



FIG Working Week 2024

19-24 May

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Demographic Transition in Aging Neighborhoods: A GIS-Based Analysis from Germany's Countryside

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Single-Family Housing Areas in Transition



The largest portion of the settlement area of German villages typically emerged after 1950.

And is characterized by single-family homes.

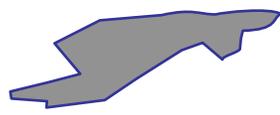


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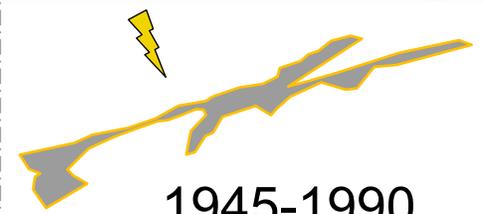
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Old town



1945-1990



after 1990



Commercial area



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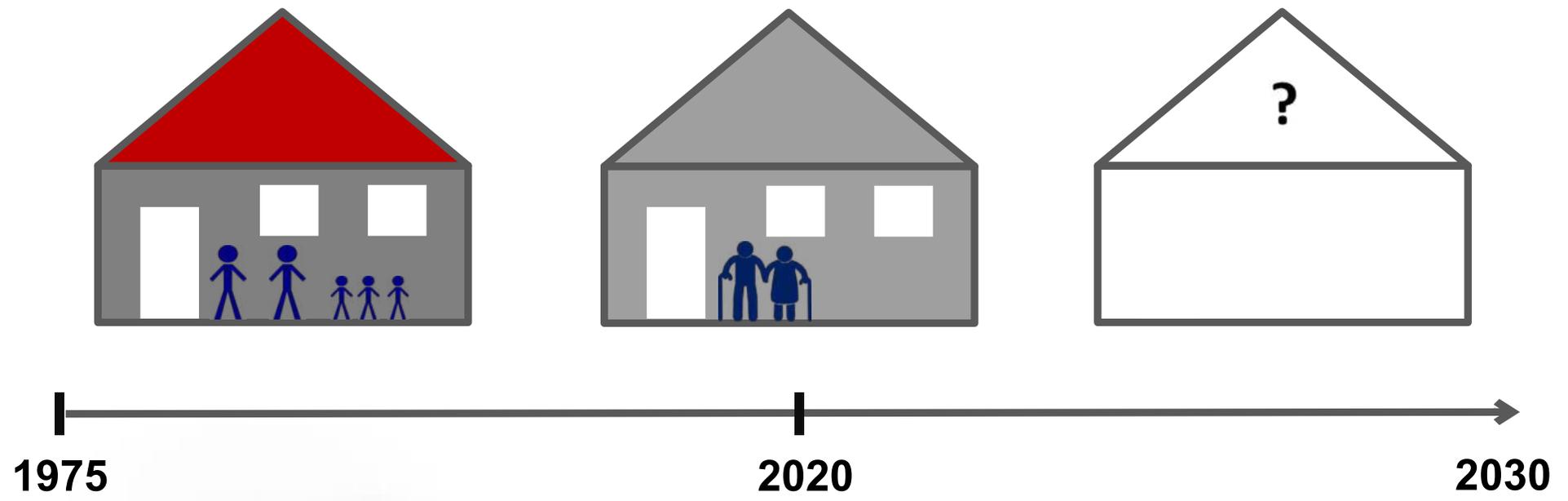
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Ageing builders, empty-nesters

Previous studies recommend establishing a detailed monitoring system, but so far, it has not been consistently addressed.



adapted from
Schaffert 2011



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GIS as a contribution to the solution: The example of Flossenbürg

- ~ 1500 inhabitants
- Close to border with Czech Republic
- Population decline

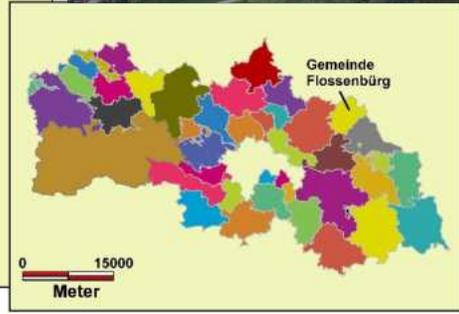
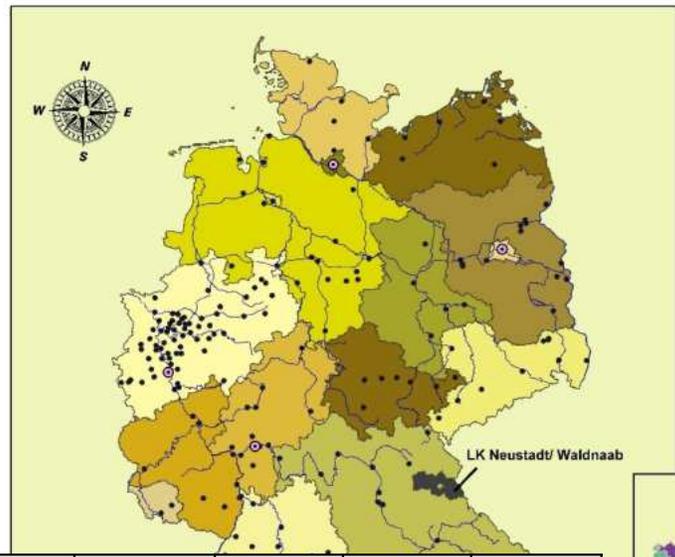


