FIG WORKING WEEK 2019

22–26 April, Hanoi, Vietnam

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"Geospatial Information for a Smarter Life and Environmental Resilience"

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FIG WORKING WEEK 2019
22–26 April, Hanoi, Vietnam
"Geospatial Information for a Smarter Life and Environmental Resilience"

Geospatial Information to Support Real Estate Valuation

Winrich VOSS and Keno BAKKER, Germany
(Paper 9991)

Leibniz University Hannover
Chair of Land and Real Estate Management

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Structure

- Background and Aim of research approach
- Model of automated determination of site quality / location quality
- Available geodata, weighting approach and quality rating
- Results and validation

Background

- Strong increase of property prices, esp. of land prices
- Scarceness of / demand for more reliable land market data
- Supporting Standard Ground Value detection in locations with less market activity (improving market transparency)
- Availability of geodata (e. g. open data initiatives, INSPIRE initiative of EU)

Aim

- **Automated detection of site quality / location quality by using free available geodata**
- **Comparability of locations at cross-regional level**

Detection of property-related location quality due to geodata

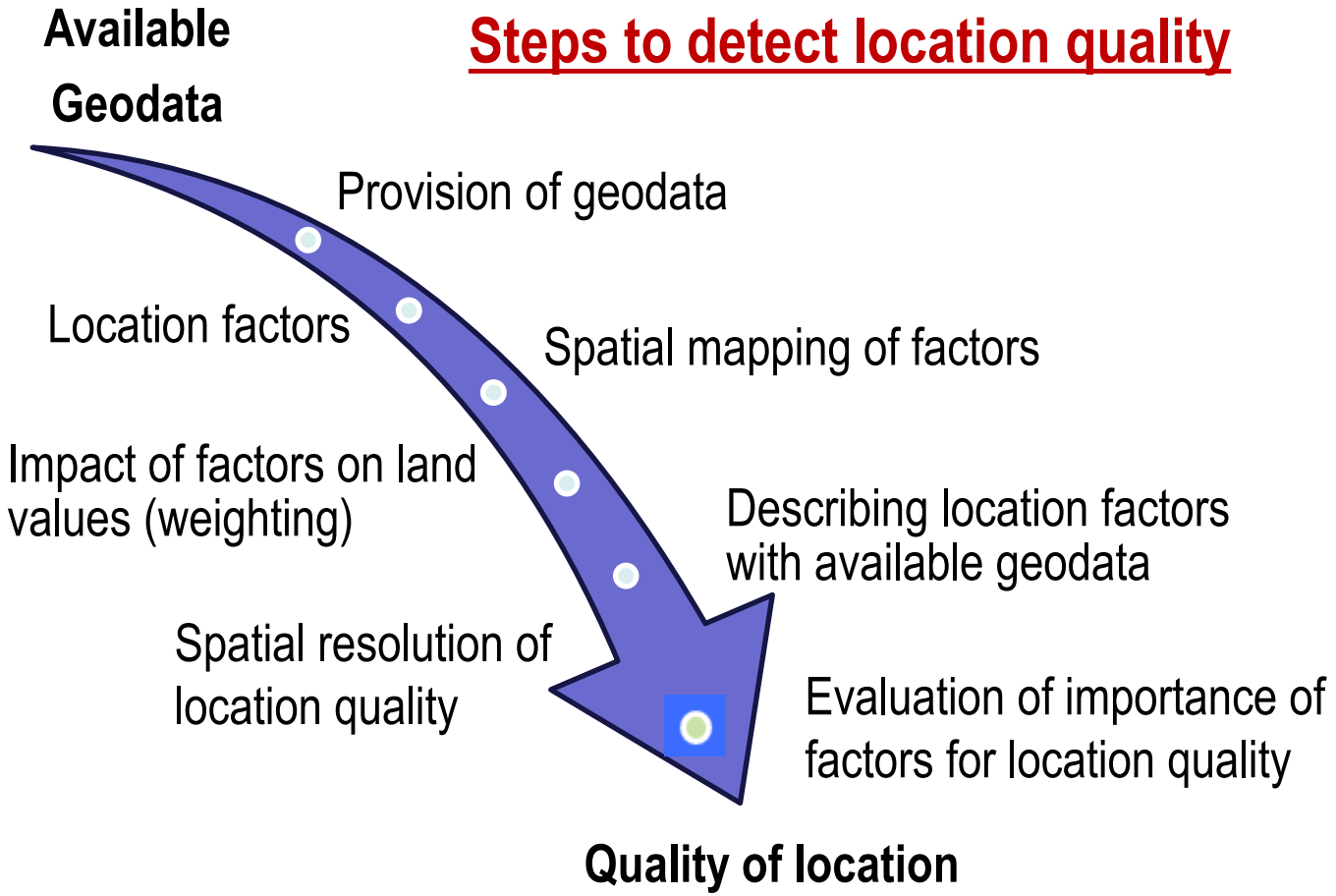
- Residential locations
- Office locations
- Retail locations
- Logistic locations

