

## Potentials of open data and socio-spatial linked data: Addressing equity in urban policy

Sujit Kumar Sikder

Research Area: Spatial Information und Modelling



# Terminologies

## Equity

Fairness

Justice

Disparity

Inequality

## Open data

OpenGovData

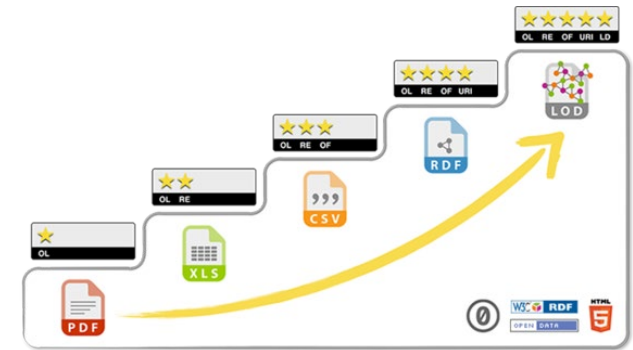
Crowd sourced

Volunteered Geographic Information

## Linked data

Linked open data

Cross-domain



Source: <https://5stardata.info>

# Open Data

# Augmenting Electric Vehicle Charging infrastructure

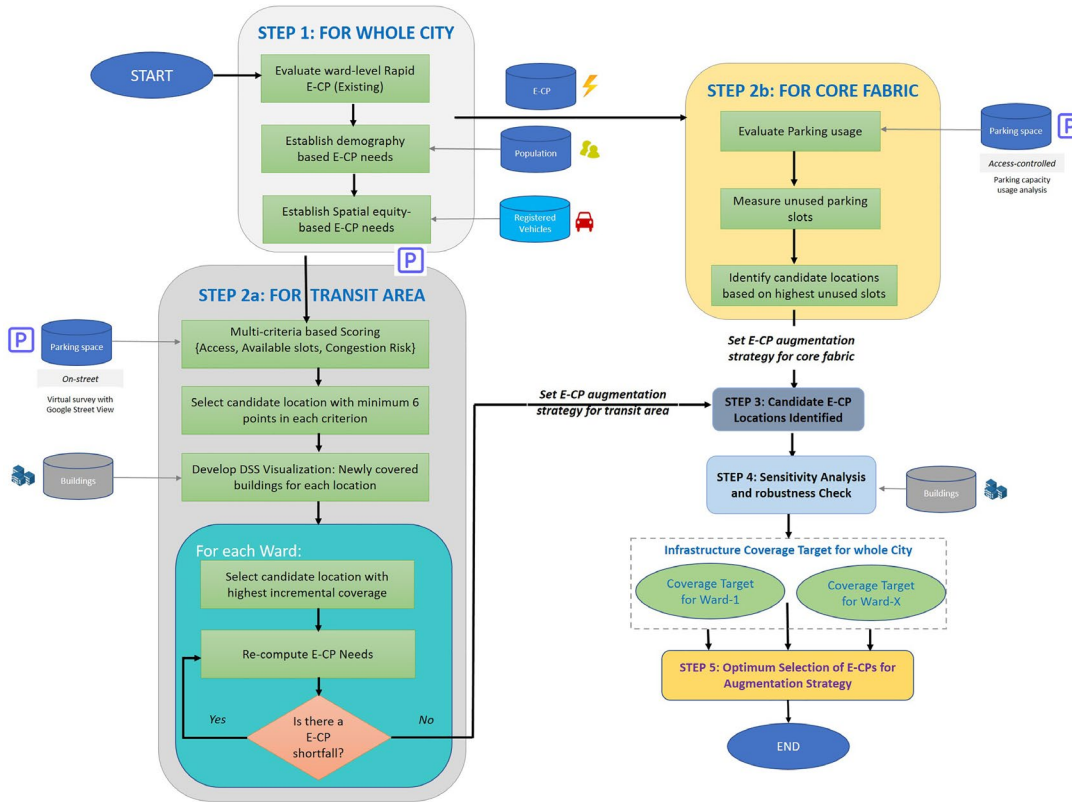


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Source: [unsplash.com/jennyUeberberg](https://unsplash.com/jennyUeberberg)

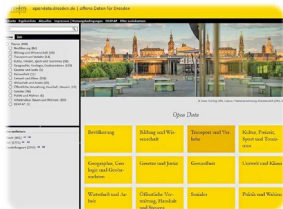
- Consider equity
- Built on existing parking space
- Potentials of open data



