

CIRCULAR PARK

Consulting services of GIS experts to develop urban design and placemaking concepts for areas in the Circular Park in Yerevan, Armenia.



CIRCULAR PARK

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USING DATA TO ANALYZE URBAN SPACE

Users' performativity in crowd-sourced locative platforms and especially location-based social networks centred on urban spaces is contingent on the places where the actions take place. The great potential of crowd-sourced data is being exploited to analyze a diverse range of topics related to the functional organization of the city (Arribas-Bel and Tranos, 2018), such as: the relationship between urban form and function (Crooks et al., 2015, 2016); the identification of POIs —points of interest— (Van Canneyt et al., 2012; Deng and Newsam, 2017; García-Palomares et al., 2015; Van Weerdenburg et al., 2019) and their accessibility in terms of density and diversity (Shen and Karimi, 2016); the characterization of Livelihoods according to the collective behaviors of residents (Cranshaw et al., 2012); and, the delimitation of functional areas to understand social and spatiotemporal aspects of the city (Chen et al., 2017; Rösler and Liebig, 2013).

United Nation's Development Programme UNDP invited SPIN Unit to analyse the most important urban park of Yerevan, the capital of Armenia. This report presents the outcome of our analysis on the historic Circular Park, based on multiple geo- referenced data sources and advanced spatial analysis tools. Our analysis is aimed to help the forthcoming work on sustainable urban design and socially meaningful placemaking of the Circular Park and the historic centre of Yerevan.

READING THE CITY THROUGH ACTIVITY

The link between the physical aspects of the urban form and the clustering of city functions contributes to create a specific type of urban life (Crooks et al., 2015; Kropf, 1996).

Urban activity together with other factors —i.e. social preferences and urban morphology— have a significant impact on the perceived character of neighborhoods (Cranshaw et al., 2012; Kropf, 1996). In fact, 'the availability and easy access to the range of goods and services that provide for residents' necessities and amenities give neighborhoods a sense of place and identity (Mehta and Mahato, 2018). Indeed, at a cognitive and perceptual levels, neighborhood units are largely defined by the association of spatial features to socio-economic and behavioral aspects (Kropf, 1996; Lynch, 1960).

Structure, function and form are not sufficient for the generation of social relations; they can only favour it. In the context where social platform became ubiquitous, the socio-cultural expression and economic transactions are no longer space-bound. Instead they dramatically influence the determination of social needs, which can be influenced by global trends as well as by local phenomena.

In this context, the collection and study of activities that people engage with becomes fundamental to learn more about contemporary life in the city. In urban planning, there is a long-lasting tradition of functional zoning and, more generally, a consideration towards classifying urban structures and infrastructures according to functional typologies – which separate for example housing, leisure and work, as well as organisational typologies that distinguish public and private spaces and providers. If on the one hand the functional classification of amenities has its values in regards to planning and regional law, it does not consider the actual use that dwellers make of urban structures (Cerrone, López Baeza and Lehtovuori, 2020).



**Dr. JESÚS
LÓPEZ BAEZA**
Project lead

Project Architect in SPIN Unit and Lead Scientist in CityScienceLab at the HafenCity Universität Hamburg, where he has led and participated in several international projects in Europe and Asia.

Part of his work encompasses social cohesion, activities and livability of urban spaces, and citizen preferences in urban public spaces, urban identity production, spatial perception, agent-based modeling, among other dynamics in the field of advanced socio-spatial analysis



**DAMIANO
CERRONE**
Expert

Damiano Cerrone is Consultant at Demos Helsinki and co-founder of SPIN Unit, an international urban agency, combining art and science to find new approaches to urban planning and design.

He works on the development of new avenues of research inquiry around urbanity and digital societies to foster change in policy making and urban management. His personal research leverages digital footprints to study new solutions to retrofitting inner cities to contemporary life.



**Prof. Dr. PANU
LEHTOVUORI**
Senior expert

Panu Lehtovuori is the Professor of Planning Theory at the Tampere University, School of Architecture, and the head of Urban Planning Research Group. Before the current position, he was the Professor of Urban Studies at the Estonian Academy of Arts in Tallinn.

Lehtovuori's research interests focus on contemporary forms of public urban space, new urban design approaches and the resource-efficiency of built environment. Lehtovuori is partner of Livady Architects, one of Finland's leading experts in heritage evaluation and conservation, co-founder and LAB lead at SPIN Unit international urban agency.



**KRISTI
GRIŠAKOV**
Expert

Tallinna Tehnikaülikooli Arhitektuuri ja urbanistika akadeemia programmijuht ning TallTech Targa linna tippkeskuse teadur. Alates 2009 aastast teadur ja külalislektor Aalto Ülikoolis. Koostöös SPINUnitiga viinud läbi erinevaid uurimisprojekte liikuvuse, linna- ja regionaalplaneerimise ja stsenariumiplaneerimise valdkonnas.

Grišakovi uurimisteemad keskenduvad tuleviku planeerimise meetoditele, eelkõige stsenariumiplaneerimisele, samuti liikuvuse ja linnaruumi andmepõhisele planeerimisele. Maastikuarhitektuuri õppekavade programmijuhina omab ekspertilisi kasutajakeskse disaini ning (maastikuarhitektuurse) projekteerimise valdkonnas.

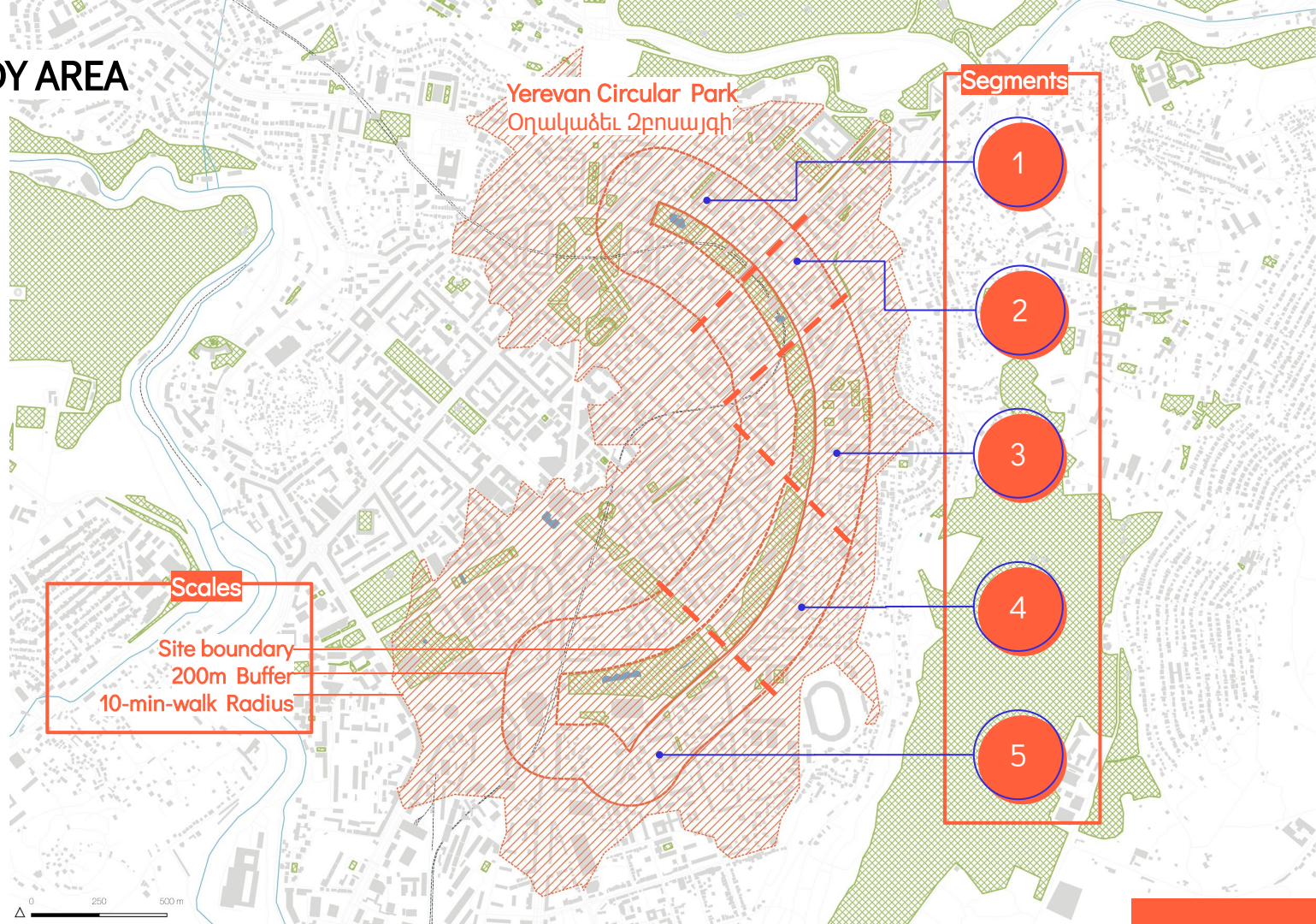


**KRISTJAN
MÄNNIGO**
Data analyst

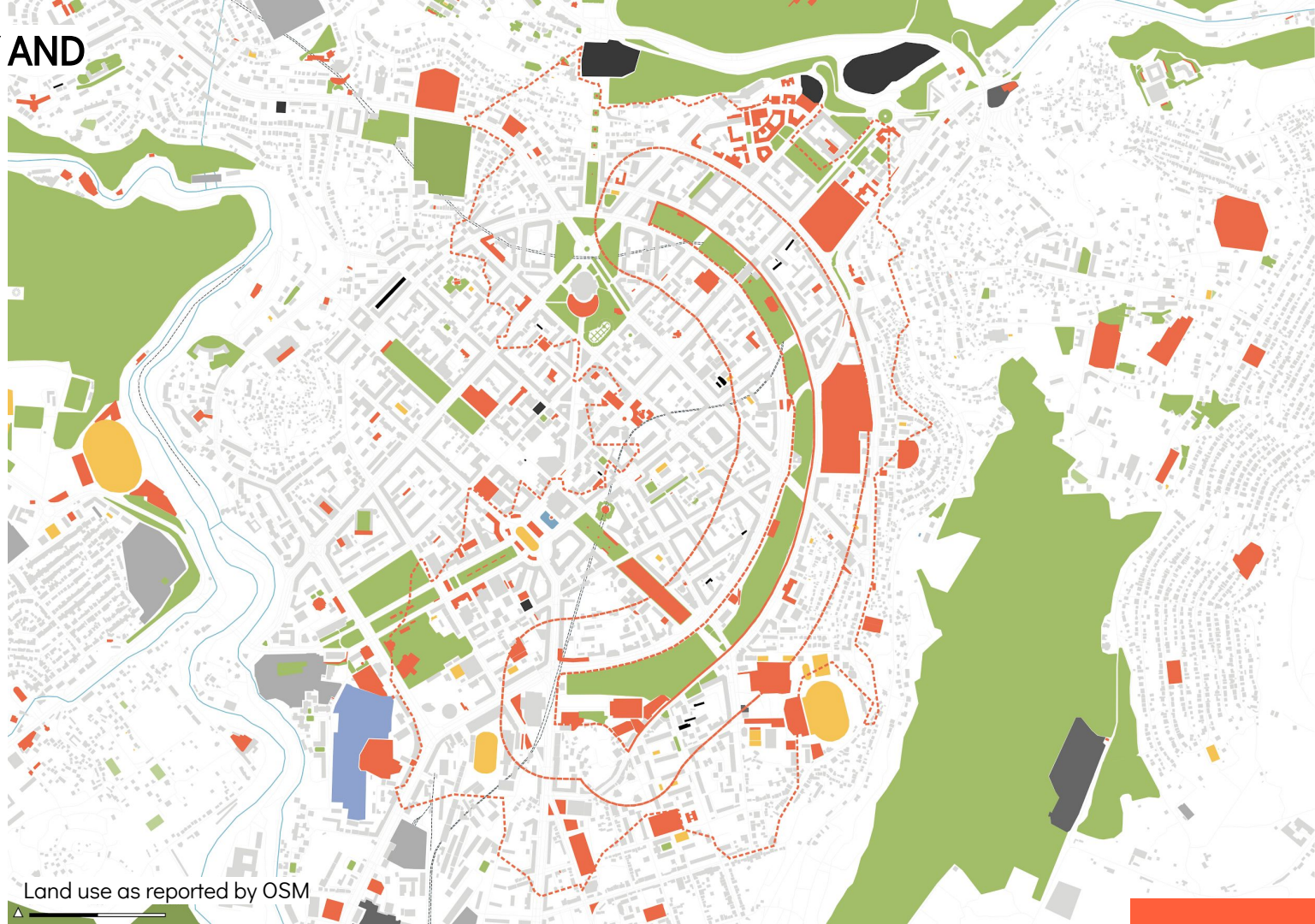
Kristjan Männigo is a member of the international urban research agency SPIN Unit, executive architect of Ars Projekt and an external lecturer at the Faculty of Architecture of the Estonian Academy of Arts.

Kristjan's main interests are city, architecture and construction data models and their practical applications in creating a better environment. In recent years, he has participated in several urban research projects as part of SPIN Unit and worked as an architect in the design of high-rise buildings.

Yerevan Circular Park
Օղակաձեռ շքուայգի



TERRITORY AND LAND USE



Land use as reported by OSM

CATEGORISING URBAN AMENITIES

The SPIN wheel shows a way to categorise the currently available rich data on urban amenities in ten broad types that are socially meaningful and understandable. The ten types - such as leisure or mobility - are further divided in **necessary and optional activities**, following Jan Gehl's classic formulation. Key idea is that good urban space needs to have a balanced mix of optional and necessary activities.

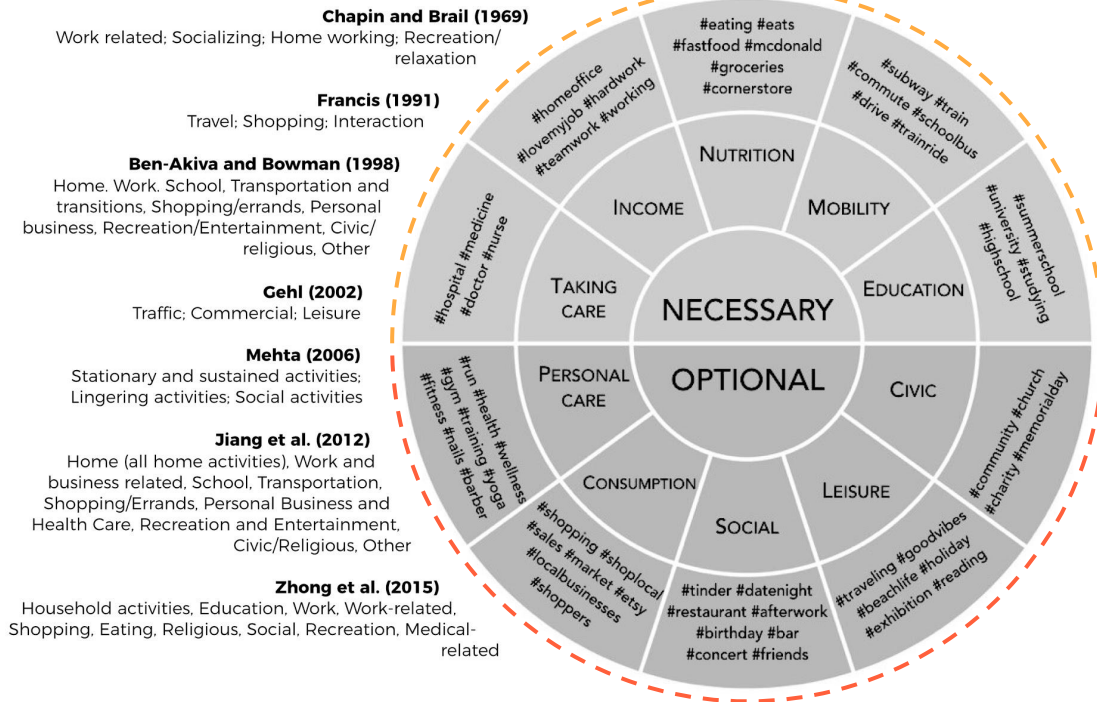
Optional activities

Taking a walk by the river, jogging in the park, sun bathing, eating out



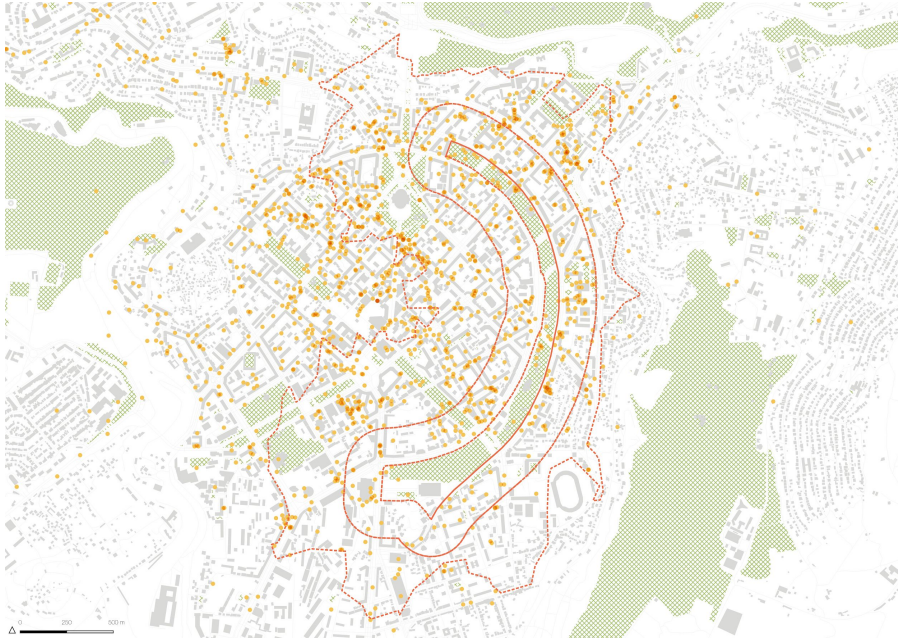
Necessary activities
Going to work, to school,
doing the groceries