Calculation of location quality for different spatial levels

- Automated (by GIS)
- High resolution (500 x 500 m^2)
- Updating periodically
- Objective and market-orientated

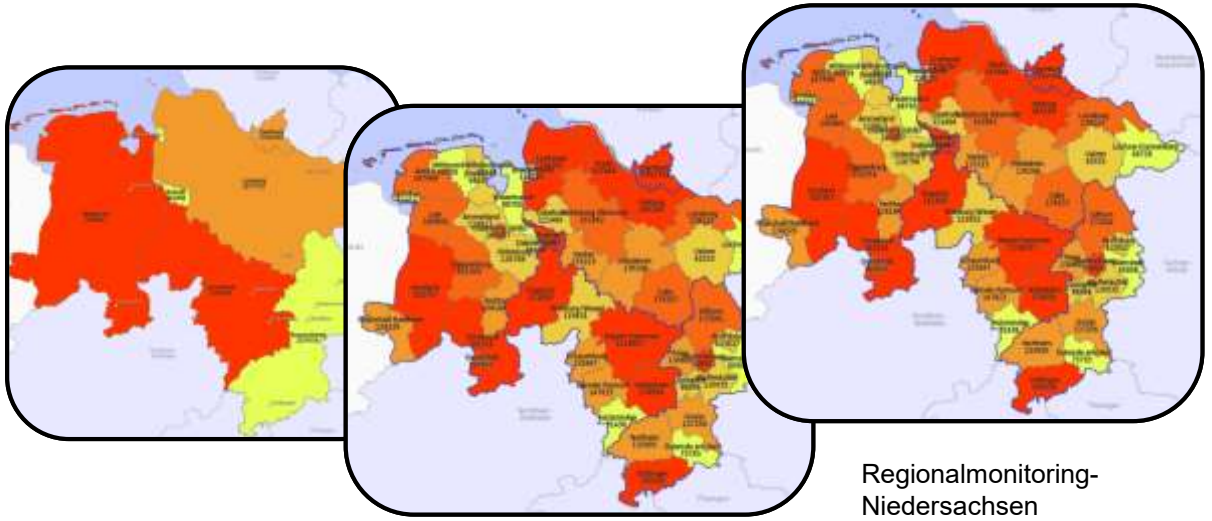
Application of location quality for supporting market analysis and valuation

