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How many, Who, Where, What and How long. Mapping public space in Russian monotowns through Jan Gehl's theory

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Abstract: The paper presents a method to operationalize Jan Gehl's question for public space into metrics to map urban life of Russian monotowns in 2017. With the use of social media data, it becomes possible to scale Gehl's approach from the survey of small urban areas up to the analysis of entire cities while maintaining the resolution of the human scale. Where underperforming public spaces are detected, we propose a matrix for urban design intervention using Jane Jacobs' typology of conditions for good city life. Furthermore, this method was deployed to improve the conditions of public space in Russian monotowns through a series or architectural briefs for design competitions and urban design guidelines for local administrations.

1. Introduction

Monotown is an urban settlement whose economy is dominated by a single industry or company. The term is relevant especially in Russia, where the Soviet-era economic and military planning created hundreds of single-industry towns. Typically, monotowns were planned close to natural resources, such as precious minerals, coal and water power, and far from state borders to protect for war [1]. While the majority of monotowns are located in central Russia and along the river Volga, many are also in Southern and Eastern Siberia and in Russia's arctic zone.

In an international comparison, rather similar *factory towns*, *mill towns* or *company towns* were built in the UK, US, Germany and Japan during the early phases of industrialization. In the Western societies, the rise of the welfare state and structural changes in the economy made the company town model gradually obsolete. In Russia, the structural change of economy is underway right now, making monotowns topical both for academic analysis and policy interventions [2].

According to Turgel [3], monotowns account for 43-46 percent of all cities in Russia. Roughly 40 percent of the country's GDP is put up in monotowns [4]. Officially, a municipality is considered a monotown if it fills the following criteria: 1) it has status as urban district or urban settlement; 2) it's population exceeds 3,000 people; 3) the core-company employs at least 20 percent of the local workforce; and 4) the core-company operates in mining or industry, except oil and gas. With these criteria, Russia had 319 monotowns in 2017 with a total population of 14 million people. Largest monotown is Tolyatti, a car-making city of 700 000, and the most remote is Beringovsky, a tiny port at the arctic Bering Sea.

Amongst academics, there is a general agreement that Russian monotowns experi-

ence serious difficulties [5]. Since the collapse of Soviet Union, the problems have evolved in complex ways, however, and the general picture of monotowns and their future is varied. In the 1990s, monotowns lost the Soviet planned economy support and linkages. Their production declined and became uncompetitive, and workers' wages decreased. The town-forming enterprises downsized social services they used to provide for citizens, lowering their quality of life. Kryukova et al. [1] succinctly summarize that "the main problem of social development of mono-towns in Russia is a fact, that living standards of the population directly depend on the financial and economic situation at the core enterprise". Around 2000, the living standards among monotowns started to differentiate, however, as cities based on oil and metallurgy could tap to the international export markets and developed relatively well. The World Financial Crisis and subsequent national shocks stopped most of the positive developments, leading to protests and unrest in some locations (e.g. [4]), but nevertheless some monotowns remain stable today [1] A specific problem is the *predatory* privatization. An example is provided by the aluminum company RUSAL, which possesses a number of town-forming plants but failed to invest any profits into the production, not to mention city-building, thus spoiling its own business [5].

1.1. Importance to study the quality of life in monotowns

Monotowns are by definition specialized. Specialization made them efficient in the Soviet era, but in the contemporary situation they lack diversity that could foster innovation and good social life. Monotowns fell prey to "lock-ins", which turned the initial strengths of the highly developed and specialized infrastructure, close inter-firm linkages and political support to obstacles and shortcomings. Grabher [6] distinguishes three major lock-ins that old industrial districts tend to face: functional, cognitive and political. In the Russian context, Didyk et al. [7] further highlight the notion of geographical lock-ins, which refers to the long distances, poor infrastructures and harsh climate that may make some monotowns hostile places to live.

While there are big differences from town to town, in general Russia's Federal Government aims to diversify monotowns' economy. This is reflected in the national policy program "Comprehensive Development of Monotowns". Amongst more traditional tools, the program focuses on improving urban environment and public space as means to improve the quality of life and foster positive socio-economic processes. Thus, Russian monotowns clearly provide for an interesting test ground for connecting an academic study to real-life planning guidance and actual urban interventions.

