SPIN UNIT

Project report: "The development of the recreation and tourism industry in 2012-2018"
Client: KB Strelka
Consultancy 1: 29 June / 1 July 2016
Consultancy 2: 10 June / 16 July 2016

REPORT 1

Initially our consultancy required the review of the methodology presented in the document "Standards of improvement for recreational objects in Moscow" (Phase 1) and propose our action plan for improvements (Phase 2).

Phase 1: methodology review

In this section we highlight the problematics divided into topics.

UNDERSTANDING THE DOCUMENT

Overall the document was difficult to comprehend due to its length and complexity. For being an interim methodology booklet, we found this document to be oversized, in fact it could be a publication in itself. It is apparently written and organised by different authors as the different chapters of the document do not seem to flow one after another, giving the sensation that each part of the methodology has been developed independently. The amount of schemes and graphs presented is overwhelming and to a new reader, even an academic one, it is a challenge to grasp the key information that is communicated. We have read and analysed all the tables and schemes several times but only when we had the chance to receive an oral explanation from the KB Strelka team we had fully understood the content.

In the text we have also found relevant issues with the taxonomy and the ontology presented in several sections but possibly this could be a translation issue, therefore we have not presented further comments on this regards.

STORYLINE

The book we consulted for is the first of 7 volumes so it represent a small chapter for the whole project. The analytic section of this book it is only one small part but it is essential because it will guide the storyline for all 7 volumes. For this reason the structure of the analysis presented and arguments printed in the first volume have to be essentially clear, understandable and easy to be followed and interpreted through all the volumes.

At the moment of our review the storyline was confusing and too complex to be the ontological core of this publication. The storyline was build in three sequential blocks:

- Data analysis
- Presentation of the 5 criteria
- Network analysis

The first and major problem is the order in which they are presented, because the data analysis comes before the statement of the 5 Criteria of inquiry, and after the statement comes the 3 Networks that appear to be a separate working package. It is common to follow the logic of having first the criteria of inquiry because it is based on that the main questions are formulated. Once the questions are stated one may sketch a list of analysis and for each of them define what are the datasets and tools necessary to perform them and answer the initial question. In the methodology statement we didn't find this sequence and for this reason was hard to grasp the connection between what the team is trying to achieve and how they are going to achieve it. Usually we would expect a logic and a chronologic structure such as:

- General criteria of inquiry
- Questions
- List of analysis that may answer the questions
- List of required date sets
- Results
- Final statement (how the results of these analysis will be used connect all the following 6 books)

METHODOLOGY

The objects that are analysed in this first book are Green, Blue and Grey networks and the 5 Criteria are used to analyse and intervene on their spatial design through future recommendations. In this we found two visible gaps: the first one is the missing link, both in terms of ontology and logic sense, between the structure of the 5 criteria and the one of the network analysis and the second was the gap between Data analysis and Network analysis. In other words these three blocks should use one unified approach but instead they are not linked and also for this reason the analytic process it hard to comprehend.

From our side the hardest task to undertake was reading and understanding the tables used to define the analysis of the three networks. The complexity was extremely high because in each cell we were finding a different typology of inquiry and a different analytics method. Each of the 5 Criteria were treated differently in the analysis, creating a matrix of possible combinations that is beyond the scope of this book.

More critical was the nature of this table from the academic perspective. As for today, we have a large number of published academic works that have presented similar subject of inquiry and studies. From Project for Public Space to Jan Gehl's works or STREETS and so on. In this project it was put a big

effort in trying to introduce a new large methodology from scratch, that eventually it seemed to be gone out of hands in scale and complexity. It is always common sense starting an inquiry using available academic knowledge and if that was not enough, tailor the present analytic models around the 5 criteria or the 3 networks. Shortly, taking existing methodologies and adjust them or development them around the current project.

The reason why we believe that the complexity of the methodology was leading the project out of hand, is the amount of analysis present in the tables. We did a very simply thing of counting the number of cells in each tables, or matrixes, each of one corresponded to one analysis or output. The results are the following:

- Data analysis matrix: 36
- Network analysis matrix: 117

According to these tables, the team had to be capable to produce 153 outputs. Ideally the team would need to produce 8 outputs per day which is clearly impossible no matter the size of the team. At the same time it also means that the book had to be big enough to host all of the 153 outputs planned by the matrix and text had to be written to explain each of them.

From our perspective, counting the amount of outputs present in the methodology framework gave us a clear idea that the methodology matrixes had lost their scope. So we didn't go any deeper but we focused our consultancy on thinking out to restructure the work, without changing the ontology in order to meet the delivery goal within 20 working days.

Phase 2

In this part of the report we are going to list the proposal of change we have presented during our stay at KB Strelka and describe the support we have provided during the second day of works in Moscow.

STORYLINE
We proposed to change the storyline to follow a logic which is closer to the workflow of common international practice. At the same time there was no time for restructuring the workshop so we have only proposed to swap places between the different sections starting with the definition of the 5 criteria —> based on which are the defined and analysed the 3 networks —> that are analysed using the dataset

With this structure it is possible to clearly understand:

- What are the criteria of inquiry
- What are the objects of analysis
- How the objects of analysis (networks) are going to be analysed using the datasets

METHODOLOGY
Our goal was to propose a new methodology that would not alter the ontology of the 5 criteria and the structure of the 3 networks while ensuring that all analysis proposed could be managed in the time span of 20 working days.

We have carefully studied the structure of the methodology to get to essence of what this project was trying to study and communicate. What we found is that the supporting elements of this project were the 5 Criteria and the 3 Networks were the objects to be analysed according to the first ones. Therefore, to minimise efforts and keep the structure inteact, we proposed a matrix to analyse the 3 Networks according to the 5 Criteria.

With this approach each of the three networks would be analysed using the same set of mind and technical tools, making it easier for the team to think and perform while reducing the time required to hand out the job. With this new structure the analysis to be performed have shrunk from 153 to 15 in the time space of 20 working days, which we still consider a challenging plan. Although this seems more approachable we forecasted that the deadline can be

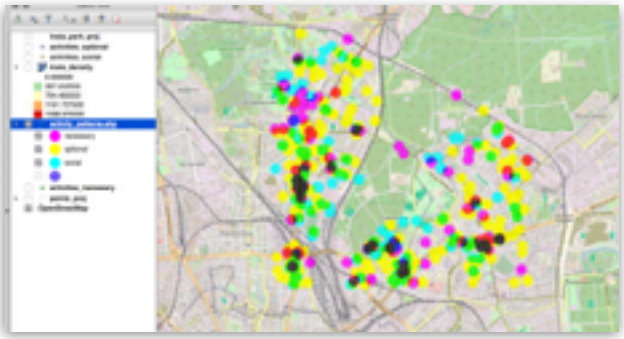
meet only if all datasets purchased were available within 2 days from our leave.

KNOWLEDGE TRANSFER WORKSHOP
The second part of phase 2 consisted of hands-on workshops where we first analysed and restructured the workflow of the KB Strelka GIS team and later transferred all the knowledge required to perform the spatial analysis. In a nutshell, our work consisted of:

- Checking current GIS files structure
- Checking geo-referenced layers and correct positioning of all coordinate systems
- Checking geo-database structure and data consistency
- Checking and validating all base data: street network, buildings, 3 Networks areas
- Giving advice on data structure for each of the dataset purchased by KB Strelka
- Presenting and teaching different methods to perform spatial analysis in GIS
- Presenting and teaching new urban metrics to calculate spatial accessibility (Reach index). For this task we have also provided knowledge about Reach calculation, data preparation and data abstraction.

- Presenting and teaching methods to use Instagram data to map activity patterns. For this task we have also provided data sample and knowledge on: Instagram location-choice analysis, hashtag based spatio-temporal patterns analysis, activity pattern analysis, problematics with origin destination analysis and methodology to implement origin destination analysis.

- Presenting and teaching methods to use urban amenities data (retails, bars, cinemas etc.) to study activity patterns in Moscow. For this task we have also provided data sample and knowledge on: Acquisition of OSM data, OSM data classification according to activity patterns, OSM activity patterns data visualisation techniques.



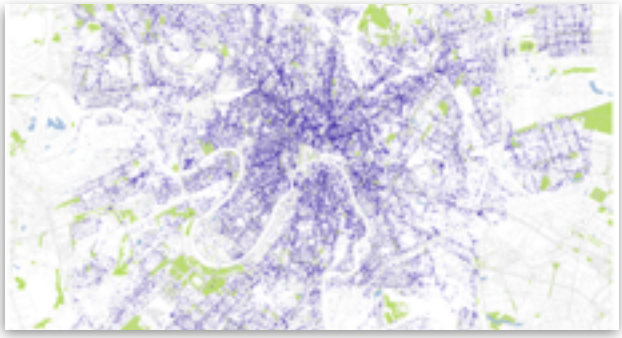
REPORT 2

In this second report we will describe the work carried out during the second visit of SPIN Unit at KB Strelka. This time our goal was less on the consulting side and more on the production. Our general goal was to assess the current stage of the project and bring to delivery. In this case we have occupied most of out time co-producing rather than advising.

Phase 1 - review

The first part of this working package had started 10 days before our visit in Moscow. SPIN Unit worked remotely to provide a series of dataset and services:

- Acquired "Google places" data, organised the dataset, converted the dataset to GIS readable format and pre-analised the data for validation and consistency.



- Acquired Instagram data, organised the dataset and converted the dataset to GIS readable format
- Instagram pictures density analysis

- Developed a script to easily query Instagram data with no need of GIS. The script was used to create sub-sets of Instagram data based on time periods, hashtags and selected events

When we visited office in Moscow, we have reviewed the current stage of the project. From the last time we visited office the methodology was changed and the 3 Networks were replaced with the 3 Moscow's rings. This solution was truly efficient as we noticed progress and more clarity if compared to the previous stage of the project. The ontology was more coherent and overall easier to comprehend. On the other hand the Reach analysis had not been performed and all the data preparation process was not done in conformity to the technique we have presented during our first visit. For this reason and the lack of one GIS specialist in KB Strelka, we have not reviewed the methodology but we made a plan of action and start to co-produce all the missing maps for the books or we faced the risk of not meeting the deadline.

The first step undertaken was listing all available outputs to understand what was missing and what could actually be achieved in the time given.

So we focused our preliminary work at KB Strelka on studying how all the available materials could fit into the new methodology and what could be produced in the given time and with the given human resources. After this preliminary observation we found communication problems within the different parts of the team, making it hard to have a clear understanding of the workflow. Yet, the deadline wouldn't allow to work on that but just focus on production.

We have rapidly sketched a list of possible deliverables for the GIS group and compared with everything that was produced so far. Unfortunately the amount of deliverables that was ready for printing was very minimal.

For all these reasons we have have changed our position from consultants to co-producers of the missing outputs.

Phase 2 - outputs

We had started working on the missing outputs by organising al the dataset in a coherent form and completing missing tasks that we expected to be undertaken before our arrival.

Data preparation

Using our tools we have extracted and prepared the Instagram data:

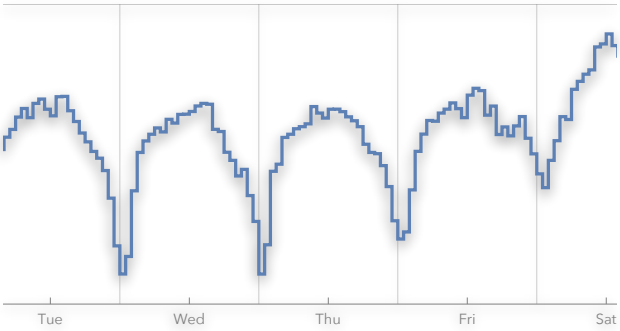
- By period
  - each season of the year (4 csv files, one for each season)
  - Each period of the day (each period one csv)
    - 00 - 02:59:59.999
    - 03 - 05
    - 06 - 11
    - 12 - 17
    - 18 - 20

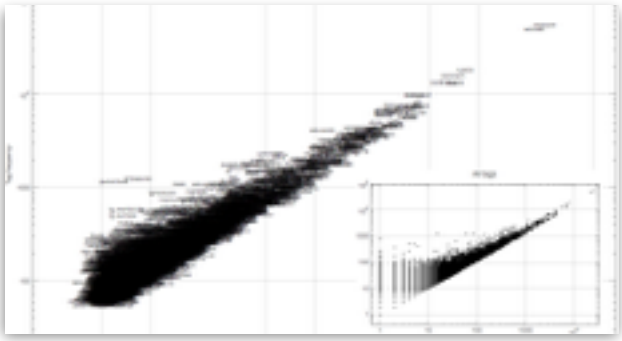
- 21 - 23
- By quarters
  - Q1 : January to March
  - Q2: April to June
  - Q3: July to September
  - Q4: October to December

- By hashtags
  - Group 1: events
  - Groups 2: sentiments
  - Group 3: single interesting hashtags

- By specific event (marathon)
  - Download pictures from the aggregate tsv only for 21 September 2014 time period 08:00 - 18:00
  - Download pictures from the aggregate tsv for 25 September 2014 time period 8:00 - 18:00

To verify the consistency of the data we have carried out statistical analysis and plot graphs that shows the distribution of Instagram pictures. This information also reveal insight on Moscow's activity patterns.





REACH

The Reach analysis is one of the most important outputs produces for the accessibility analysis. This very accurate computation calculates the amount of green area that can be reached from each single building of Moscow within a 800 meter radius. The same analysis was produced for the "Water" layer.

We have prepared the GIS data per the reach calculation using this specific method:

1. Firs split all multipart polygons to single part polygons. @QGIS Vector > Geometry Tools > Multi part to single part.
2. Use field calculator to build field Area. It will be polygone_area.
3. Pick minimum target_area. In case of moscow i picked 2000 m2
4. Sample_points are calculated by dividing polygon_area with targer_area.To make sure there is no unreasonably high number of points you can cap number of points by adding min(max_number_of_ponts, sample_points) . For moscow i used 2000 points.
5. To find sample_area divide polygone_area with sample_points.
6. Sample_area will be assigned as a weight to points.
7. Sample_points will be used as parameter to populate number of points inside polygons. There is alway at least one point.
8. @QGIS: Vector >Research Tools > Random Points. Input layer is polygons layer. Use value from input field pick sample_points
9. Transfer data from polygons to points. @QGIS> Vector > Research Tools > Join attributes by location.
10. You can clean up points by removing polygons everything else bedside sample_area.
11. Build x and y coordinate to as attributes. We can keep x and y as int. Submeter precision do not give us anything.
12. Export points as table

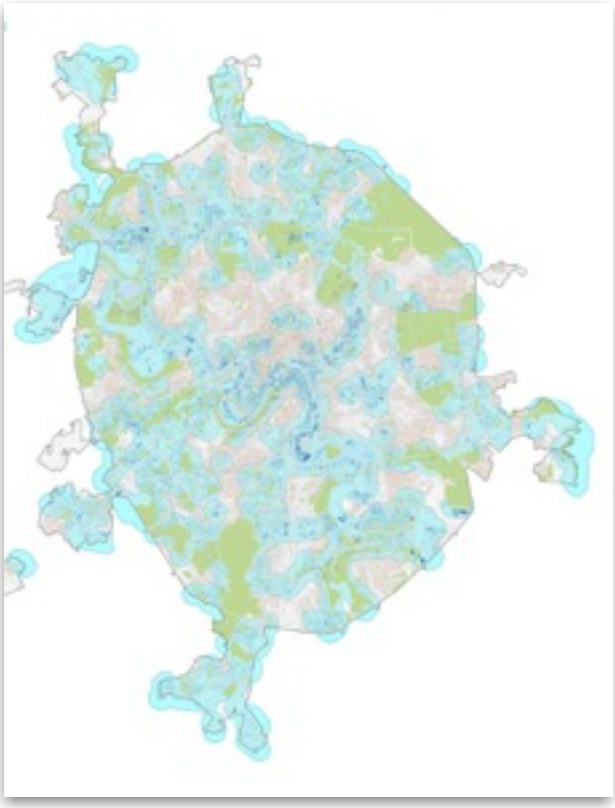
After this process the data was loaded into the Plug In for the Reach analysis developed by Raul Kalvo in Rhino 3D. To facilitate the work at Strelka, we have also developed a data interoperability software that allows to quickly exchange data from Rhino to QGis. With this tool that we developed it was much easier and faster to convert the results of Reach analysis in GIS format.

The resulting cartographies shows the buildings from which it is possible to reach green areas but also the residential and non-residential buildings that are out of reach. With this information it is possible to draft a clear action plan in selected zones that have a low reach or that completely lack of green spaces within 10 minutes walk.

After the first analysis we have noticed many inconsistency in the results. After an accurate analysis we have discovered that the street network data purchased was far from being accurate. Streets classification was not accurate, we found numerous missing links and an dramatic number of links between street segments were actually not linked. Since this was the only dataset available for purchase, we have carried out intense work to spot the locations of these problems in the network and fixing them. After a few days of correction we have recalculated Reach for

green areas this time with more satisfying results. The street network it is still far from being precise, therefore to have an accurate calculation of Reach it is needed to work further on the street network to resolve all the problematic links.

One of the mail goal of this book is findings and highlighting the architectonical and infrastructural barriers that impede access to the already existing green areas. To spot them more easily, we have produced maps for green and water areas with an 800 meters buffers calculated as the crow flies.



PEDESTRIAN FLOW

We expected to study pedestrian flow using mobile positioning data provided by one of the KB Strelka

contractors. Eventually this data was not available, therefore we studied several possibilities to still estimate pedestrian movement in Moscow. After discussing and testing different methods we have decided to use one of the internationally and scientifically established method to estimate pedestrian movement that is the Betweenness index. The Betweenness index measures the street segment and that are most likely to be passed by pedestrians. There are many different uses one can make of this index but for the purpose of this project, and with the available datasets, we found relevant to use it to find the paths that are most likely to be passed by between homes and the public transportation network. We have used residential buildings as origins and public transportation stops as destination. Usually this analysis can be enough and international practices and our own experience have show that these variable alone are good enough to estimate potential pedestrian movement. In this particular case KB Strelka had also the purchased the population data for the entire Moscow. With this information the Betweenness index it is even more precise because the analysis was weighted by the number of people living in one building.

The resulting maps highlight all the pedestrian paths that are most likely to be passed by between residencies and public transportation, giving a clear picture of movements that occur within a certain district. In fact, in our map, the very central area of Moscow has very low Betweenness values not because we estimate that less pedestrians would walk there but it's rather that very few paths are passed by within the neighbourhood. And this validate our analysis because\ the central area of Moscow it's a urban and regional destination but the amount of residents it is very low if compared to the one in the outskirt.

BRIEF CONCLUSIONS/FINDINGS

Conclusions of this analysis were already transferred to the KB Strelka team during our stay, therefore we will limit this part to a list of key findings that are explained in more details in the book n°1 itself.

- *Reach green*: the current stock of organised green areas it appears to be sufficiently close to almost every single building in Moscow in a 10 minutes walk. Although the Reach maps shows wide cracks within the urban tissue where green areas cannot be reached within walking distance. This suggests that already today it is possible to grant access to organised green spaces without building new parks and recreational areas. The first steps is to find all these barriers that impede access and propose new design solution to grant easy access to the less integrated areas of the city. A second step would be to repurpose existing green areas in the micro-districts using the "standards" so that not only everybody in Moscow would be granted access to recreational areas but at the same time it would create a new sense of place and community building within the most segregated districts.
- *Reach water:* in the case of water only the very central area of Moscow receive access to water features. This case is different from Green because outside the inner ring there is simply lack of water areas, rivers and ponds. Therefore in this case the problems of the architectural barriers it is an issue but it is marginal compared to the lack of Water areas overall.
- *Pedestrian flow*: the pedestrian estimation flow map clearly show the two aspects that are relevant to this project. Recreational areas, both Green and Water, are not located within the commonly used paths used by pedestrians between their homes and public transportation stops. This means that recreational areas do no bring any benefit or quality to the every day life of Moscow's commuters. The walk from home to the bus or metro stop is, for most of the Muscovites a grey journey while parks more of a week-end attraction. This is also clear when we look at Instagram pictures in parks, which are mostly taken during week ends and special events host in green areas. Academic research have shown that paths that are most likely to be passed by, also highlight in our maps, are the most wanted by retails,

urban amenities and are connected to real estate market values. That is the reason why most accessible paths are usually no crossing parks in most of the cities that we have also studied: because park do no produce financial wealth. For this reason parks stay at the margin of these accessible axes and they are only rarely at the centre of them. On the other hand green and water areas can have unmeasurable benefits if encountered in our everyday life. Many researchers, but more specifically Luca D'Acci, have presented the importance of having elements like parks and rivers to be met in our daily routine rather than as a week-end special. To bring together social and economic benefits it is possible to have parks that are built along or crossed by high pedestrian flow streets with temporary uses or retails that could use passers by as resource for their businesses.

Maps as planning tools

If there is the possibility of refining the datasets and the spatial analysis we proposed so far, these maps are not just analysis but real planning tool. This is because the present the current stage of recreational areas in Moscow but they also highlight potentials for future development.

- Reach green/water: can easily be used to estimate the amount of green area needed in Moscow, highlight the areas where real estate investment are worth making, highlight potentials development areas that will need a green/water area in order to be built and most of all, the analysis can be done again after the architects' proposal to estimate if the improvement proposed match with the expectations.
- Pedestrian flow: this maps can be used to plan areas for new urban development, areas for new retails development and axis for urban renewal.