## E-CP Infrastructure Augmentation (EIA) framework

**Find details in:** Sikder, S. K., Nagarajan, M., & Mustafee, N. (2023). **Augmenting EV charging infrastructure towards transformative sustainable cities: An equity-based approach.** *Technological Forecasting and Social Change*, 196, 122829 (Open Access). DOI: [10.1016/j.techfore.2023.122829](https://doi.org/10.1016/j.techfore.2023.122829)

## Open data Dresden



Ward Boundaries

Population (only 18–64  
old considered)

Number of  
registered cars

## OpenStreetMap



On-street parking  
locations

Fuel stations

Parking  
locations

Buildings

## Park-DD



Parking locations

Parking usage

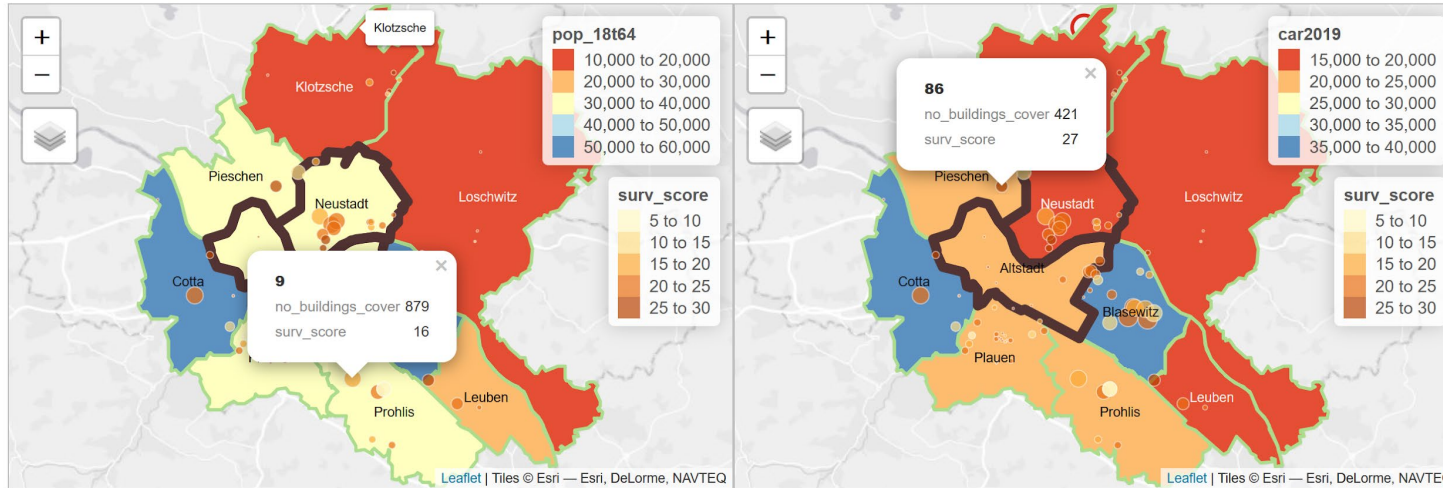
## OpenChargerMap



EV charging  
points (ECP)



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- equity mostly from the **spatial distribution dimension**;
- could not address **equity based on socio-economic indicators due to the unavailability of open data**



# Cross domain linked data

## Socio-Spatial Linked Data

Longitudinal social survey data

<Link>

Spatial science research data



- **General limitations**

- Basic technical infrastructural
- interdisciplinary nature of data

- **legal frameworks are very complex**

- data protection of Social Survey data (has sensitive personal data)