As planners and architects, we stress that spatial organization is a key element in achieving diversity and difference, working together with societal institutions which have their own spatial embeddedness [8]. Improving citizens' quality of life is about shared benefits to produce a sustainable array of human activities, beneficial both to social life and economic success. The various, interlinked benefits are a leading clue for users' location choice [9], thus helping us to understand and plan urban change. Urban amenities such as shops, bars or public buildings can offer services, activities and venues for social interactions and economic transactions. The more human activities a city can foster, the more interactions will occur, generating a vibrant urban life both in indoor and outdoor space.

The space-related approach to quality of life is relevant in monotowns. While monotowns are centrally planned what comes to location \ref{mapmono} and economic profile, they nevertheless represent a rich variety of 19th and 20th century planning styles. Some towns have older historical layers' in our study e.g. Rostov Veliky, Gorokhovets, Tutayev - and some are *puristic* modernist settlements e.g. Tolyatti, Na-

berezhnye Chelny, Kamskiye Polyany. Furthermore, topography and natural setting diversifies urban morphology and affects outdoor life, making monotowns as rich an object of study as any set of towns and cities.

The research was carried out in cooperation with Strelka KB, an urban consultancy based in Moscow, Russia. SPIN Unit OU, represented by the authors of the paper, was commissioned to study 32 Russian monotowns in order to propose policies, plans and urban design interventions to help to improve the quality of life of monotowns' citizens. Behind the innovative order was the federal non-profit organization Fund of the Unified Development Institution in the Housing Sector. In its expression of interest, Strelka KB stressed the importance of finding spaces with high value for locals in general and youth in particular, spaces for social gatherings and events, as well as spaces that are underused and may thus fall into urban blight. Besides these programmed tasks, the study team made observations on tourism, seasonal rhythms and morphological characteristics, among other themes. The proposed solutions should be cost-efficient, flexible in each location and scalable across the vast task of 319 monotowns. Furthermore, an inclusive process targeting social equity was deemed necessary.

1.2. Research question and objectives

Our research aims to develop methods to study urban life in cities from which we have little or no data, in a situation where the sheer number of municipalities involved and their geographic dispersion across 11 time-zones makes traditional surveys and statistical tools inappropriate. Scientifically, our challenge is to develop a set of relevant metrics to quantify the quality of life in a large number of poorly mapped and documented settlements. Currently, social media data offers new conceptual and analytic paths [10-13] especially if combined with other sources of understanding, including local knowledge [14-17]. Societally, thus, key issues involve increasing awareness about monotowns, foregrounding their hidden life and urban potentials, directing planning decisions and arguing for local mobilization and resource-pooling. In what follows, we show how a certain combination of classic urban design principles for better city life by Jan Gehl [18-19] and Jane Jacobs [20], operationalized through a multi-dimensional analysis of geolocated social media data, can achieve the challenging task. The methods presented below were developed to study 32 monotowns in Russia but ultimately they can be deployed to study any settlement where location based social media data is available, making the results relevant and scalable.

The metrics should provide a systematic and consistent characterization of human activities in closed and open space for an extended number of cities, starting with 32 but capable to widen the study to hundreds. At the same time it is necessary to represent the perceptual aspects to portray the small interactions and the intangible networks set underneath the tangible elements of the city. The state of art of assessing quality of life depends on extensive and detailed datasets of urban amenities, demography, economy, environmental factors, land use and more. In our case not only such information was not available but we had the necessity to embed our metrics to the range of one block, to study variation of our measures street by street. In other words, our metric should be capable of depicting life in the city as if we were surveying every corner of the urban fabric on foot. A survey that would require to extract information from locals and visitors to define the collective image of the city was clearly impossible due to restricted time available, language and budget constraints.

