Executive summary: Towards a sustainable and livable London

Abstract

In order to better achieve London's sustainability goals and increase the well-being of the surrounding residents, the project will include **three playgrounds in London's research area, two concentrated rooftop solar panels, the addition of vegetation in areas where necessary, and the analysis of local weather conditions**. QGIS tools are mostly used for spatial analysis in this project, including vegetation analysis, wind field analysis, noise analysis, temperature and thermal radiation analysis, solar energy analysis, and so on. In this research, spatial overlay analysis, such as space-weighted location selection and proximity, is also applied for complete assessment.

Playground

According to **The London Plan, Policy S4 Play and informal recreation, playgrounds development should consider:**
for residential developments, incorporate good-quality, accessible play provision for all ages. At least 10 square metres of playspace should be provided per child that:
a) provides a stimulating environment, b) can be accessed safely from the street by children and young people independently, c) forms an integral part of the surrounding neighbourhood, d) incorporates trees and/or other forms of greenery, e) is overlooked to enable passive surveillance, f) is not segregated by tenure
3) incorporate accessible routes for children and young people to existing play provision, schools and youth centres, within the local area, that enable them to play and move around their local neighbourhood safely and independently.
To choose sites, I used proximity to schools and roads, sun light and shadow, combining current vegetation to Weighting calculate 3 best sites, as well as their noise impact on surrounding buildings.

Solar Panel

According to **Planning for Roof Mounted Solar Photovoltaics in London**, installation rates in London are the lowest of any region in the UK – with data showing that 18 of the 20 local authorities with the smallest proportion of households with solar PV are London boroughs. However, there is also considerable potential in London for roof mounted solar PV, as solar radiation is high and there is extensive roof space.
When installing roof solar panel, main consideration is solar energy on building envelopes , more solar energy income , more efficiency the project is.

Vegetation

According to **London Plan Guidance,** the identification of greenery injection opportunities should be focused on what can be delivered through the planning system. Overlaying site allocations, Opportunity Areas and the location of other regeneration or significant infrastructure projects onto the baseline map provides the opportunity to understand where land use changes could secure appropriate types of new greening.
When adding new greenery, main considerations are: wind speed and cooperation with proposed playground.

Meteorological analysis

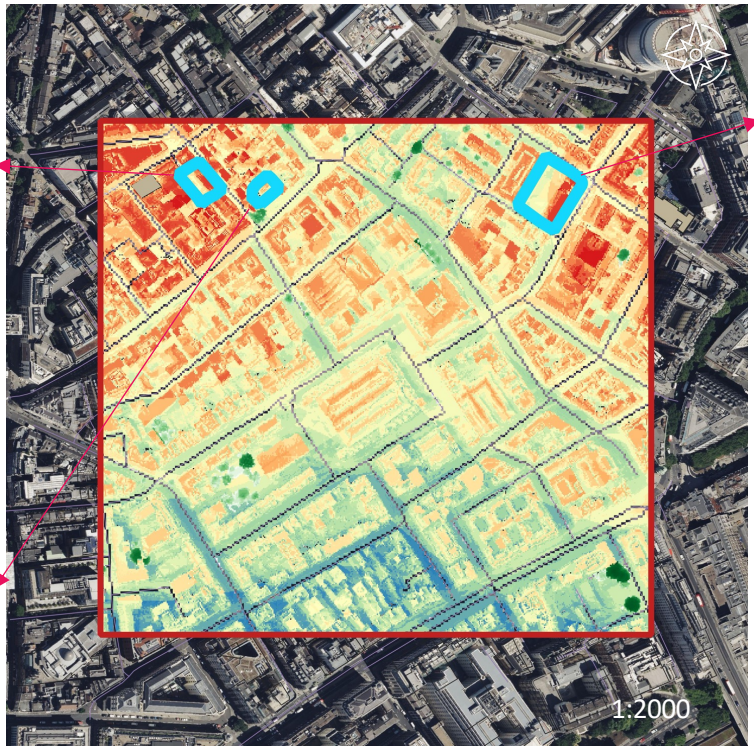
Site meteorological analysis includes the calculation and summary of radiation temperature and wind direction data at different times of the year.

