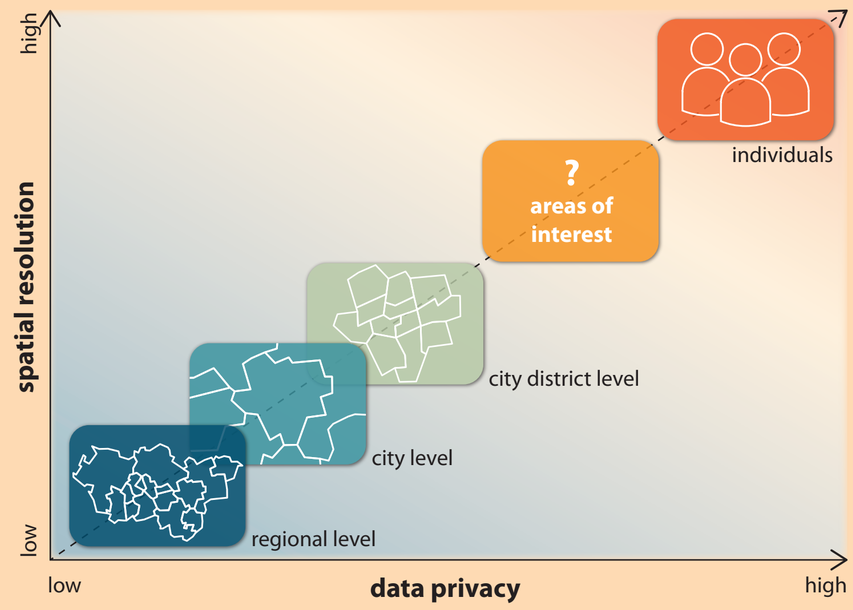
Design of a multi-thematic small-scale community data panel

Case study of Herne, Germany

Caroline Baumgart, Stefan Kaup,
ILS - Research Institute for Regional and Urban Development

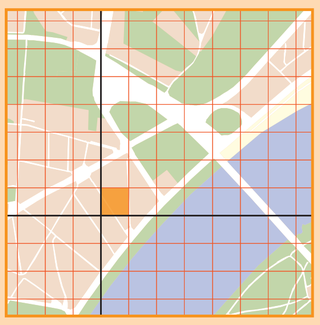
Reality

The challenge
Urban monitoring in times of increasing socio-spatial differentiation



The enormous reinforcing dynamics of spatial changes in the urban context, the fragmentation and differentiation of socio-spatial patterns and an increasing degree of uncertainty about future trends led to a new demand for valid and recent data on the small-scale level of urban development, especially for neighborhoods.
For small and medium sized cities it is hard to implement a monitoring of urban and socio spatial development. Also there is a lack of spatial units representing a usable format to gather, analyze and display spatial urban phenomenon. Spatial socio-demographic data gets into a conflict between the spatial resolution and the requirements of data privacy. Where there is low resolution, there is also low policy restriction but also low insight. High resolution would give better answers but is also highly restricted.

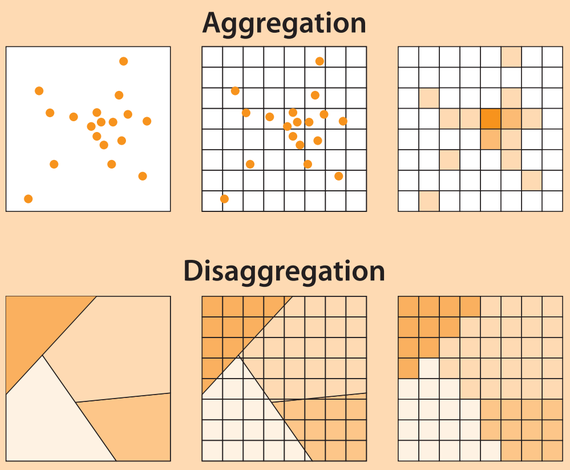
Solution proposal
The spatial GRID as observation unit



To contest the challenges described, there is a need to establish an impartial spatial unit as observation class.
We propose to use the spatial system described in the European Commission's Data Specification on Geographical Grid Systems [1)].
The specification provides rectangular grids with edge lengths of 10^x m where x in {2,3,4}.
Data that are calculated on this base are likely out of privacy issues and can easily be aggregated to GRID cells of lower spatial resolution.
In addition, data on conservative spatial units can still be easily calculated from these data[2)].