We found the optimal solution in Jan Gehl's approach to study public space. Gehl's research is based on understanding the primary quality of small urban places and feeding this information into his architecture practice to improve urban design [18]. Gehl

is standing with one foot into the academic discourse and the other into his practice, which find his methods always easy to implement in real case scenarios. In his practice, he was capable of bringing together into one single conceptual model both the physical and intangible qualities of public space. The fact that Gehl's method is designed to perform actual surveys of public space, all the metrics are engineered to be measured by human senses, mostly the eyes of the surveyor. Thanks to the high diffusion of mobile phones and the social practice of sharing a high quantity of photographic information online, we found it possible to think of social media users as proxy-surveyors of public space.

The key challenges of our study on Russian monotowns can be summarized as follows:
- to develop data gathering and analytic methods to study cities from which we have little or no data in advance;
- to propose and test novel metrics to address the quality of life and public space;
- to show how the study results may direct planning decisions and help in local mobilization.

1.3. State of the art: Mapping public life

Several valid models for mapping and studying public life in the city have been used in urban studies and planning. EUROSTAT provides a widely recognized model that relies on:
- Material living conditions;
- Productive or main activity;
- Health;
- Education;
- Leisure and social interaction;
- Economic and physical safety;
- Governance and basic rights;
- Natural and living environment;
- Overall experience of life.

EUROSTAT metrics are of high reliability and represent the standards for statistical analysis in Europe. Yet, those measures remain generic and hard to contextualize at the scale of urban settlements. To refine the scale of analysis and get deeper into the urban fabric, it is possible to measure the relationship between wages, rent and amenities to gain a deeper understanding of purchasing power and accessibility to certain activities provided by urban amenities at the local scale [21]. The method was already introduced by Sherwin Rosen [22] and it would be of high interest to categorize urban areas based on the ability for similar population group to access and/or afford a set of urban amenities. Although this would give a solid metric to highlight different level of affordance within the same city or metropolitan region, the only available indicator that is common to all cities, is the average salary. Glenn C. Blomquist has presented a variation of this metric that allows comparing a large amount of cities by aggregating urban amenities [23]. To be compiled the index would require detailed information regarding the urban fabric (e.g. height of building structures, their age, the type of housing and its room amenities), demographic information and even local weather conditions (e.g. humidity levels, hours of sunshine per year or pollution levels).

We could still attempt to work on a derived form of Rosen & Roback's index but the geodatabase of amenities available for all those cities is not consistent. The online service Open Street Map (OSM) offers a good possibility to mine a geodatabase of urban amenities but we found a high degree of inconsistency in quality and amount of amenities represented between cities, so this option had to be discarded. Yet, during this

exploration, the street network mapped in OSM appeared to be well representing the actual network visible on Google Maps. Therefore we have taken steps to manually update all the streets that were apparently missing from the OSM database.

Those are just few of the many different models currently used to measure QoL, but most of them still rely on very general information on economy, society and subjectivity and experience [24] of the model presented by the World Health Organization which follows even more personal domain believed to describe mental health: Physical, Psychological, Level of independence, Social relationship, Environment and Spirituality [25].

To face the absence of measurable dimensions, we found a reliable solution in the experiential construct of the city. Meaning the collection of information that is eventually quantifiable but which is gathered through the users of the city themselves. Christopher Alexander drove a constant search for the improvement of urban design through the study of activity patterns and the ontological elements of design [26-28]. Human activity patterns are seen as the key to having a deeper understanding of both happiness in the city and socio-economic attractions in everyday life.

An optimal approach would require the combination of both the physical and perceptual components of urban environments to bring the index closer to life, the way it is perceived by the population [29]. This dual indicator weighted to the local and personal condition have inspired more district level analysis, together with the rise in popularity of Geographic Information Software (later GIS). GIS became a step forward in fine tuning QoL metrics at the block or district scale by modeling the physical qualities of the tangible elements of the city with the way they are perceived by its population. With GIS demographic, social and economic indicators could be geofenced and seen in spatial relationship with granular information from surveys and census data. With this approach it is possible to map and so measure subjective and objective views that can describe the qualities of the Physical, Social and Economic life of one district[30].