Steps to detect location quality



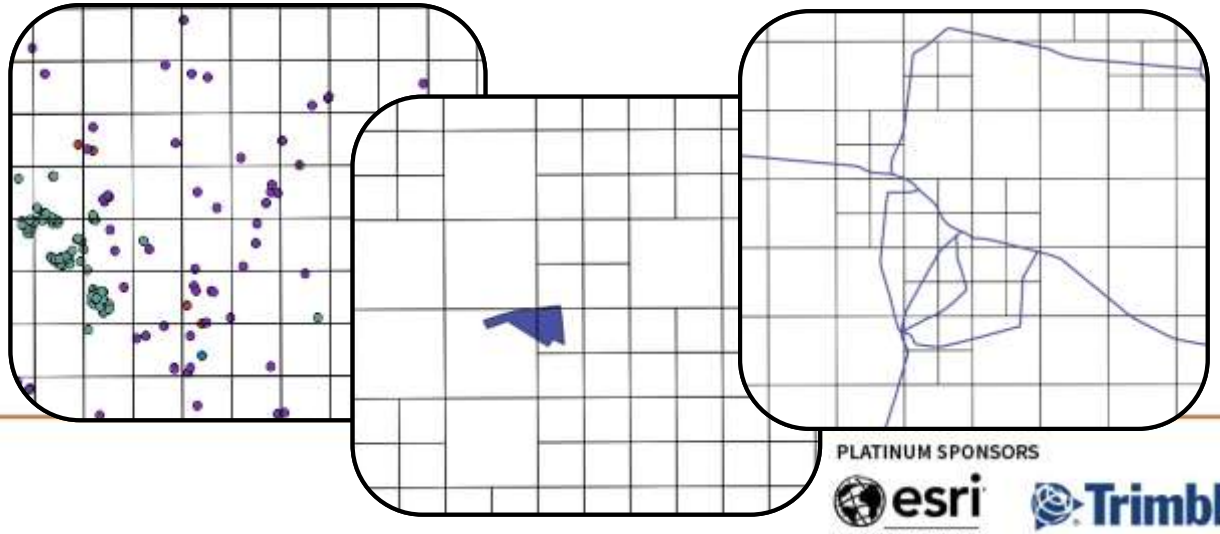
Differentiation of location factors

- Macro location
  (indicators selected by expert questioning)



Regionalmonitoring-Niedersachsen

- Micro location
  (indicators selected by expert questioning)



Two spatial levels of resolution

by INSPIRE Equal Area Grid

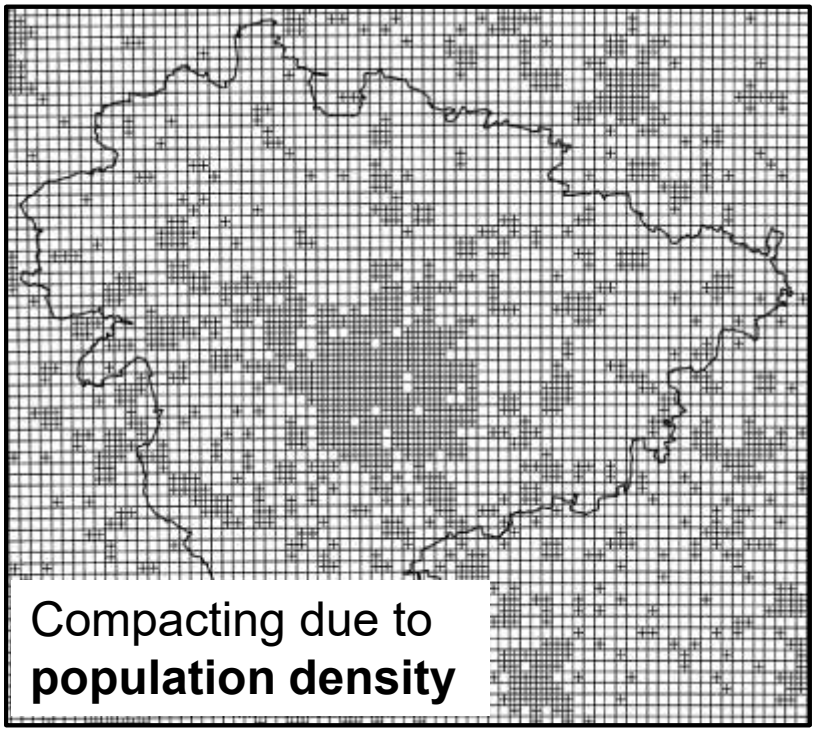
- Standard area grid:

  1000 m x 1000 m

- Compacted area grid:

  500 m x 500 m in urbanized structures

- Open source GIS solution



Compacting due to **population density**

Relevant indicators to determine **macro-location quality**:

Type of land/ property:
Residential

Spatial Level:
Macro level

Number of selected indicators:
15 Indicators

Necessary geodata:
35 datasets

Location factors	Geodata sets
Population	Number, density, age distribution of population
Employment	(Un-)employment rate, number of unemployed
Economic performance	GDP, change of GDP
Spending capacity of households	Available income, change of income
Recreational value	Proportion of recreational area, change of area
etc., etc.	

Relevant indicators to determine **micro-location quality**:

Type of land/ property:
Residential

Spatial Level:
Micro level

Number of selected indicators:
15 Indicators

Necessary geodata:
24 datasets

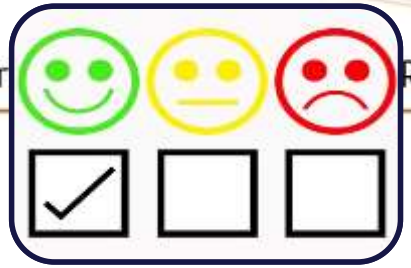
Location factors	Geodata sets
Distance to next town center	Distance per grid to large and medium-size town
Vacancy rate	Vacancy rate
Distance to kindergarden	Location of kindergardens
Impact of noise pollution	Road, train and aircraft noise
Broadband access	Quality of broadband
Distance to nature	Public park, waters, forest, preserve areas
etc., etc.	

Impact of location factors on land values (weighting):

- Method: Expert questioning by priority analysis (factor by factor)
- Summarized expert opinions

		...hat im Vergleich zu diesem							Weighting (total)	Weighting (%)
		A	B	C	D	E	F	G		
Dieser Indikator...	A		0	0	1	2	0	1	4	10%
	B	2		2	2	1	0	0	7	17%
	C	2	0		1	1	2	0	6	14%
	D	1	0	1		0	0	1	3	7%
	E	0	1	1	2		0	0	4	10%
	F	2	2	0	2	2		2	10	24%
	G	1	2	2	1	2	0		8	19%
									42	100%

Evaluation of importance



due to location quality:

Macro-location

Micro-location

Example: Proportion of unemployed people [%]

Boxplot

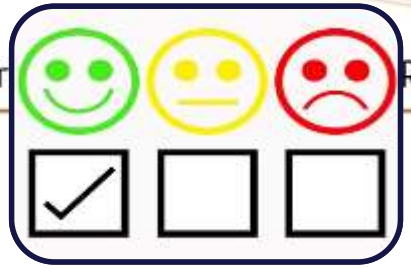
Evaluation

3 (above-average) **< 3,3 %**

2 (average) **≥ 3,3 % / ≤ 5,5 %**

1 (below-average) **> 5,5 %**

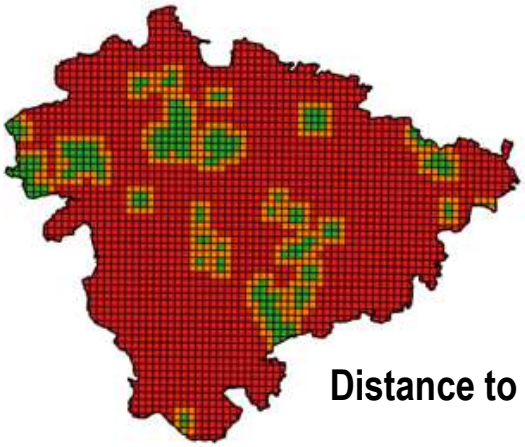
Evaluation of importance due to location quality:



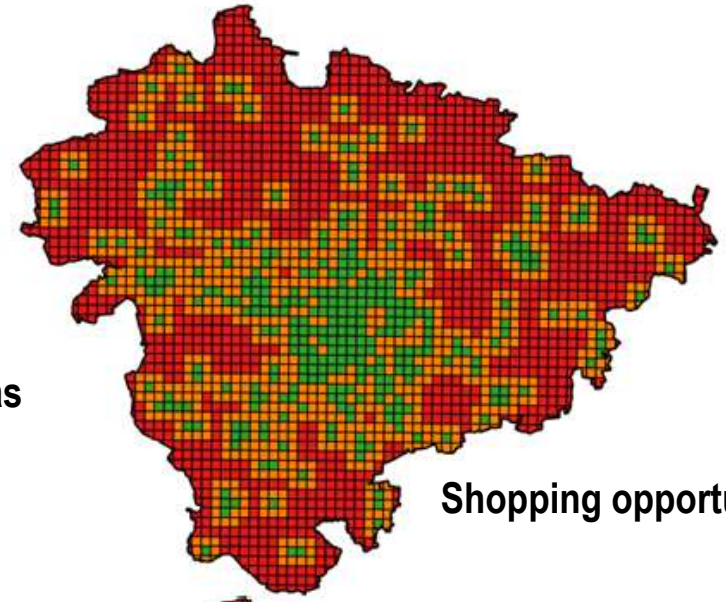
Macro-location

Micro-location

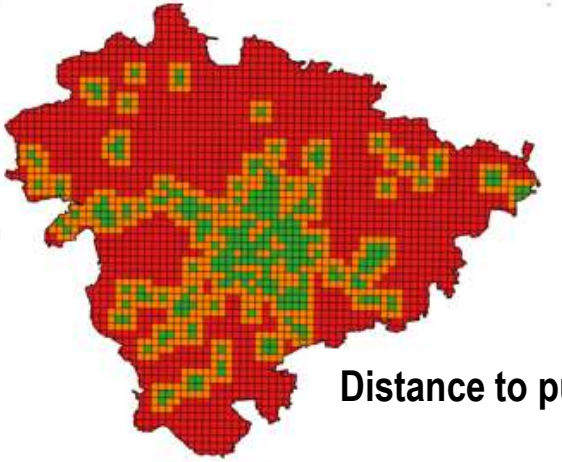
		Distance classification (m)		
Location factors	**POI**	1	2	3
Distance to high-voltage lines	Pylon	< 500	500 - 2.000	> 2.000
Distance to educational institutions	Primary school	> 2.000	1.000 - 2.000	< 1.000
	Secondary school	> 5.000	2.000 - 5.000	< 2.000
Distance to medical institutions	Medical specialist	> 5.000	2.000 - 5.000	< 2.000
	Hospital	> 10.000	5.000 - 10.000	< 5.000



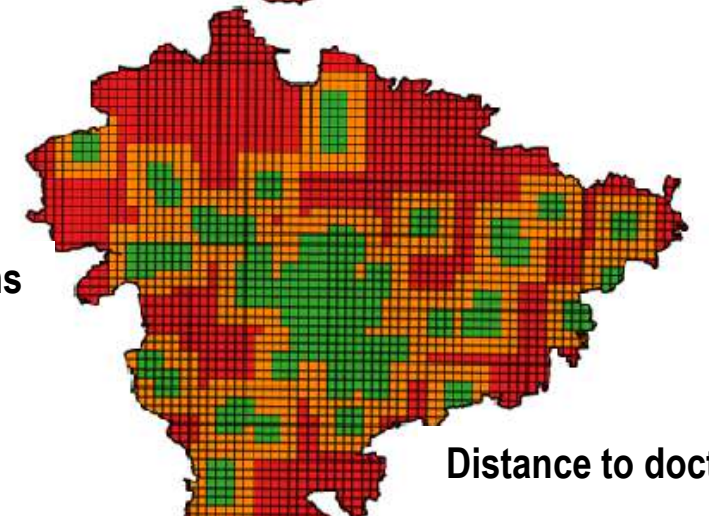
Distance to preserve areas



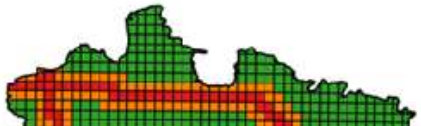
Shopping opportunities



Distance to public greens



Distance to doctors



Summation of importance of location factors :