SPIN
UNIT

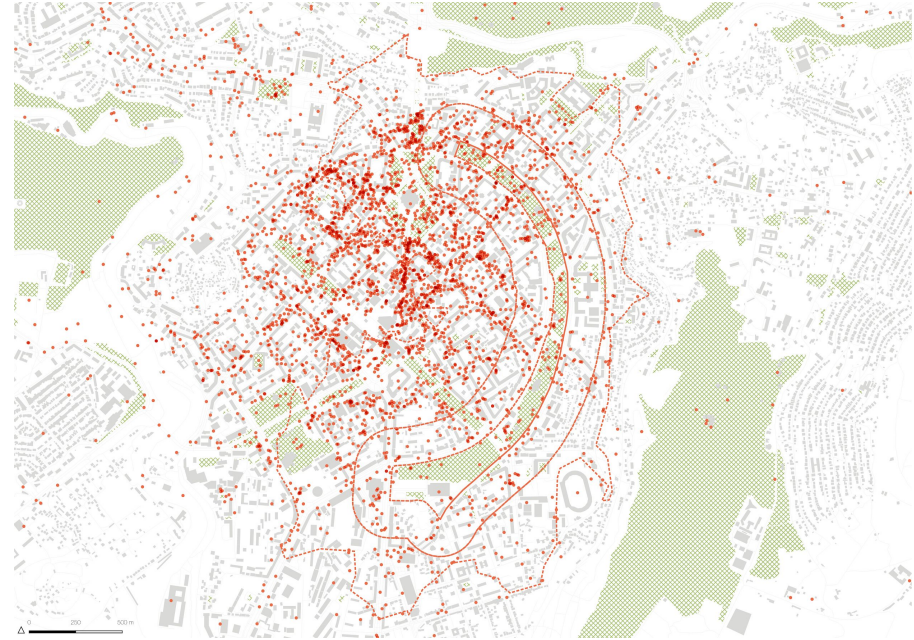


SPIN wheel

Classification of urban activity types



Necessary activities



Optional activities

TERRITORY AND LAND USE

Optional activities

Civic

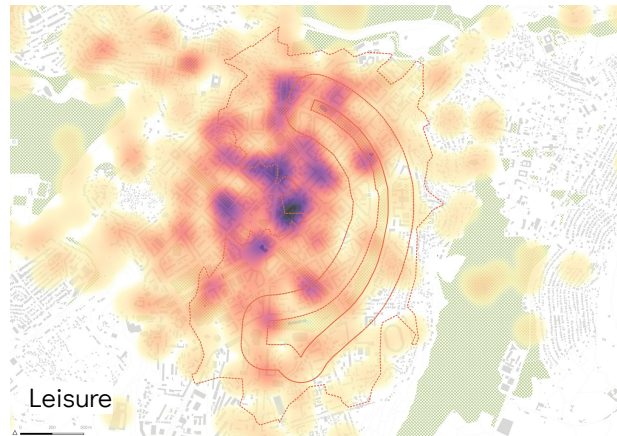
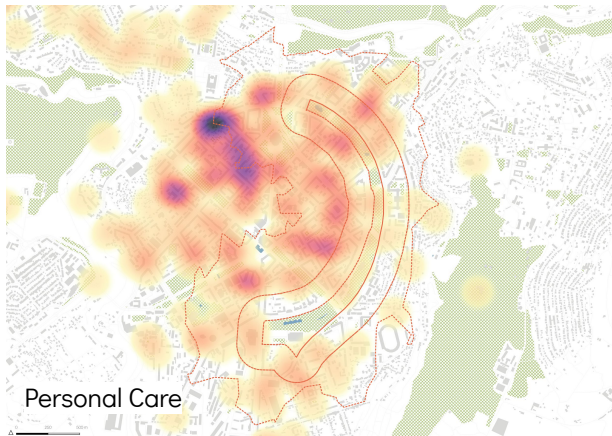
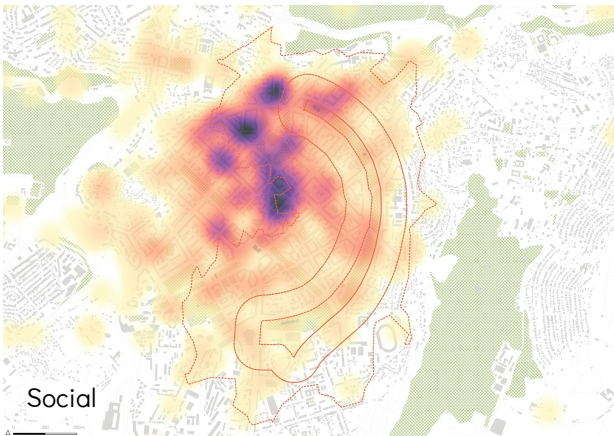
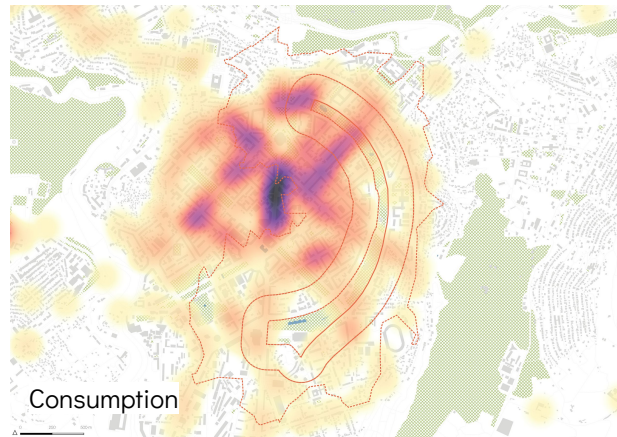
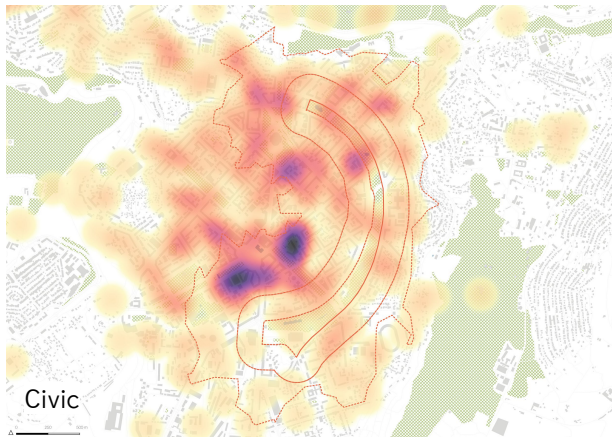
Consumption

Social

Personal Care

Leisure

This series of cartographies show the density of potential activities in the city.



TERRITORY AND LAND USE

Necessary activities

Education

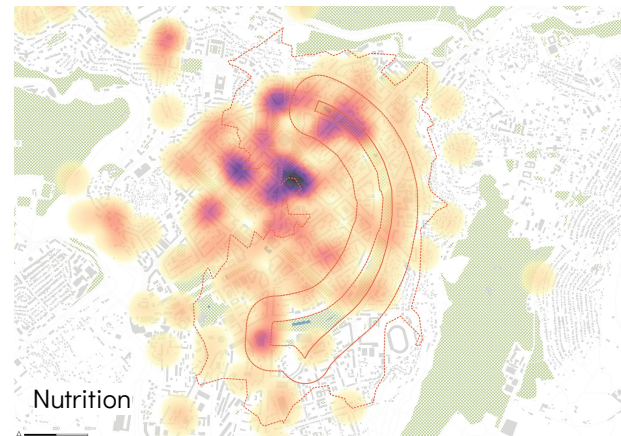
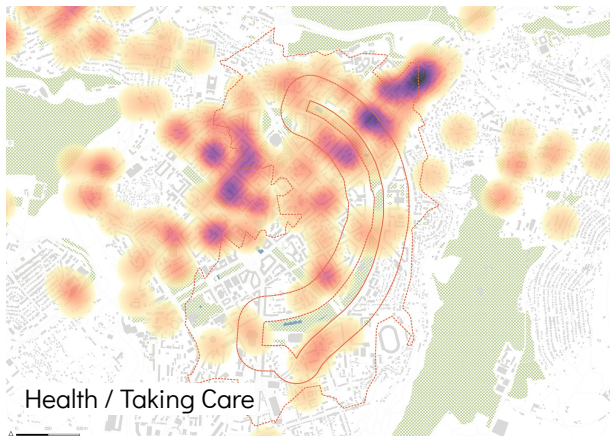
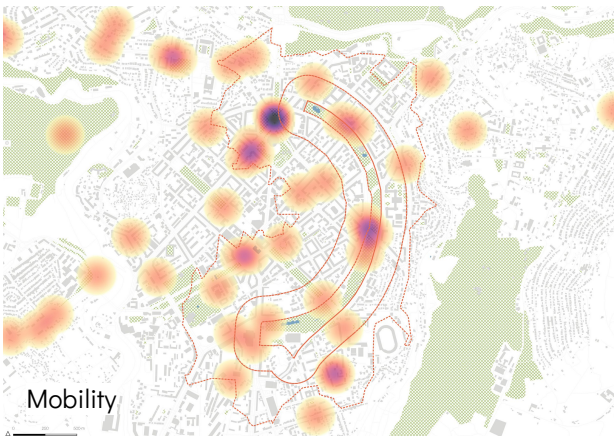
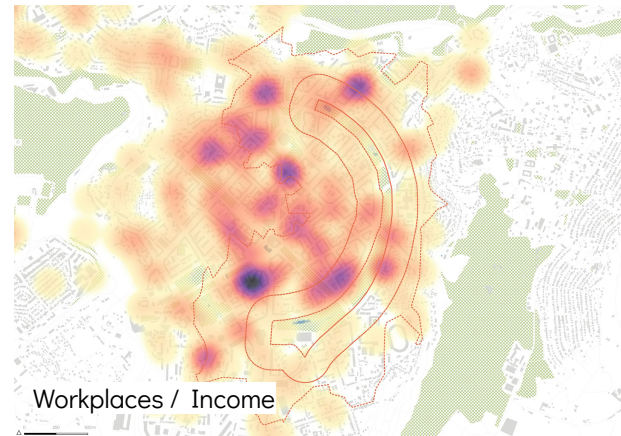
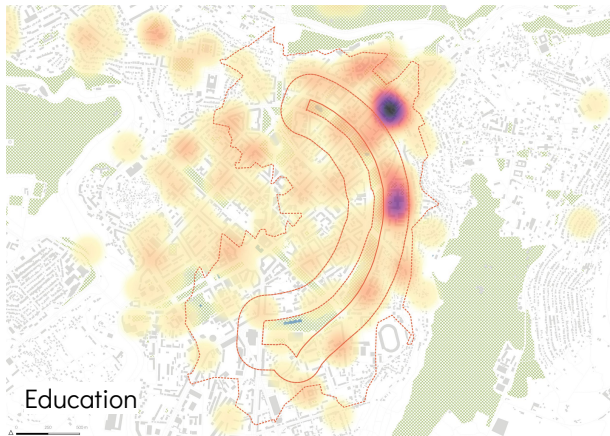
Workplaces / Income

Mobility

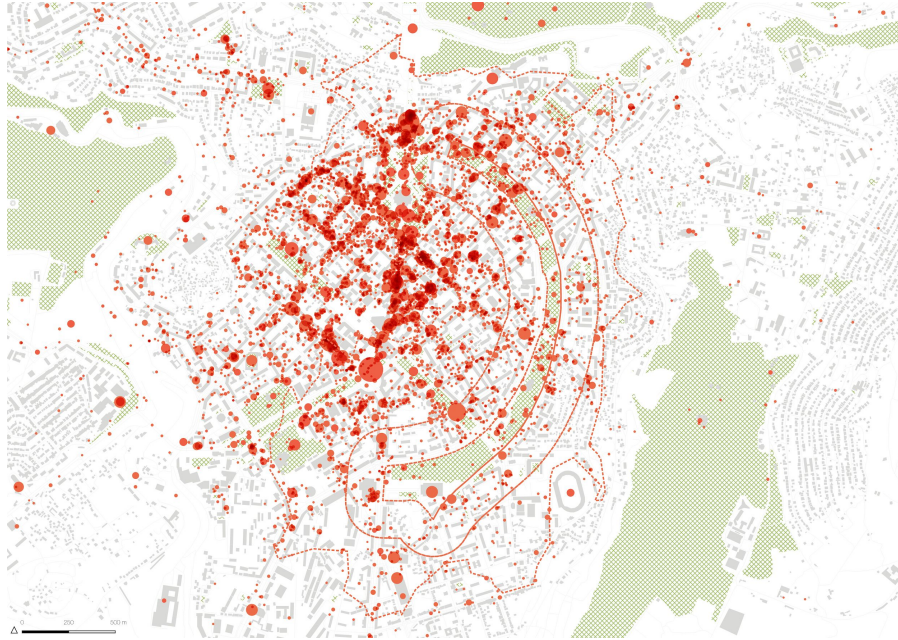
Health / Taking Care

Nutrition

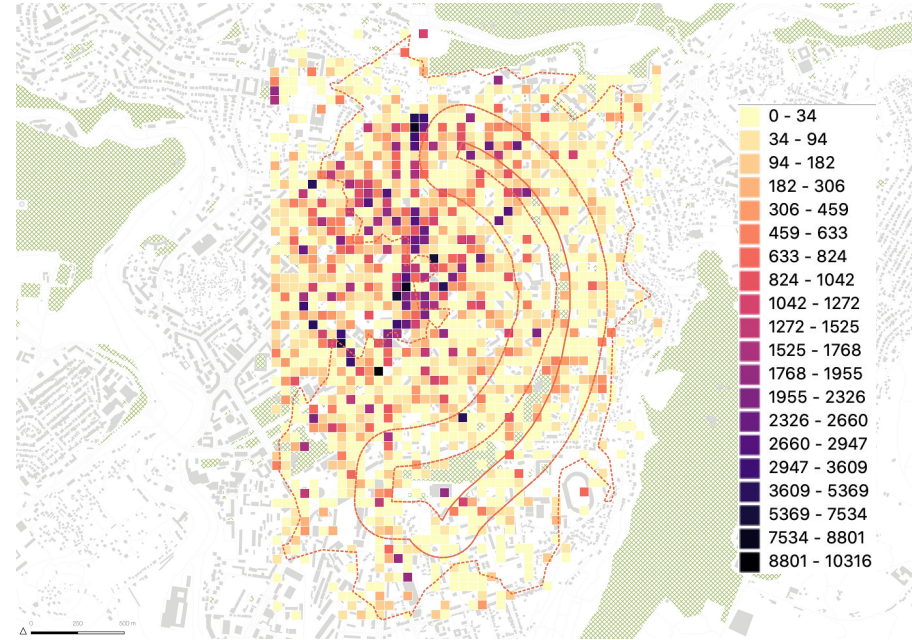
Density and distribution of activities of each type



POPULATION AND ACTIVITY



Number of different users visiting each place

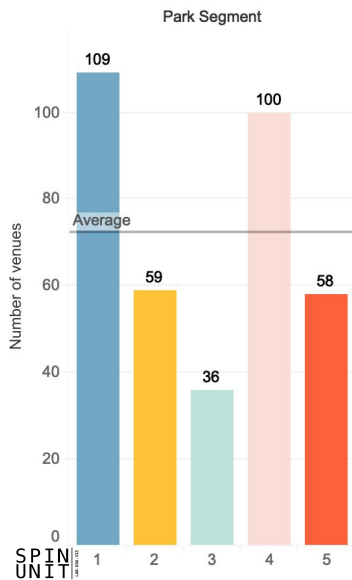


Number of different users per 2500sqm (50x50 grid)