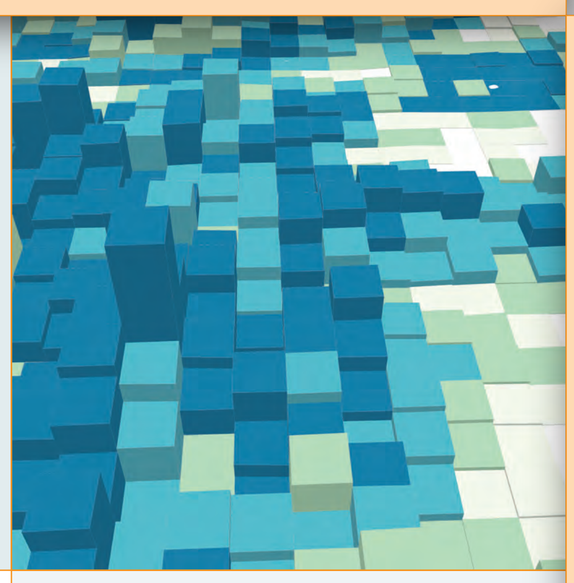
Transformation of input data

Different data sources from communities, federal state, private sectors and own collections are used to set up the database for the community panel.
The spatial resolution needs to be smaller than community level, but differs from land cover polygons to individual data points due to a heterogeneous data source.
All input data is transferred and aggregated or disaggregated to GRID cells.
This database offers comparability between communities as well as within, independent from political, administrative boundaries.



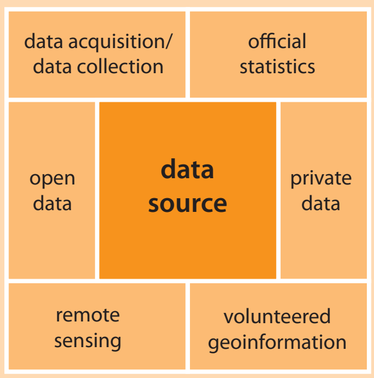
GRID model

Data model



GRID model

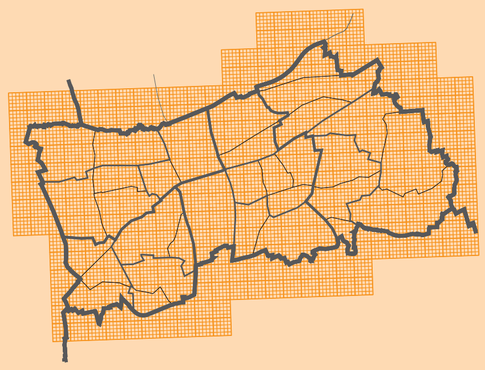
Data sources and thematic scope



To produce a holistic data panel, information must be collected from a variety of sources, first and most important from city authorities' register data.
In addition data must be integrated from the fields of open data/vgi, official statistics and geomarketing agencies (private data).
Indicators can be delineated from remote sensing also. For each indicator an algorithm is needed to calculate its value on a GRID base.
This procedure results in a set of indicators collected in a comparable spatial unit system.
To perform analysis from this stage on, there is no more need for spatial operations but just simple math processing.

The Case Study

As a pilot use case for the community data panel the city of Herne (Ruhr Area) was selected. ILS cooperated with the statistical and registry offices to produce register and mapping based GRID indicators. On top of these data, various additional sources were integrated including the federal state's open data initiative, contributed information from the OpenStreetMap community as well as geomarketing indicators regarding the social milieu and housing situation.
As a result a multi-thematic and multi-temporal data set is generated on a common system of spatial objects for prediction free analyses of urban patterns, spatial data mining and small area classifications.



subdivisions [3)]

contact
caroline.baumgart@ils-research.de
stefan.kaup@ils-research.de
www.ils-research.de

cartography and layout
Jutta Rönsch, ILS Dortmund

ILS - Research Institute for Regional and Urban Development

Data source
1) http://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_GG_v3.1.pdf

2) KAMINGER I., KATZLBERGER G. and RAINER N. (2010): Statistical grids as tool for small area analysis. In: 27th SCORUS Conference. Creating a knowledge base for successful cities and regions, along the statistical value. http://scorus.org/wp-content/uploads/2012/10/2010JurmalaP4.5.pdf

2) https://commons.wikimedia.org/wiki/File:Herne_statistical_subdivisions.svg#/media/File:Herne_statistical_subdivisions.svg