- **social scientists needs easy to adapt application of GIS**



**SoRa**  
Data linking service



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<https://sora-service.org/>

## Project Partners

**gesis**

Leibniz Institute  
for the Social Sciences



Leibniz Institute of  
Ecological Urban and  
Regional Development

**SOEP**

Das Sozio-  
oekonomische  
Panel

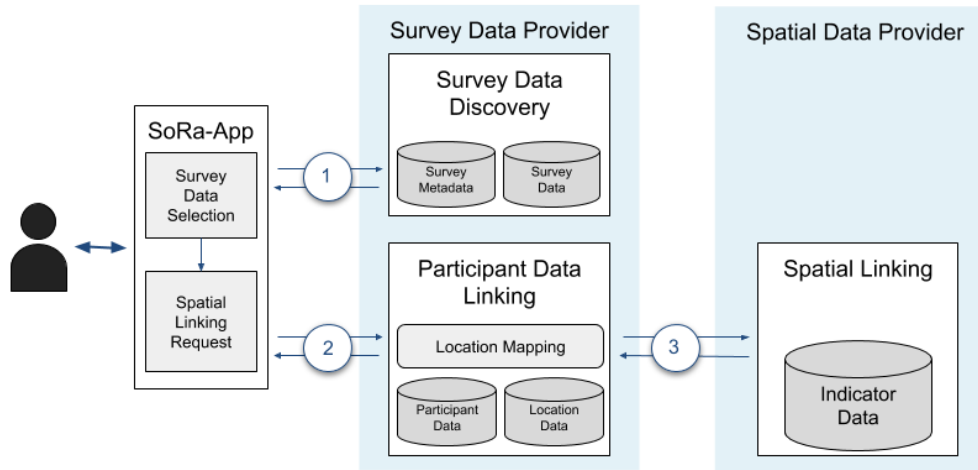
## Funded by

**DFG**

Deutsche  
Forschungsgemeinschaft

National Science  
Foundation

# Conceptual Model of SoRa-Service Infrastructure



**Interoperability via semantic knowledge models** which link data on metadata level and provide interfaces between the data sources

**Find details in:** Bensmann et al. (2020), An Infrastructure for Spatial Linking of Survey Data, Data Science Journal 19 (2020) 1 (27), Page. 1-18, DOI: <http://doi.org/10.5334/dsj-2020-027>



**SoRa**  
Data linking service



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Research question?

- Personal Opinion
- Spatial Relation



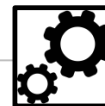
*Data Privacy, Security*

Secure  
data  
room



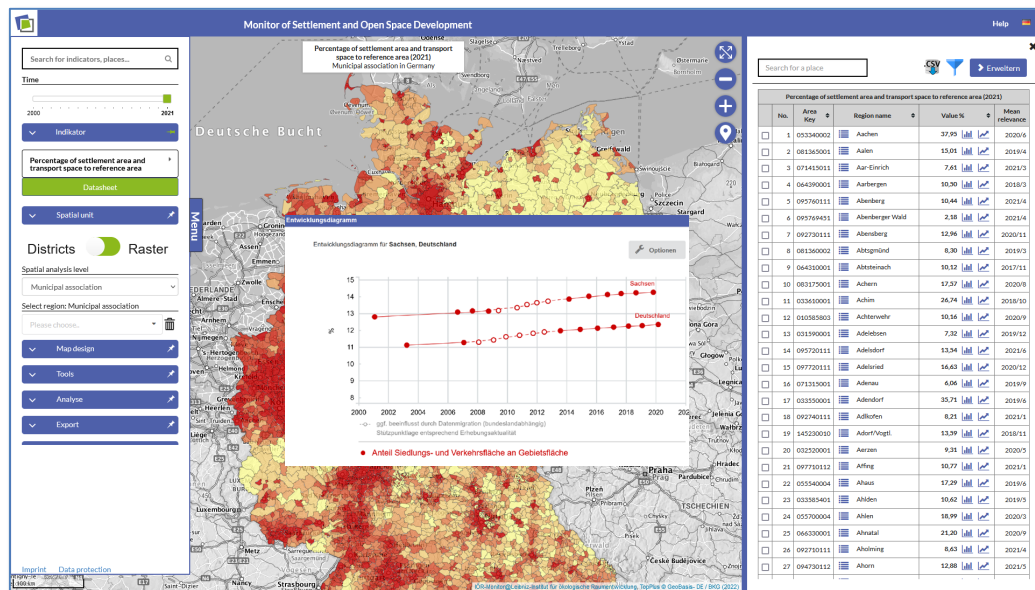
**SOEP**

**German Socio-Economic Panel**



**Open SDI of IOER**

**Monitor**   
der Siedlungs- und Freiraumentwicklung



**Web:** <https://monitor.ioer.de>  
**API:** [https://monitor.ioer.de/monitor\\_api](https://monitor.ioer.de/monitor_api)