- Using the evaluation and weighting of location factors
- Summation represents the location quality of an area relativly to all other areas

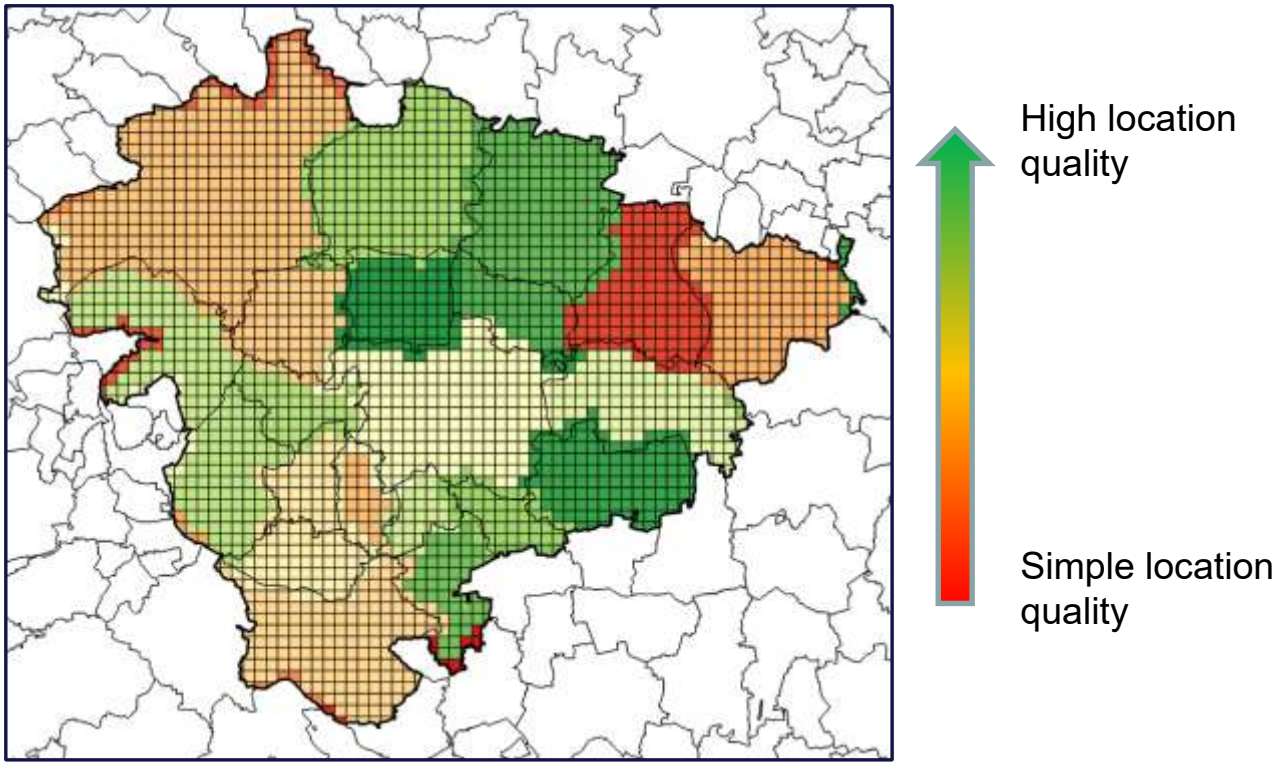
Macro-location:

Calculation of location quality

Weighting	Faktor 1 10%		Faktor 2 17%		Faktor 3 14%		...		
	Evaluat	Sum	Evaluat	Sum	Evaluat	Sum			Location quality
Municipality 1	1		3		3				
Municipality 2	3	30	2	34	1	14			78
Municipality 3	2	20	2	34	1	14			68
...									