In the process of selecting a playground, the main considerations are:

- the distance from the school
- the distance from the road
- the radiation temperature in January
- the radiation temperature in July
- Greenery condition

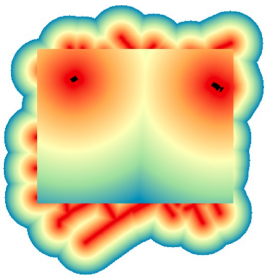
Site1:Children playground(648.97sqm) This is a continuous commercial area with a higher weighted result,indictaing it is near school, warmer in winter and cooler in summer.However it's relatively lack of greenery to provide shading.

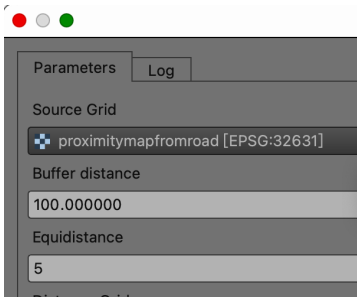
Site2:Community playground(317.33sqm) This is a open area located in a residential community,relatively small in area but is nearer to the apartments, could be used as a small community playground. indictaing it is also near school, warmer in winter.



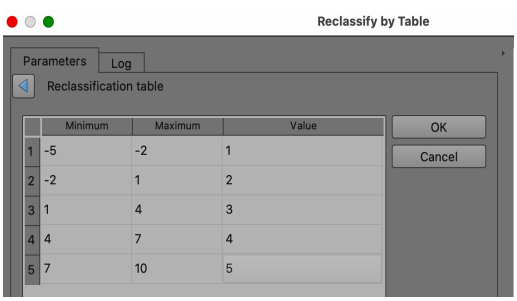
Site3:Children playground(1835.58sqm) This is also a bigger open area which has a higher weighted score, allowing more sports infrastructure.

In terms of the method, The roads and schools are rasterized to a resolution of 1*1 respectively. The radiative air temperature data for January and July, generated by SOLWEIG , are reclassified and standardized into five categories. Subsequently, they are graded and evaluated based on criteria favoring playground construction. The final evaluation map is produced using the raster calculator, incorporating factor importance weighting. In addition, the difficulty of demolishing the existing building and the location of vegetation layer is overlaid to help the site consideration.