Photo: lois Köppl, Gleiritsch 2014; CC BY-SA 3.0

year	1970	1987	1995	2005	2010	2015	2022
inhabitants	2071	1980	1925	1747	1657	1582	1460

wikipedia.de

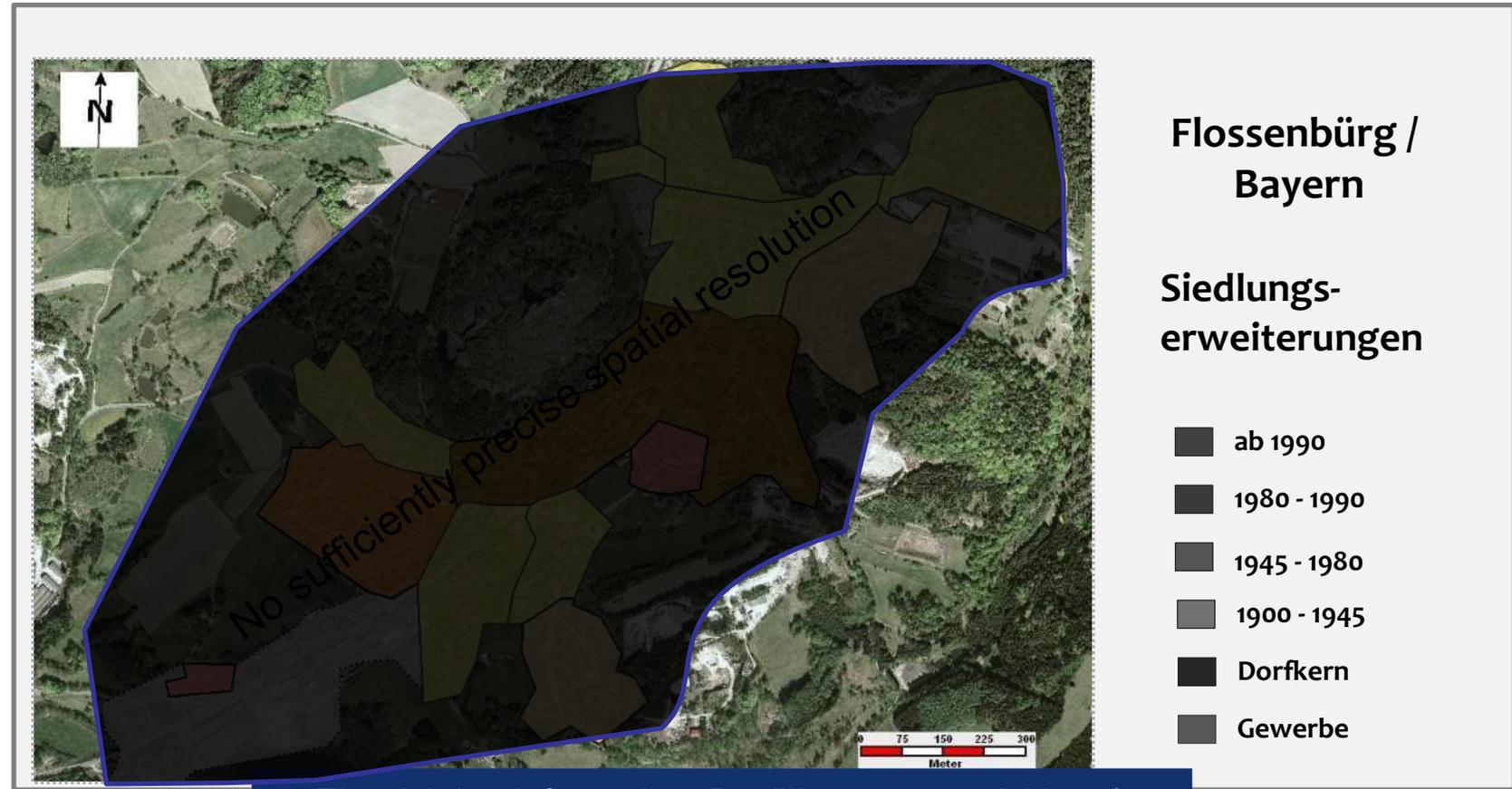


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Which demographic data set should be used?

