

Heat Perception of Heidelberg Residents Using the Sketch Map Tool and KoboToolbox

Heidelberg, Germany

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Annica Horrer and Daniel Pflüger are both Master's students in Geography.

The Sketch Map Tool was used as part of a seminar at Heidelberg University on GIS for Disaster Risk Reduction and Humanitarian Aid in 2024.

The seminar has the goal to introduce students to tools like the Sketch Map Tool and analysis around risk reduction. As a result, this use case is a student project. The case study maps heat perception with locals in Heidelberg old town and analyzes the resulting perception in heat maps.

The Project

The primary aim was to experiment with methods for collecting and analyzing geospatial data in an urban environment. The methodological interest lay in testing the usability of the Sketch Map Tool.

Thematically, the project focused on documenting local perception of heat in the old town of Heidelberg. It wants to explore how residents experience urban heat stress in their everyday life.

As a student project, the study was limited in geographic scope and therefore focused on testing methods and implementing the method in an academic context.

Why was the Sketch Map Tool used?

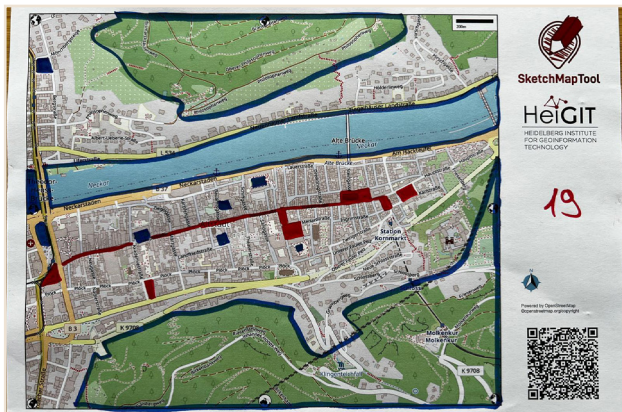
The Sketch Map Tool was used because it is easy to use for interviews with pedestrians and capturing their spatial perceptions in a cartographic format. The motivation of the project was to explore the potential of combining KoboToolbox and Sketch Map Tool in a single data collection and mapping workflow.



How was the Sketch Mapping organized?

The mapping process was designed to capture local perceptions of urban heat in Heidelberg's old town through a combination of participatory mapping and a short questionnaire. It was chosen as the focus area due to its dense building structure, lack of green and shady areas and restricted air circulation, which all together contribute to a so called urban heat island effect.

19 participants took part in the mapping activity. Each participant was asked individually to mark the Sketch Maps and answer questions on the Kobo questionnaire. The Kobo questionnaire captured questions about personal data such as age, gender and personal handling of heat and knowledge of the respondents about maps in general and Heidelberg's old town. The participants were asked to mark hot (red) and cool (blue) areas on a printed Sketch Map, with only limited instructions provided. The location where the questionnaire was completed and the user-friendliness of both, the Sketch Map Tool and the questionnaire, using a school-grade-style rating system, was also noted.



Sketch Map of Heidelberg's Old Town: perceptions of hot areas marked in red, cold areas marked in blue

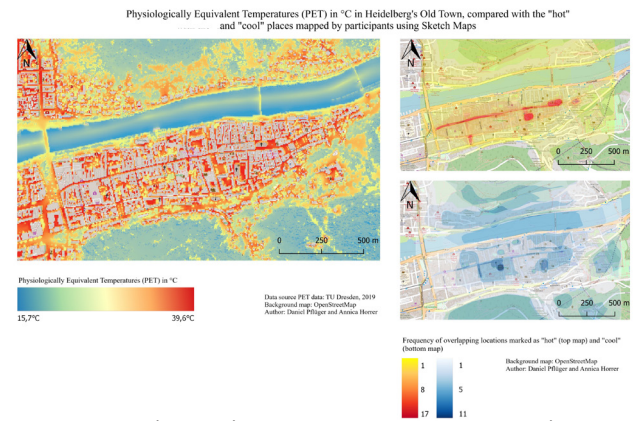
How were the Sketch Maps analyzed?

First, the geodata was analyzed in ArcGIS. The 19 GeoJSON files with the detected markings were loaded into ArcGIS using the "GeoJSON to Feature"- tool. Incorrectly recognized colors were corrected manually. In the second step the overlapping features of the red or blue markings from all 19 Sketch Maps were counted.

The results of the analysis are presented as a heat map, in which the areas that appeared in markings on several maps are highlighted in more intense colors. The final step was to add an additional visual comparison in ArcGIS through layers of collected data and official data of the city of Heidelberg.

Results and Impact

The Analysis of the Sketch Maps revealed that frequently visited areas like Heidelberg's "Hauptstraße" were often marked as both hot and cool. A comparison with the Physiologically Equivalent Temperatures (PET) map showed no significant temperature difference between areas captured on the Sketch Maps and other parts of the old town, underlining the value and challenges of subjective input.



Left Map: PET in °C; Right Map: frequency of overlapping areas marked as "hot" and "cool" on a scale from 1 to 17 (hot) and 1 to 11 (cold).

Conducted in summer 2024, the mapping supported the final phase of the HEAL project, a transdisciplinary project by the Heidelberg Institute for Geoinformation Technology (HeiGIT), the GIScience research group and the TdLab Geography (Transdisciplinarity Lab). The results helped inform the development of the HEAL routing app, which suggests cooler paths through the city. In addition, the various surveys, publications and events helped to raise individual awareness of heat in the city and provided important insights for municipal heat adaptation.

Lessons Learnt

The participatory mapping showed that most participants could orient themselves. However, a short and clear introduction on how to use the Sketch Map, ideally printed on the map itself or provided as a separate guide, would improve the use. The combination of the Kobo questionnaire and the Sketch Map Tool proved to be user-friendly and effective and the results showed benefits of the combination. Still, we observed a bias in perceptions. Frequently named "hot" areas were not necessarily hotter, but often more well-known or frequented places.

Sources

[1] Hausarbeit: Annica Horrer, Daniel Pflüger 2024: Untersuchung des Hitzeempfindens von Heidelberger Bewohner*innen mit-hilfe des SketchMap Tools und KoboToolbox - Eine Analyse zur Nutzer-freundlichkeit der Tools

[2] <https://heigit.org/heal/>

[3] <https://heal.openrouteservice.org/#/place/@8.685808181762697,49.41442144045737,15>