In urban studies many efforts were done to stress the importance of the subjective view in for a healthy living [31-33], in understanding the intersection between urban design, social life and economy [20, 34] but they often remain discursive or at least hard to operationalize at large scale. QoL in small urban scale is becoming topical to the field of planners and designers as we are now in the phase of reaching full building capacity in many western urban and metropolitan regions [35]. This is calling for a dynamic metric of QoL in relations to the changes in city form [36] and historically this moment was seen as the occasion to shift from quantitative change (growth) to qualitative change [37].

2. Materials and Methods

In "How to study public life" Jan Gehl introduces "The list of questions that can be asked about the interaction between life and form is essentially endless" [19]. Although those questions are originally designed for field surveys, we propose to operationalize Gehl's method to transform observations into quantifiable metric. He continues "Every city is unique, and good observers must use their eyes..." emphasizing the importance of having eyes on the city to have a finer appreciation of the spatial and cultural complexity of a place. Only from the human scale it is possible to learn about the degrees to which people can experience the city and interact with each other and with small architectural artifacts. But how can we survey a large amount of cities? And for those cities how can we observe and record:

- **How many** people are present passing by every street, square or park in one city?
- **Who** are the people crowding or strolling by all those places?

- **Where** those people prefer to spend their time? 237
- **What** people do in each corner of the city? 238
- **How long** people stay in public space? 239

Those questions can be answered through classic surveys and experts' observations 240
on site but hardly they can be implemented to survey large urban space and through 241
different seasons. The method we are presenting aims to operationalize Gehl's 242
methodology into a quantifiable set of metrics using images taken by dwellers, becoming 243
direct surveyors of space and activities through their personal perspectives. The five 244
questions proposed are the means to gather the collective image of the city and quantify 245
the hidden life of both indoor and outdoor space. To do so, we have analyzed 1.1M 246
publicly shared images from the 32 Russian monotowns on the social media platform 247
VKontakte (later VK) through its public API. We selected only georeferenced pictures 248
within the geographic boundaries of each city and assigned a unique identifier to each 249
image to anonymize and randomize the data. 250

Clearly, the analytic framework is set by questions of this research and the 251
representative sample of population is limited to the VK users', but there is intrinsic 252
difference between interrogating social media data and classic interview, surveys, 253
participant observations, personal mapping, softGIS, action research, and many other 254
qualitative methods. Those all involve researchers' direct influence in formulating 255
questions and interviewees personal and professional biases [38]. Gehl proposed his five 256
questions for public space with the purpose of making tangible the forces that govern it. 257

2.1. How many 258

With the first metric *how many*, Jan Gehl proposes to observe the number of people 259
walking by one street or staying in one square. This models the pedestrian flow and it 260
originally has been designed as a method to assess users' preferences in public spaces and 261
urban cores. We operationalize this metric by calculating the density of geolocated 262
pictures as a proxy to measure the presence and preference of dwellers through the city 263
and its peripheral region. 264

When the use pattern of public urban space is juxtaposed with the pedestrian 265
accessibility analysis (UNA) of the underlying spatial configuration, three basic 266
categories for each modeled unit of urban space can be distinguished: (1) under-used, (2) 267
used as expected, and (3) used surprisingly actively. These typologies help the designer 268
in locating interventions and finding right tools for each situation. In stepping from 269
analysis to intervention, Matthew Carmona's conceptualization of the urban design 270
process as a "place-shaping continuum" is helpful. For Carmona, urban design involves 271
four distinct phases: (1) design; and (2) development - together shaping the physical 272
realm for use; (3) space in use; and (4) management - together shaping the public realm 273
through use [39]. We link Carmona's phases 1 and 2 to introducing new land uses and 274
urban elements and phases 3 and 4 to the gradual and contextual improvements of the 275
existing situation. Carmona's typology is not helpful regarding the most actively used 276
areas that do not warrant any physical change, however. For that third urban situation 277
we propose temporary uses as a tool to achieve positive changes, such as inviting new 278
user-groups or changing the temporal use-pattern [40-41]. Clearly, the three types of 279
situation and the related processes of design, use and social innovation are characterized 280
by different economic logics, collaborative networks and temporalities. 281

2.2. Who 282

The question *who* is presented by Gehl to map dwellers' demographics in public space and learn which are more successful at hosting a higher mix of people through gender, age and social groups. Through observations on site, researchers can study users' location choice by mapping which spaces they occupy and noting down their profiles. We operationalized Gehl's method using the categorization of prevalent gender and age of people present in public shared geolocated pictures. Successful cities are the ones that are capable of bringing together dwellers and visitors of all social and cultural backgrounds, therefore this metric is aiming to measure the demographic blend in public space to find segregation or integration phenomena.

Our preferable target group was the youth of the city, therefore we focused on mapping the presences of teenagers in public space. To do so we have manually categorized pictures portraying teen-agers. We defined our reference groups as all the kids that are between 10 and 18 years old. Younger dwellers were categorized as *Children* and older ones as *Adults*. If children were accompanied by adults, those groups were categorized as *Children with adult*. This particular task was assigned to anthropologists who categorized images according to their abilities to capture all the characterizing elements that are distinctive to their respective age groups. Computer vision could have been used to obtain an approximate categorization of this demographic but we chose to carry it out manually since other observations for other metrics had to be carried out visually.

From the analysis of demographic maps depicting places popular by youth and adults, it became clear that youngsters are usually avoiding adults. In spatial terms, it has been observed that youth gather mostly in locations that are far from centers of urban life, transportation hubs, landmarks and other crowded places. Those could be courtyards, unused parts of natural territories and abandoned territories, where the control for their action is minimal.

2.3. Where

With the question *where* Gehl is observing dwellers' activity-location choice in public space to maps "where people move or stay in individual spaces" [19]. Using geotagged photographs allows us to explore only the static component of this question. To learn what type of urban environment dwellers prefer to carry out their activities in, we are going to classify pictures whether they are taken Indoor or Outdoor. This categorization can be altered according to the geographic scale of the study. For analysis of small public spaces, streets or plazas the classification can focus on micro-environments. Pictures could be categorized based on the properties of the location in which people are gathered. Such properties can include, for example, the quality of the light: are people gathered in a bright environment or in the shadows? In the past, this approach has been suggested by Gehl.

The picture categorization process was carried out using scene recognition, one of the hallmark tasks of computer vision, allowing defining a context for object recognition. In this project we used a scene-centric database called Places, with 205 scene categories and 2.5 millions of images with a category label. Examples of scene tags are attic, auditorium, badlands, ballroom, bar, basilica. Using convolutional neural networks (CNN), the system is able to learn deep scene features for scene recognition tasks, and establish new state-of-the-art performances on scene-centric benchmarks. The first step consisted in applying to all the images in our corpus the scene recognition algorithm that assigned to each photo a set of category labels with associated a confidence score. To assign to a picture the label indoor or outdoor we first associated each scene tag to the corresponding label, e.g., a park would be associated to the outdoor label while a

ballroom would correspond to an indoor scene. Then for each image we took the 3 scene tags with the highest confidence score and we assigned to the picture the corresponding label if and only if all the three labels were equal, e.g., a photo with three indoor/outdoor scene tags was tagged as indoor. In case a complete agreement was not possible, we tagged the pictures as unknown and omitted them from our sample.

In general a mixing of indoor and outdoor activities can be considered an asset and a sign of positive urbanity. The mixing can occur in two scales: between adjacent morphological units, or inside one morphological unit. In the worst case, concentrations of outdoor uses in urban parks, boulevards and squares are ranked by active indoor uses in the neighboring urban blocks. These configurations show potential to spread indoor uses, such as restaurants or cultural events, seasonally to parks, and to enliven the economies of interior uses through pedestrian flow nearby. In the second case, the mixing can mean active yards or small kiosks in parks, features that show small-scale development opportunities for one actor, be it the municipality (parks) or a housing association (microrajons). However, active street-fronts typically require coordination between the city and shop-owners.

