# Town and Gown:
# visualising university neighbourhoods as places within the urban environment.

# The example of three universities in Moscow

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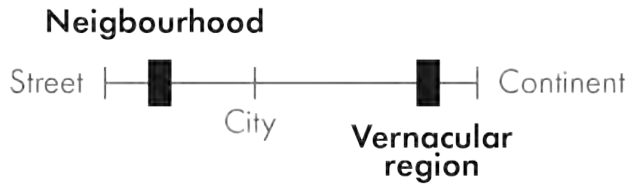
25.10.2021

# Overview

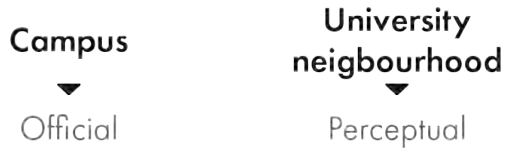
- **Context and motivation**
- **Research questions and objectives**
- **Workflow**
    - **Prestudy**:
        - **Study sites**
        - **Survey**
        - **Results**
    - **Methodology**:
        - **Visualisation techniques development**
        - **Maps styling**
        - **Evaluation of the techniques**
        - **Results**
- **Conclusions**

# Context

- **Unofficial toponyms and informal regions**
- **Vernacular region and neighbourhood**




- **University campus as a special case of a city neighbourhood**
- **Neighbourhood as a spatial and placial feature**



# Research Objectives

1. **Generating cartographic means to depict 1) boundaries and 2) internal structure of university neighbourhoods**

2. **Empirically evaluating how these techniques deal with conveying information about the geography and sense of place of university neighbourhoods**.

# Research Questions

1. **What types of cartographic visualisation are suitable for depiction of neighbourhoods with both fuzzy and clear boundaries?**

2. **Which visualisation techniques are able to represent the internal structure and connectivity between different parts of the neighbourhood in a suitable way?**

3. **Do these techniques manage to clearly illustrate geography and sense of place of university neighbourhoods?**

# Research Questions

1. **What types of cartographic visualisation are suitable for depiction of neighbourhoods with both fuzzy and clear boundaries?**

    1.1. **Which types of boundaries exist for neighbourhoods, in particular university neighbourhoods?**

    1.2. **Which general techniques to convey fuzzy boundaries have been described in literature?**

    1.3. **Which of these or novel techniques to be developed can be applied to university neighbourhood visualisation?**

# Research Questions

**2. Which visualisation techniques are able to represent the internal structure and connectivity between different parts of the neighbourhood in a suitable way?**

**2.1 Which types of geographical features strongly contribute to the inner structure of a neighbourhood?**

**2.2 Which visualisation techniques related to spatial patterns have been described in literature?**

**2.3 Which visualisation techniques that are traditionally not employed in the context of spatial patterns can be adapted?**

# Research Questions

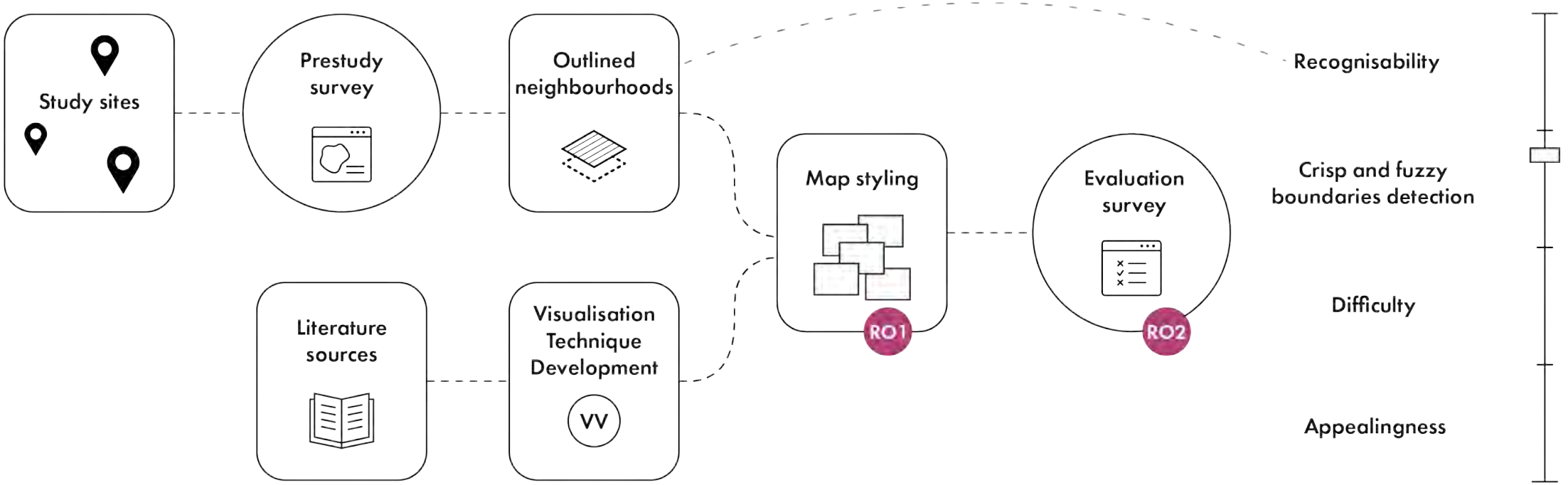
**3. Do these techniques (chosen and/or developed in RQ1, RQ2) manage to clearly illustrate geography and sense of place of university neighbourhoods?**

**3.1 How to identify the core, the boundary of a neighbourhood and different amenities within it?**

**3.2 How well does the visualisation convey an impression of the neighbourhood to people who are familiar with the area and people who are not? (here: first-year students and senior students)?**

**3.3 Focusing on the example of campus neighbourhoods in Moscow, how do the techniques explored in RQ1 and RQ2 compare conceptually in the way they are able to convey information about boundaries, the neighbourhoods, and their structure?**

# Workflow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VV
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RO1
Evaluation survey
RO2
Recognisability
Crisp and fuzzy boundaries detection
Difficulty
Appealingness

# Study sites

**MSU**

relatively isolated
“classic” campus

**HSE**

distributed campus
in the city centre

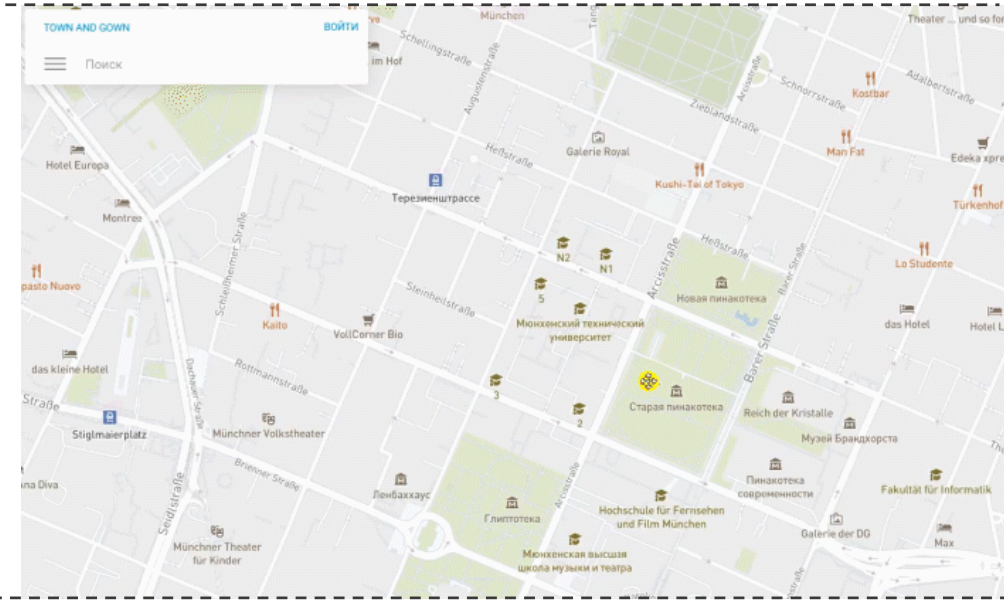
**TU Bauman**

semi-peripheral
campus


# Prestudy

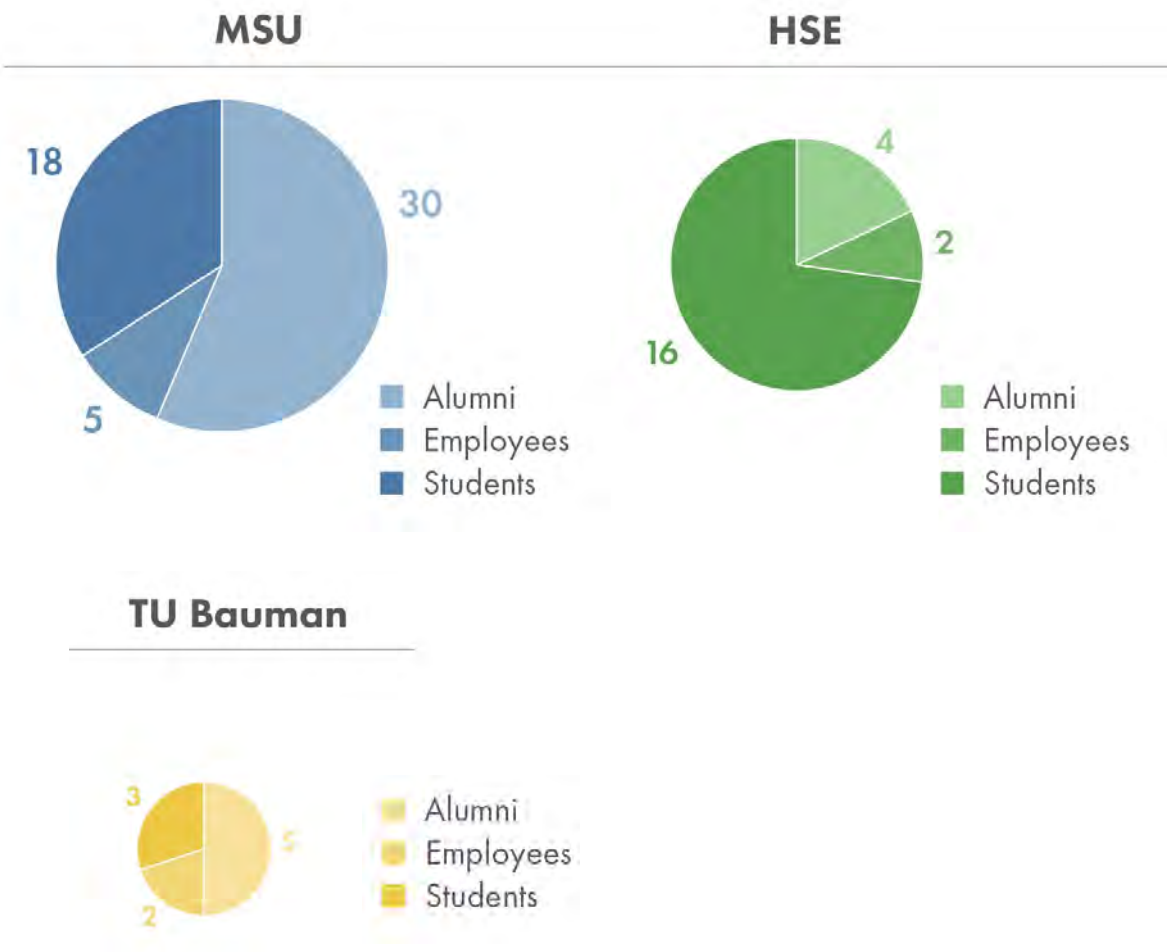
- **Intro**

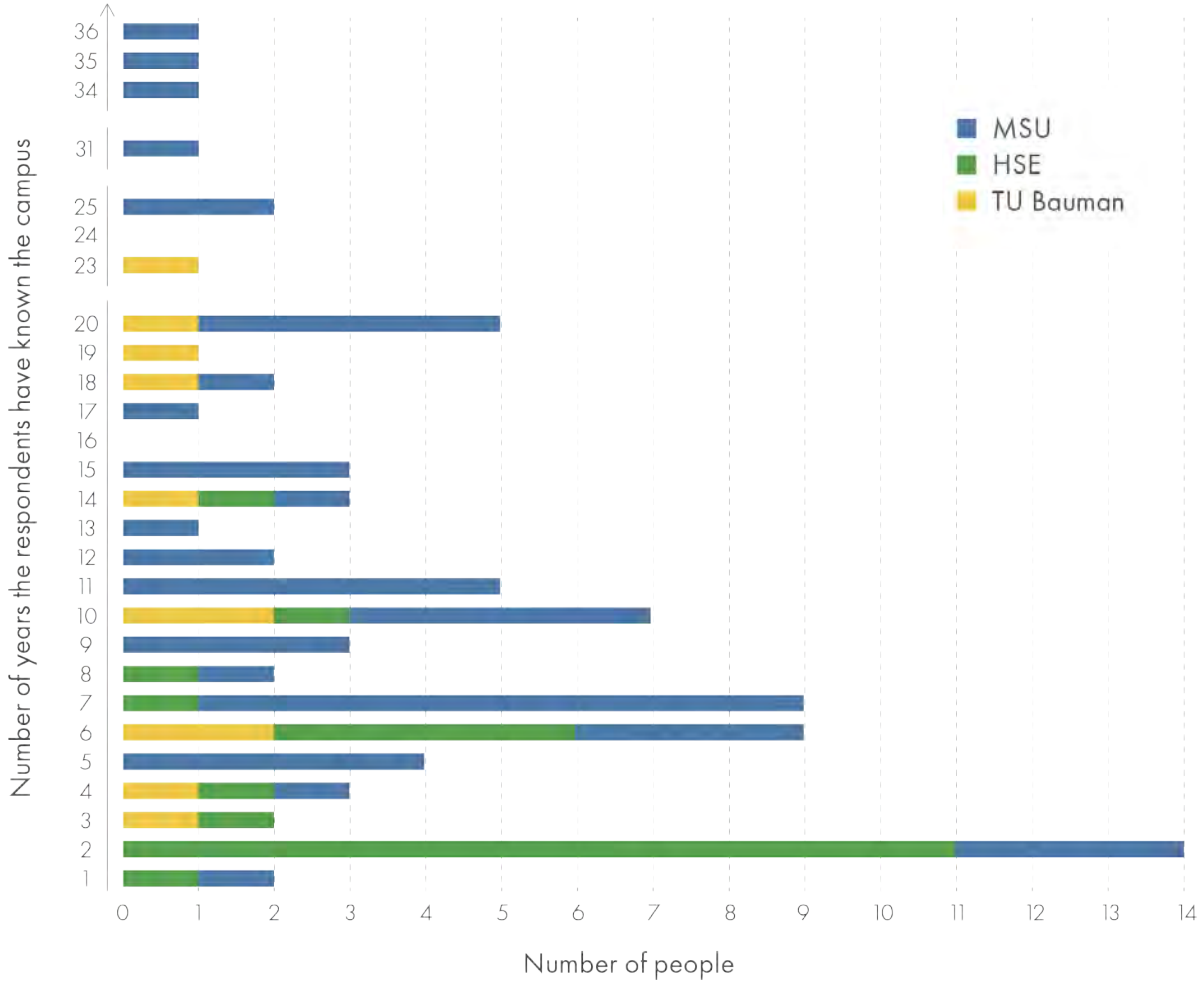
- **Outlining the neighbourhood**
- **Drawing the core part of the neighbourhood**
- **Marking the most frequently walked streets**



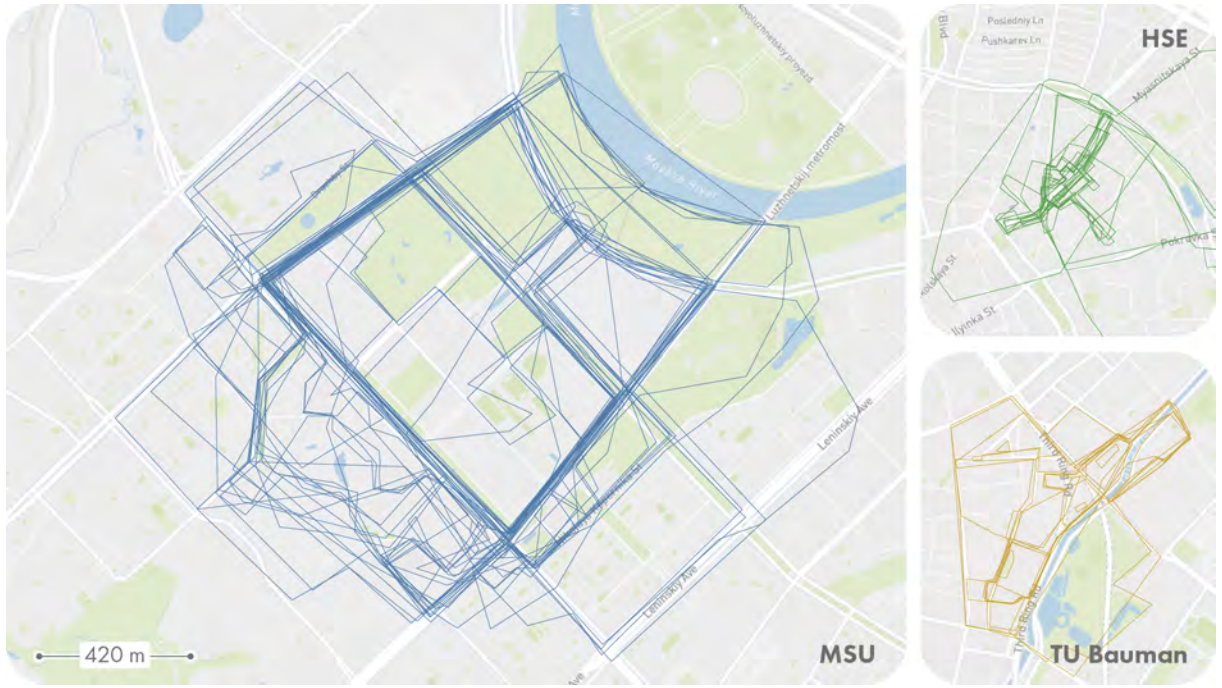

- **Additional information: most visited places,**
- **most comfortable places, nicknames for the places, etc.**

# Prestudy: results



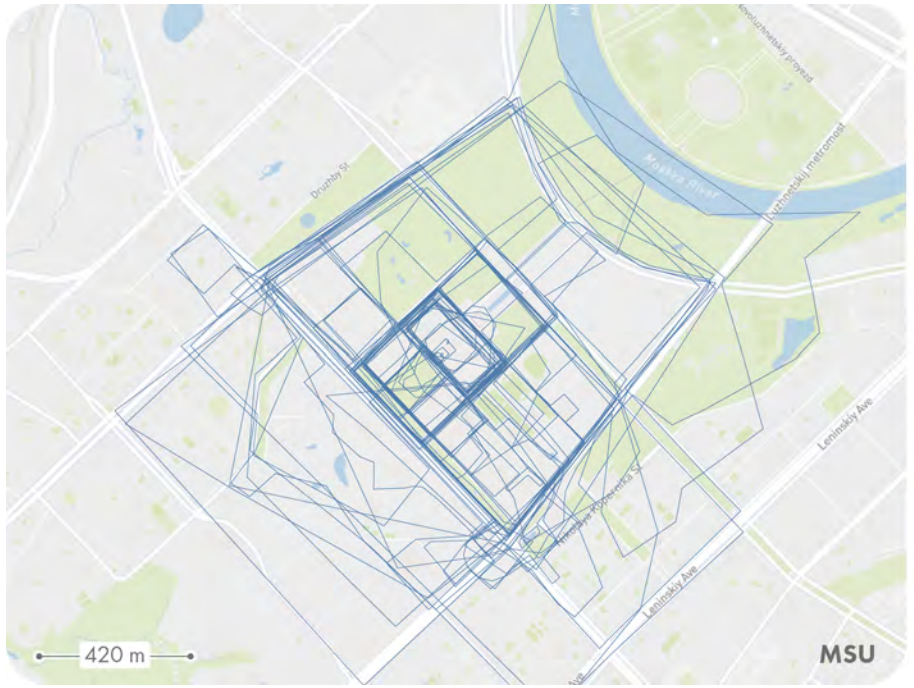



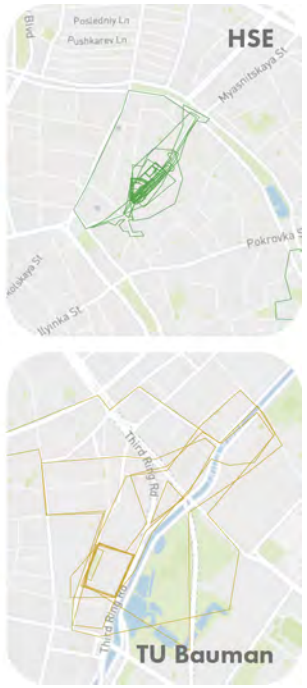
# Prestudy: results







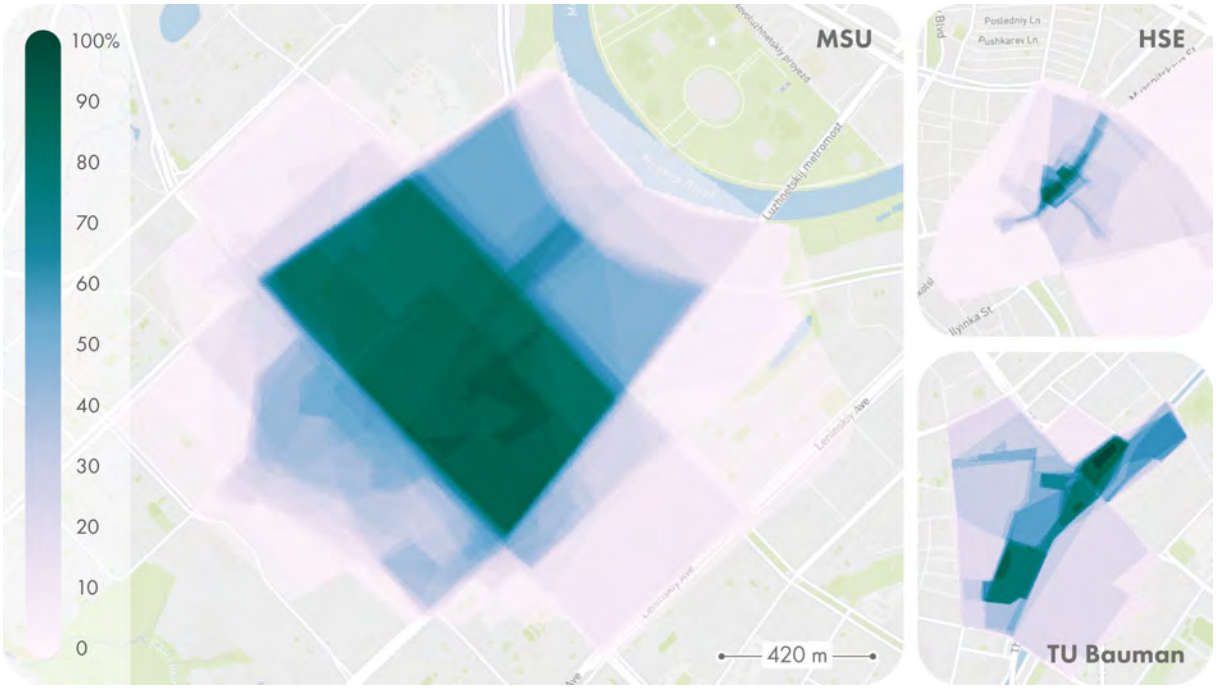



**neighbourhoods**

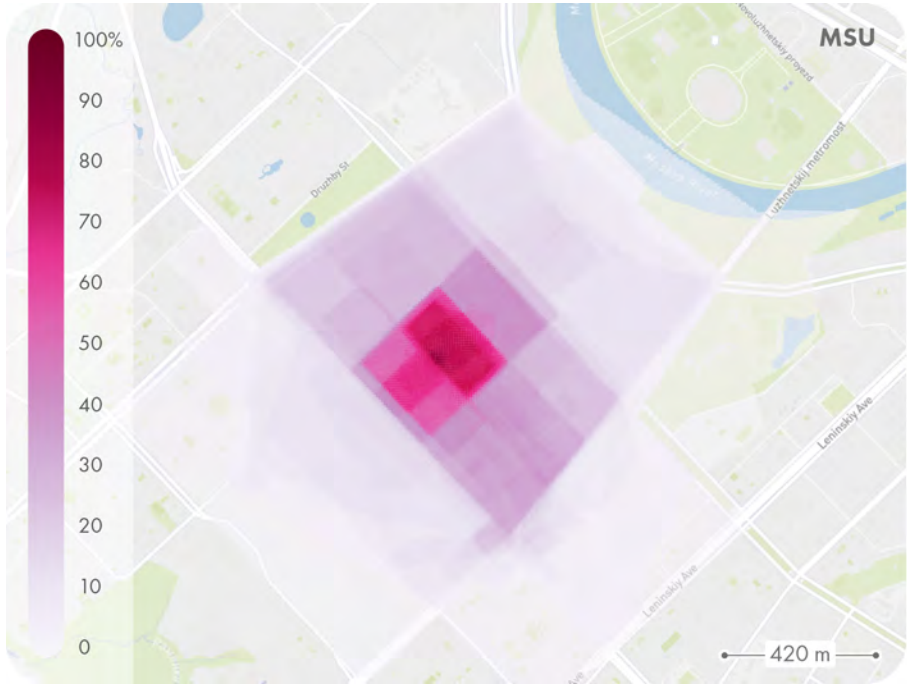
**centres**

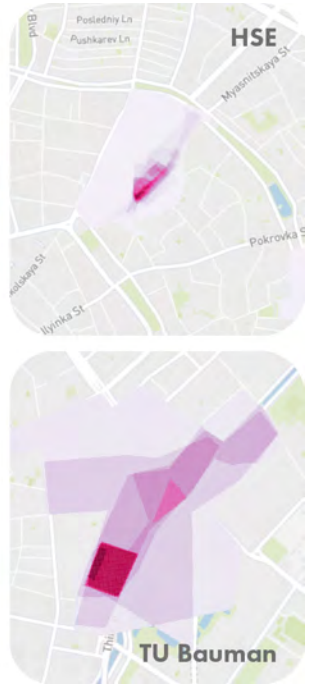
# Prestudy: results










**neighbourhoods**

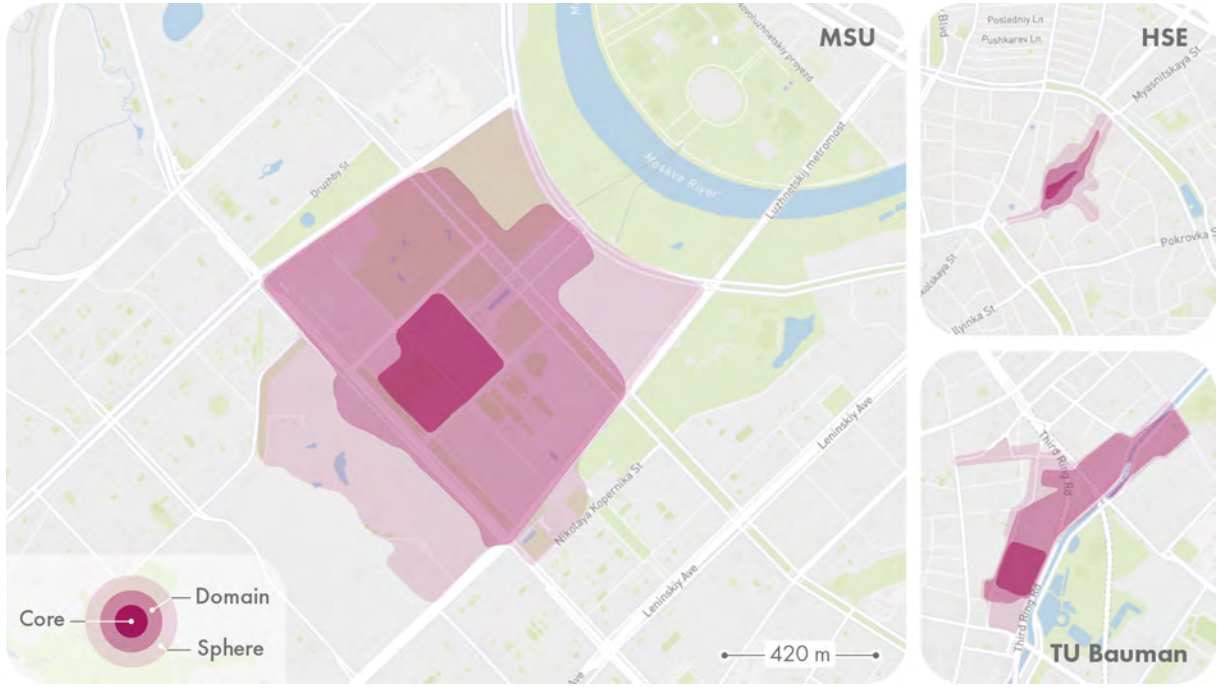
**centres**

# Prestudy: results

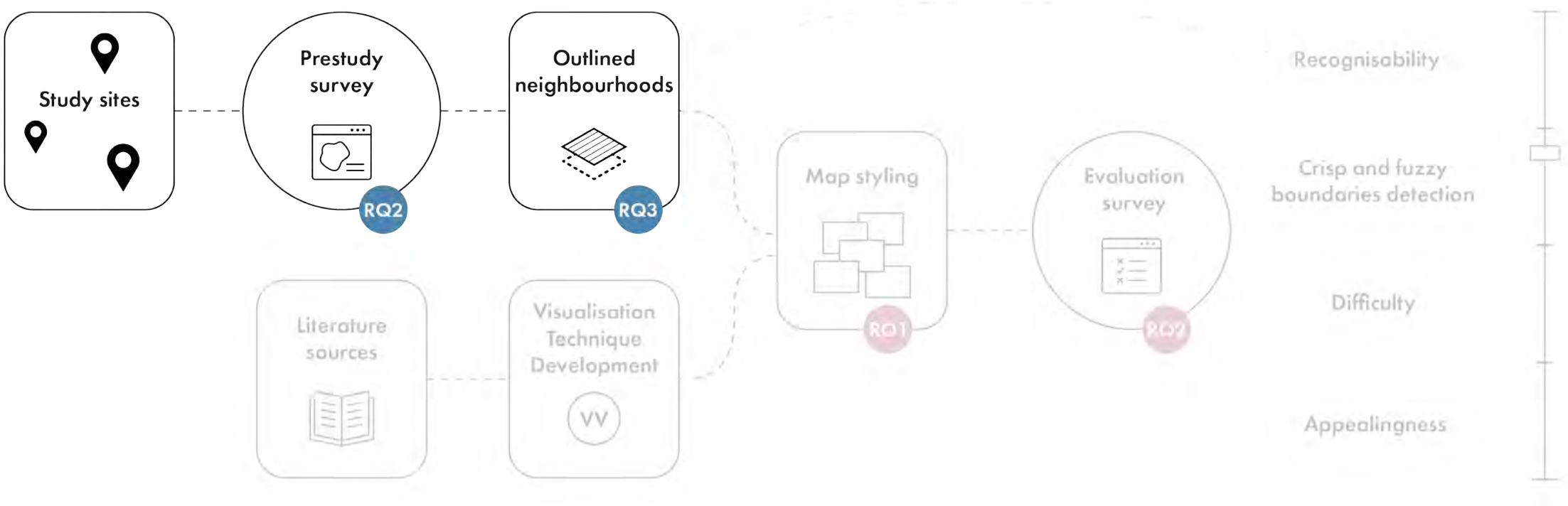
**Core:** area marked as a centre of a neighbourhood by more than 50% of the participants

**Domain:** area that more than 50% of the participants consider their neighbourhood

**Sphere:** area that more than 25-49% of the participants consider their neighbourhood



# Workflow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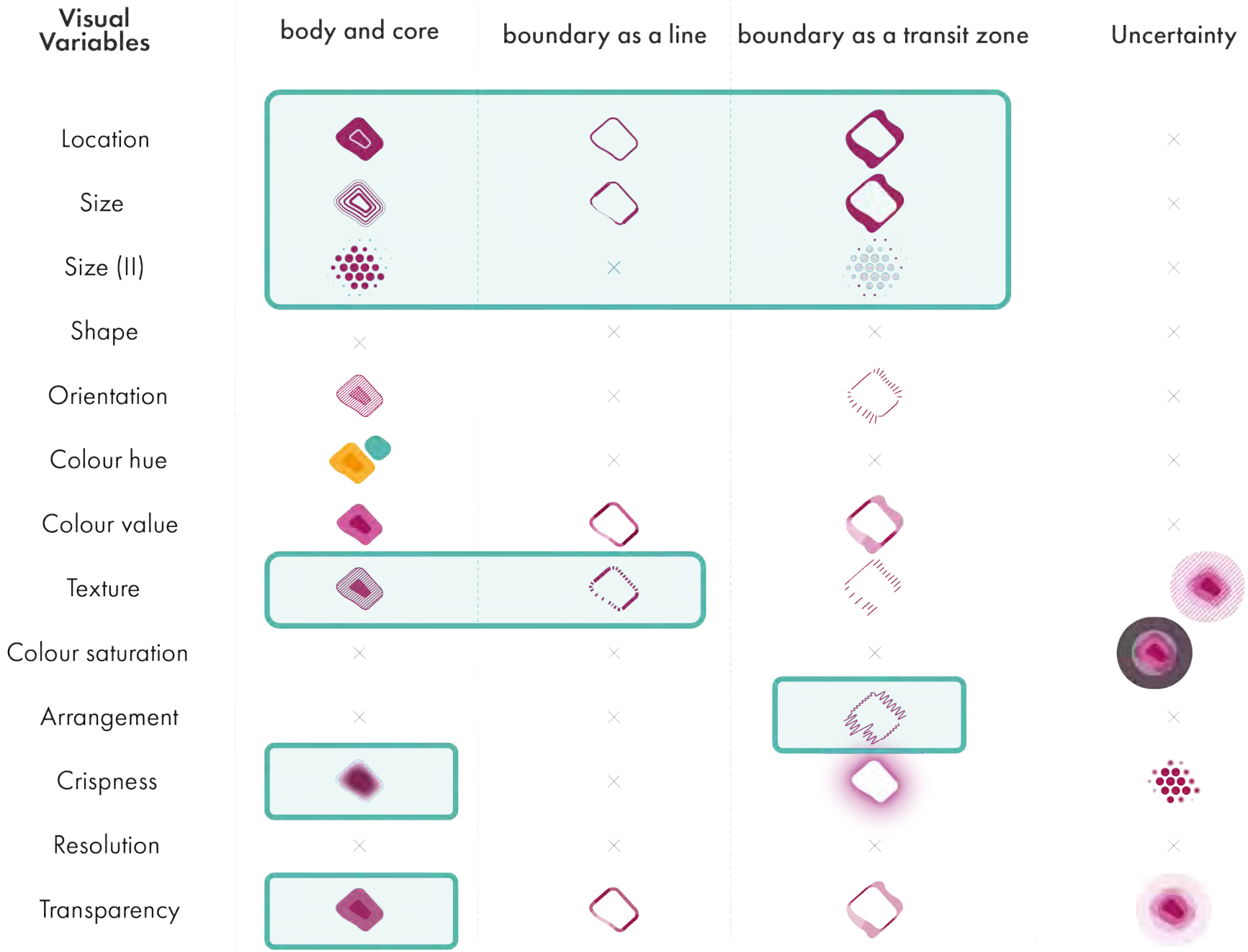
# **Methodology**: Visual variables employed in the techniques development

| | |
|---|---|
| J. Bertin (1967) | **Location**<br>**Size**<br>**Shape**<br>**Orientation**<br>**Colour hue**<br>**Colour value**<br>**Texture** |
| J. Morrison (1974) | **Colour saturation**<br>**Arrangement** |
| A. MacEachren (1995) | **Crispness**<br>**Resolution**<br>**Transparency** |

| Visual Variables | body and core | boundary as a line | boundary as a transit zone | Uncertainty |
|---|---|---|---|---|
| Location |  |  |  | × |
| Size |  |  |  | × |
| Size (II) |  | × |  | × |
| Shape | × | × | × | × |
| Orientation |  | × |  | × |
| Colour hue |  | × | × | × |
| Colour value |  |  |  | × |
| Texture |  |  |  |  |
| Colour saturation | × | × | × |  |
| Arrangement | × | × |  | × |
| Crispness |  | × |  |  |
| Resolution | × | × | × | × |
| Transparency |  |  |  |  |


Visual Variables
body and core
boundary as a line
boundary as a transit zone
Uncertainty
Location
Size
Size (II)
Shape
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Colour hue
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Texture
Colour saturation
Arrangement
Crispness
Resolution
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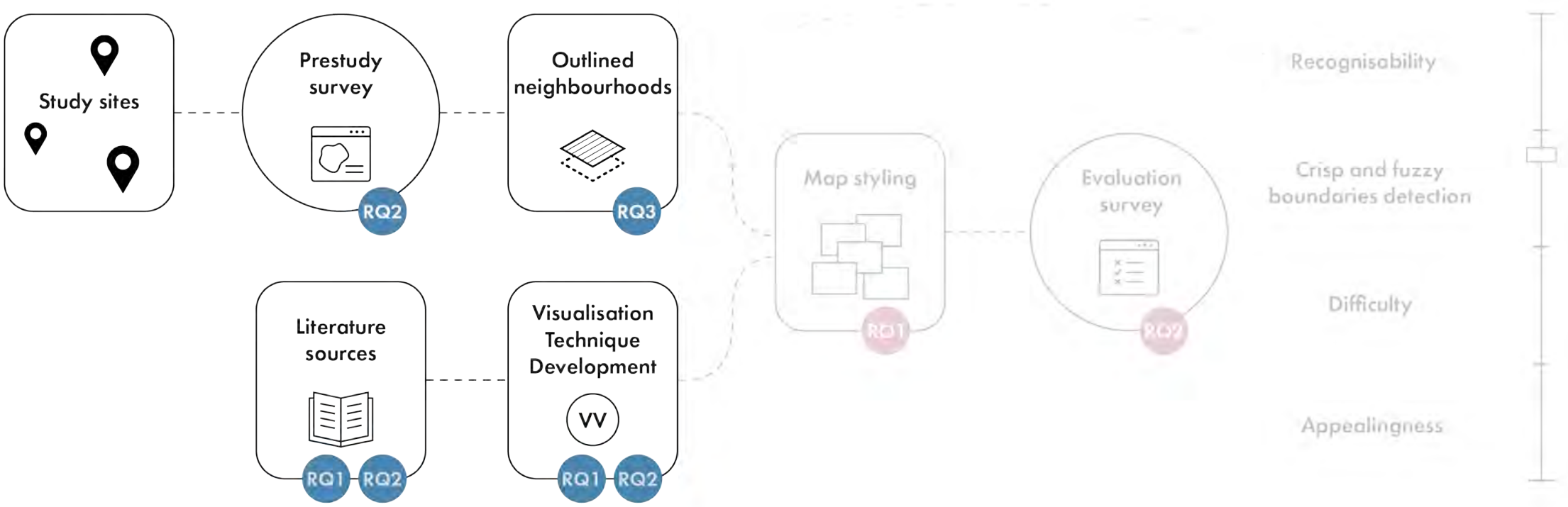
# Workflow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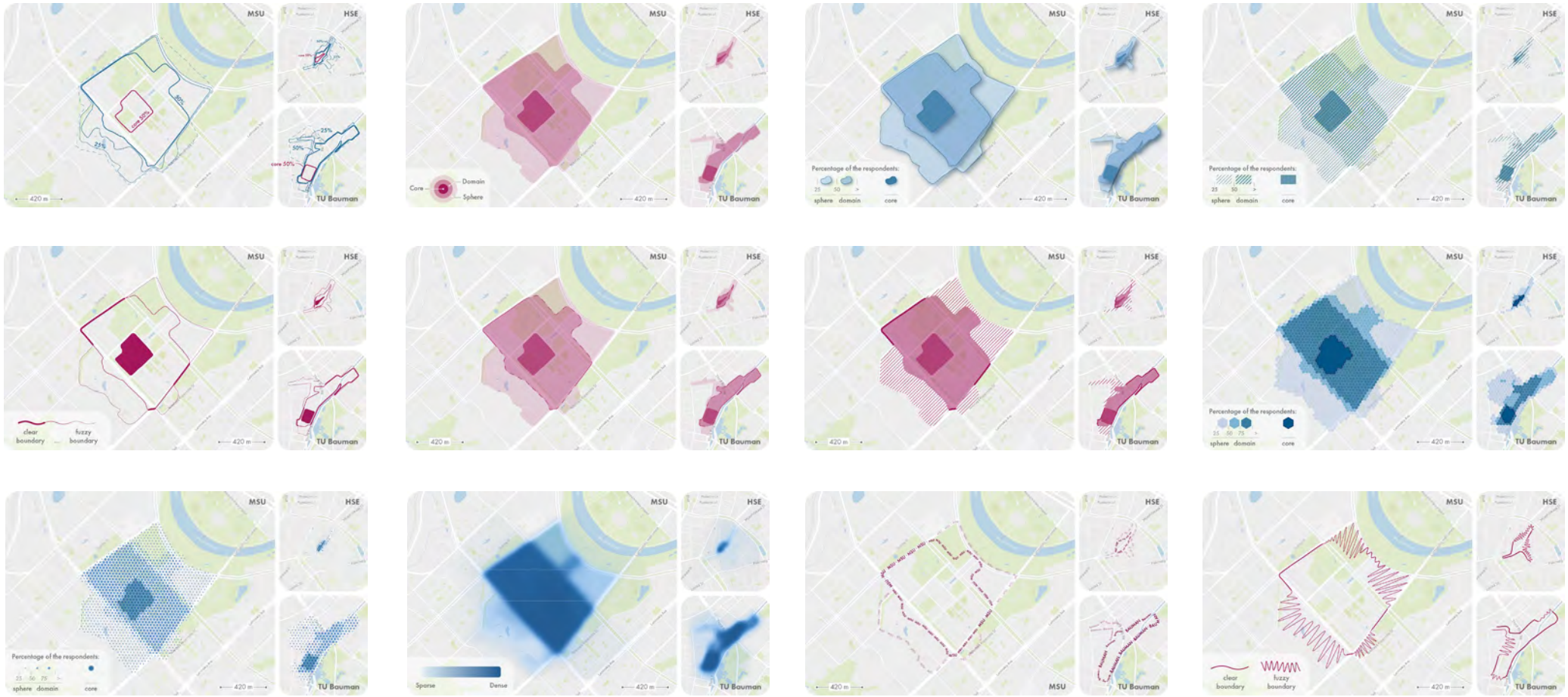
# Methodology: Map Styling



# Methodology: Affordances of resulting visualisations

| Visualisation technique | Visual variable employed | Continuous or discrete | Clearly differentiates between C, D, S | Allows to see the background | Allows overlap with neighbouring districts | Allows to increase the number of 'steps' | Allows to implement uncertainty information |
|---|---|---|---|---|---|---|---|
|  | location, size | D | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | transparency | D | ✓ | ✓ | × | ✓ | ✓ |
|  | crispness, transparency | D | ✓ | × | × | ✓ | ✓ |
|  | texture, size | D | ✓ | × | ✓ | ✓ | ✓ |
|  | location, size | D | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | transparency, size, texture | D | ✓ | × | × | × | × |
|  | transparency, size, texture | D | ✓ | × | × | × | × |
|  | transparency, texture | D | ✓ | × | × | ✓ | ✓ |
|  | size | C | ✓ | × | ✓ | ✓ | ✓ |
|  | crispness | C | × | × | × | × | ✓ |
|  | texture, size, transparency | D | × | ✓ | ✓ | × | ✓ |
|  | size, arrangement | D | × | ✓ | ✓ | × | ✓ |

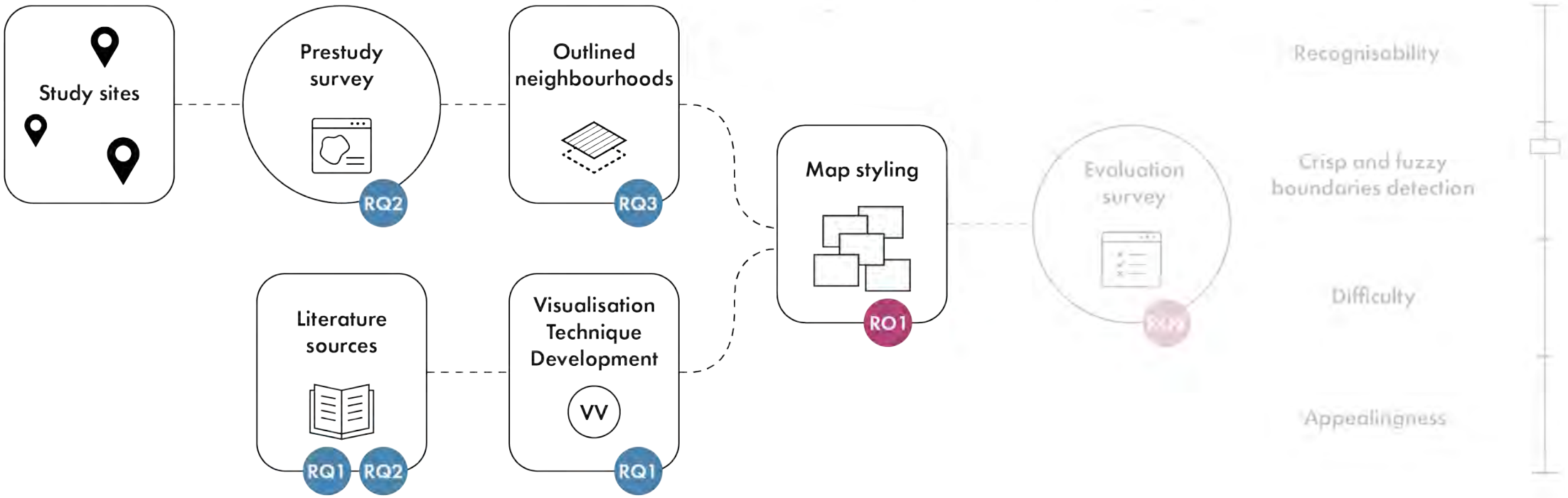
# Methodology: Affordances of resulting visualisations

| Visualisation technique | Visual variable employed | Continious or discrete | Clearly differentiates between C, D, S | Allows to see the background | Allows overlap with neighbouring districts | Allows to increase the number of 'steps' | Allows to implement uncertainty information |
|---|---|---|---|---|---|---|---|
|  #1 | location, size | D | ✓ | ✓ | ✓ | ✓ | ✓ |
|  #2 | transparency | D | ✓ | ✓ | ✗ | ✓ | ✓ |
|  #3 | crispness, transparency | D | ✓ | ✗ | ✗ | ✓ | ✓ |
|  #4 | texture, size | D | ✓ | ✗ | ✓ | ✓ | ✓ |
|  #5 | location, size | D | ✓ | ✓ | ✓ | ✓ | ✓ |
|  #6 | transparency, size, texture | D | ✓ | ✗ | ✗ | ✗ | ✗ |
|  #7 | transparency, size, texture | D | ✓ | ✗ | ✗ | ✗ | ✗ |
|  #8 | transparency, texture | D | ✓ | ✗ | ✗ | ✓ | ✓ |
|  #9 | size | C | ✓ | ✗ | ✓ | ✓ | ✓ |
|  #10 | crispness | C | ✗ | ✗ | ✗ | ✗ | ✓ |
|  #11 | texture, size, transparency | D | ✗ | ✓ | ✓ | ✗ | ✓ |
|  #12 | size, arrangement | D | ✗ | ✓ | ✓ | ✗ | ✓ |

# Methodology: Affordances of resulting visualisations

| Visualisation technique | Visual variable employed | Continious or discrete | Clearly differentiates between C, D, S | Allows to see the background | Allows overlap with neighbouring districts | Allows to increase the number of 'steps' | Allows to implement uncertainty information |
|---|---|---|---|---|---|---|---|
|  | location, size | D | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | transparency | D | ✓ | ✓ | ✗ | ✓ | ✓ |
|  | crispness, transparency | D | ✓ | ✗ | ✗ | ✓ | ✓ |
|  | texture, size | D | ✓ | ✗ | ✓ | ✓ | ✓ |
|  | location, size | D | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | transparency, size, texture | D | ✓ | ✗ | ✗ | ✗ | ✗ |
|  | transparency, size, texture | D | ✓ | ✗ | ✗ | ✗ | ✗ |
|  | transparency, texture | D | ✓ | ✗ | ✗ | ✓ | ✓ |
|  | size | C | ✓ | ✗ | ✓ | ✓ | ✓ |
|  | crispness | C | ✗ | ✗ | ✗ | ✗ | ✓ |
|  | texture, size, transparency | D | ✗ | ✓ | ✓ | ✗ | ✓ |
|  | size, arrangement | D | ✗ | ✓ | ✓ | ✗ | ✓ |

# Workflow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# Evaluation of the Techniques: Survey structure

- **Intro: affiliation**

- **Recognisability of the neighbourhoods' boundary and core outlines**
- **Crisp and fuzzy boundaries identification**
- **Ranking the maps according to their appealingness**

# Results: Population

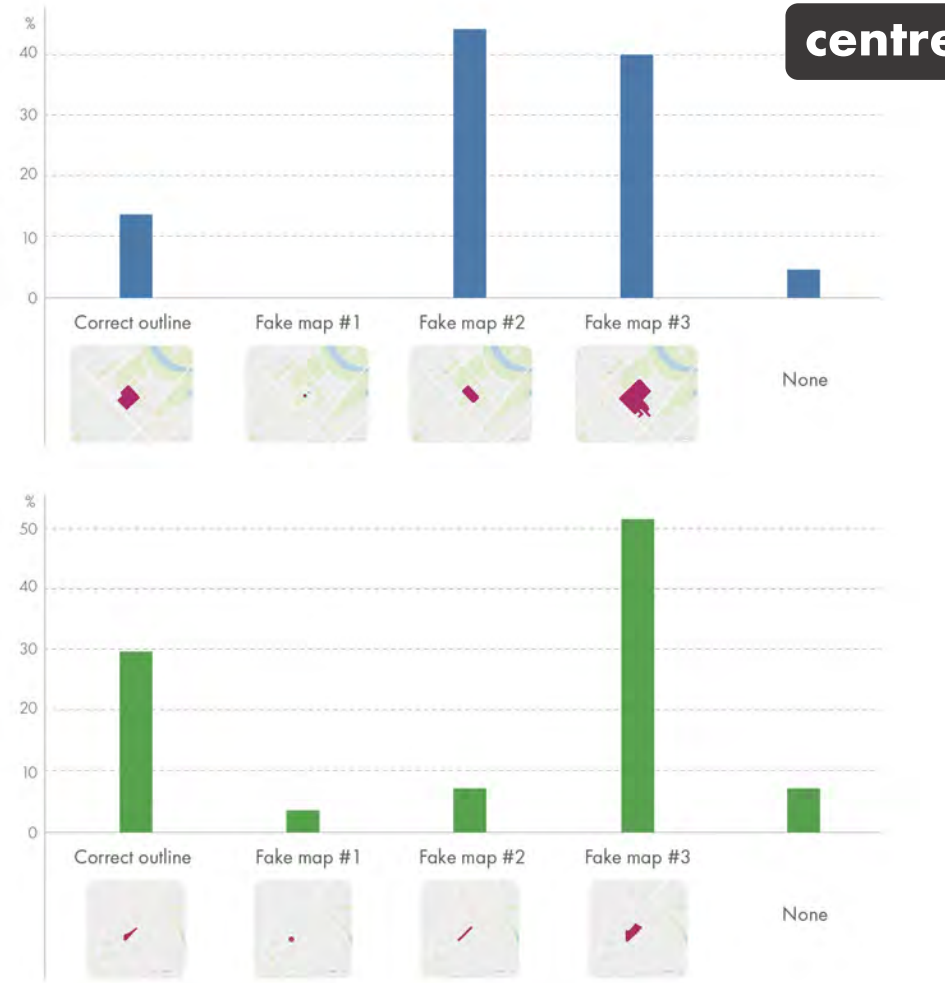
# Results: Recognisability

MSU

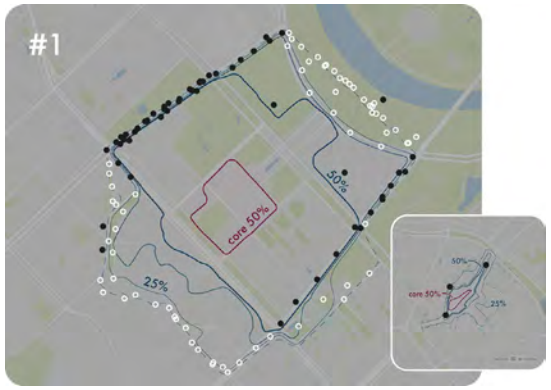
HSE

neighbourhoods

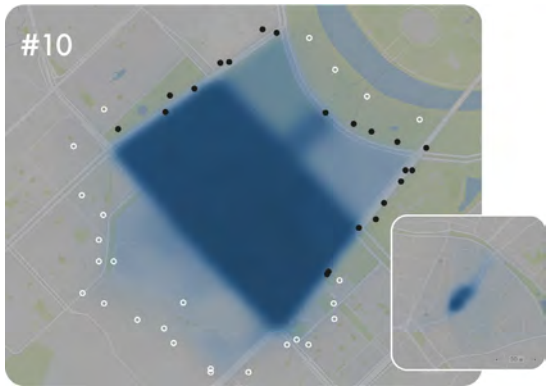

centres

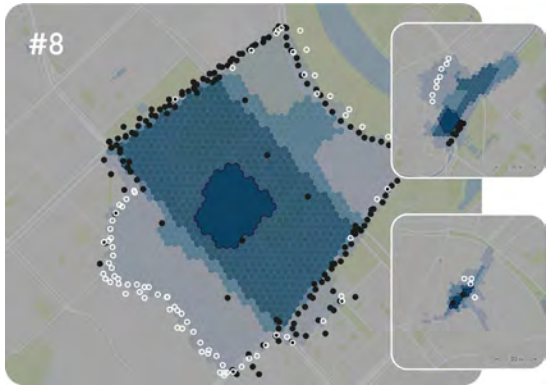


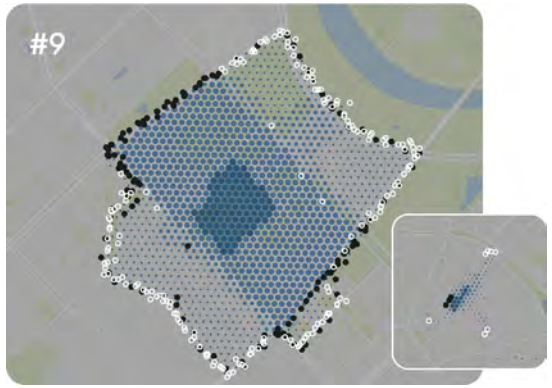
# **Results**: Crisp and fuzzy boundaries identification

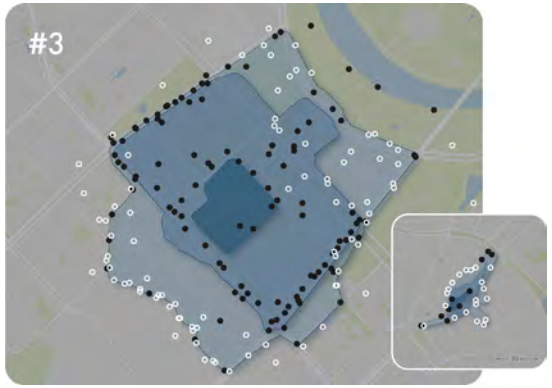




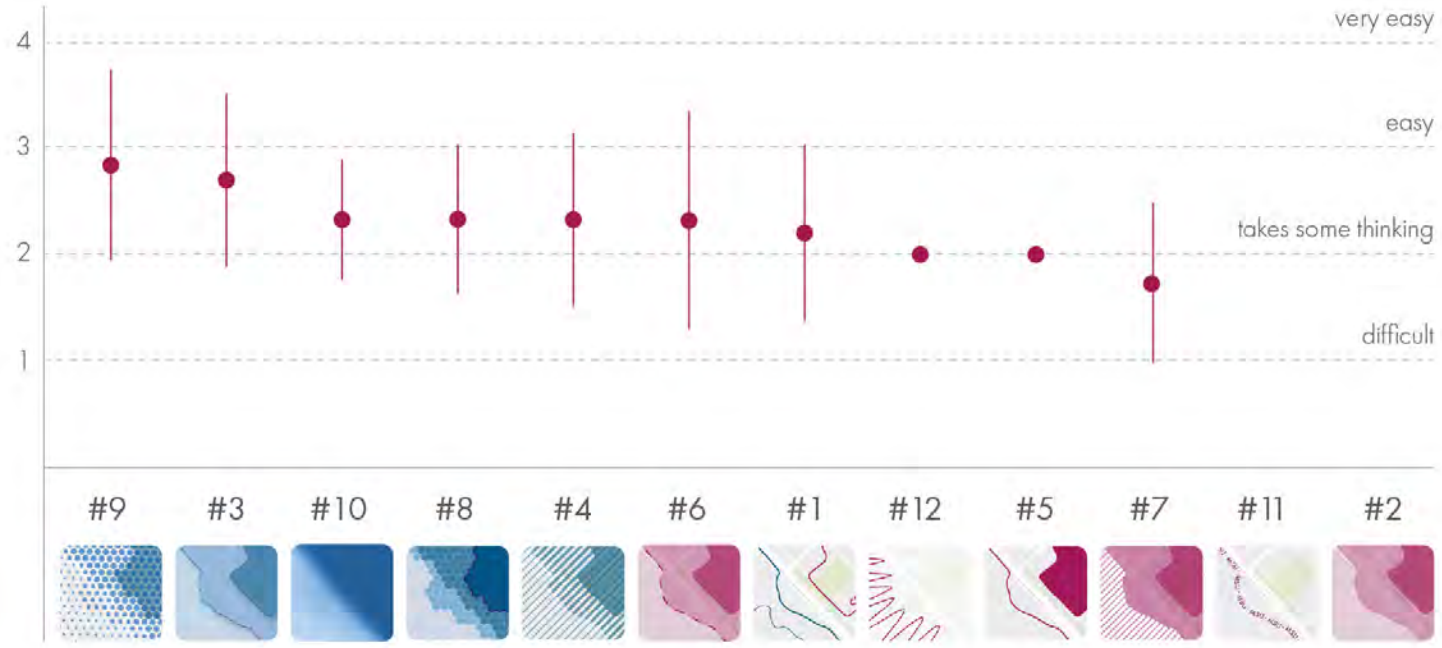


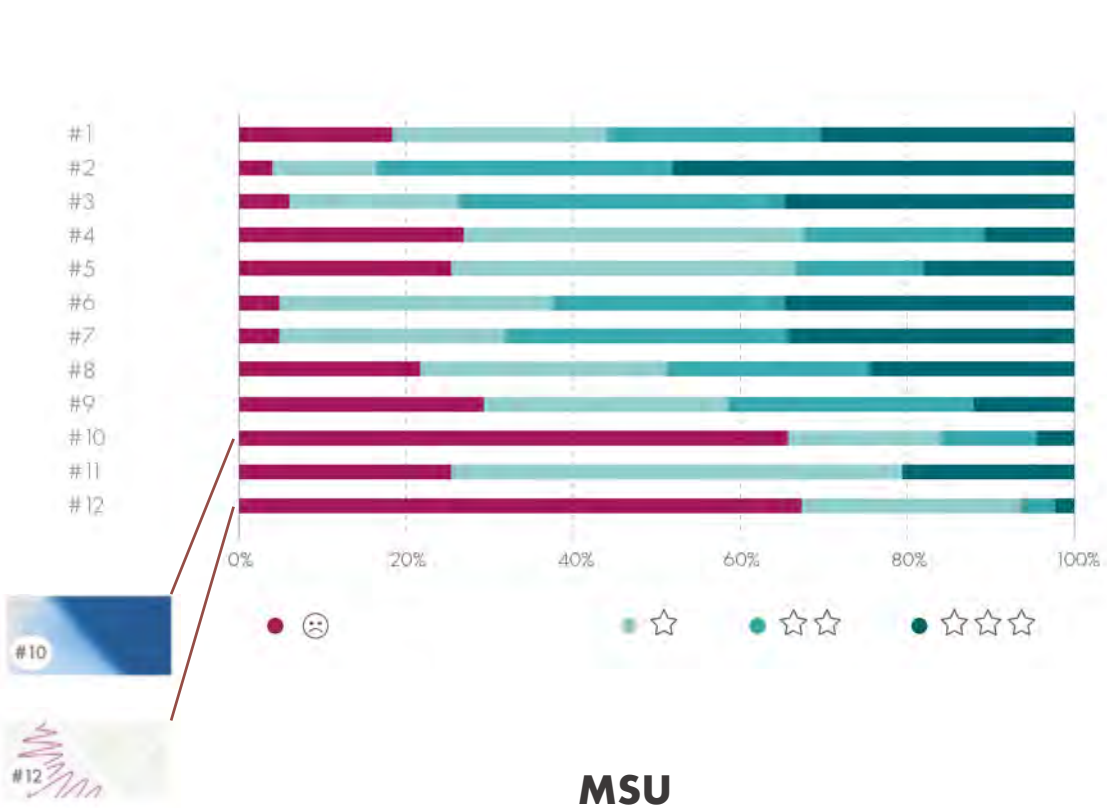



# **Results**: Difficulty of performing the fuzzy boundaries identification task

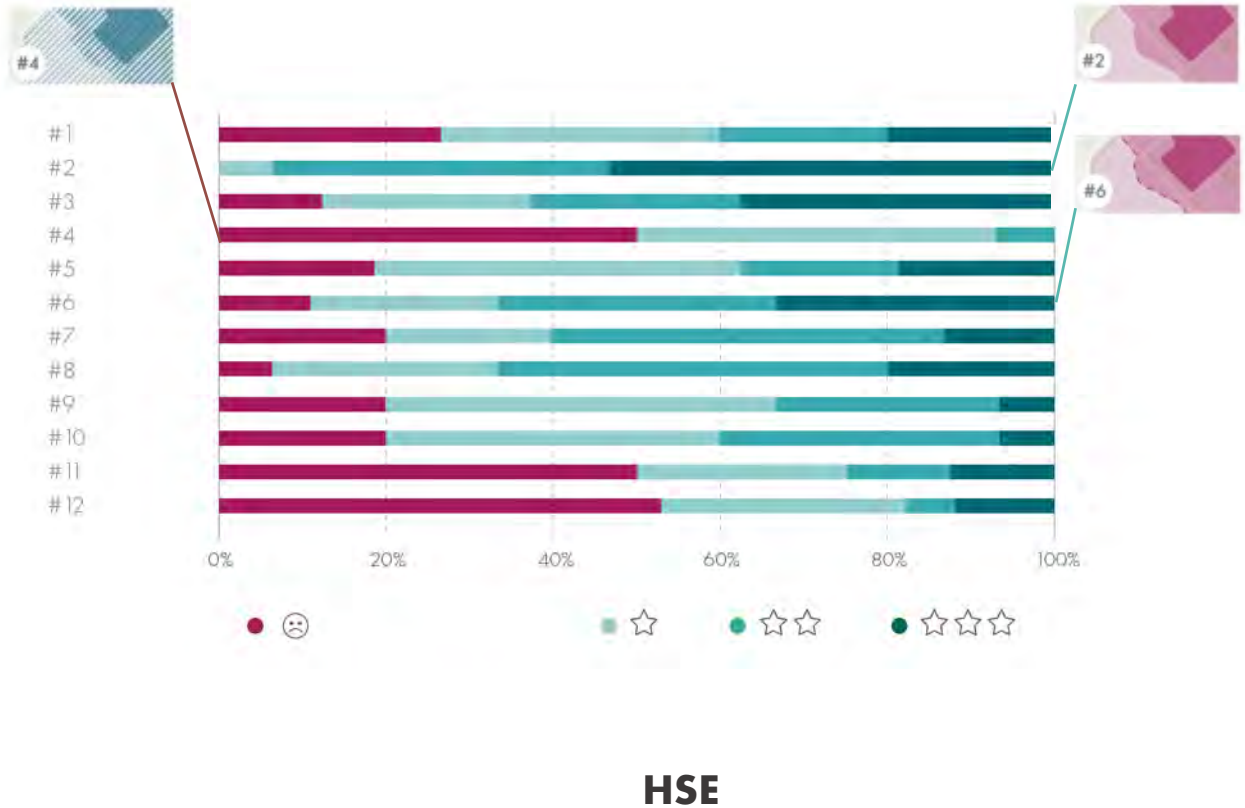



| | #9 | #3 | #10 | #8 | #4 | #6 | #1 | #12 | #5 | #7 | #11 | #2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| μ | 2,86 | 2,70 | 2,33 | 2,33 | 2,33 | 2,33 | 2,20 | 2,00 | 2,00 | 1,71 | n/a | n/a |
| σ | 0,90 | 0,82 | 0,58 | 0,71 | 0,82 | 1,03 | 0,84 | - | - | 0,76 | n/a | n/a |

# **Results**: Measuring appealingness

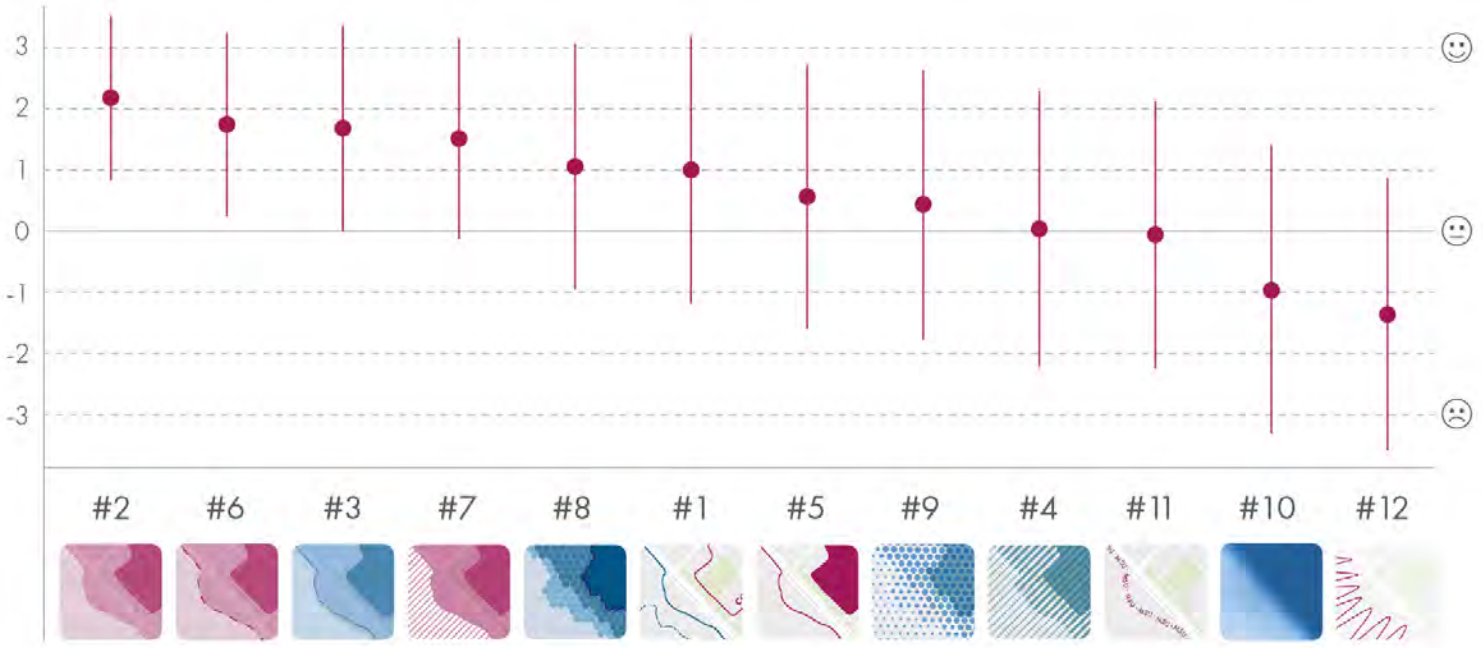



**MSU**



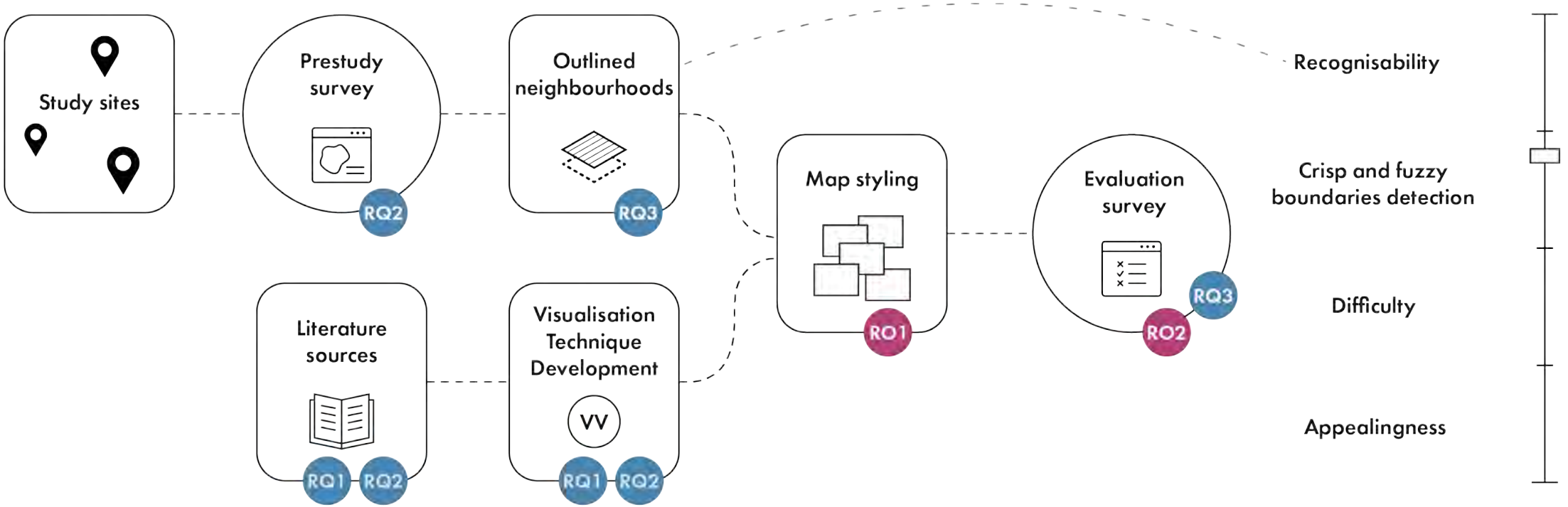

**HSE**

# **Results**: Measuring appealingness




| | #2 | #6 | #3 | #7 | #8 | #1 | #5 | #9 | #4 | #11 | #10 | #12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| μ | 2,14 | 1,75 | 1,72 | 1,55 | 1,05 | 1,00 | 0,58 | 0,45 | 0,02 | -0,04 | -0,93 | -1,33 |
| σ | 1,33 | 1,50 | 1,67 | 1,64 | 2,00 | 2,17 | 2,14 | 2,19 | 2,24 | 2,19 | 2,35 | 2,23 |

# Workflow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# Overall performance of the visualisation techniques

| visualisation technique | Transparency identified correctly | Fuzzy boundaries identified correctly | Accessibility mean value | Aggregation mean value |
|---|---|---|---|---|
|  | ✓ | ✓ | 2,2 | 1,0 |
|  | n/a | n/a | n/a | 2,1 |
|  | ✗ | ✓ | 2,7 | 1,7 |
|  | ✗ | ✓ | 2,3 | 0,0 |
|  | ✓ | ✓ | 2,0 | 0,6 |
|  | ✓ | ✓ | 2,3 | 1,8 |
|  | ✓ | ✓ | 1,7 | 1,6 |
|  | ✓ | ✓ | 2,3 | 1,1 |
|  | ✓ | ✓ | 2,9 | 0,3 |
|  | ✗ | ✓ | 2,3 | 0,9 |
|  | n/a | n/a | n/a | -0,1 |
|  | ✓ | ✓ | 2,0 | -1,3 |

difficult — easy (1 2 3 4)

hate — like (-2 -1 0 1 2 3)

# Conclusions

- **Fuzzy boundaries are easier to identify in comparison to the crisp**
- **The crispest boundaries run along physical a natural barriers (but they can be also inner axes)**
- **Fuzziness as a result of the lack of data or vague nature of an object**
- **Not just symbology, but also a geometry**

- **Most successfully depict both fuzzy and clear boundaries: isolines and circles of varying size techniques – just as it was anticipated**
- **The users' favourite is layer tinting, absolute outsiders are jagged line and heatmap**

- **What the users need: clarity, simplicity, and the ability to see a basemap**

# Thank you for listening!