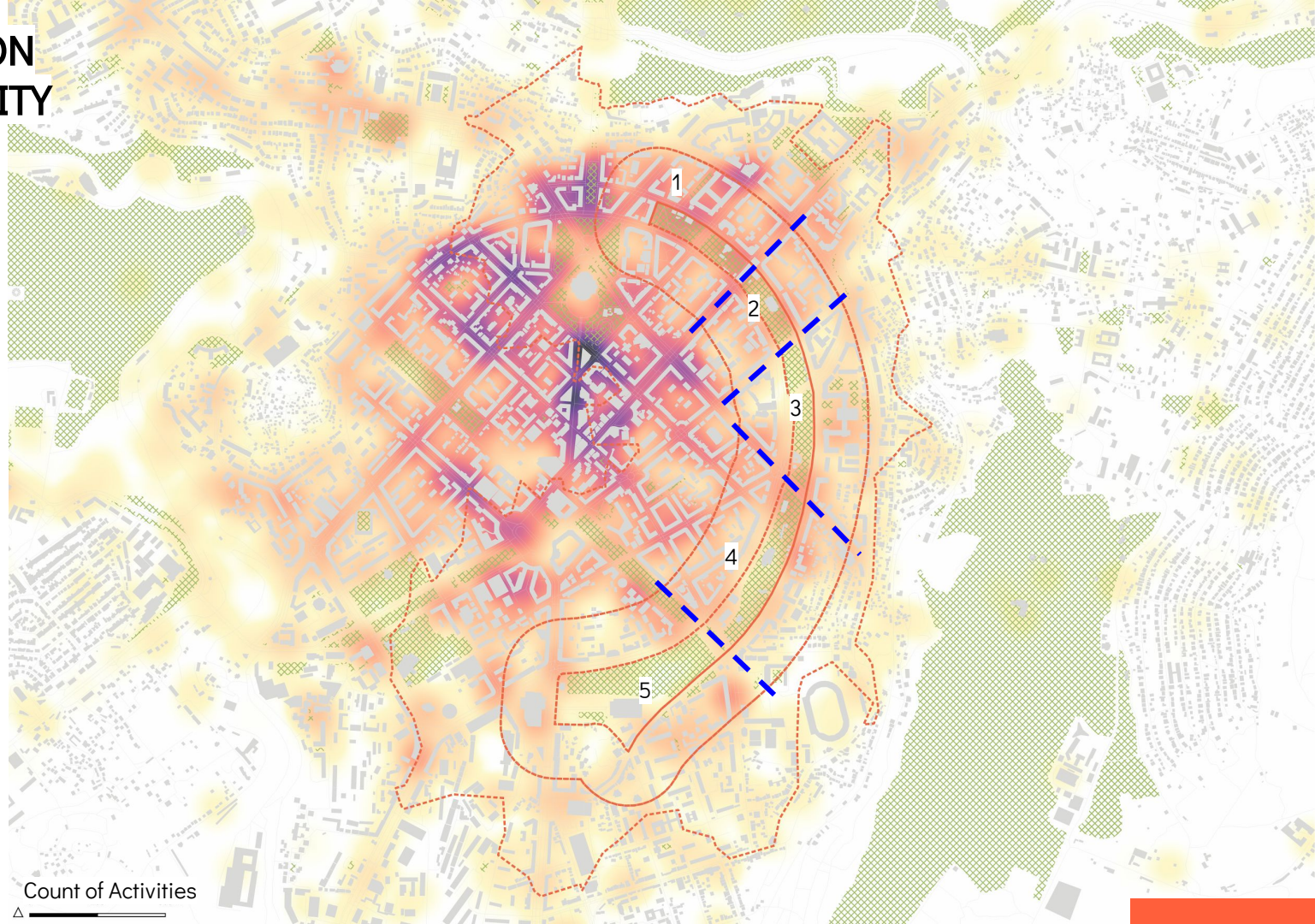
5

POPULATION AND ACTIVITY

The five segments of Circular Park are very different regarding the number of popular venues.



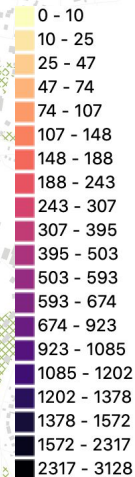
Count of Activities



LANDMARKS AND HOTSPOTS

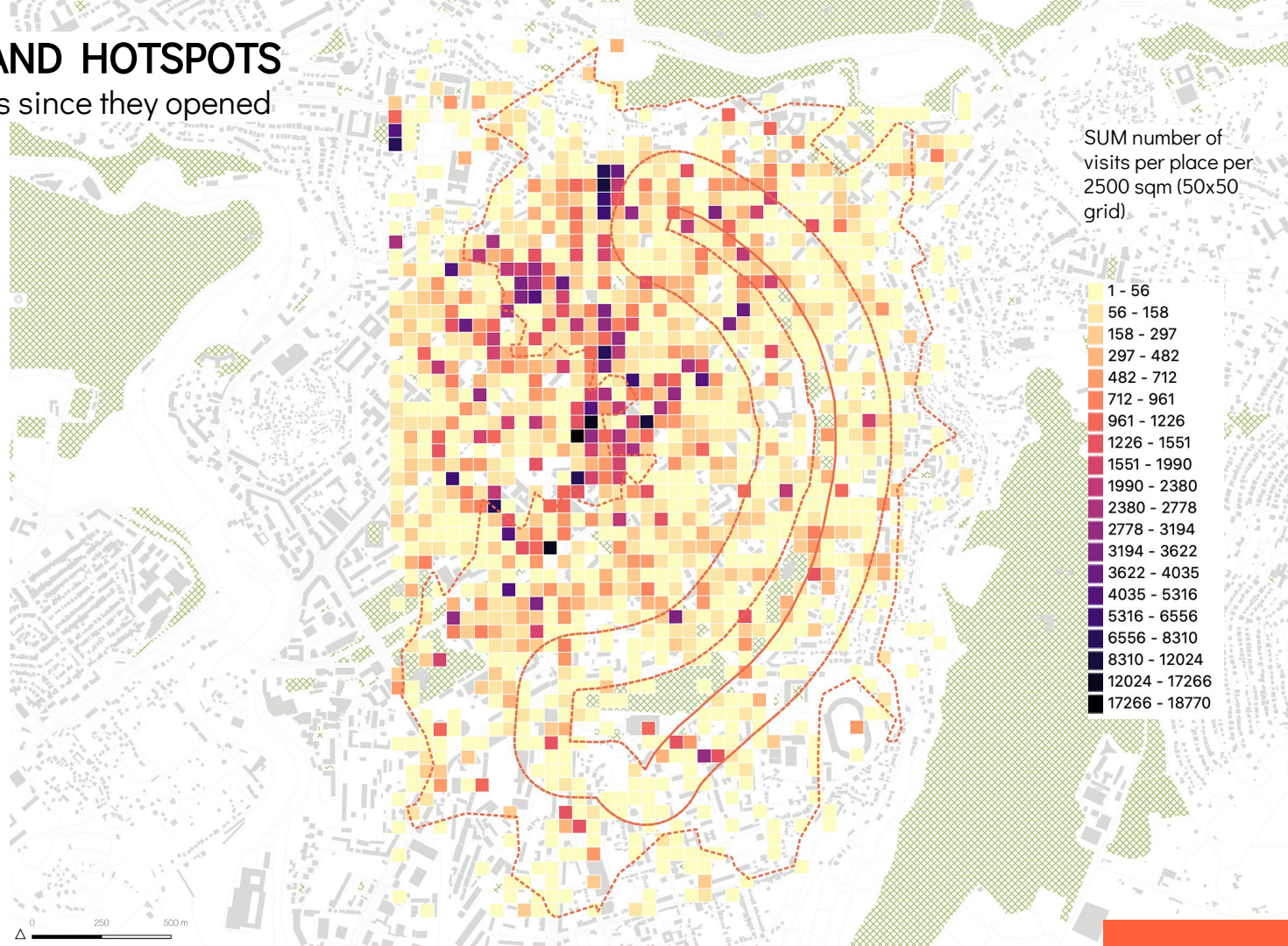
Popularity

Average
number of visits
per place per
2500 sqm
(50x50 grid)



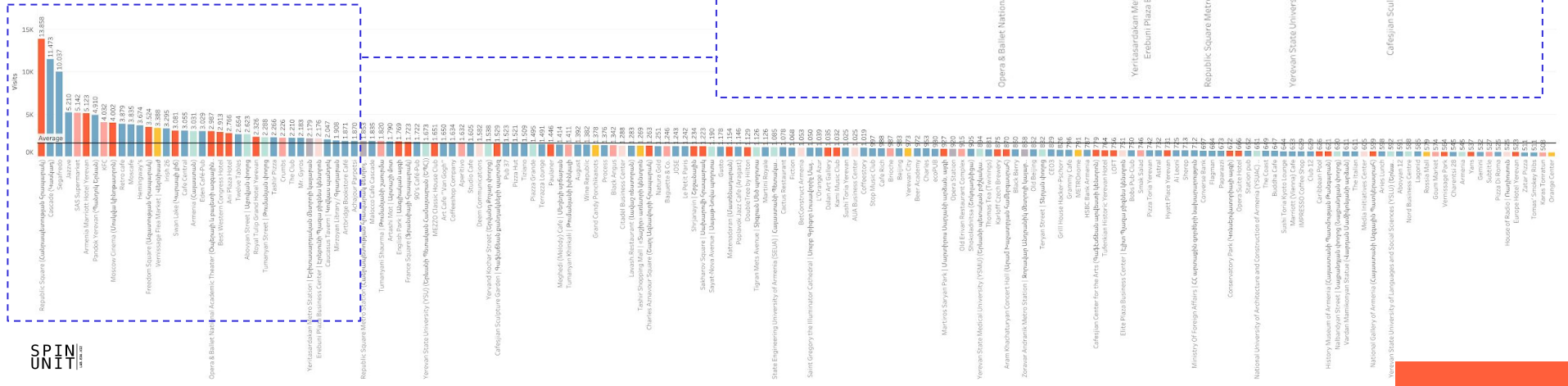
LANDMARKS AND HOTSPOTS

Most visited places since they opened

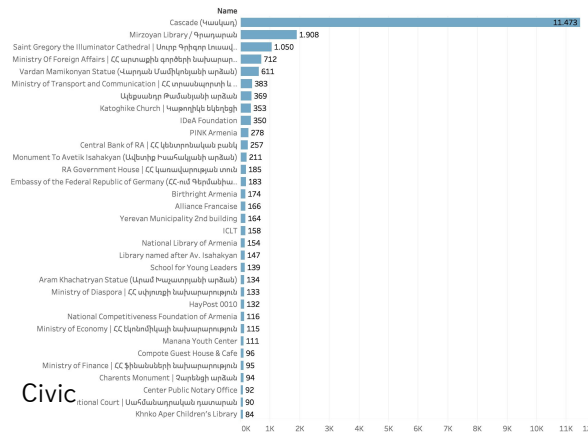
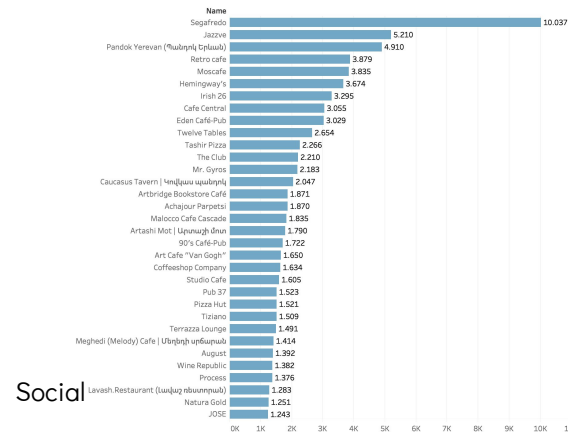
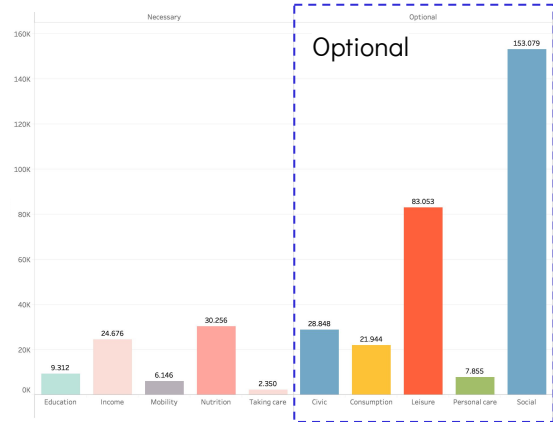


LANDMARKS AND HOTSPOTS

Number of visits in most visited places



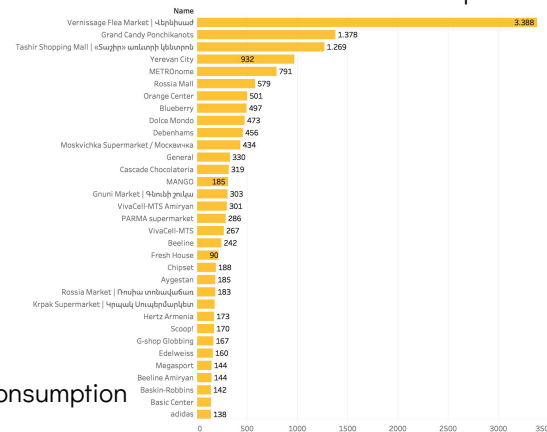
LANDMARKS AND HOTSPOTS



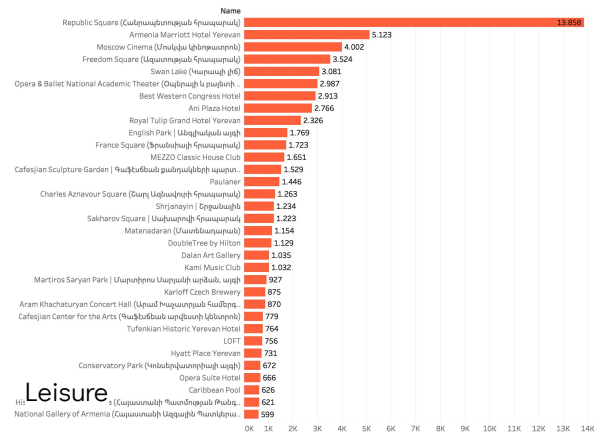
Civic

Personal Care

Number of visits in most visited places

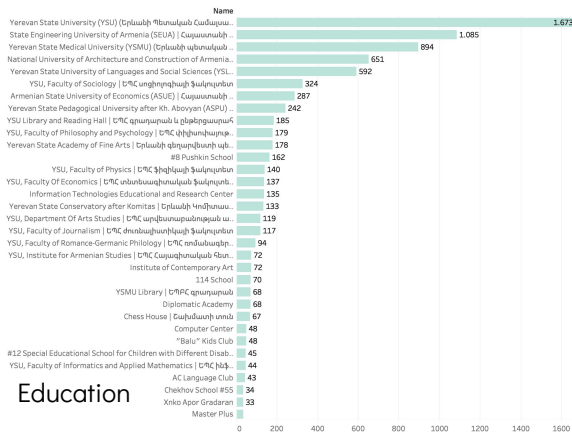
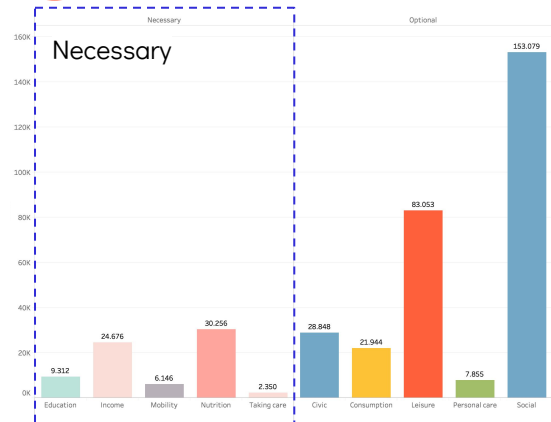


