_buy)
```

In [117]:
```
def calculate_distance(latitude, longitude):
    global base_application

    transformer = Transformer.from_crs("EPSG:27700", "EPSG:4326")
    base_application['latitude'], base_application['longitude'] = zip(*base_applicat

    point = Point(longitude, latitude)
    gdf = gpd.GeoDataFrame(base_application, geometry=gpd.points_from_xy(base_applic

    gdf = gdf.to_crs("EPSG:27700")
    transformer = Transformer.from_crs("EPSG:4326", "EPSG:27700", always_xy=True)
    transformed_point = Point(transformer.transform(longitude, latitude))
    buffer = transformed_point.buffer(250)

    buffer_gdf = gpd.GeoDataFrame(geometry=[buffer], crs="EPSG:27700")
    within_buffer = sjoin(gdf, buffer_gdf, how="inner", op='within')
    within_buffer['distance'] = within_buffer.geometry.distance(transformed_point)
    base_application = within_buffer.drop(columns='geometry').reset_index(drop=True)
```

In [134]:
```
def deal_with_other_data(latitude, longitude):
    global base_areas

    transformer = Transformer.from_crs("EPSG:4326", "EPSG:27700", always_xy=True)
    base_areas['easting'], base_areas['northing'] = zip(*base_areas.apply(lambda row
    input_easting, input_northing = transformer.transform(longitude, latitude)
    base_areas['distance'] = np.sqrt((base_areas['easting'] - input_easting) ** 2 +

    base_areas = base_areas[base_areas['distance'] < 250]

    conditions = [
        base_areas['amenity'].notna(),
        base_areas['shop'].notna(),
        base_areas['leisure'].notna(),
        base_areas['landuse'].notna()
    ]

    values = [
        base_areas['amenity'],
        base_areas['shop'],
        base_areas['leisure'],
        base_areas['landuse']
    ]
    base_areas['type'] = np.select(conditions, values, default=np.nan)
    base_areas = base_areas.loc[~base_areas['type'].isin(['yes', 'fuel', 'clinic','s
    base_areas.loc[(base_areas['type'] == 'car_rental') | (base_areas['type'] == 're
    base_areas.loc[(base_areas['type'] == 'pub')] = 'bar'
    base_areas.loc[(base_areas['type'] == 'garden_centre')] = 'park'
```

In [129]:
```
def deal_with_descriptions(latitude,longitude):
    global base_areas
    global descriptions_type
    global descriptions_application
    global base_areas

    type_counts = base_areas.groupby('type').size().reset_index(name='count')
    min_distances = base_areas.groupby('type')['distance'].min().reset_index(name='m

    temp_summary = pd.merge(type_counts, min_distances, on='type')

    closest_info = []
    for _, row in temp_summary.iterrows():
        type = row['type']
        min_distance = row['min_distance']
        closest_entry = base_areas[(base_areas['type'] == type) & (base_areas['dista
        closest_info.append({
            'type': type,
            'longitude': closest_entry['longitude'],
            'latitude': closest_entry['latitude'],
            'name': closest_entry['name']
        })

    closest_info_df = pd.DataFrame(closest_info)
    summary = pd.merge(temp_summary, closest_info_df, on='type')

    descriptive = summary.apply(lambda row: f"{row['type']} has {row['count']}, the

    for string in descriptive:
        descriptions_type =descriptions_type+string

    descriptions_facilities="This is information about nearly facilities: "+ descrip

    base_application['proposal'] = base_application['proposal'].astype(str)
    base_application['stage'] = base_application['stage'].astype(str)
    base_application['content'] = base_application['proposal']+"("+base_application[
    descriptions_application = '; '.join(base_application['content'].tolist())
    descriptions_application="This is information on nearly application: " + descrip
```

In [143]:
```
def open_ai_question(question):
    response = openai.ChatCompletion.create(
        model="gpt-3.5-turbo",
        messages=[
            {"role":"system","content":"You are a helpful assistant."},
            {"role":"user","content":question}
        ],
        temperature=0.7,
        max_tokens=1000,
        top_p=1,
        frequency_penalty=0,
        presence_penalty=0
    )
    return response['choices'][0]['message']['content']
```

In [152]:
```
def generate_report():
    global descriptions_type
    global descriptions_application

    question_facilities = descriptions_facilities+' '+' According to all existing pr
    answer_facilities=open_ai(question_facilities)

    question_application_ad= descriptions_application+' '+' Do all the planned proje
    answer_application_ad=open_ai(question_application_ad)

    question_application= background+descriptions_application+' '+' For all the ongo
    answer_application=open_ai(question_application)

    question_total= background+answer_application+'.'+'\n'+answer_application_ad+'.'
    answer_total=open_ai(question_total)

    html_content = text_to_html(answer_total_buy)
    with open("report_new.html", "w", encoding="utf-8") as file:
        file.write(html_content)
```

In [145]:
```
base_application=pd.read_csv('leeds_council_planning_apps_centroids_stx_y.csv')
base_areas=pd.read_csv('Leeds_areas.csv')
openai.api_key='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'
descriptions_type=""
descriptions_application=""
```

In [154]:
```
search = widgets.Text(
    description='Postcode:',
    value='',
)

button = Button(
    description='Generate your report for builders',
    layout=Layout(width='300px')
)

def button_clicked(b):
    clear_output(wait=True)
    display(search, button)

    postcode = search.value

    response = requests.get(f'http://api.postcodes.io/postcodes/{postcode}')

    data = response.json()
    if data['status'] == 200:
        latitude = data['result']['latitude']
        longitude = data['result']['longitude']

    calculate_distance(latitude,longitude)
    deal_with_other_data(latitude,longitude)
    deal_with_descriptions(latitude,longitude)
    generate_report()

    print("The report has been done!")

button.on_click(button_clicked)

display(search, button)
```

A Jupyter widget could not be displayed because the widget state could not be found. This could happen if the kernel storing the widget is no longer available, or if the widget state was not saved in the notebook. You may be able to create the widget by running the appropriate cells.

A Jupyter widget could not be displayed because the widget state could not be found. This could happen if the kernel storing the widget is no longer available, or if the widget state was not saved in the notebook. You may be able to create the widget by running the appropriate cells.

In [ ]: