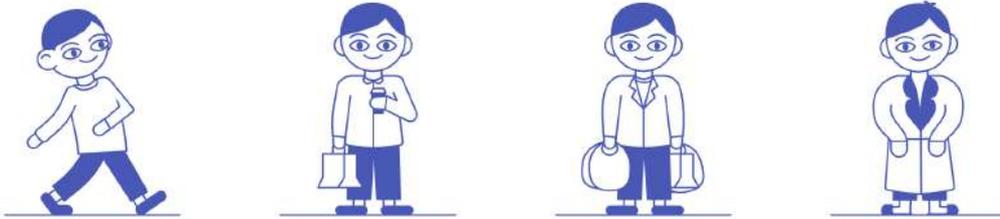# Dwell Time

Connecting time with economic activity

- Most people spend less than half an hour in every location;
- 30 to 60 minutes – time for a short shopping, lunch or coffee;
- People spend 1-3 hours in a restaurant or a mall;
- Community shopping centers do not attract people for more than an hour;
- More than 5 hours – work in the office or (rest) at home.

Intro

Modern cities are complex structures that consist of various types of places – busy downtown areas and crowded shopping streets, white-collar business clusters and quiet residential quarters, – but in this diversity only certain locations become **points of attraction**. These attractors are *particular functions* that interest the audience and compete for their time.

A way to analyze the demand for locations is to estimate **dwell time**, how long people stay there. The importance of a place is determined not only by the volume of traffic flow, but also by its *dwell* share – people staying longer consuming services or recreating.

Each business works with its audience using a set of various tools – attracting people by landscape and design decisions, real estate concepts, or by just being unconventional. One way or another, by converting the flow from the number of people into *man-hours*, the place (and the business located there) receives additional profit, gets a higher rank in the city-wide hierarchy of locations, and increases the potential of the surrounding area.

Exploring locations, we found the relationship between the length of stay and the business function based on the **dwell time**. We divided it into 4 types and studied the spatial and statistical distribution for each of them:
- On the Move (0-30 min);
- Out and About (30-60 min);

- Work and Leisure (60-180 min);
- Staying Put (300+ min).

On the Move type highlights transit flows and short errands trips. **Out and About** activity is associated with lunch, household shopping or visiting a doctor. **Work and leisure** (1-3 hrs) is business meetings, going to the movies, dinner or a thorough shopping. A working day at the office or just being at home (on weekends and at night) can be attributed to a stationary dwell time (**staying put**).

We examined the distribution of dwell time in the whole city, and in some locations of business clusters and shopping malls. Below are the most interesting findings.

Data

In the analysis we use anonymized data of the cellular operator, aggregated by a regular grid 250x250 meters for March 2020. This reflects movements of Muscovites before the quarantine measures related to the COVID-19 pandemic. The data shows the dwell time types distribution in shares (%).

On the move is the most common dwell type, the majority of people spend less than half an hour in every location

ON THE MOVE
DWELL 0–30 MIN

CELL PHONE USERS SHARE, %
- 87–98
- 78–87
- 71–78
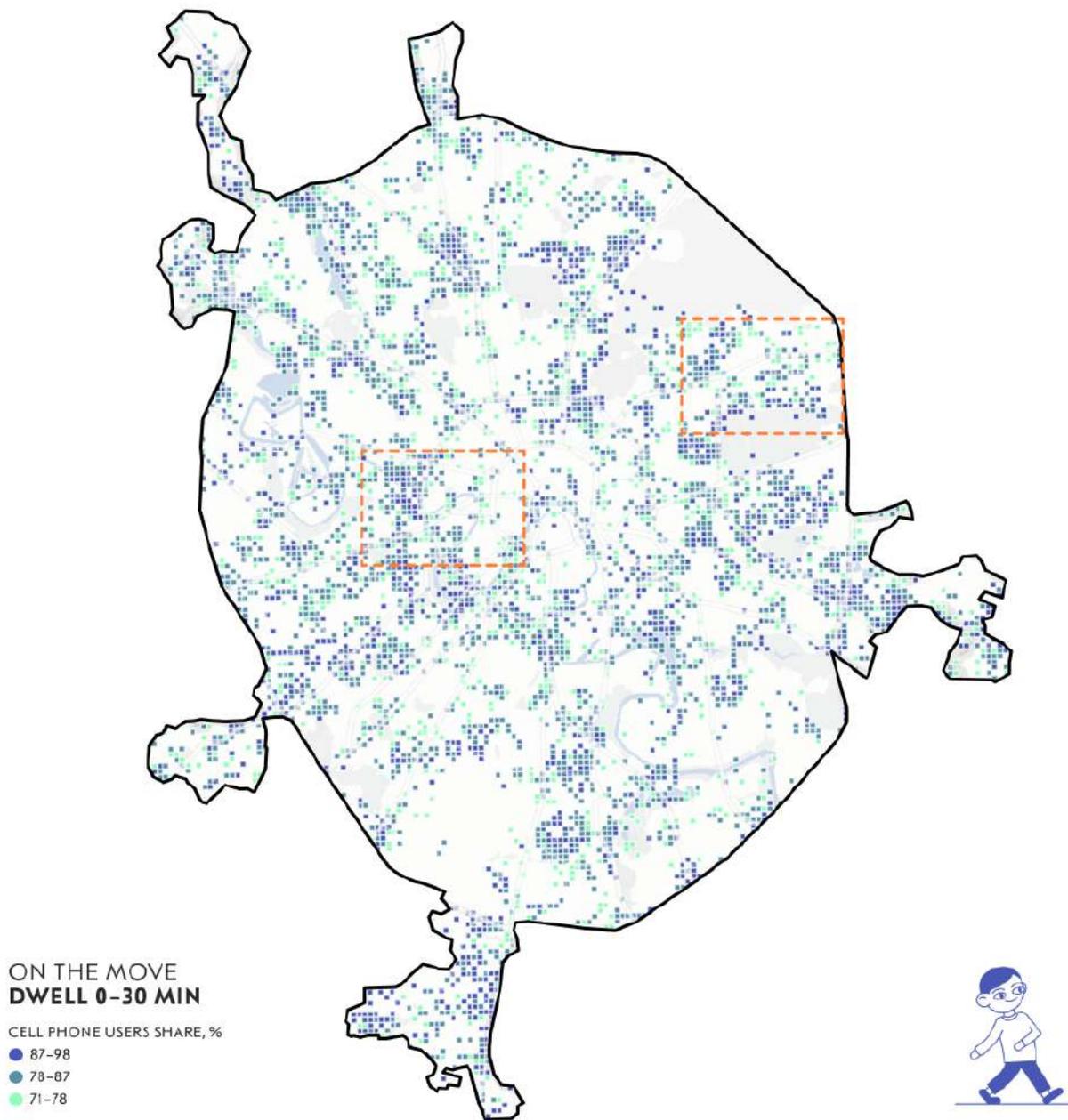
Out and About represents transit traffic flows. Concentrations of this dwell type highlight metro stations, transport hubs and highways – on the enlarged segment of the map (see below) high values can be found by railway stations and along the Third Transport Ring (a busy highway) in the north-west of Moscow.
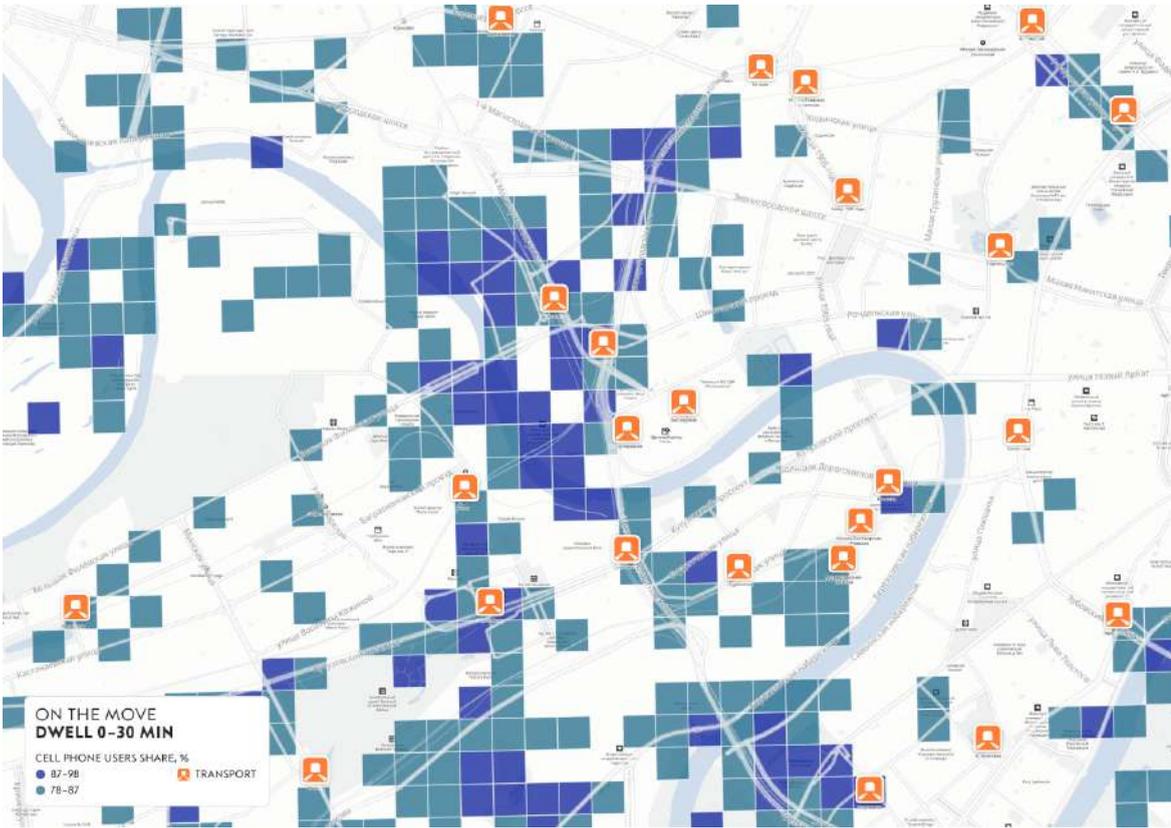
High concentrations near transport hubs and on the highways

However, *On the Move* dwell time is not limited to transit only. High concentrations are also found in non-metro locations – at local clusters of FMCG stores and pharmacies.
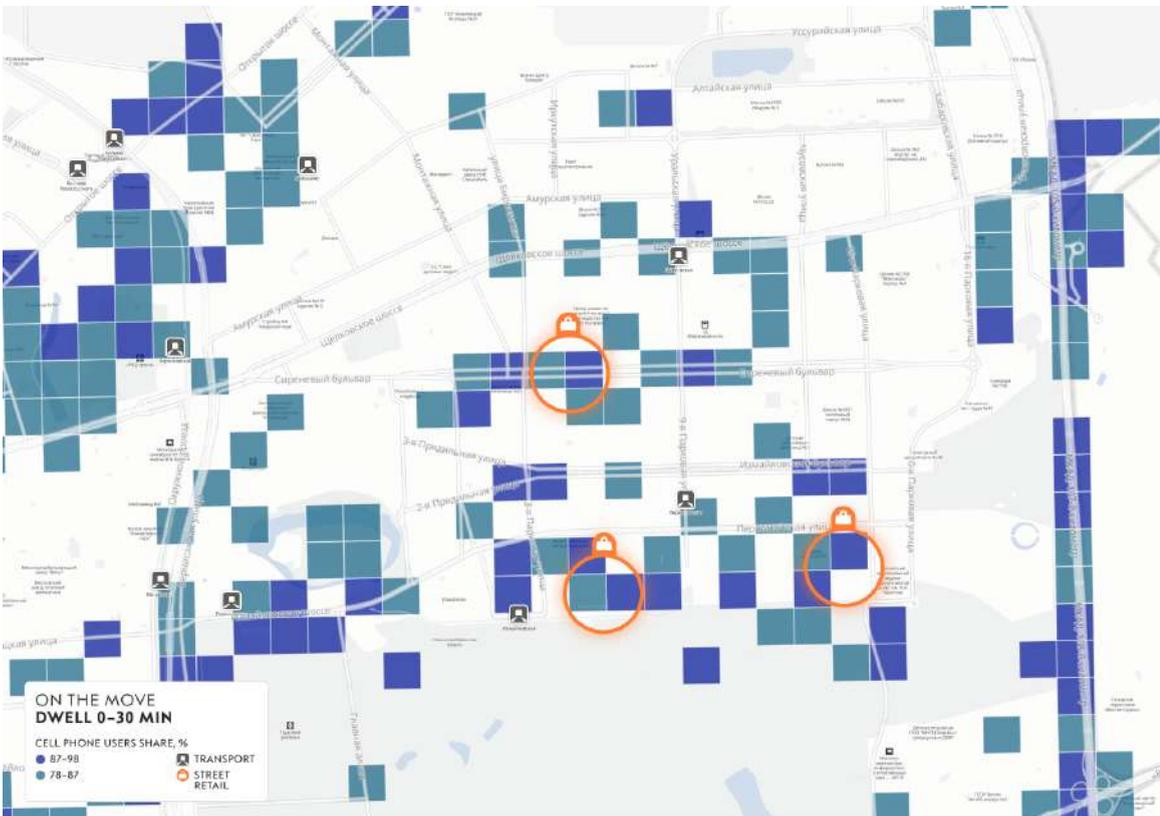

East of Moscow, non-metro locations

Out and About. 30 to 60 min, cafes and shopping streets

Presumably, this type of dwell time is typical for groceries and household shopping, short lunch or coffee breaks. We identified two groups of properties to see how long people usually stay there:

- Local commercial clusters – grocery and hardware stores, pharmacies, consumer services (as well as beauty salons and clothing / footwear stores);
- Cafes and restaurants, including those located in or near business centers.

Local commercial centers – shopping streets with commercial diversity clusters, are characterized by two types of dwell time: **On the Move** and **Out and About.** Indeed, a person rarely spends more than 30 min in a grocery store or pharmacy, but for longer lists of household purchases these clusters provide a significant part of the weekly shopping which may take up to an hour.

OUT AND ABOUT
DWELL 30–60 MIN

CELL PHONE USERS SHARE, %
- 17–31
- 15–17
- 13–15
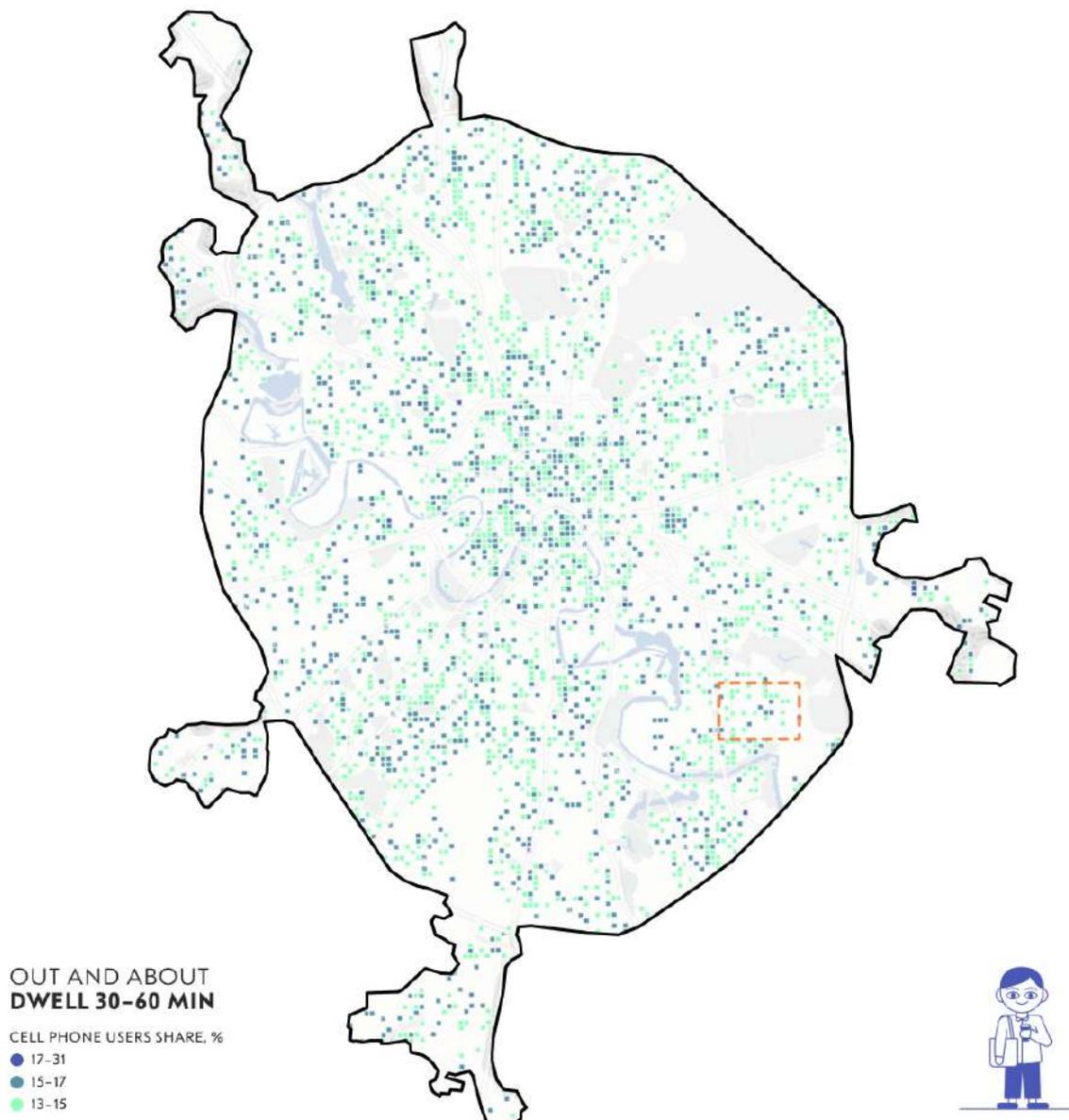
We expected to see a different distribution of dwell time related to cafe and restaurant visits – identifying lunch places, where people spend up to an hour, and classy dinner restaurants. But there was no significant difference, in both cases the dominant dwell time type is **Out and About**.

Speaking city-wide, local shopping streets are points of attraction where you face the everyday life of a neighbourhood. These areas with **Out and About** dwell time share prevailing over the **transit** dwell, are local centres that may have the potential for growth, as well as setting up new businesses – retail, cafes, etc.

Work and leisure. 1 to 3 hours in restaurants, malls and business centres

WORK AND LEISURE
DWELL 60–180 MIN

CELL PHONE USERS SHARE, %
- 20–39
- 16–20
- 14–16
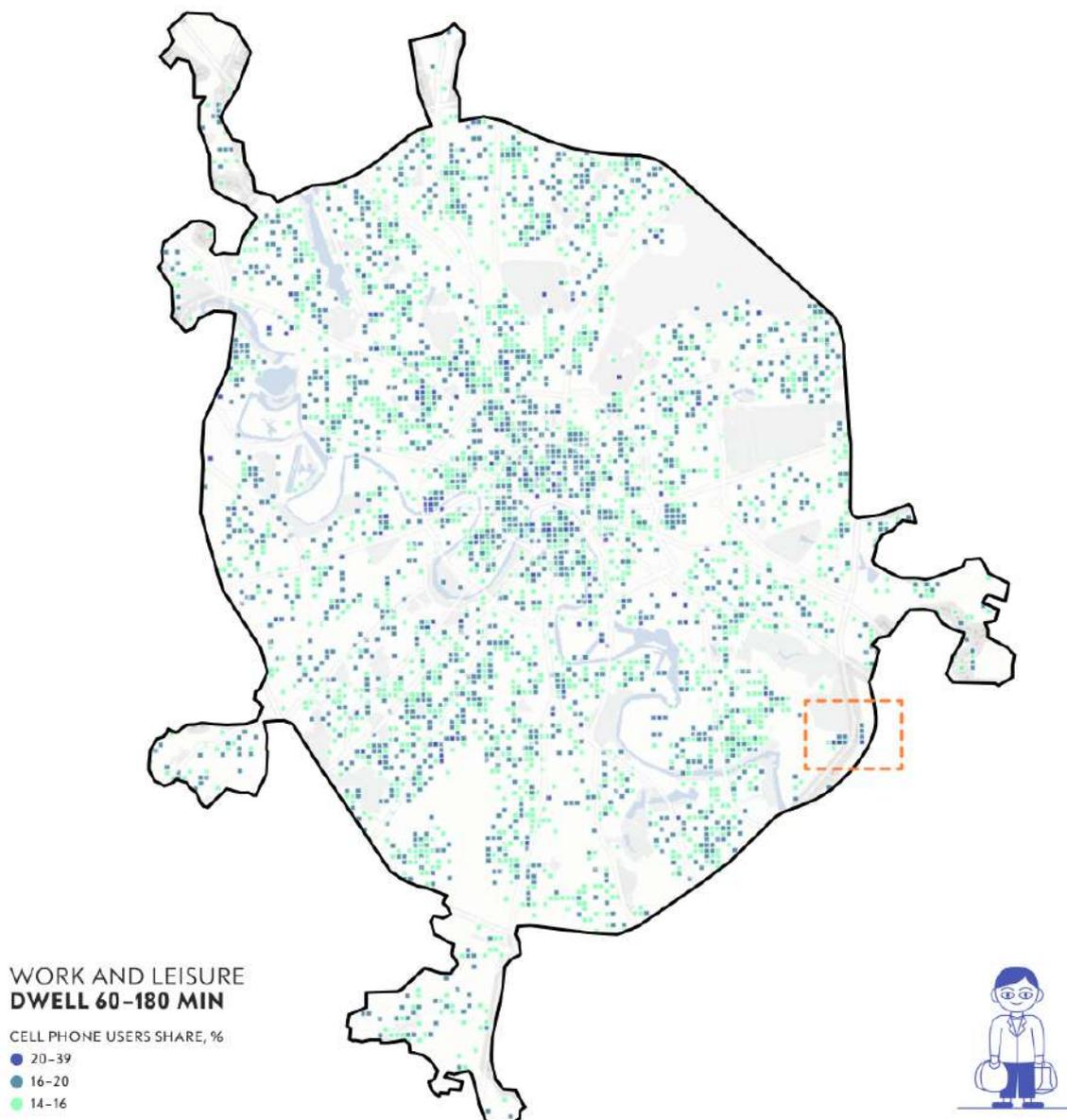
Most of the shopping malls fall into the visiting pattern from 30 to 180 minutes, where two groups are clearly distinguished: community (or neighbourhood) shopping centres and

malls of city-wide significance. The former are usually located within 20 min walk from home, often near metro stations; the latter are those located outside the city or along major highways or at transport interchanges.

People visiting community shopping centers (as well as shopping streets) usually dwell from 30 min to 1 hour there, the dwell pattern for city-wide malls is 1 to 3 hours as a trip to a large mall takes time and is more likely to involve some solid shopping.

Below are two examples – the 1st figure shows the distribution of dwell time for a large mall on the highway (Moscow Ring Road), the 2nd is a community shopping center in a local neighbourhood.
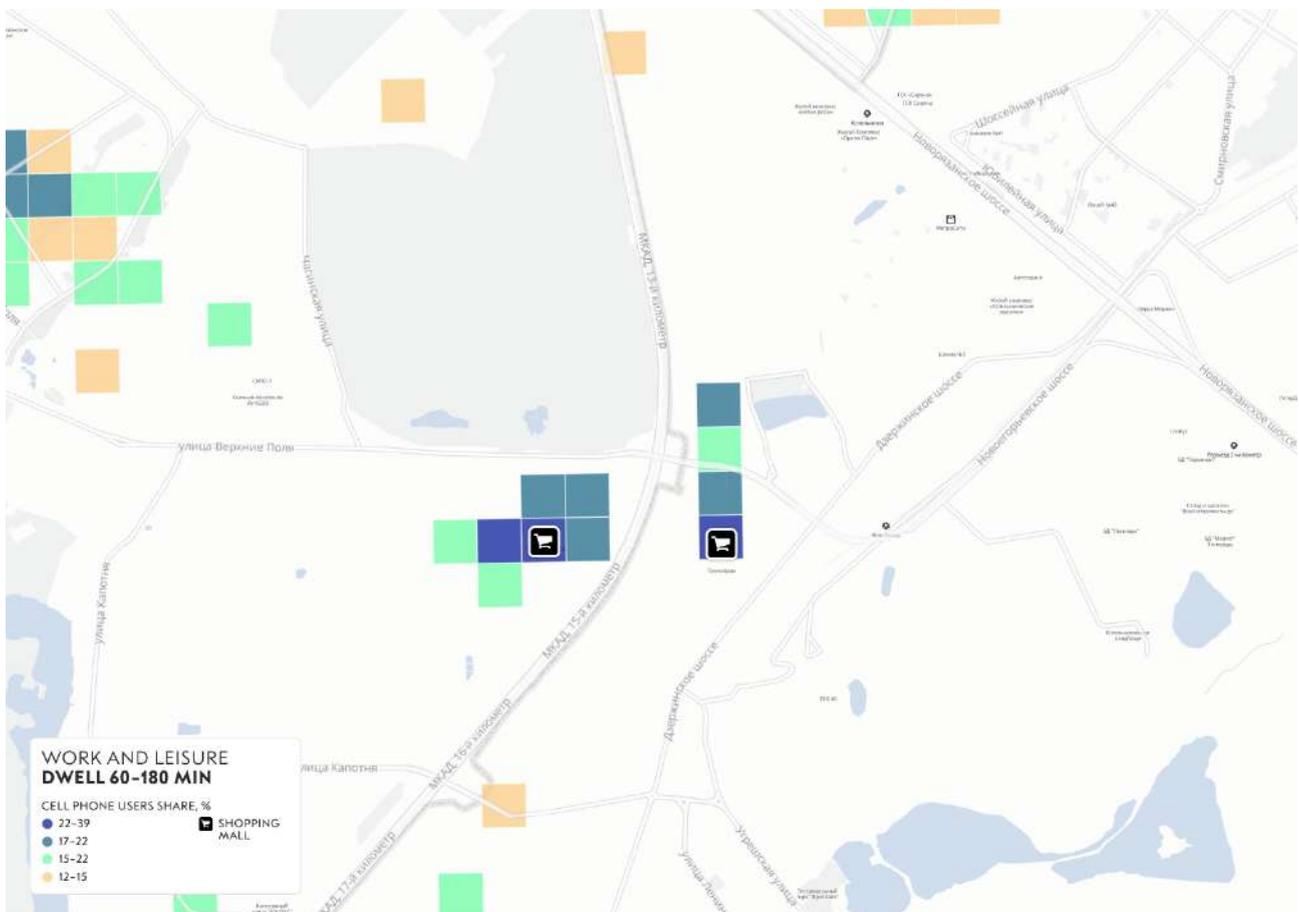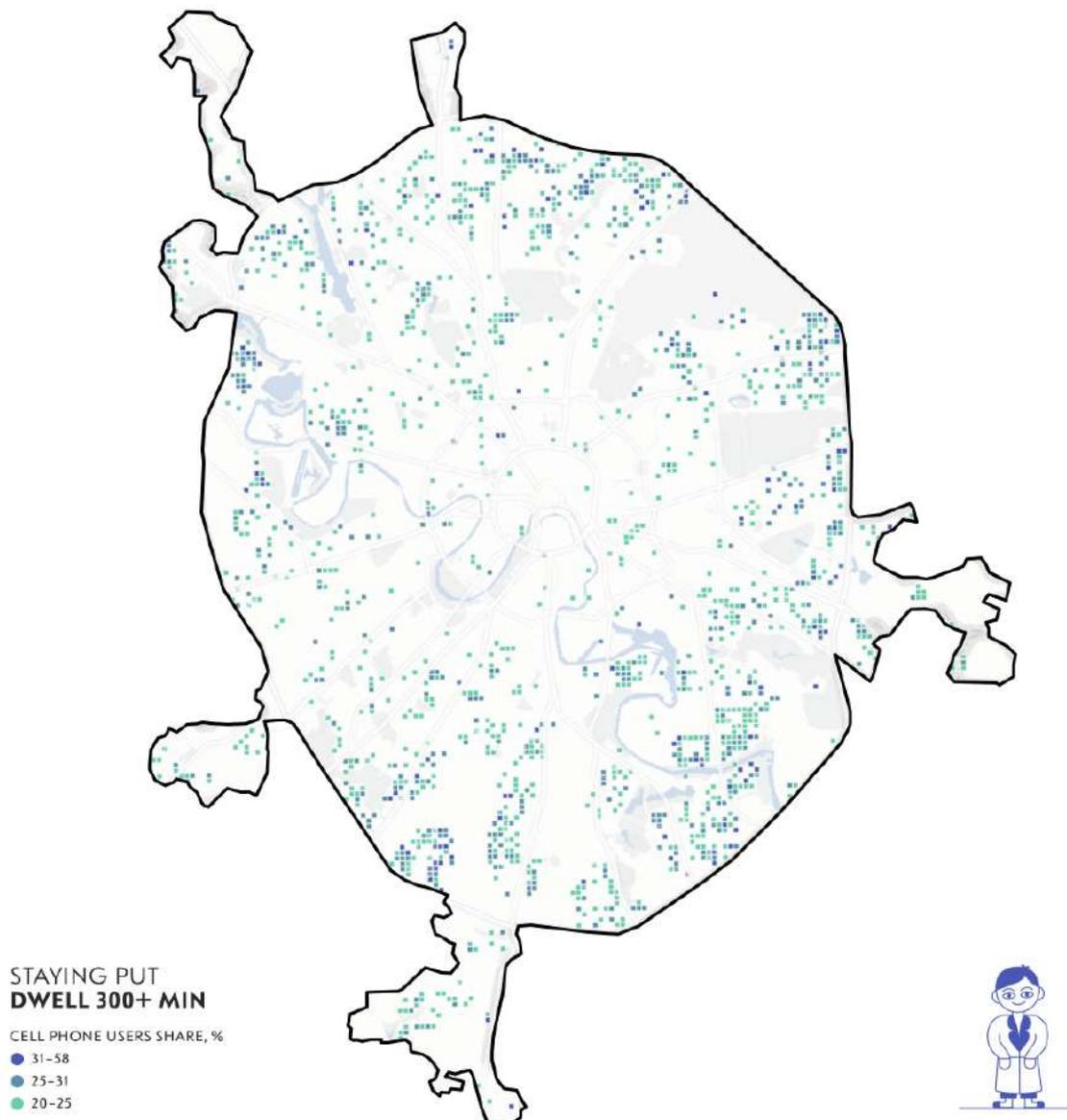

Large malls out of the city
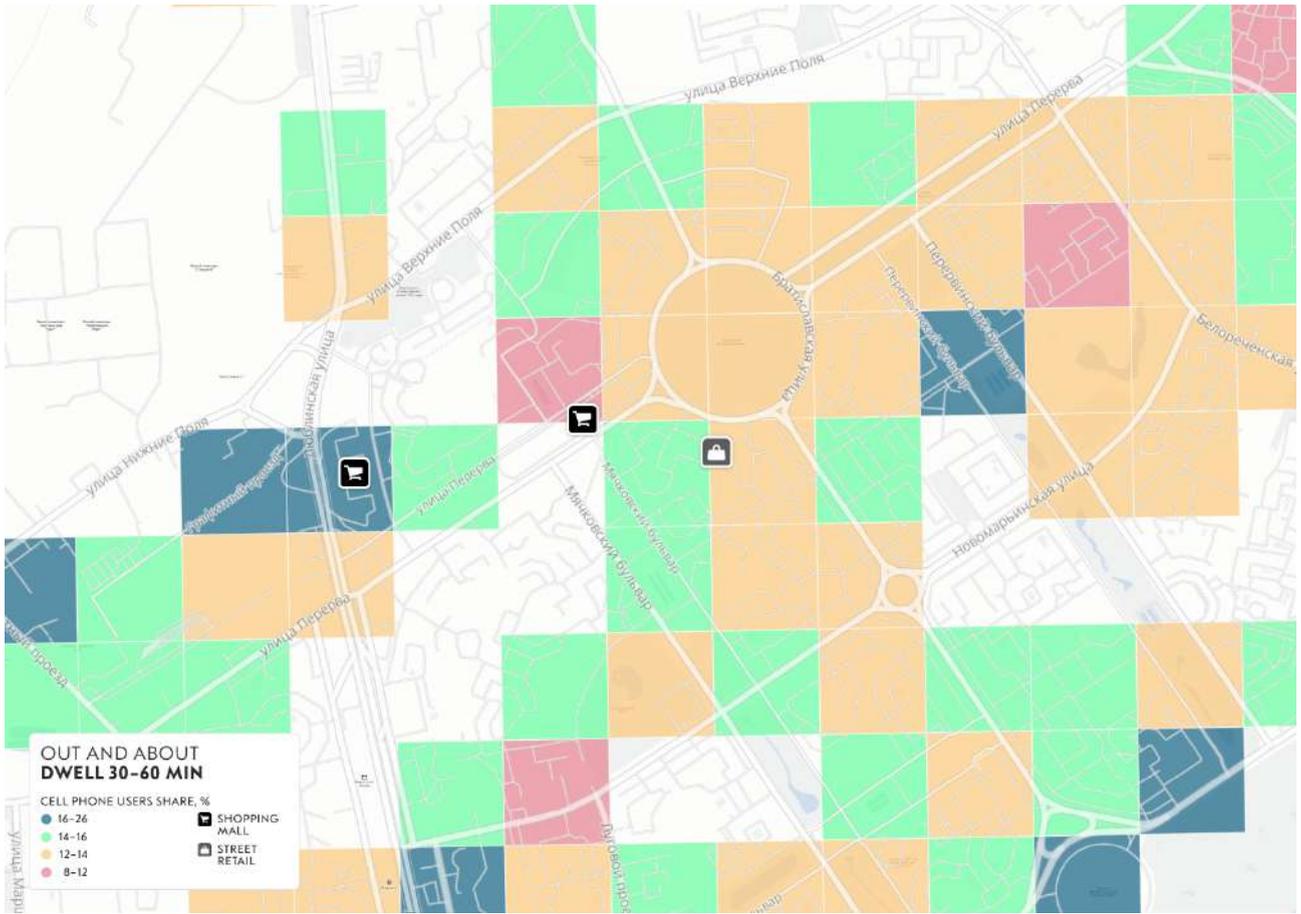
Community shopping mall and street retail in a local neighbourhood

Staying put. Offices and residential areas.
Long stays are typical for 70+% of business centers

STAYING PUT
DWELL 300+ MIN

CELL PHONE USERS SHARE, %
- 31–58
- 25–31
- 20–25

Most business centers fall into 2 types of dwell time – 1 to 3 hours and 5+ hours, and the 1st one prevails. We see this pattern as workers go out for lunch breaks and meetings, but at the same time it is also influenced by the data. Despite the fact that there were no lockdown measures in March 2020 yet, some companies have already transferred their employees to remote work, and general patterns of mobility have begun to change.

Staying put dwell time is more typical for home activities (evenings, nights, weekends) and most often is found in residential areas outside the city centre.

Takeaways

By connecting places with the activity of their visitors, it is possible to see differences in people's behavior in various types of locations. The results can be used to adjust or even change functions of real estate assets (like, from shopping mall to an office), plan local area improvement or redevelopment, or develop a strategy for business expansion on a city scale.

So, transport hubs and metro stations are marked with **on the move** dwell time, while **staying put** is typical for residential areas. The dominance of a single type of activity usually describes monofunctional locations, which leads to decay. As an example, during the COVID-19 lockdown some of Moscow transport hubs lost all their audience when commuters disappeared as there were no other attractors except for the transit function.

It should be noted that one of the recent trends for transit areas is their transformation into shopping and business hubs in order to "anchor" visitors by creating diverse functional zones and comfortable public spaces.

The situation is different with **out and about** and **work and leisure** types of dwell time. Both are associated with the activity in shopping malls and street retail – commercial density and diversity **clusters**. Mixed use areas are more likely to be characterized by mixed dwell time either, as multifunctionality and complexity are common for well-developed locations.

Each city is unique – for example, Moscow has lots of transit and industrial areas, and housing and business clusters are not optimally located causing overruns. Therefore, transforming "transit" flow into a "productive" is one of the main development goals and it should go together with functional profiling, increasing the role of rental housing, etc.

Having said that, with such a study a city gets a performance indicator to evaluate and plan its effectiveness in terms of beautification and urban development, area planning and its overall profitability.