Consumption

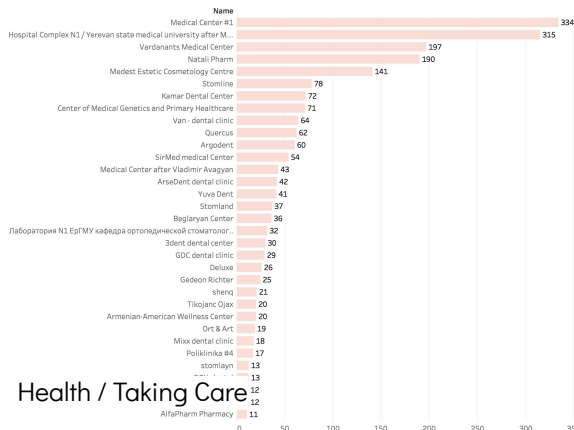


Leisure

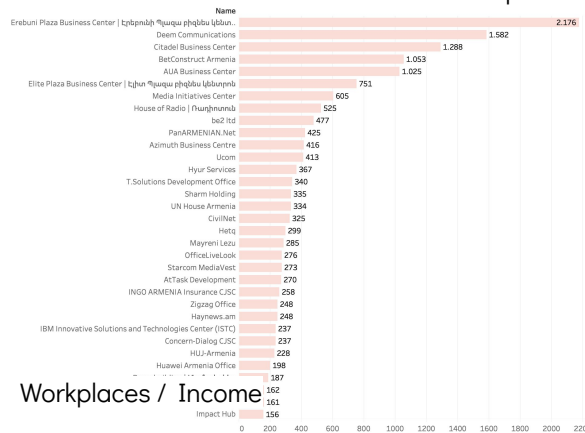
LANDMARKS AND HOTSPOTS



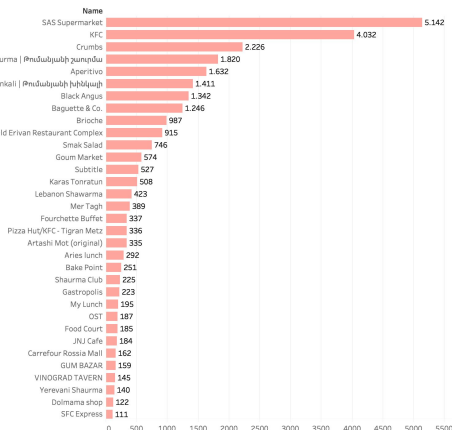
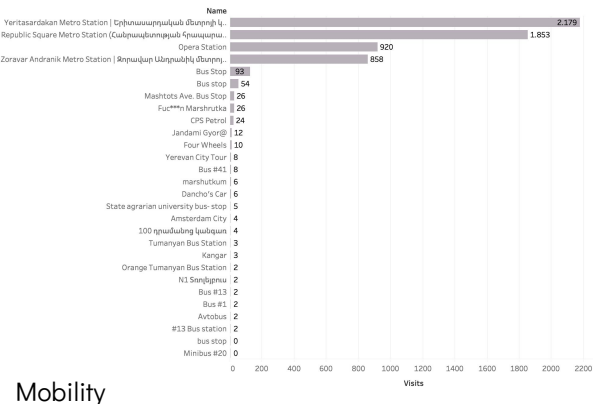
Health / Taking Care



Number of visits in most visited places

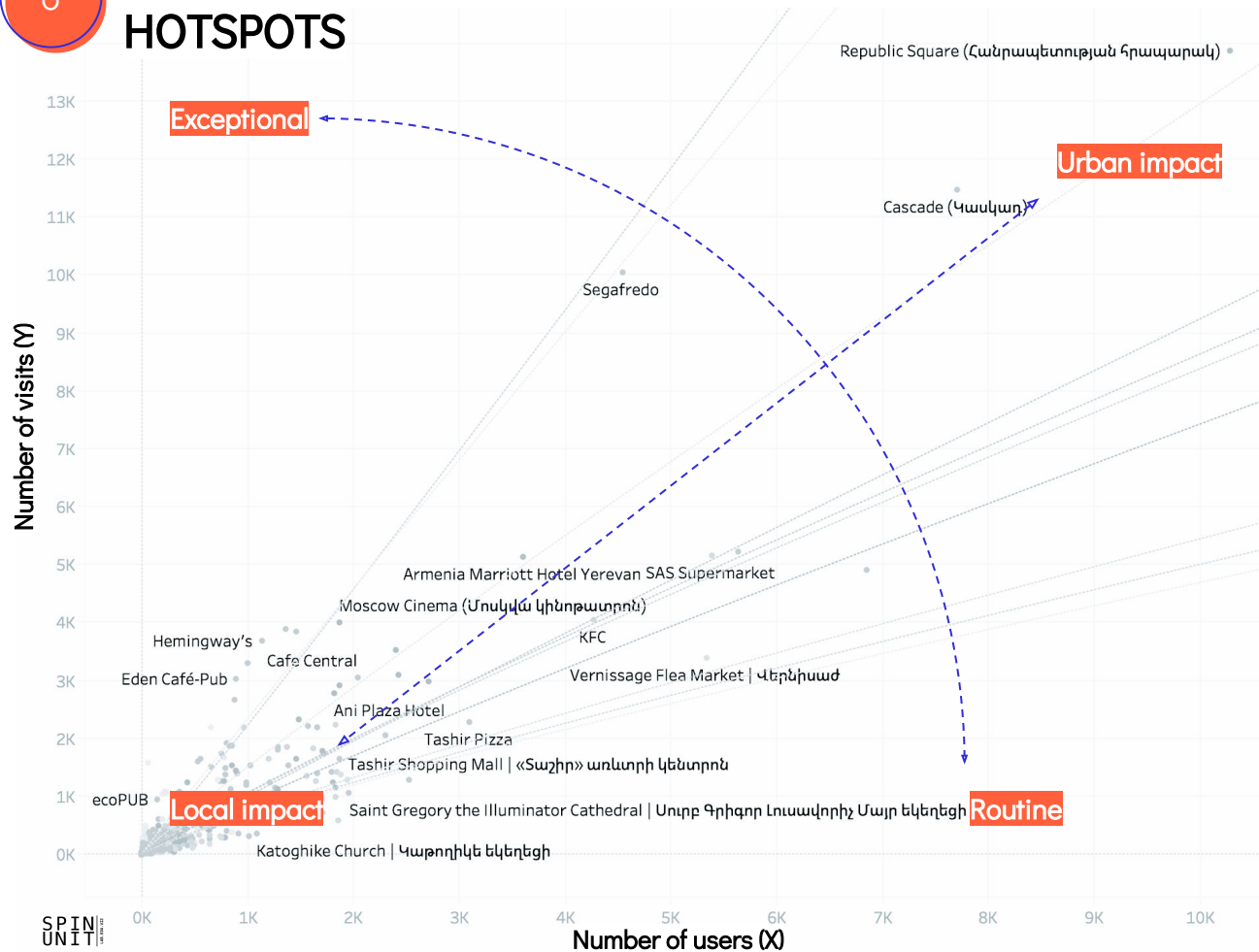


Workplaces / Income



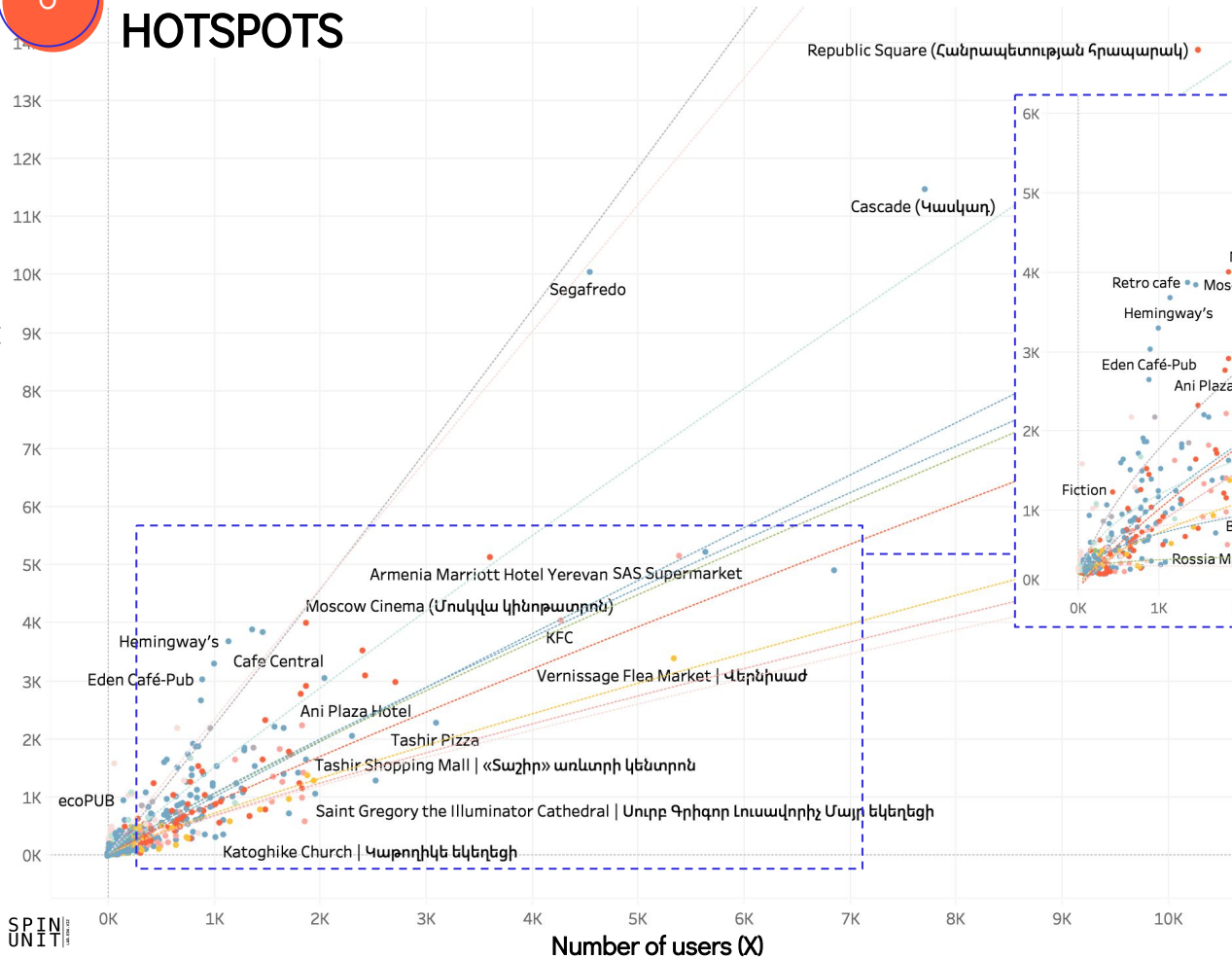
Nutrition

LANDMARKS AND HOTSPOTS

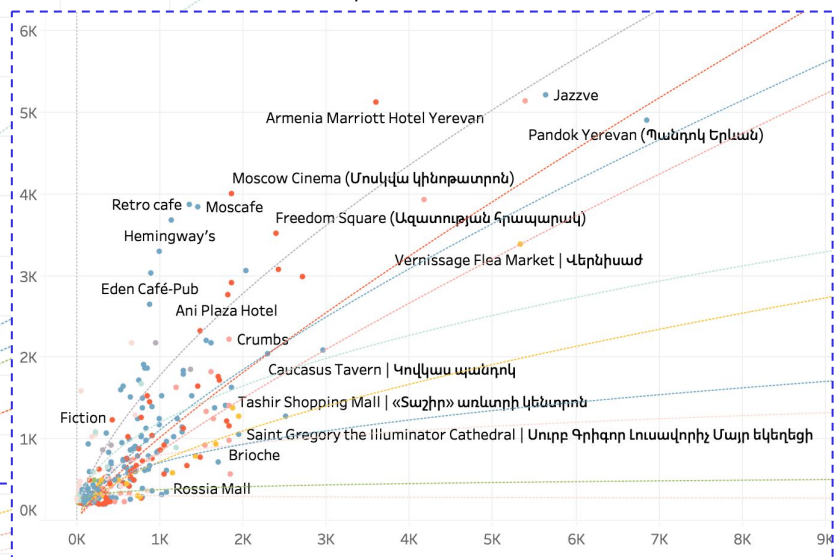


LANDMARKS AND HOTSPOTS

Number of visits (Y)

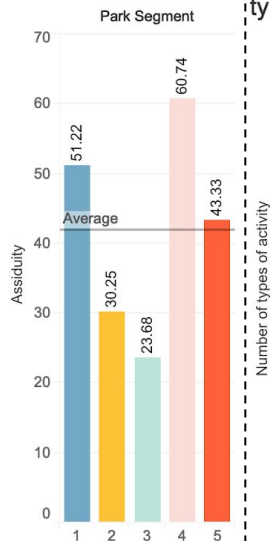


Assiduity: Number of visits (Y), Number of users (X)