Information service for supporting sustainable development of cities and regions

89

**Indicators** on 15 themes



**Annual update** using official geodata of Germany

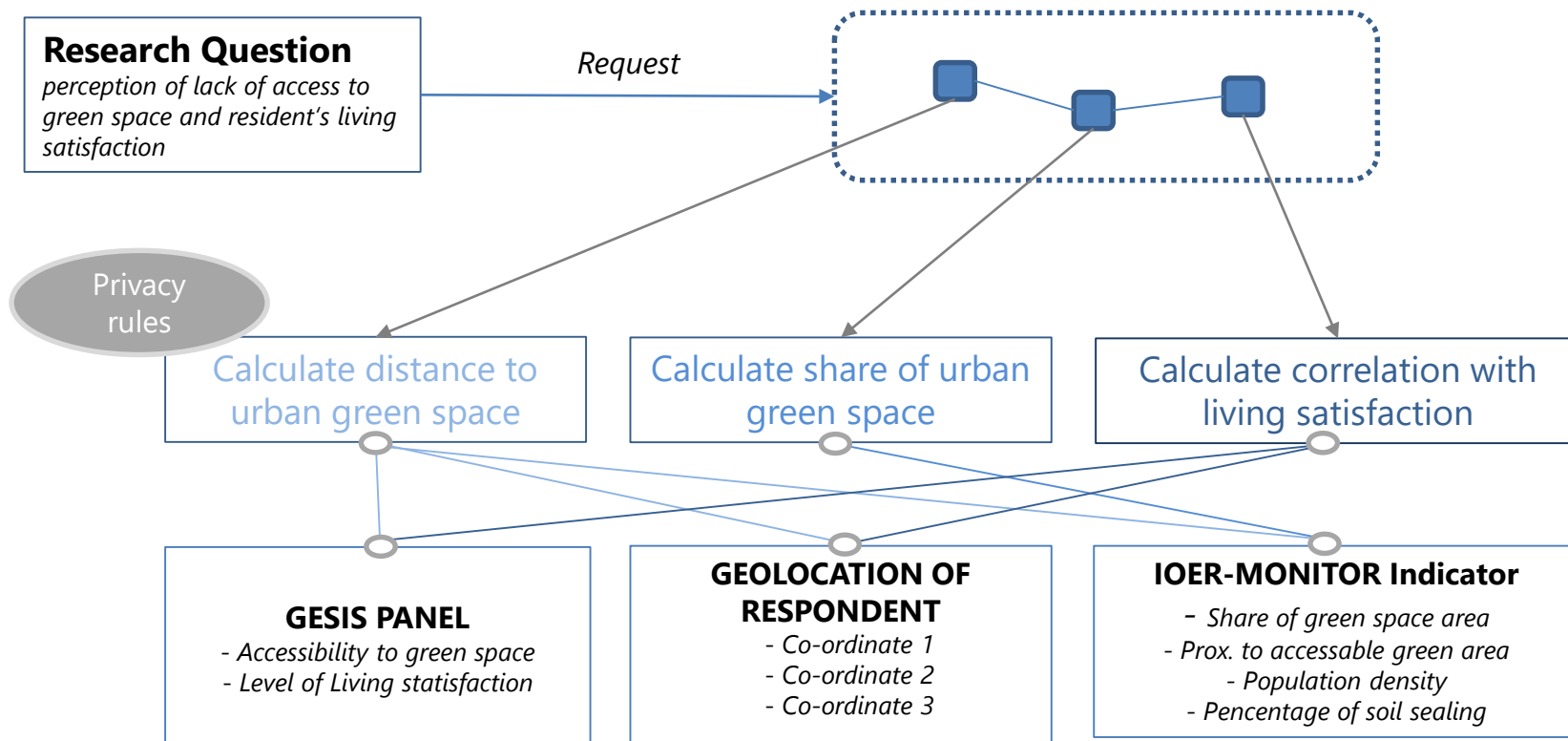


**Open data**

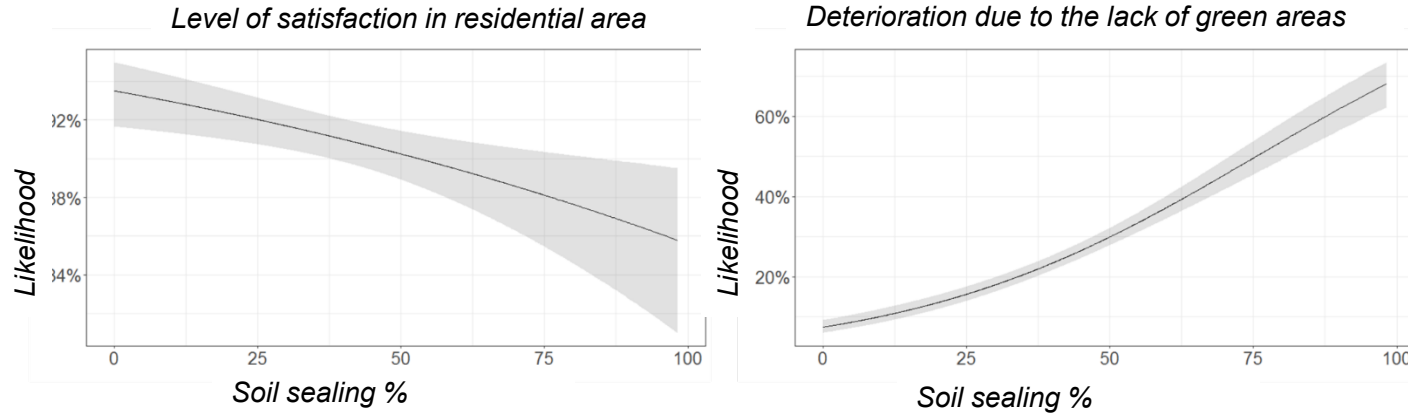


**GIS-Integration**  
WFS-, WMS-, WCS- und WPS-services, Rest-API

# Example – Service and workflow of SoRa



# Example: Explorative Data Analysis



**Note:** Results based on predictions of two logistical regression models on basis of GESIS Panel (N=2718). Statistical control of degree of soil sealing in area of 500m, age, gender and income of participants.

# Outlook - SoRa End-to-End: Way to FAIR

- **Pilot to Infrastructure Implementation**
- **FAIR Data, Digital object creation and publication**

**F**indable

**A**ccessible

**I**nteroperable

**R**e-useable



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# DATA SCIENCE JOURNAL

Reading: An Infrastructure for Spatial Linking of Survey Data
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## Research Papers

### An Infrastructure for Spatial Linking of Survey Data

**Authors:** Felix Bensmann , Lars Heling, Stefan Jünger, Loren Mucha, Maribel Acosta, Jan Goebel, Gotthard Meinel, Sujit Sikder, York Sure-Vetter, Benjamin Zapilko

#### Abstract

Research on environmental justice comprises health and well-being aspects, as well as topics related to general social participation. In this research field, among others, there is a need for an integrated use of social science survey data and spatial science data, e.g. for combining demographic information from survey data with data on pollution from spatial data. However, for researchers it is challenging to link both data sources, because (1) the interdisciplinary nature of both data sources is different, (2) both underlie different legal restrictions, in particular regarding data privacy, and (3) methodological challenges arise regarding the use of geo-information systems (GIS) for the processing and analysis of spatial data.

In this article, we present an infrastructure of distributed web services which supports researchers in the process of spatial linking. The infrastructure addresses the challenges researchers have to face during that process. We present an example case study on the investigation of environmental inequalities with regards to income and land use hazards in Germany by using georeferenced survey data of the GESIS Panel and the German Socio-economic Panel (SOEP), and by using spatial data from the Monitor of Settlement and Open Space Development (IOER Monitor). The results show that increasing income of survey respondents is associated with less exposure to land-use-related environmental hazards in Germany.