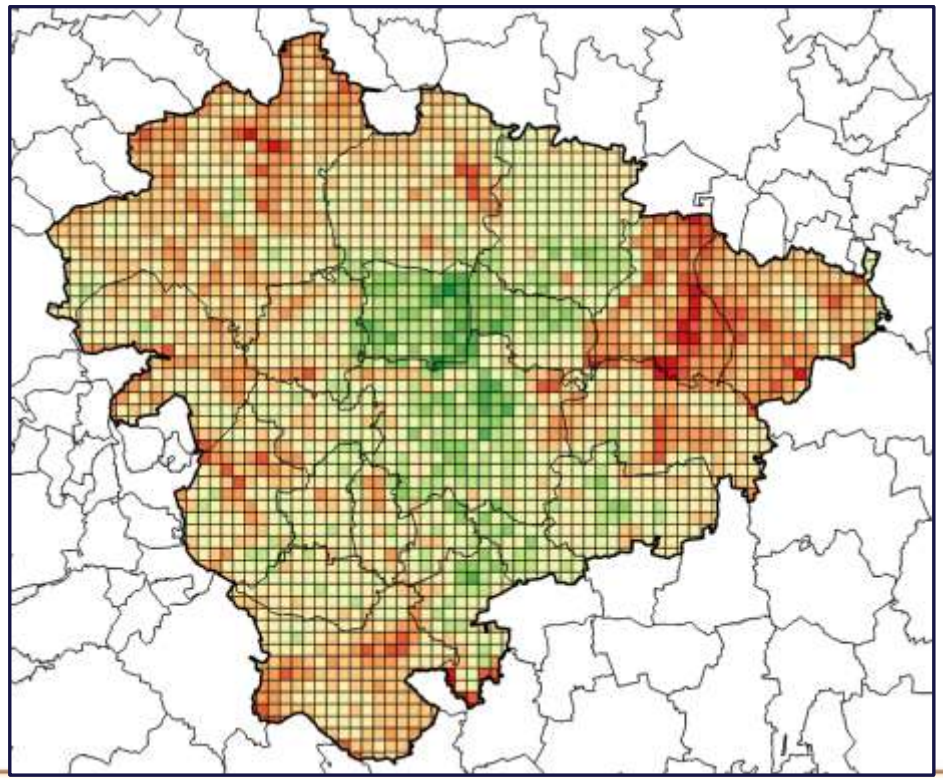
Example : Results for 21 Municipalities of Hannover region

Macro-location:



Example : Results for 21 Municipalities of Hannover region

Combination of macro-location (20 %) and micro-location (80 %):