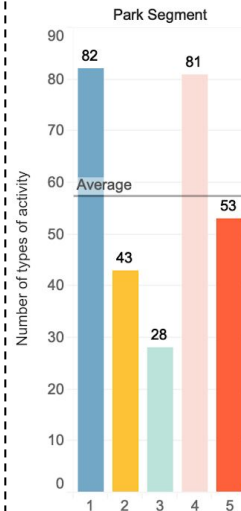


LANDMARKS AND HOTSPOTS

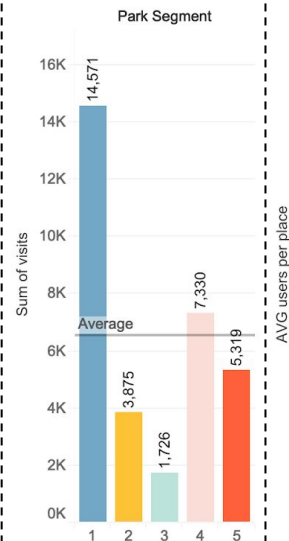
Assiduity



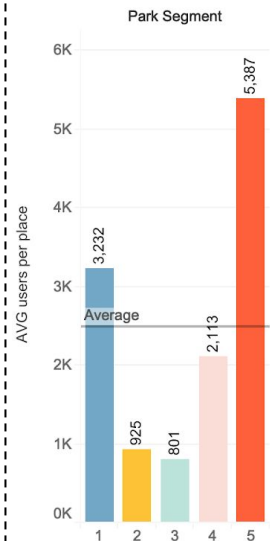
Diversity of use types



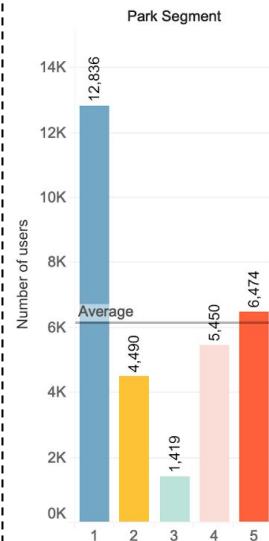
Number of visits



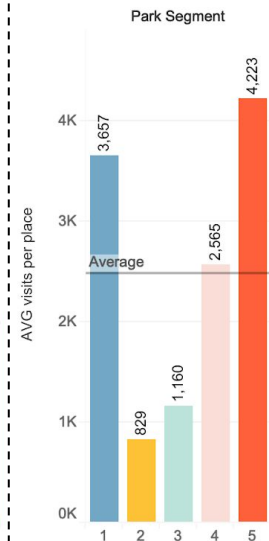
AVG users per place



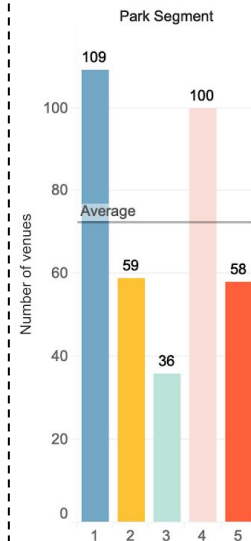
Number of users



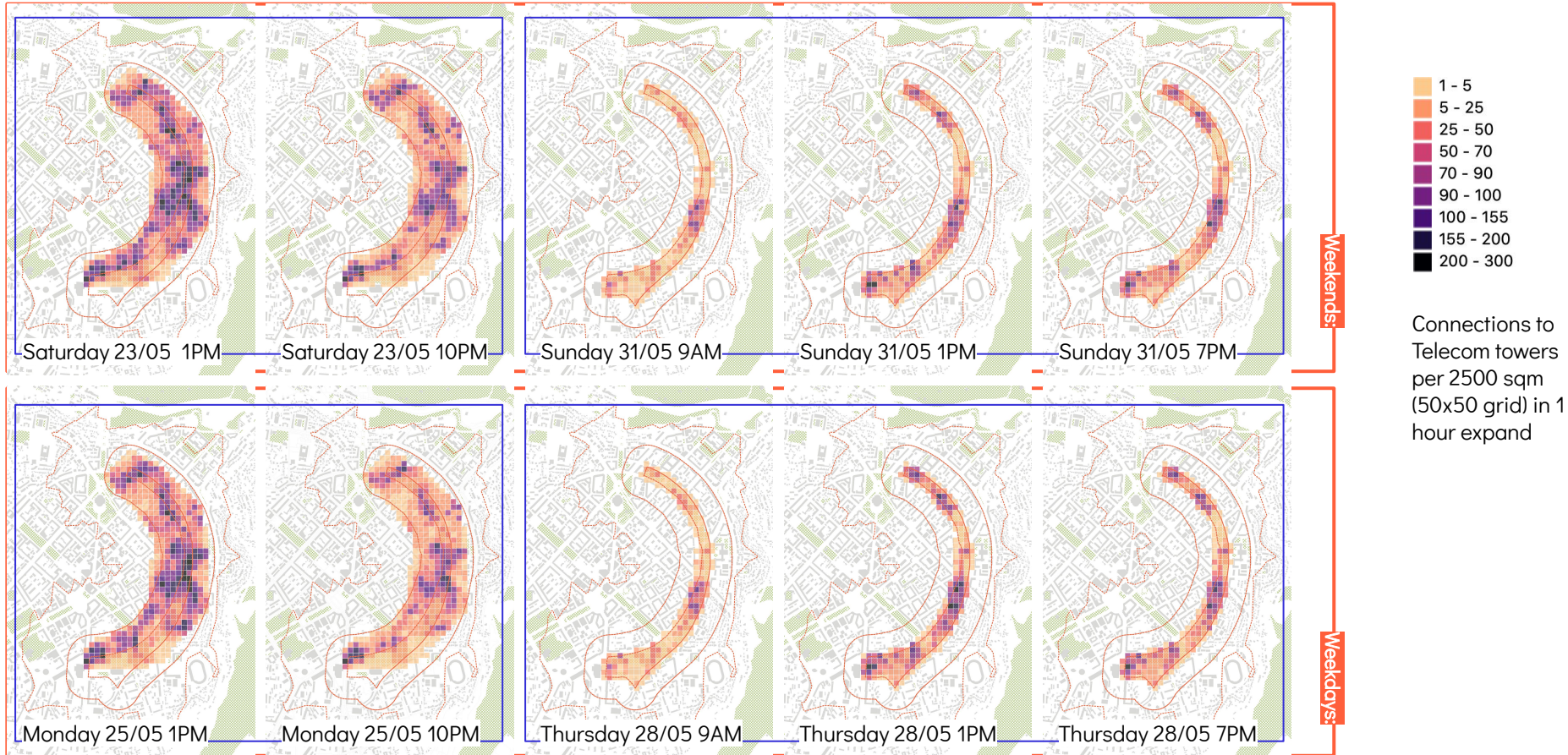
AVG visits per place



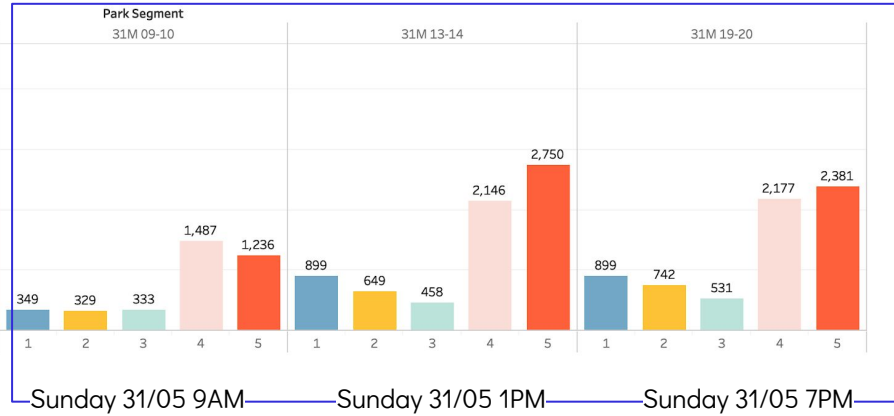
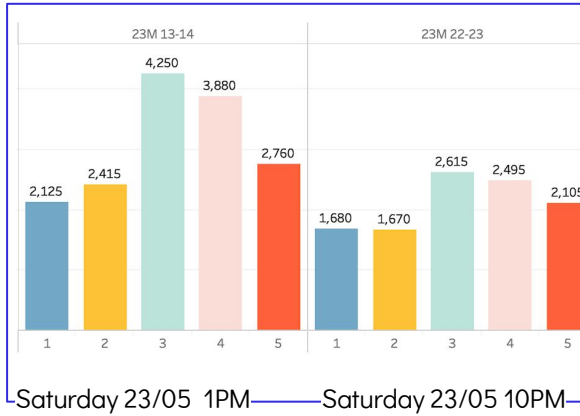
Number of venues



DAY / NIGHT ACTIVITY

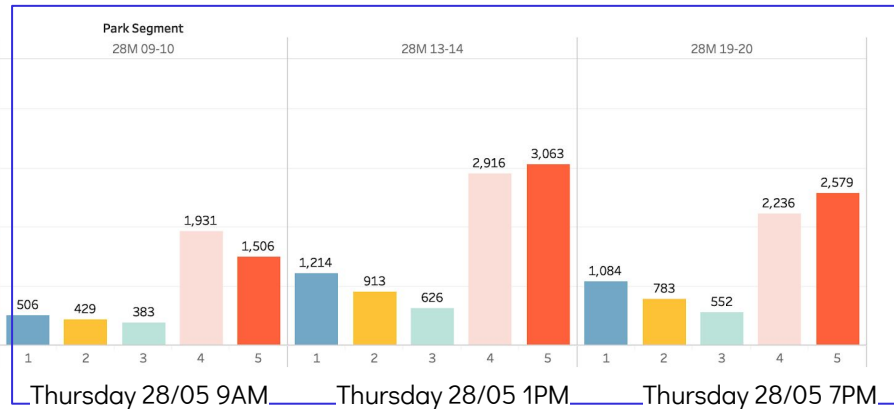
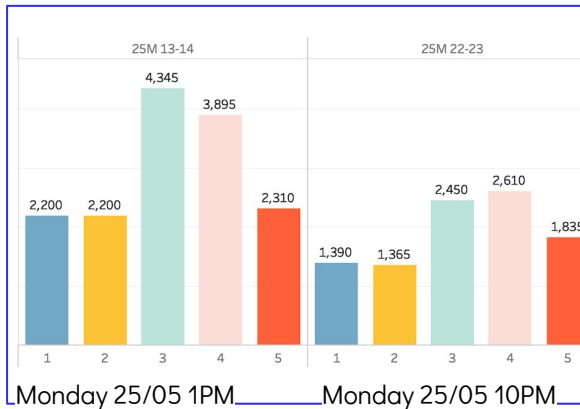


DAY / NIGHT ACTIVITY

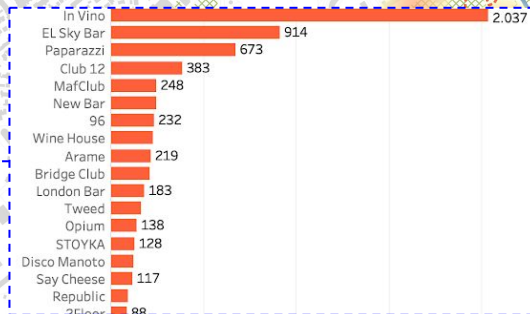
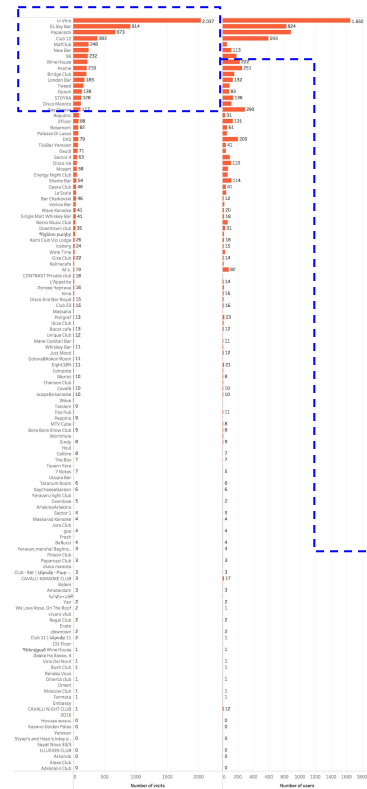


Weekends:

Connections to
Telecom towers
per park segment
in 1 hour expand



Weekdays:

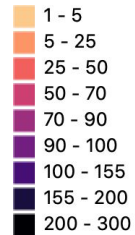


Density of nightlife amenities



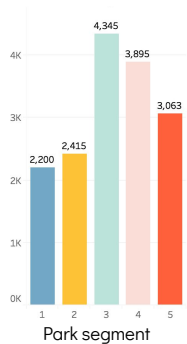
DAY / NIGHT ACTIVITY

Frequency of connections to telephone towers



● Mobility nodes

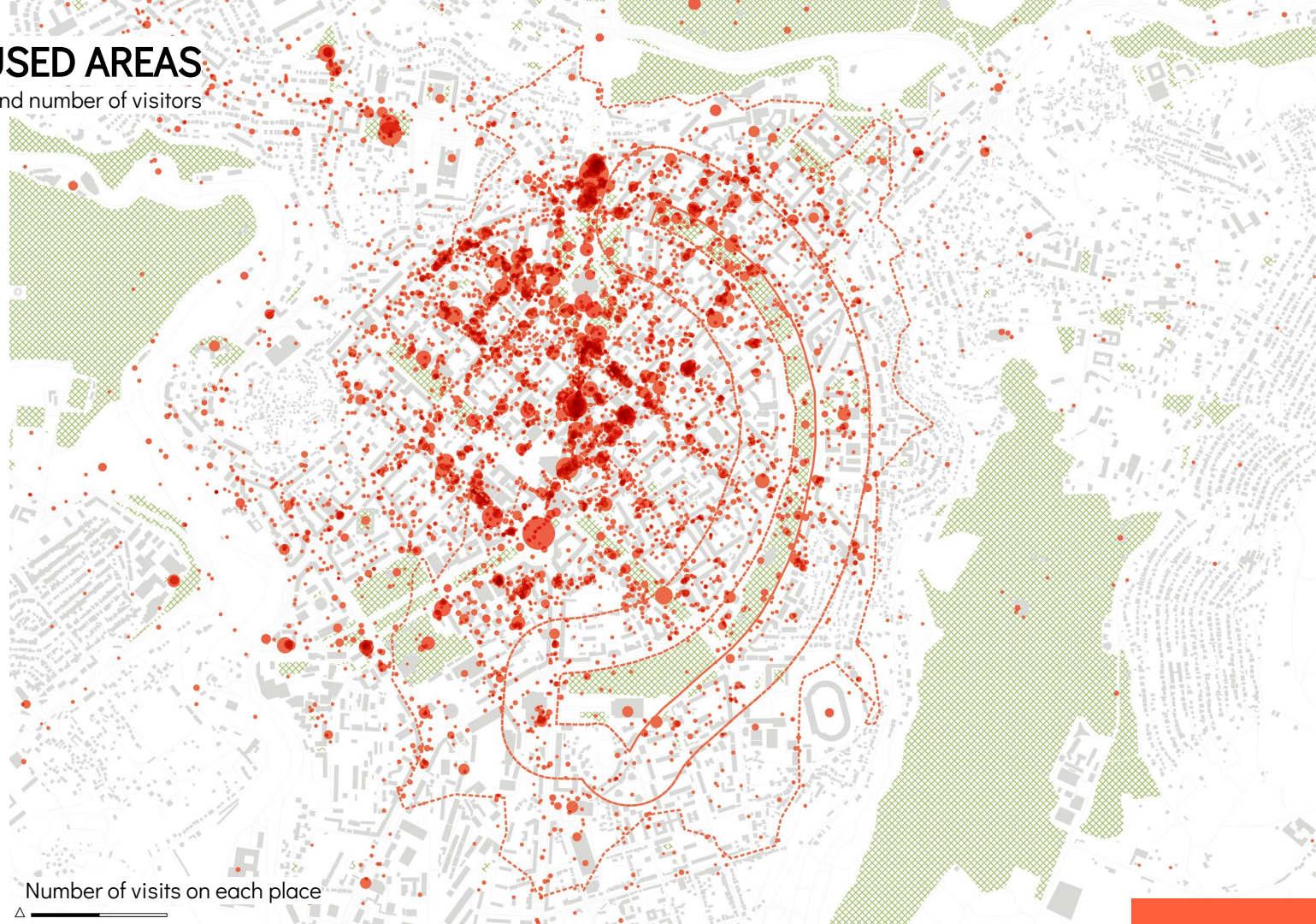
○ Correspondence



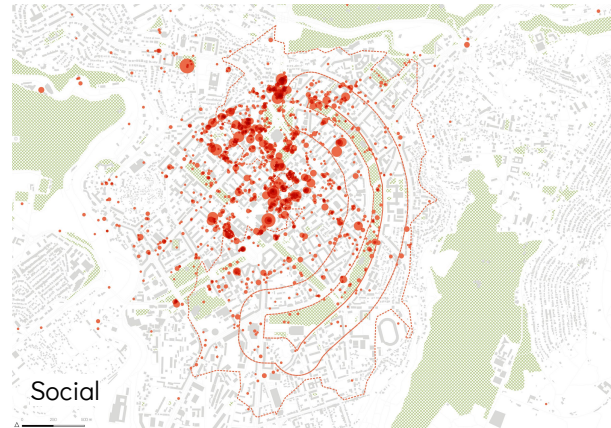
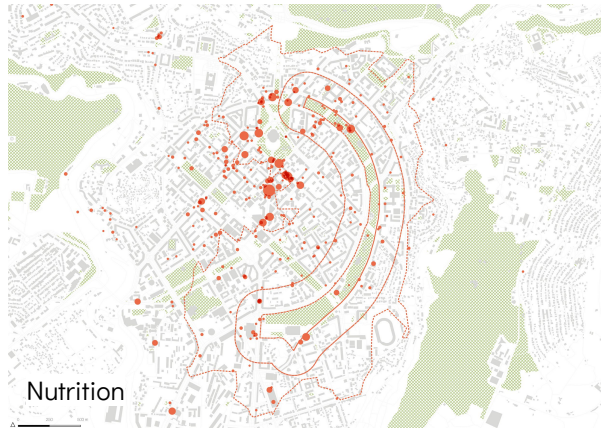
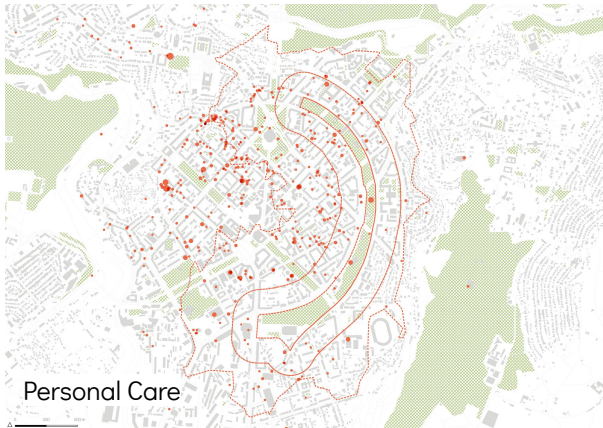
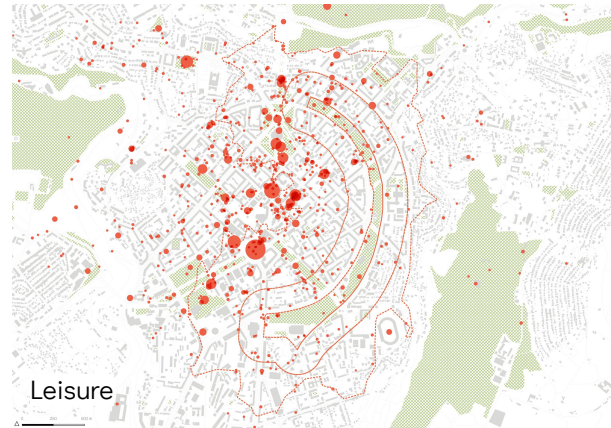
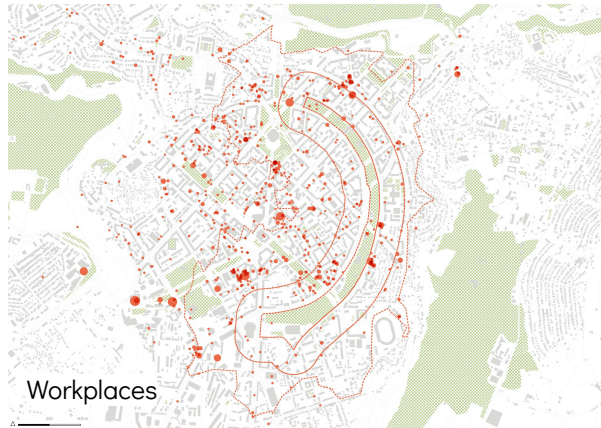
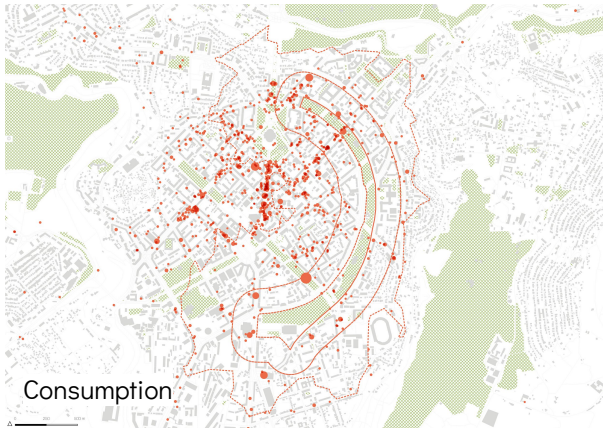
Mobility nodes and AVG frequency of telephone connections

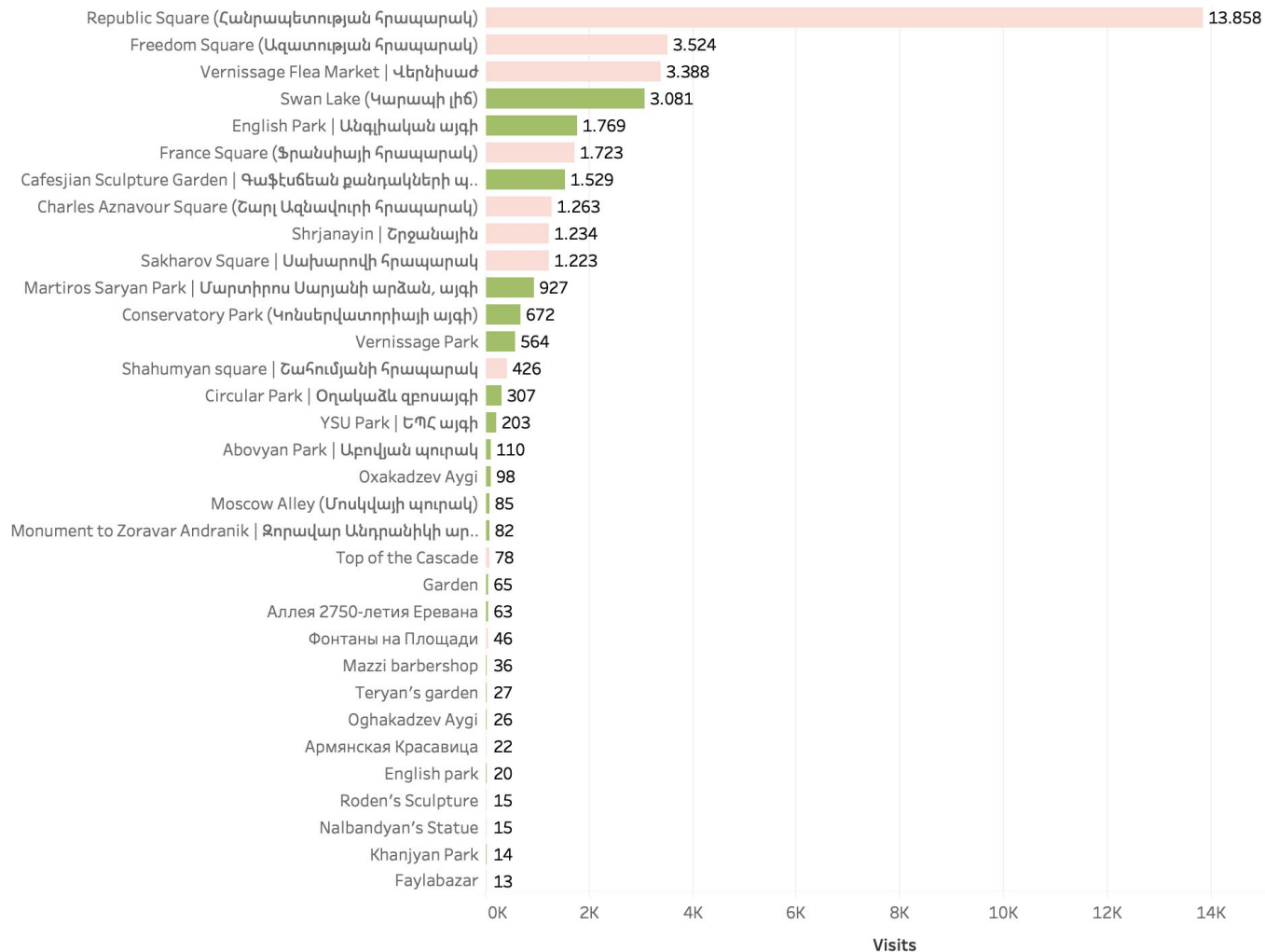
ACTIVELY USED AREAS

Location of places and number of visitors

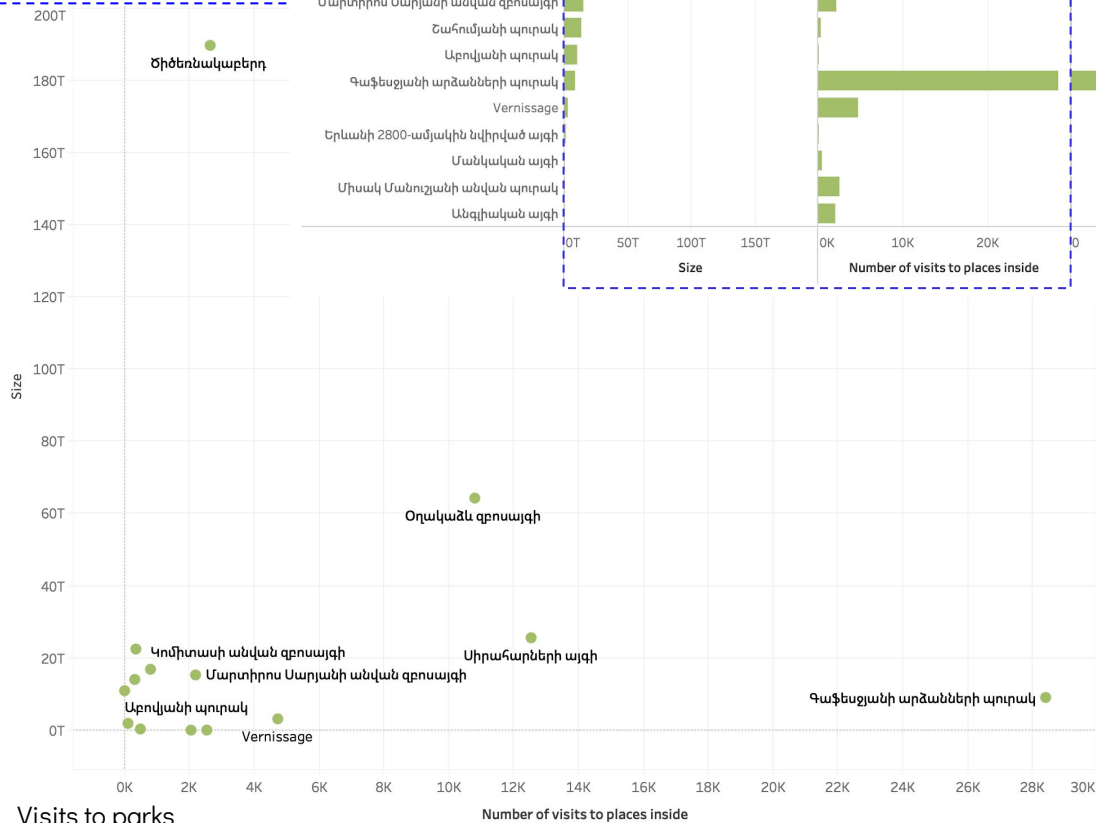
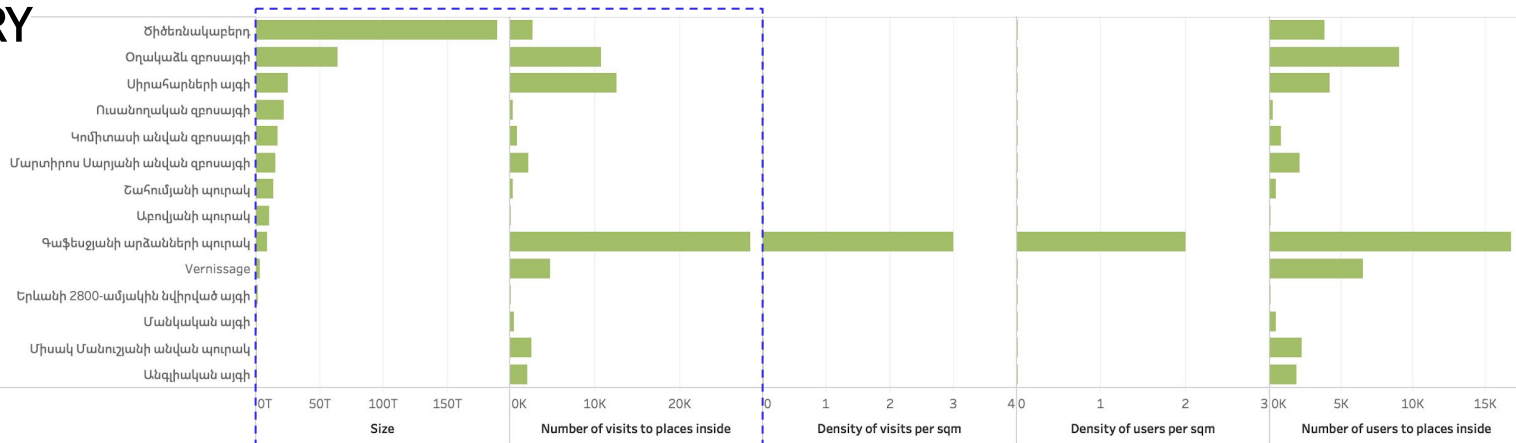


ACTIVELY USED AREAS





GREENERY



Visits to parks

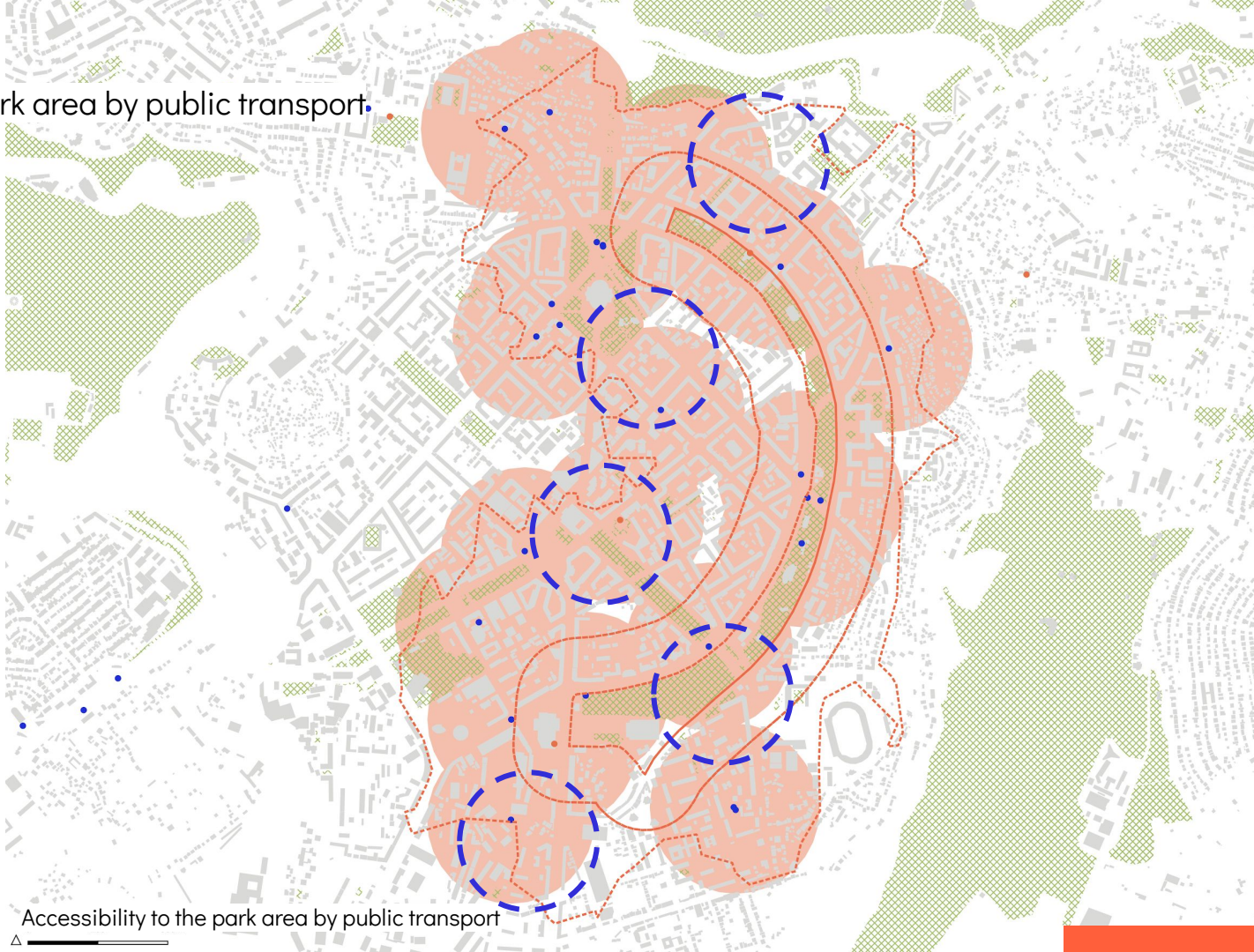
GREENERY

Accessibility to the park area by public transport.

● Public Transport Stop

○ 5 min walking distance

○ Further than 5 min

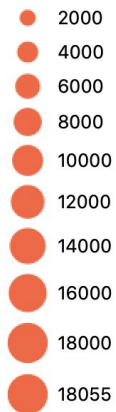


Accessibility to the park area by public transport



SOCIAL FACILITIES

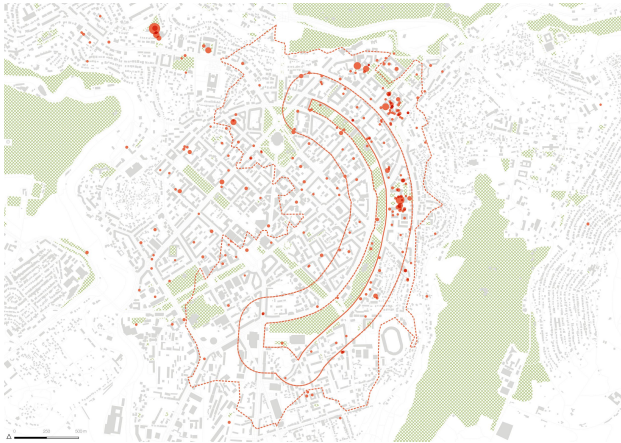
Visits



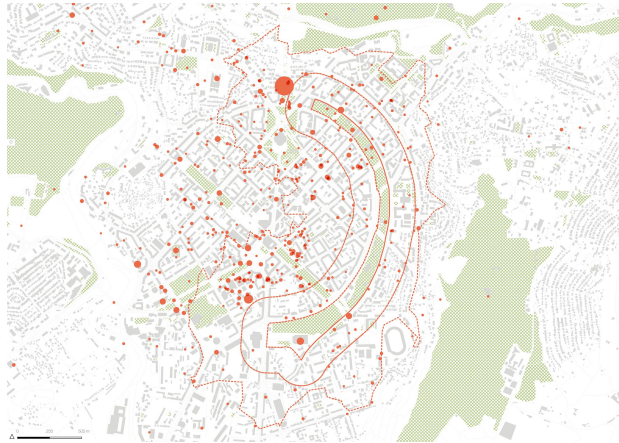
Number of students in education facilities



SOCIAL FACILITIES



Number of visits on each **Education** amenity



Number of visits on each **Civic** service



Number of visits on each **Health** service

SOCIAL FACILITIES

Distance to Educational services

Close distance

Long distance

Distance from Education to services



SOCIAL FACILITIES

Distance to community (civic) services

Close distance

Long distance

Distance from Civic to services



SOCIAL FACILITIES

Distance to health services

Close distance

Long distance

Distance from Health to services

Δ



TRANSPORT AND ACCESSIBILITY

Distance to mobility services (public transit stops and station)

Close distance

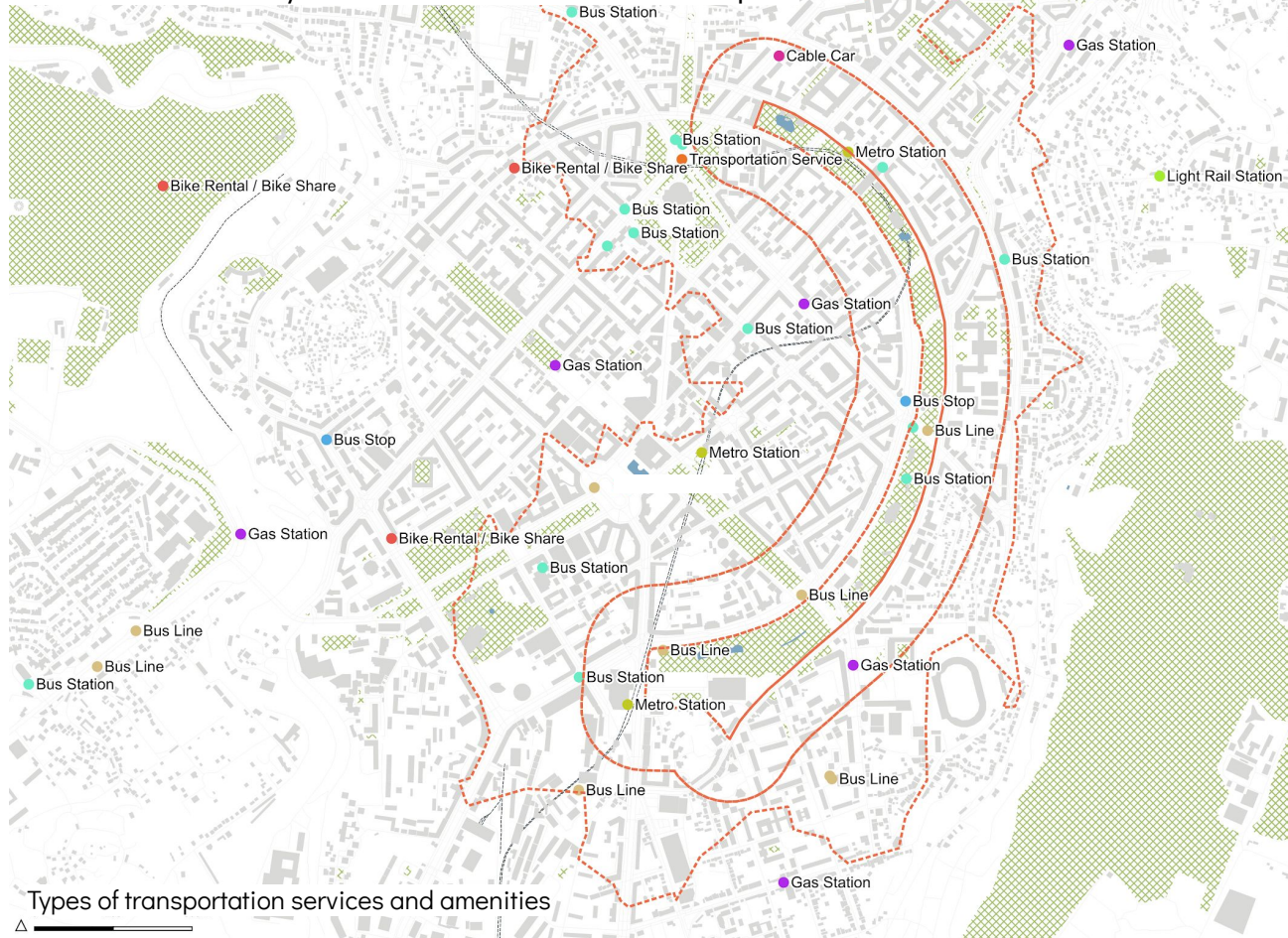
Long distance

Distance from Mobility to services



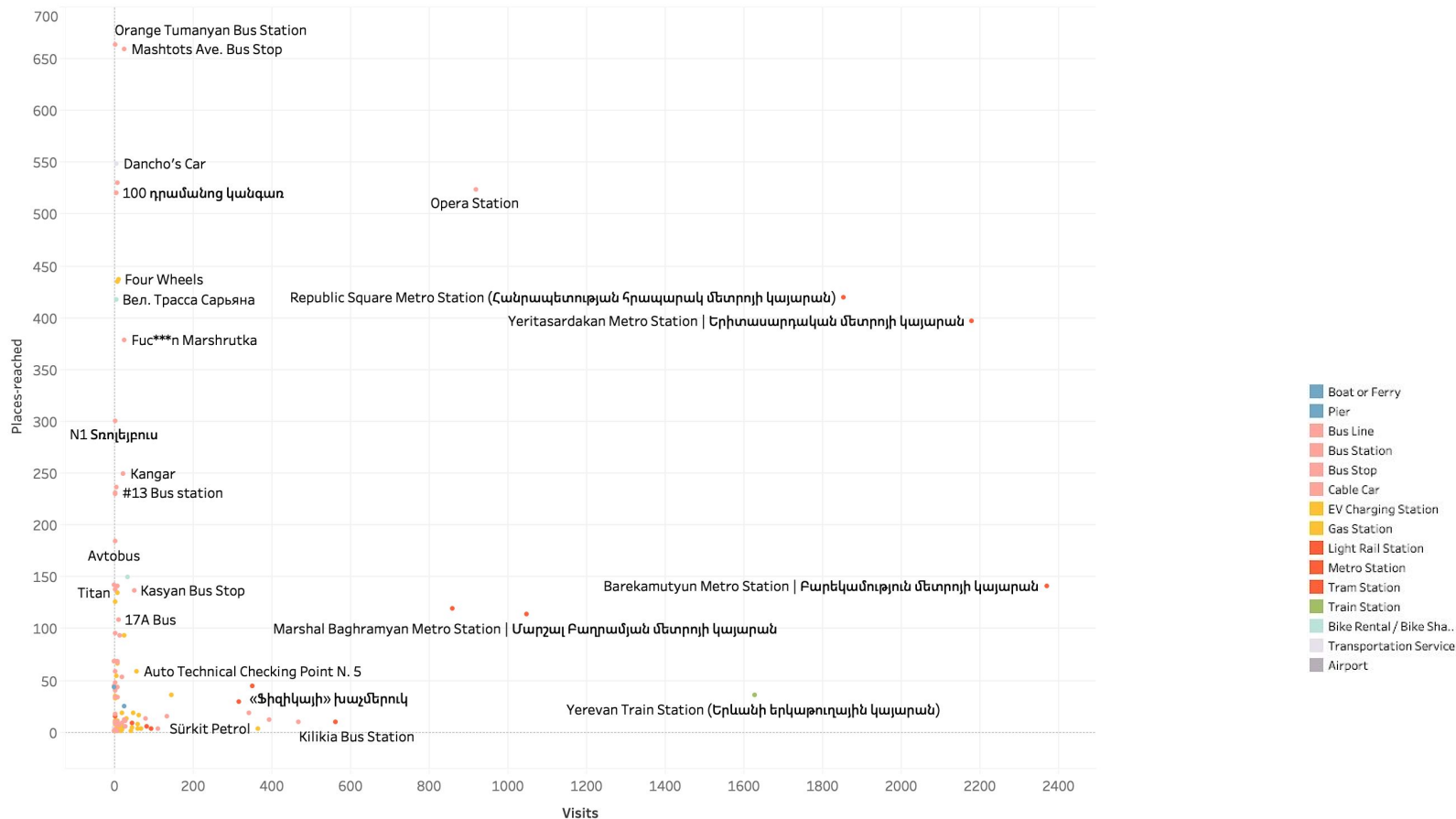
TRANSPORT AND ACCESSIBILITY

Key transport services and facility for the main modes of transport



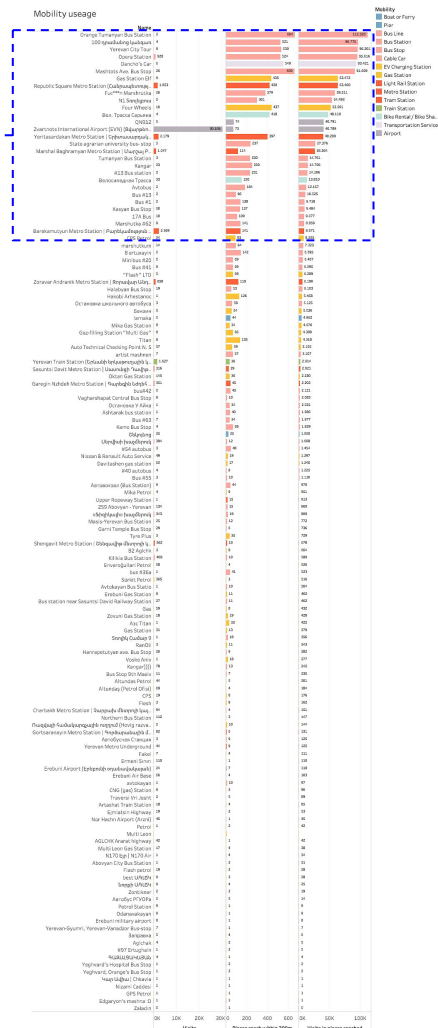
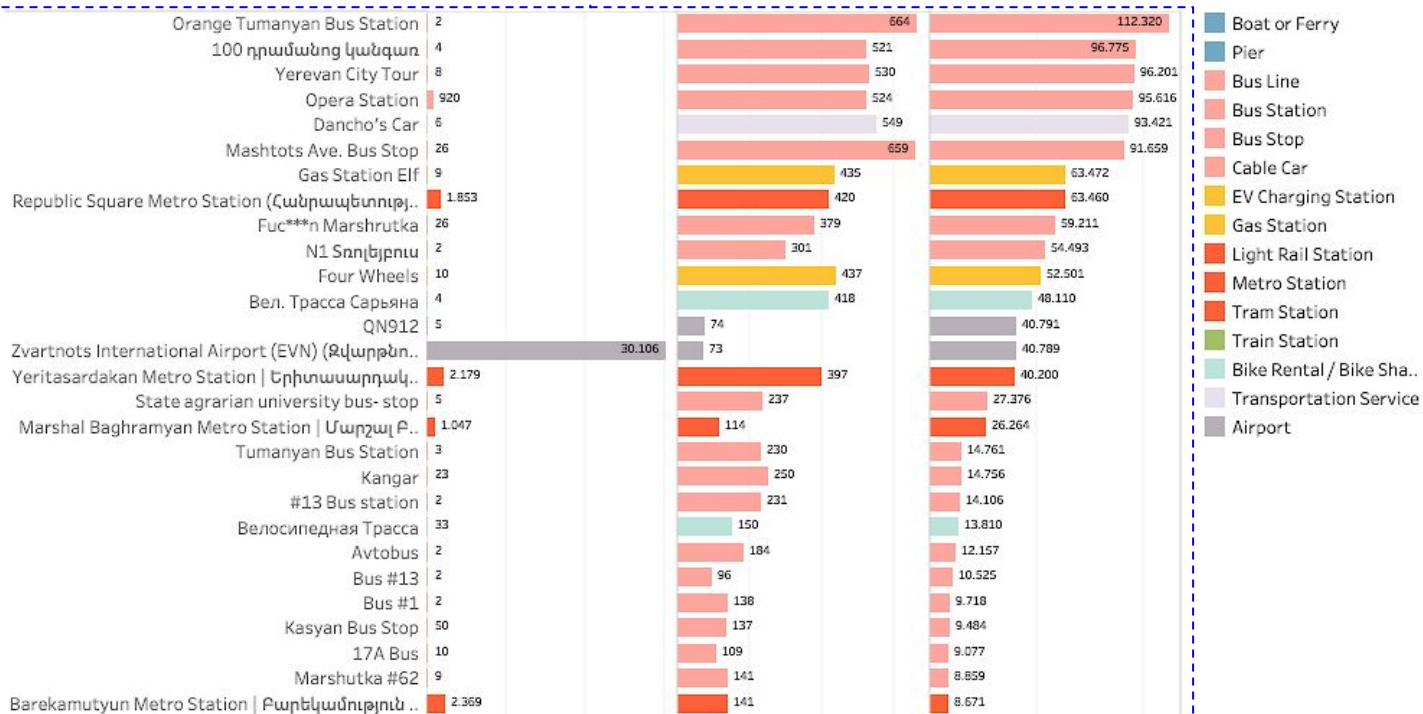
TRANSPORT AND ACCESSIBILITY

Places reached from each transport service (Y); Usage of transport service (X)



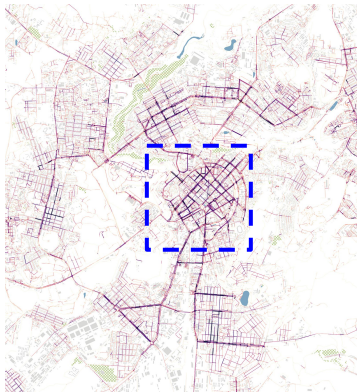
TRANSPORT AND ACCESSIBILITY

Popularity of places reached from each transport service and usage of transport service



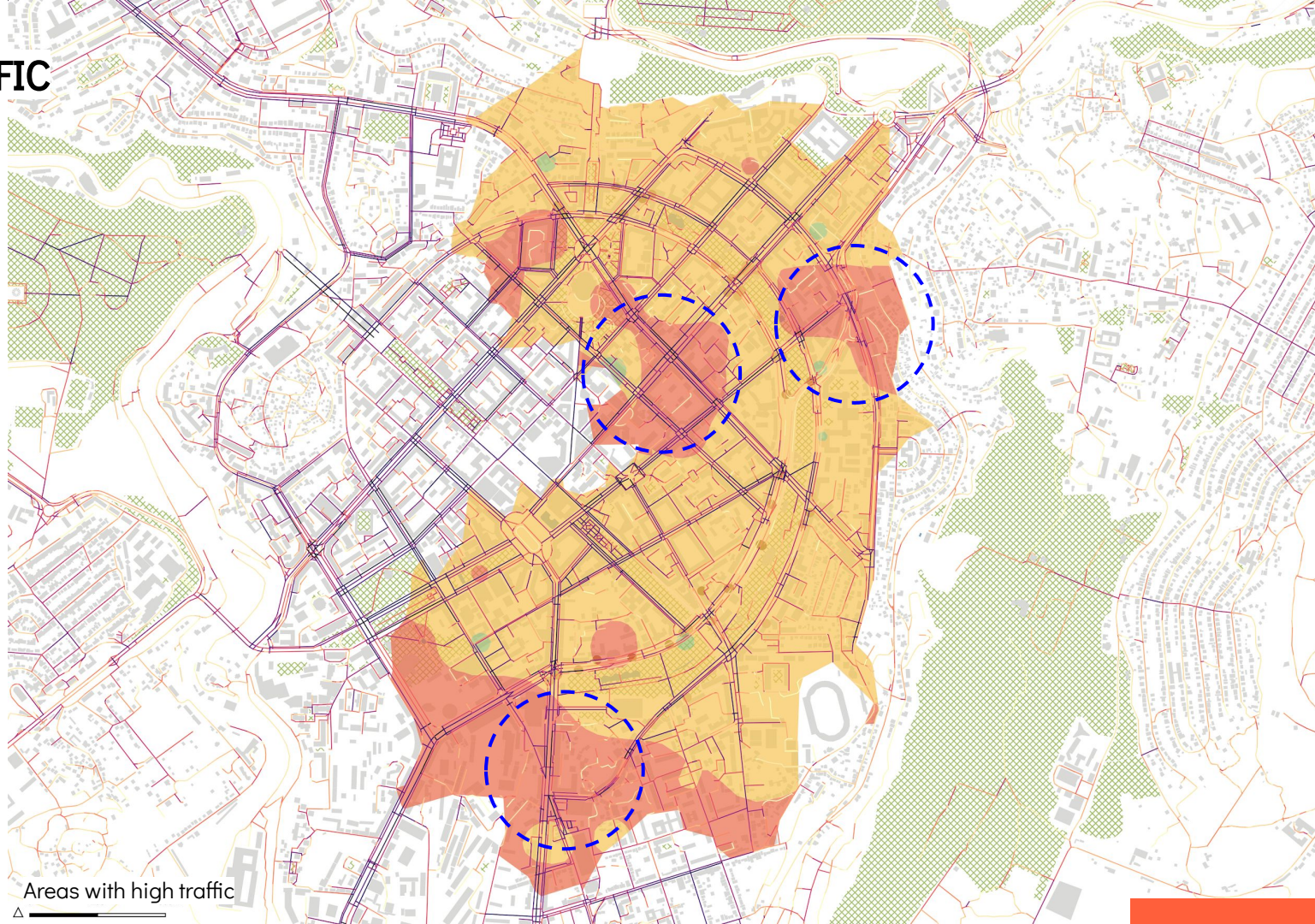
ACCESSIBILITY

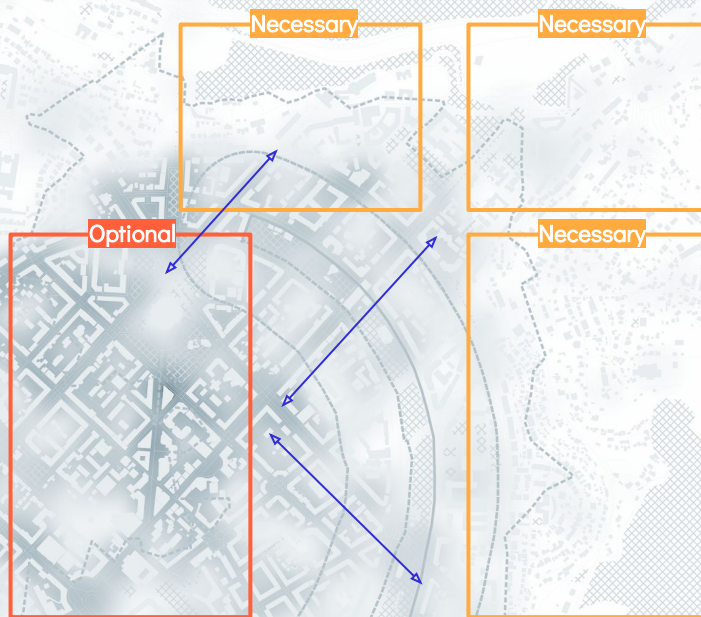
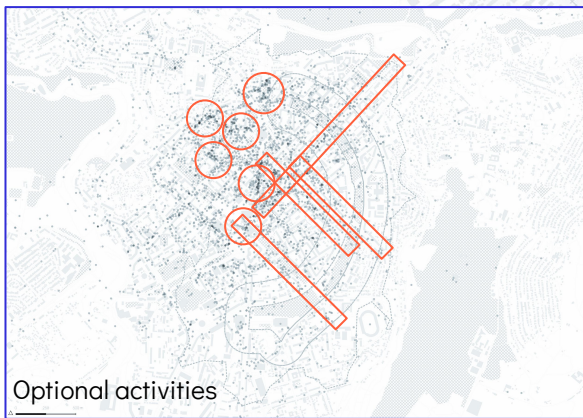
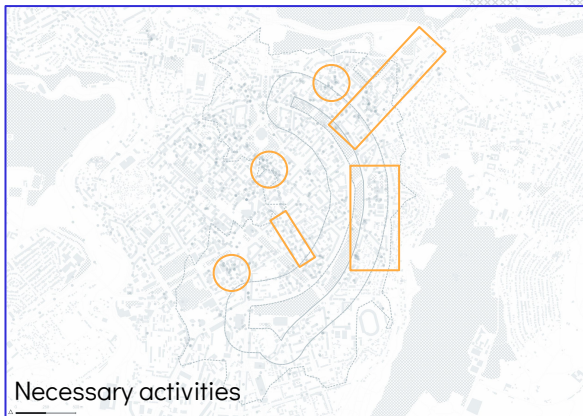
The centrality of streets, based on Space Syntax analysis of the street network, indicate likelihood of pedestrian movement.