2.4. What

What are the activities people engage with in public spaces? Gehl's question is aiming to map activity patterns to learn what are the requirements for urban design to host them adequately. We quantify this question by analyzing the variety of activity patterns observed through social media data. This is one of main proxy to assess the perceived quality of life as the mixing of uses and activities is the hallmark of good city life together with their spatial distribution and accessibility [42-43], Jacobs is also defining the variety of amenities, and consequently of human activities, as one of the four principles for good city life [20]. She also defines cities with less specialized activities to be more resilient compared to others and likely to have better economic outputs [34]. Through social media data we can do that for indoor and outdoor spaces and in public and third places.

Activity patterns will be analyzed through the objectual content of publicly shared social media images. To do so we are using the *activity wheel* which extends Gehl's dual system of Necessary and Optional to all its quantifiable and measurable components, unifying his work these different approaches into one simple set of categories to map activity patterns [44]. Activities were mapped by trained researchers by manually assigning tags to a randomized sample of 45 000 social media pictures from the 32 Russian monotowns based on the activities they can recognize in one them. In a second phase of the project not reported in this article, we have extended the amount of pictures categorized to focus on relevant areas of interest.

As a result of this categorization we developed a simple metric to estimate the QoL across the cities examined, and sort them in the graph above. This metric favors both cities with a greater number of different reported activities and cities where the number of pictures is more uniformly distributed among the different activities there recorded. This approach correlates quality of life with the variety of activities offered by a city, favoring those cities where no single activity dominates.

This metric, M, for a given city is defined as follows:

$$V = V(city)/max(V(allcities)),\tag{1}$$

The formula used to measure the estimated quality of life of the cities and order them in the graph is:

$$\text{(Number of activities / Maximum number of activities)} * \text{(Maximum variance recorded in the number of pictures across different activities / Variance in the number of pictures across different activities)} \qquad (2)$$

2.5. How long

Permanence is a clear indicator of preference. The period of time spent in a certain place is a measurable parameter that describes the bonds and interactions between people and the space they inhabit. Gehl analyses permanence in a dynamic and a static form. The first one is about measuring the lapse of time required to walk through a given place and the second is the measurement of the duration of time one spends in a given place. They can be used together although they can be used to study public space in different ways. The first metric describes how the environmental factor and preferences may affect human behavior by slowing or accelerating their movements and the latter describes the duration of human activities.

With social media data we can focus on the second metric described by Gehl as the duration or permanence of human activities. To do so we use the timestamp of VK posts to characterize indoor and outdoor spaces based on how long they are used through the day, days of the weeks and seasons of the year. A series of cartographies were designed to map the use of space according to days of the weeks and seasons. Those were used to perform a visual inquiry of the 32 cities at the urban scale. For instance to study how parks were experienced through the seasons or spot the areas and districts that were active and in use throughout the week.

Jane Jacobs has stressed how the duration of activities in public space are beneficial to the city life in social terms, street safety and economic outputs. "On successful city streets, people must appear at different times. This time is considered hour by hour through the day." [20] (p.198). We do so by studying the temporal distribution of social media photos throughout the day. This daily probability distribution is discretized into 24 hour-long time bins. To compare these time probability distributions across cities with significantly different temporal distributions and numbers of samples, we use the Kullback-Leibler (KL) divergence as a measure of the difference between each time distribution T and a corresponding uniform distribution U. For each time distribution T, the KL divergence $D(T||U)$ provides a measure of the entropy of the time distribution itself relative to a uniform distribution. In coding terms, the KL divergence can be interpreted as providing the number of additional bits required to compress T with a code optimized for U. For a discrete distribution with 24 uniform bins, this number of bits ranges from 0 (where T is uniform) to a maximum value of 4.58.

3. Results: Urban interventions

Architects, planners, developers and other actors can influence the evolution of cities both through fostering new activities -- such as temporary uses, events and local activation programs -- and through physical changes in urban space -- such as new developments, infrastructure and parks, or physical reconstruction and remodeling of existing structures. Some commentators distinguish these two types of intervention as "place-shaping" and "place-making" [45], where the latter demands more monetary investment, organizational capacity and time.

Strelka KB used the output of this study to provide local administrations across Russia with a set of guidelines to improve urban design and draft architectural competition briefs for selected sites. Later, a national co-creation platform was introduced, inviting citizens to work for their own locales and propose new ideas for collaborative vetting. In this process, resource-efficiency was one important parameter, sometimes directing attention to quick and light "place-shaping" solutions.

As our role in the process was to mediate between analysis and design, we wished to enrich the place-shaping / place-making frame to better facilitate the work of expert designers and planners in reading the outputs of the 5 metrics and help the definition of interventions. The link between analysis and design is not simple. This relation is discussed by Carlo [46] as two distinct "moments" in the design process, the typological moment and the moment of invention. Our question was how to move from metrics to interventions, from analytic maps to focused and realistic physical designs and social innovations.

The objectivity of the patterns observed through the 5 questions has to reconcile and be comparable with experts' knowledge regarding the actual spatial, social, cultural, economic and administrative context of monotowns. To do so we produced a matrix to interpret the results of the maps according to local knowledge and scale of intervention based on Jane Jacobs generators of diversity for good city life - the results are visible in \ref{Bigtable}. For each metric we have three classes of intervention: for *Less than expected* the metric output values are lower than the desirable ones, for *As expected* the metric output values are equal to the desirable one and for *More than expected* the metric output values are higher than the desirable values. The definition for the desirable values are different for each metric and they are defined in the row KPI. Based on visual analysis of all the metrics provided, Strelka KB have defined guidelines for interventions in their areas of interest.

Table 1. This is a table. Tables should be placed in the main text near to the first time they are cited.

Title 1	Title 2	Title 3	Title 4
entry 1	data	data	data
	data	data	data
	data	data	data
entry 2	data	data	data
	data	data	data
entry 3	data	data	data
	data	data	data
	data	data	data
	data	data	data
entry 4	data	data	data
	data	data	data

4. Discussion: Guidelines for urban design interventions

4.1. Less than expected: Land-use and urban design

The initiation and realization of new urban projects involve case-by-case issues of both process and form. The process entails establishing a vision; creating social and economic value; defining objectives and making the plan; marshalling resources; leading the project; as well as negotiating consensus and garnering support (adapted from [39], [45]). Regarding form, we meet the perennial questions about the desirable outcomes of newly-planned urban extensions and urban renewal projects. Jane Jacobs claims that diver-

sity across scales is an essential condition for success. According to her, diversity requires four conditions:

- mixed land uses to attract people with different purposes;
- small blocks to promote contacts and slow down cars;
- aged buildings with a variety of form and condition to facilitate a mix of high and low rents, and
- dense concentration of people and buildings to ensure liveliness [20] (see also [47]).

4.2. As expected: Improvements of use and management

The spaces that are already rather well-used can be shaped through use. The process entails activation and appropriation of the place; looking for opportunities; adaptations and new amenities; as well as everyday stewardship of the place, curating and control. The use and management should have a long-term investment view, preparing a new project initiation in some time-frame (adapted from [39], [45]). Interesting for our project on improving public space in Russian monotowns is the twin question of how to draw users in and how to make them stay longer, or "linger". Making the intervention on an existing movement corridor, visual permeability and amenities, such as cafes, are keys in drawing people in, while soft surfaces and grass, good design of seating and a variety of microclimatic conditions to cater for different user-groups are some ways to ensure that people linger [39] (p.23). The notion of "power of ten" emphasizes the importance of the richness and diversity of uses and amenities.

4.3. More than expected: Programming temporary uses

Most actively used spaces do not necessarily require any physical changes in the foreseeable future. They can, nevertheless, be improved by intensifying or prolonging their use and inviting new user groups, such as youth. Temporary uses is one possible approach to achieve these goals. Temporary uses are "*place-based and involve a development orientation, understood as a stake, shorter or longer, in defining a place and imagining its future*" [48] (p.49). They involve appropriation of urban space and communal creation of value (ibid.). Temporary uses have a broad potential in nurturing the possible and leading to spatial and social innovations. Bishop and Williams in Temporary City claim that *"[t]o be truly effective, temporary activities should not be viewed as an experimental prototype for a longer-term use. They are essential features of the urban and spatial condition in their own right?*" [40] (p.215). Besides location and form, a key design issue is their temporality itself, ranging from momentary "stand-in" to a pioneering "impulse" and from a dependent "parasite" to "co-existence" with other uses [49]. Very important observation is temporary users' potential to move from site to site, thus spreading the innovations created in the most actively used spaces.