**Keywords:** spatial linking, georeferenced survey data, spatial data, environmental justice, research infrastructure, semantic web technologies





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 Published by De Gruyter Oldenbourg May 21, 2021

## IOER Monitor: A Spatio-Temporal Research Data Infrastructure on Settlement and Open Space Development in Germany

Gotthard Meinel , Sujit Kumar Sikder  and Tobias Krueger 

From the journal *Jahrbücher für Nationalökonomie und Statistik*  
<https://doi.org/10.1515/jbnst-2021-0009>

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### Abstract

This paper gives a comprehensive introduction to the IOER Monitor – an open research data infrastructure (RDI) in Germany providing domain-specific multi-temporal geospatial datasets, services and visualizations for land use and land cover (LULC)-related development of settlements and open space and closely related topics. Its easy-to-use information system provides multi-scale data offers to form a discussion platform that supports spatial development assessment and evidence-based decision making. It contributes to public land-use change discourses by enhancing information offers that can be adopted by other multi-disciplinary data users – even from non-spatial domains. All data and services are freely available. IOER Monitor is committed to offering continuous services implementing FAIR principles (findable, accessible, interoperable and re-usable) and policy-relevant inputs for transformative spatial development.

**Keywords:** geodata infrastructure (GDI); indicators; LULC; open science; research data infrastructure (RDI); spatial science

**JEL Classification:** Q01; Q56; R52; Q24; O18

In: Journal of Economics and Statistics, 242 (2022) 1, Page.159-170. DOI: <https://doi.org/10.1515/jbnst-2021-0009>

In: Data Science Journal 19 (2020) 1 (27), Page. 1-18  
DOI: <http://doi.org/10.5334/dsj-2020-027>



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**Vielen Dank  
für Ihre  
Aufmerksamkeit!**

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[www.ioer-fdz.de](http://www.ioer-fdz.de)

<http://www.ioer-monitor.de>

[www.sora-service.de](http://www.sora-service.de)

*Acknowledgement: DFG-SoRa Project Team*

[www.ioer.de](http://www.ioer.de)