Proximity map of schools and road



Reclassify Janurary temperature into 5 catagories

```
"reclassifiedschoolproximity@1" * 0.4 + "relassifiedroadproximity@1" * 0.2 + "janTmrtreclassified@1" * 0.3 +
"julyTmrtrelassified@1" * 0.1
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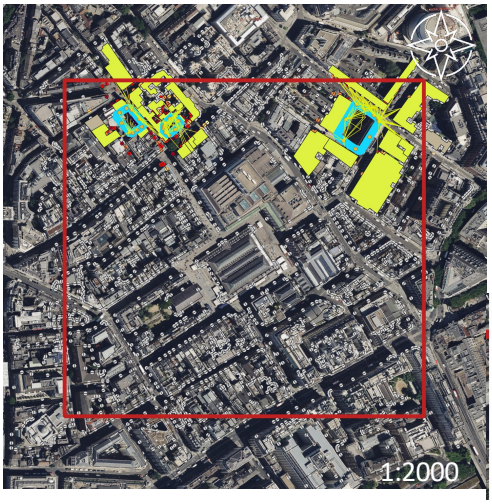
Weight of each factor , to facilitate a children playground, the proximity to school is most important,which accounts for 40%, in terms of weather, In London,it is more important to have it warmer in winter than cooler in summer.

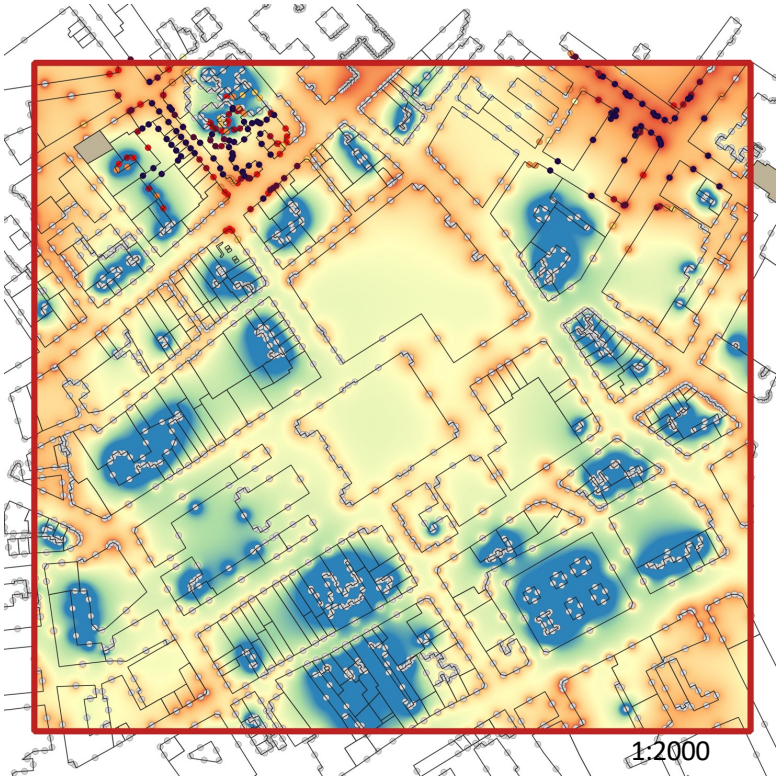


In total of 24 buildings will be effected by the noise, most of them are residential area, with small portion of business.

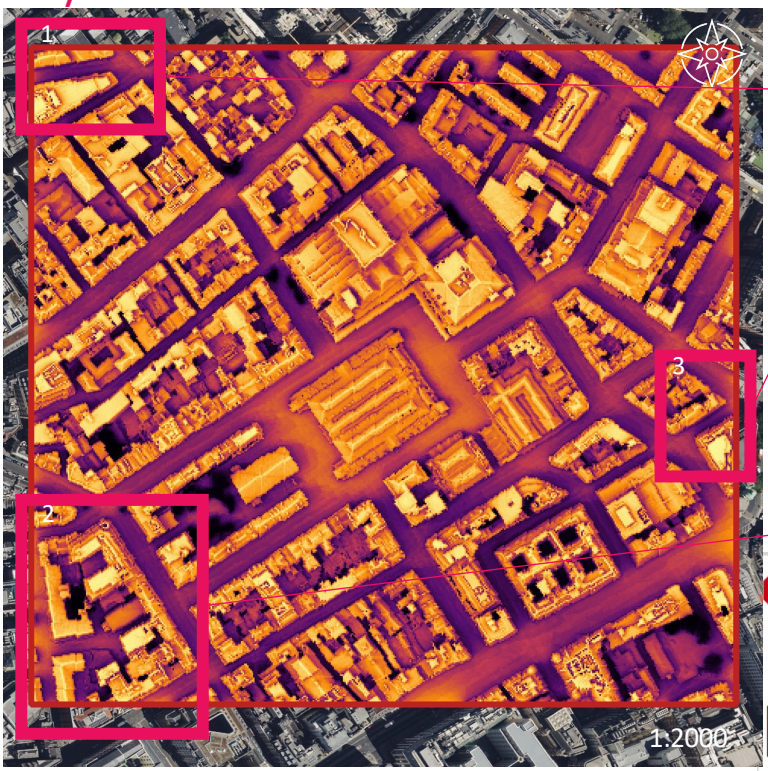
	full_id	osm_id	osm_type	building
1	w80120142	80120142	way	apartments
2	w123314478	123314478	way	apartments
3	w123315493	123315493	way	apartments
4	w173544660	173544660	way	apartments
5	w173544661	173544661	way	apartments
6	w670986515	670986515	way	apartments
7	w986952081	986952081	way	apartments
8	w173544659	173544659	way	office
9	w173544664	173544664	way	office
10	w173544243	173544243	way	residential
11	w173544259	173544259	way	residential
12	w173544280	173544280	way	residential
13	w173544281	173544281	way	residential
14	w173544303	173544303	way	residential