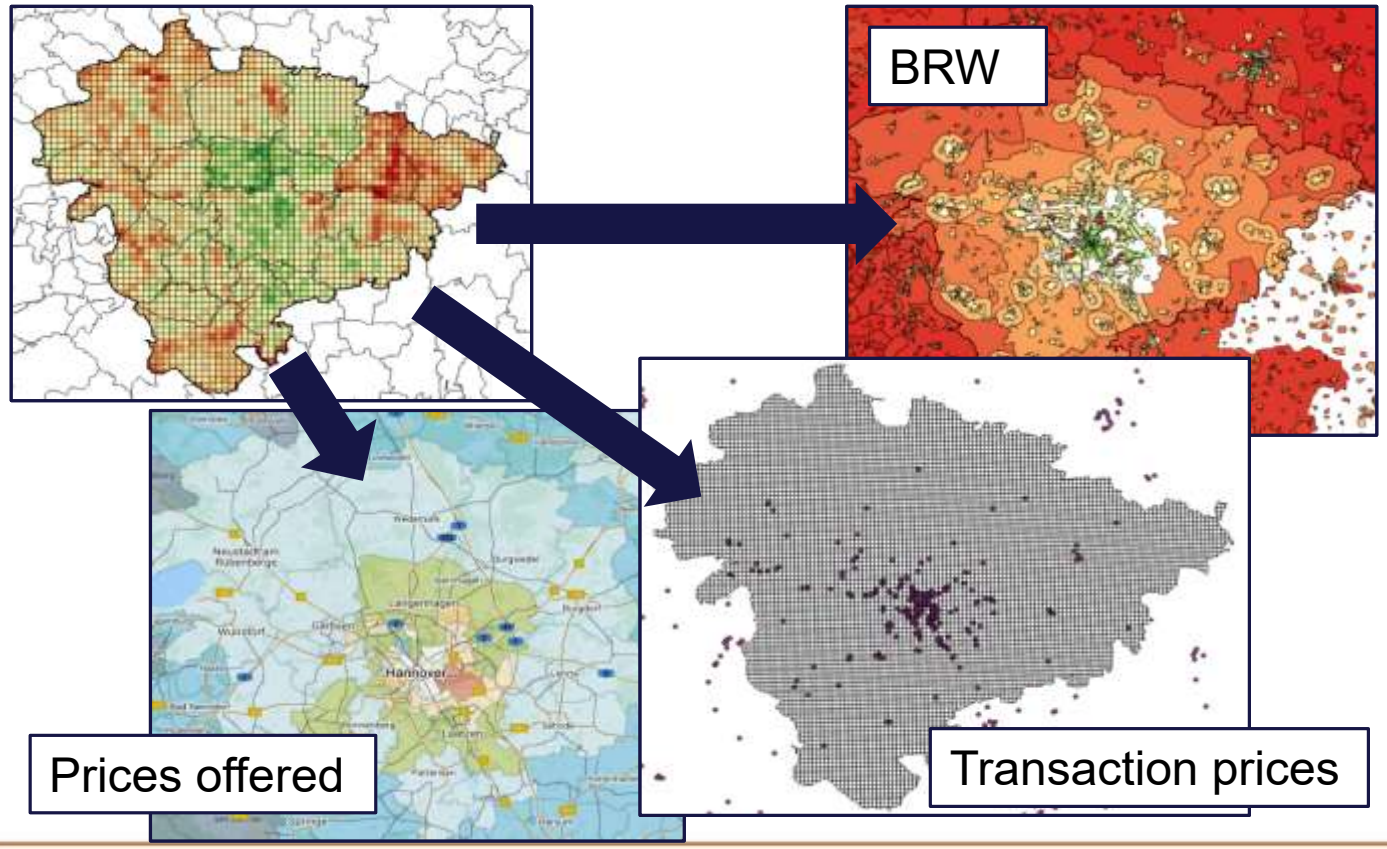


High location quality

Simple location quality

Validierung des Modells

Validation of the model due to market results (different approaches)



Results - Conclusions

- Automated tool to compare locations
  at local, rqegional and supra-regional level (implemented for Lower Sax.)
- Applications in valuation and market analysis
  - NO substitute for valuation !
  - Selection of comparable locations and comparable transactions
  - Plausibilisation of land values
  - Additional information in regions with few transactions
- Methodology is important, system is extendable
  - Automated = short-term updating with small ressources, free geodata
  - More detailed geodata available → more detailed grid is possible
- Tool still in progress, not yet finalized

Thank you for your kind attention

CONTACT

Prof. Dr.-Ing. Winrich Voss
Land and Real Estate Management
Geodetic Institute
Leibniz University Hannover
GERMANY
Email: voss@gih.uni-hannover.de

Nienburger Straße 1
D-30167 Hannover
Phone +49-511-762-19927
Fax +49-511-762-19929

Internet: www.gih.uni-hannover.de