HIGH TRAFFIC

High car traffic is expected in areas with high level of air pollution, which coincide with street segments calculated to be more central.



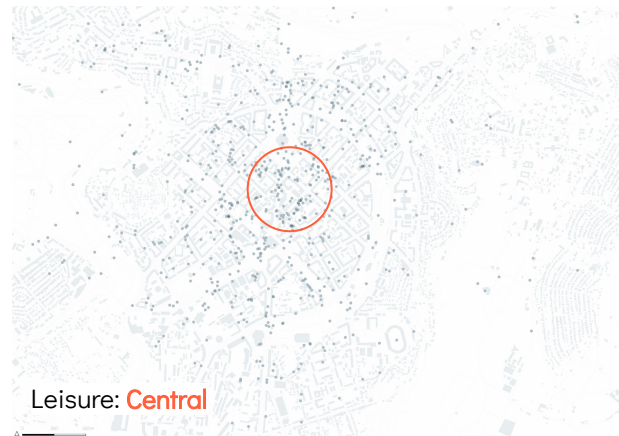
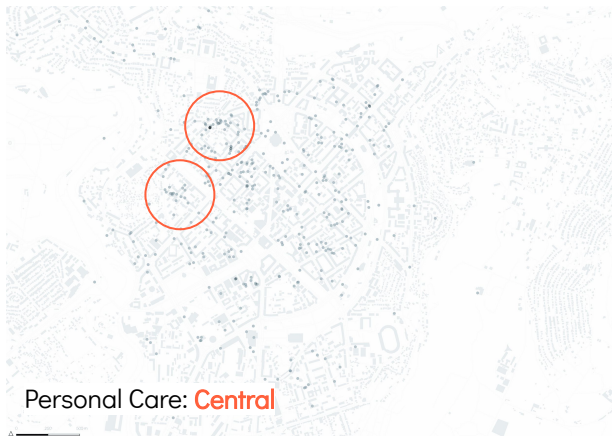


Dialogue Optional-Necessary

Complementary distribution of non-matching clusters of Optional and Necessary Activities create linear flow between hotspots

Hotspot structure

Different patterns of distribution and clustering in each activity type with tendency towards a central hotspot in each function



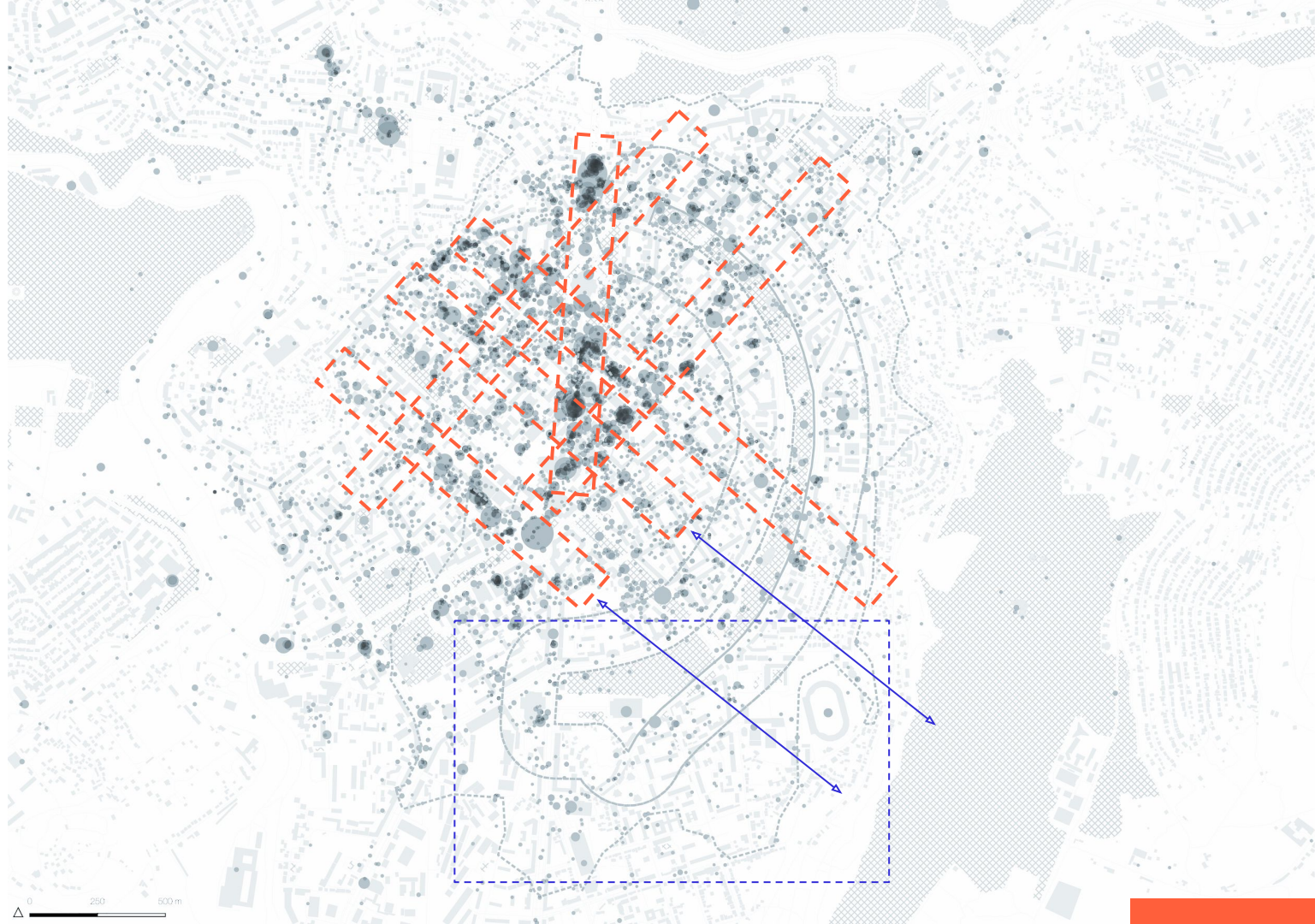
Hotspot structure

Different patterns of distribution and clustering in each activity type with tendency towards a central hotspot in each function



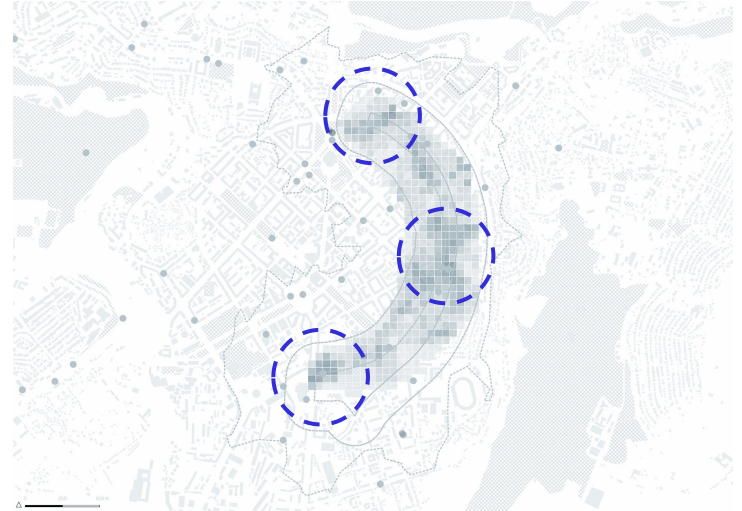
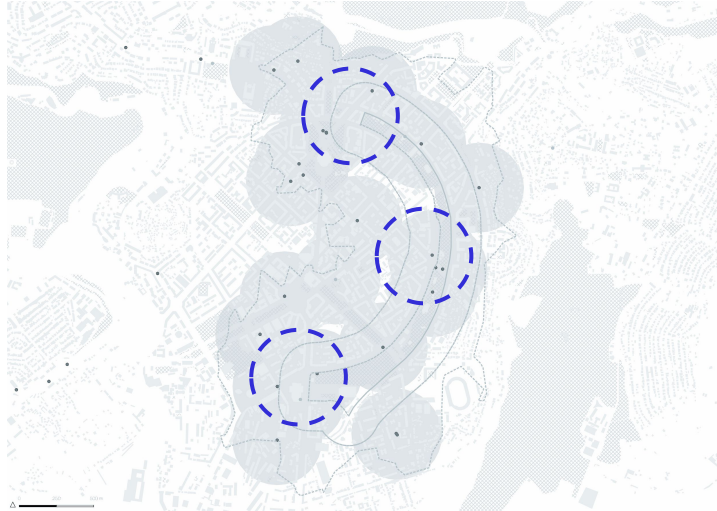
Main corridors

Social activeness and liveliness tends to gather along certain main streets, some of them being extended through the Circular Garden at the north side. Consequently, reported activity levels in the north side of the park are considerably higher than in the south.



Activity and mobility

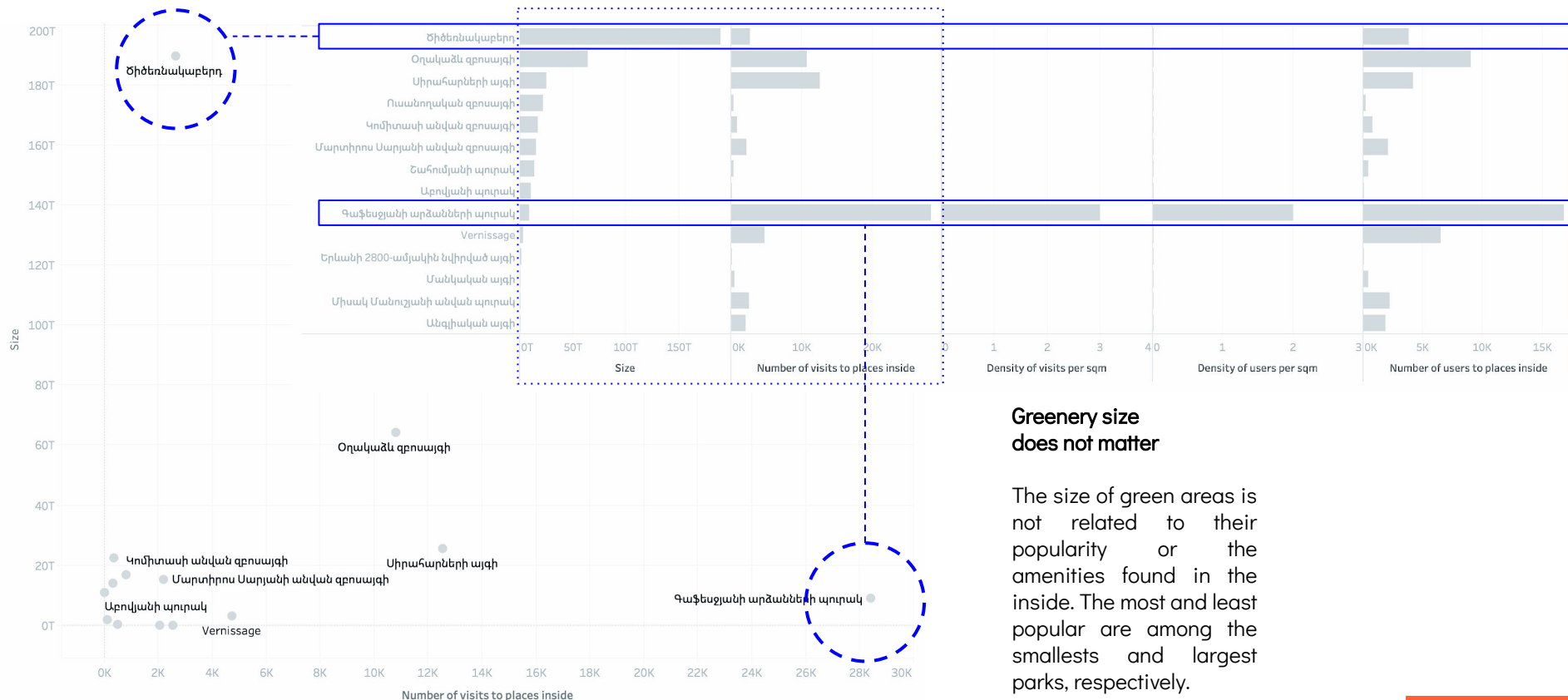
Main activity reported by
telephone towers
correlates to public
transport network



Distance to services

The inner area bounded by the circular garden measures shorter distances to services than in the areas outside of the center. The southern part of the garden presents a lower density of services thus longer distances.





The edge effect

The nature of the northern half of the area differs from the south. The north is characterized by a high concentration of activities, venues and services, all supplied by an accessible public transportation network creating a consistent dialogue between east and west sides of the park, as activity types complete each other. On the other hand, the southern area presents a much lower density of activities, lower accessibility to public transport, and higher level of car traffic resulting in higher level of air pollution.

These difference in not morphological but rather socio-spatial layers could more likely be reflected at a perceptual level creating a noticeable “edge” effect separating north from south.



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USING FOURSQUARE DATA

Mapping activities begins with retrieving the Foursquare dataset of all urban amenities and categorising them to the nature of the activity that can be performed in them. Traditionally, Jan Gehl deployed a reliable classification system to study public space and the links between design and public life. Even though Gehl's focus is in small public spaces such as streets, squares and parks, his approach can be used to survey urban space in general thanks to its elemental yet powerful categorization. The applicability of a classification to all kinds of activity within the city should be regardless of space characteristics – including also those performed in indoor or private spaces. Operationalising and scaling up this approach would potentially allow estimating and study activity patterns for one or many cities while keeping the resolution of the analysis at a human scale. The core benefit of this approach including crowd-sourced data is the possibility to chart tangible environment with the elements that are intangible but valuable for the social and economic success of one neighbourhood and its streets and squares (Cerrone, López Baeza & Lehtovuori, 2020).

Taking care: to maintain or improve the condition of health.

Income: to receive a payment for a good or service.

Nutrition: to consume food with no other purpose.

Mobility: horizontal physical displacement by a mean of transport.

Education: to learn by being taught.

Civic: to pertain to citizenship.

Leisure: to recreate by making use of the freedom from demands of work or duty.

Social: to be in companionship with others.

Consumption: to make use of a good or service.

Personal care: to maintain or improve the condition of comfort, wellbeing, fitness .

DATASETS GIVEN

- ☒  Activities
 - ☐ • amenity_points
 - ☐ • leisure_points
 - ☐ • natural_points
 - ☒ **Amenity**
 - ☒ **Natural**
 - ☒ **Greenery**
 - ☒ **Leisure**
- ☐  AOI LIMITS
 - ☒ border
 - ☒ buffer200
 - ☒ pedestrian_10min
- ☐  Creative Capital
 - ☒ • Schools_StudNum
 - ☒ • Universities_StudNum
- ☐  Spatial Quality
 - ☒  Benches_Number
 - ☒  Bins_Number
- ☐  Environmental Quality
 - ☒ • NoisePollutionCircularPark
 - ☒  AirPol-Dust-Load
 - ☒  AirPol-Children-Non-Carcin-Health-Risk
 - ☒  AirPol-Summary-Pollution-Index
- ☐  Livability
 - ☒  MobileSubscriberActivity-25052020_2200_2300
 - ☒  MobileSubscriberActivity-25052020_1300_1400
 - ☒  MobileSubscriberActivity-23052020_2200_2300
 - ☒  MobileSubscriberActivity-23052020_1300_1400
 - ☒  MobileSubscriberActivity-310520_1900_2000
 - ☒  MobileSubscriberActivity-310520_1300_1400
 - ☒  MobileSubscriberActivity-310520_0900_1000
 - ☒  MobileSubscriberActivity-280520_1900_2000
 - ☒  MobileSubscriberActivity-280520_1900_2000
 - ☒  MobileSubscriberActivity-280520_1300_1400
 - ☒  MobileSubscriberActivity-280520_0900_1000
- ☐  Safety
 - ☒  LightsWatts
 - ☒  Crime_Number

DATA LIMITATIONS

1. Data in geotagged screenshots to be transferred into a grid
2. Telecom data: not the same area each data day
3. Null values and 0 values are mixed: no data measured or data=0 ?
4. Telecom data: The times of the day vary
5. Telecom data: The scales of visualization vary
6. Telecom data: Size of the grid 50x50 seems arbitrary
7. Telecom data: south of park missing in some datasets
8. Telecom data: missing summer/winter (only May)
9. No demographic data (population or density)
10. Data from 23-25 May (different format) and also reporting much higher values of activity (probably due to the format)
11. North East campus missing in University data
12. Datasets from Foursquare and Yandex do not document extraction and aggregation methods