15	w80207928	80207928	way	yes
16	w80207930	80207930	way	yes
17	w81071469	81071469	way	yes
18	w81071485	81071485	way	yes
19	w173544239	173544239	way	yes
20	w175156877	175156877	way	yes
21	w186337062	186337062	way	yes
22	w186337096	186337096	way	yes
23	w562307439	562307439	way	yes

Show All Features

Noise level before the playground construction



July

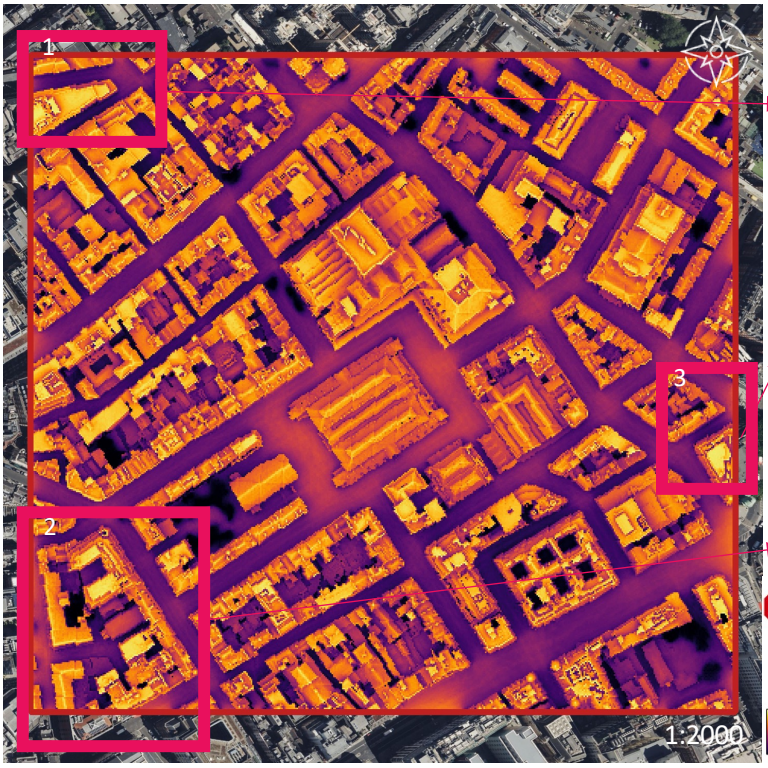


In July ,The roof has a flat and continuous space for solar panel installation, which is the highest in the area (8.40) .

In July ,this roof has a 8.5 radiation,however its typology is not suitable for installation.

In July ,this roof also has a higher solar radiation, which accounts for 8.3.

Janurary



In Janurary ,this roof still has a high level of solar radiation compared to others ,which is approximately 0.44.

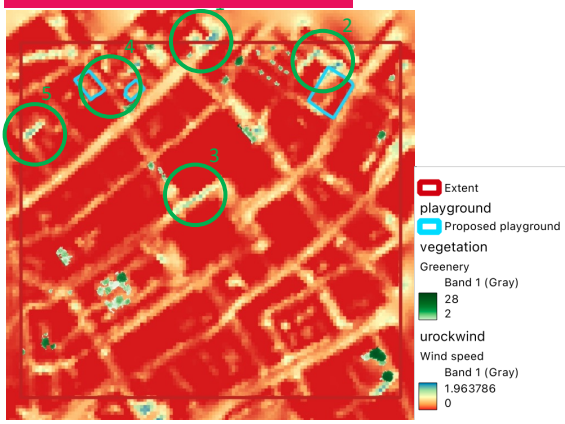
This roof is the highest in the area(0.45).

This roof accounts for 0.435.

After comparative analysis, the solar radiation of buildings in January and July are 1 and 3, which are more suitable for installing pieces of solar panels.

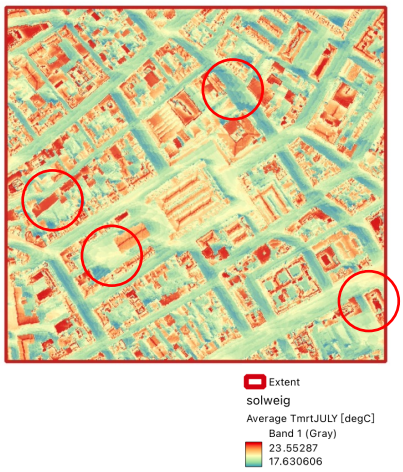
Vegetation

Wind speed and vegetation