5. Conclusions

Currently, some forms of social media data are available in nearly ubiquitous manner across settlements globally. They can be harvested and used in urban research to provide new insights, remembering strict ethical guidelines on users' personal privacy and results' non-commercial application. In the Russian case, we used the popular social media application VK. In other countries, other applications are relevant, such as Instagram or Foursquare, making the approach scalable across the globe. In using social media, the user profile of each platform has to be taken in account, but despite some limitations there is little doubt that social media provides valuable insights that cannot be replaced by any other data. In the monotown study, we piloted the combination of Urban Network Analysis (UNA) and cultural analytics of geo-located social media images and texts. This combination is efficient in linking the social media results to urban form, on

one hand, and opening paths towards partial automation of the cultural analytics, on the other. Machine learning of big visual data clearly warrants more research and tests.

The metrics on the quality of urban life, based on a novel operationalization of Jan Gehl's classic formulations on the intensity and rhythms of the use of public space turned out to be a relatively good way to approach the complex question of quantifying the quality of life. It became evident that against some preconceived ideas, every monotown is unique. The analysis of the use of public space, buildings and natural areas have given surprises and new findings in every single case. Our approach, which utilizes social media images voluntarily uploaded by countless citizens, has a unique strength in avoiding professional and cultural bias that would wrongly direct the analysis of what locals value and where they want to spend time and socialize. We have cautious confidence to say that as it is represented in citizens' posts in VK the network, the social life in most monotowns is positively traditional. There is a lot of attention to family and children, to birthdays, weddings and spending big holidays together. School parties, graduation ceremonies and sports, too, seem to bring people together. The flip-side to the importance of these social institutions is the lack of non-traditional settings and commercial urban amenities. In our data, there is very little evidence of people eating out in restaurants, going to coffee shops, having nightlife or engaging in shopping. Cultural offer such as concerts, art or civic meetings, seems limited.

The specific interest of Strelka KB was youth. We found out that youth, in general, prefer two types of location: either they stay in the most urban and densely used parts of the city, or they focus on marginal and under-defined locations near the urban core and *microrajons*, such as bridges, small forests at the edge of an estate, railway lands and empty lots. In our sample, the "most urban or dense" means either the main street and main square (especially clear in Stalinist classical plans) or the *microrajons* (planned housing districts) that had the highest built density and population density in nearly every case city. Youth do not go out in nature but stay in the built area. Lack of indoor gathering places may, thus, be a problem to be addressed.

An interesting observation is that the factory of the town-forming company is in most cases not depicted in social media at all. Locals do not share images or other content regarding the factory. This may mean that the factory is closed and forgotten, that people do not take pictures while working, or that the connotations are negative. In few cases, however, the factory was a landscape icon, a place of exploration and excitement or a site of renewal and new uses. In shrinking monotowns not much can be done to reuse the factory, but in stable and growing ones this might be an opportunity, following countless examples worldwide.

Regarding the third challenge of putting the study results in use, we firstly can conclude that the citizens of monotowns sent a positive signal that their place is not decaying neither hopeless. On the contrary, there is a clear point and even urgency in making the monotowns public realm better, while other policy measures (on income, housing, culture) are probably needed, as well. We believe that the analyses, done in a comparable manner for all 32 cases, have helped in focussing in most important areas and topics in each city and starting to build on their hidden, invisible potentials. The classification of type of intervention, inspired by Jane Jacobs' work, did help in clarifying the scale and intensity of relevant intervention, be it place-making, place-shaping or using the potentials for a quantum leap in urban process and quality. The societal challenge has after the original study developed further by Strelka KB as a nation-wide co-creation toolbox for improving public space.

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