Population data from the State Statistical Offices is popular

It provides current annual information for the entire municipality, but no data on residential areas

Ein wichtige Information: Bevölkerungsentwicklung/-struktur in Wohngebieten, aber liegt diese Information vor?

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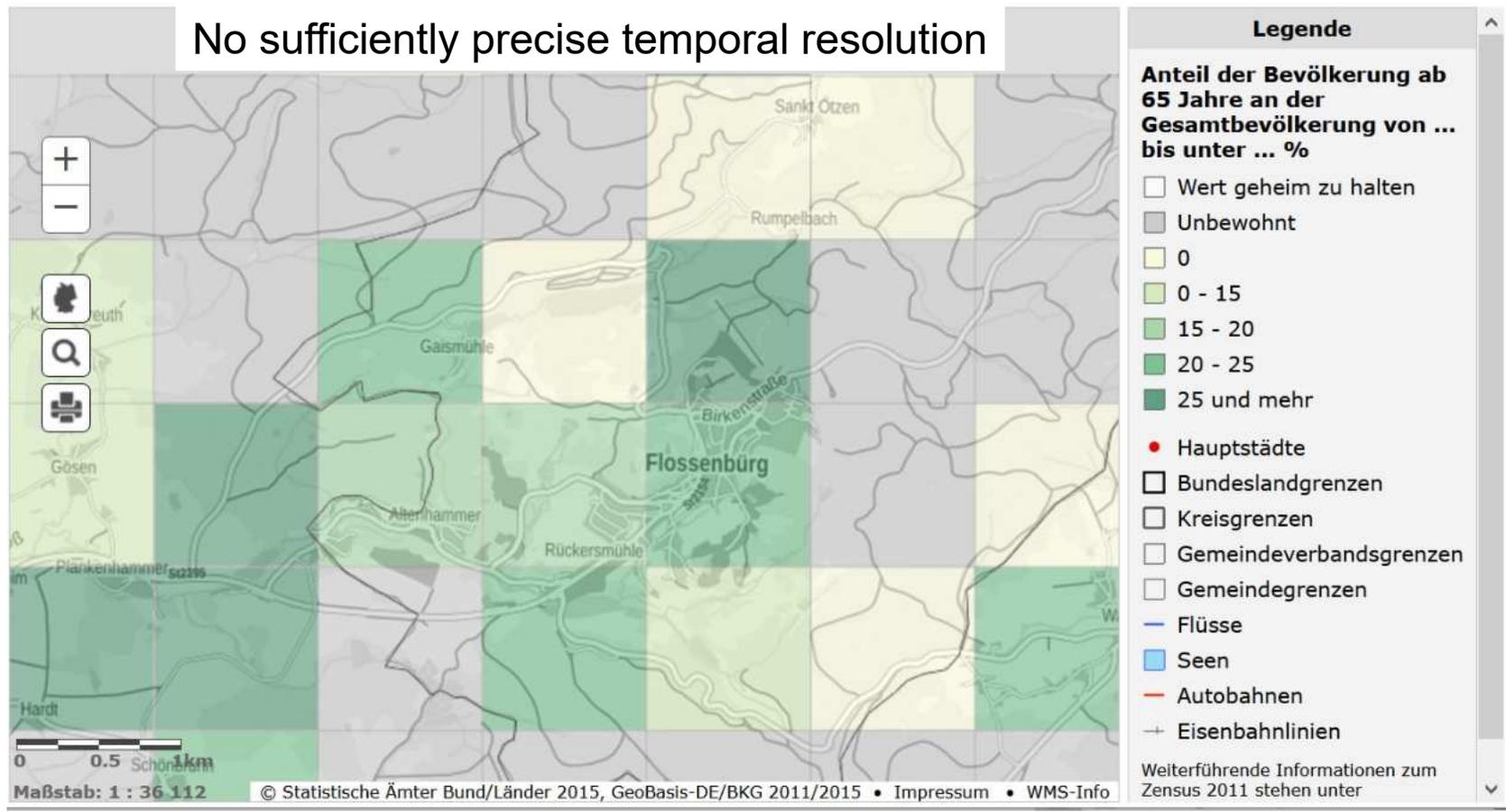
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No sufficiently precise temporal resolution



Which demographic data set should be used?

Census data is also popular and also georeferenced

It provides data with a resolution of 100x100 meters, but is only collected every 10 years.