Increase vegetation in 5 locations: Overlay the wind speed map made by UROCK. In this community, roadside vegetation can be added to 1,3 and 5 to improve the walking comfort of passers-by due to the faster wind speed caused by the narrow pipe effect; There is both the narrow tube effect and the proposed location of the playground in site 2 ; 4 is the central area of the two new playgrounds, and trees and shrubs can be appropriately added for shade.

Thermal comfort and vegetation

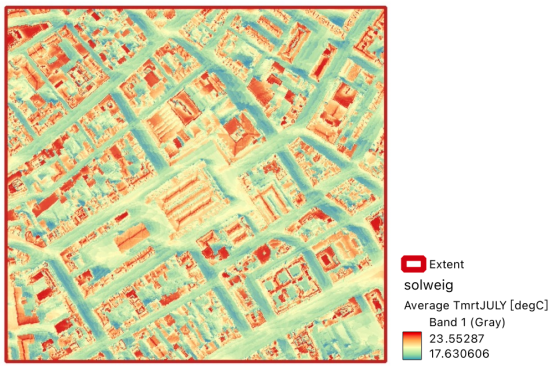


Comparative analysis of shadow formation by vegetation in July

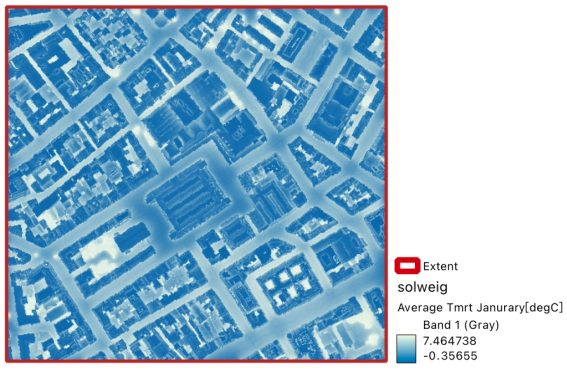
The comparison found that areas in shadow generated by vegetation were 0.5 to 1 ° C cooler in July than areas directly under the sun (solar radiation data generated by solweig), but had no noticeable effect in January. It is proved that vegetation has a significant cooling effect on urban communities.

Meteorological analysis

July



Janurary



The average radiation temperature difference between winter and summer is about 15 degrees. The interior of the closed building is warm in winter and cool in summer, and the seasonal temperature difference is the smallest. The roof, especially the flat roof, has the biggest seasonal temperature difference. The visibility of the sky generated by the use of skyviewfactor has little difference in seasons, and the difference is larger in winter and summer in areas mainly covered by vegetation canopy.