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municipal population register data

- However, a suitable population data set exists: the municipal population register
- up-to-date
- spatially and thematically flexible
- but not designed and processed for urban planning & analysis (raw data)
- Challenge: There is a lack of resources for processing in small and medium-sized towns or villages
- Methodology: Off-the-shelf GIS is established in many municipalities. This allows important information to be extracted and visualized from the population register. No extra software, no extra data to be collected

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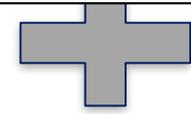
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Registration register export	Address	Gender	Birthday	Type of Change	...
	Hauptstr. 3	male	12.12.2012	relocation	...



geocoding



→ „GIS-ready“

<http://gdz.bkg.bund.de/index.php/default/amtliche-hauskoordinaten-deutschland-hk-de.html>

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Small-scale monitoring: Demographic indicators

Topic	Indicator
Age structure	Average age
	Old-age dependency ratio
	Share of foreigners
Natural population development	Change in population number
Population movement	Net migration
	In-migration
	Out-migration
Other	Duration of residence
	Fluctuation
	Empty-nest-indicator



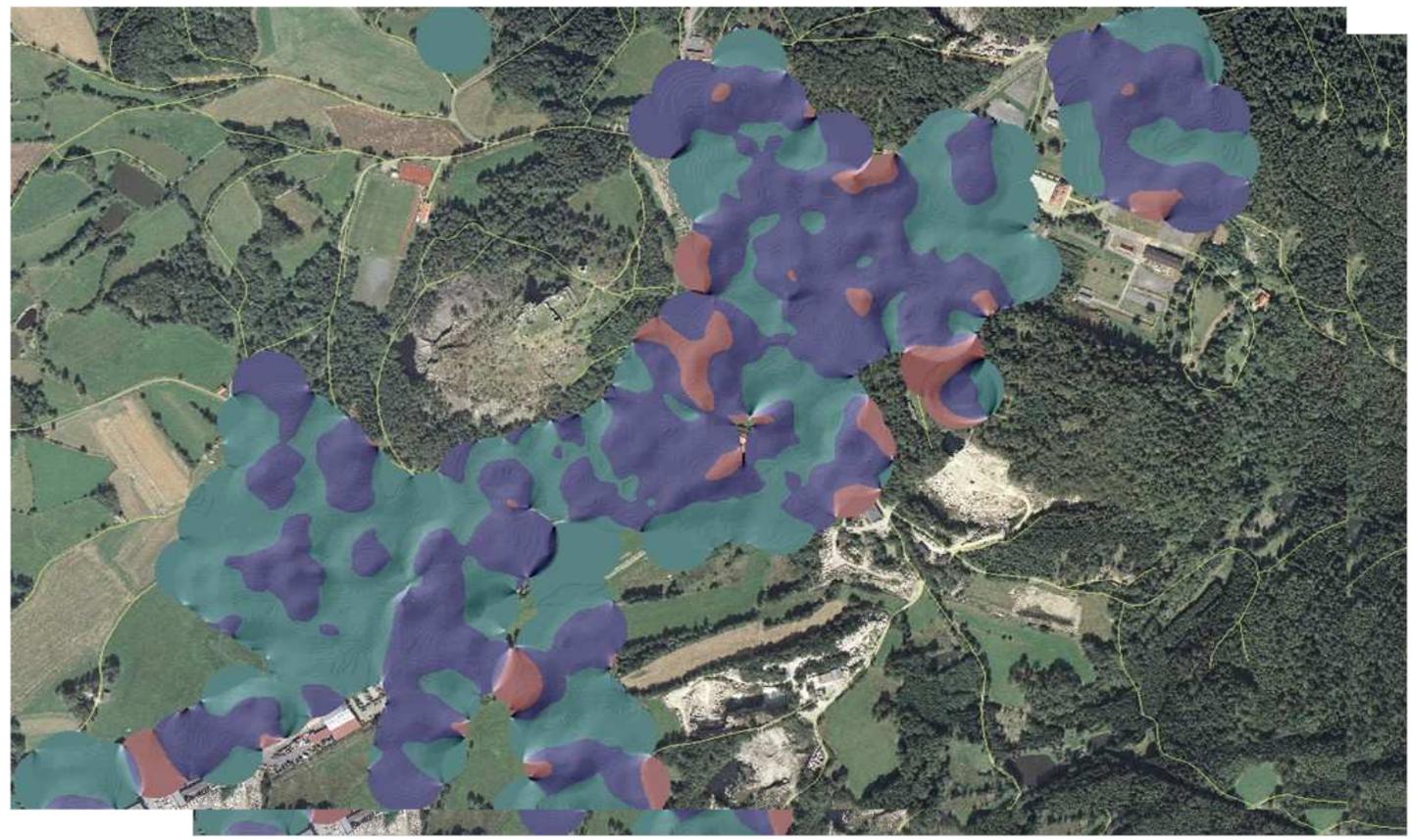
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neighborhood demographics



Schaffert 2011

Indicator: Average age

Visualization: fuzzification
(privacy)

- > 65 years
- 45-65 years
- < 45

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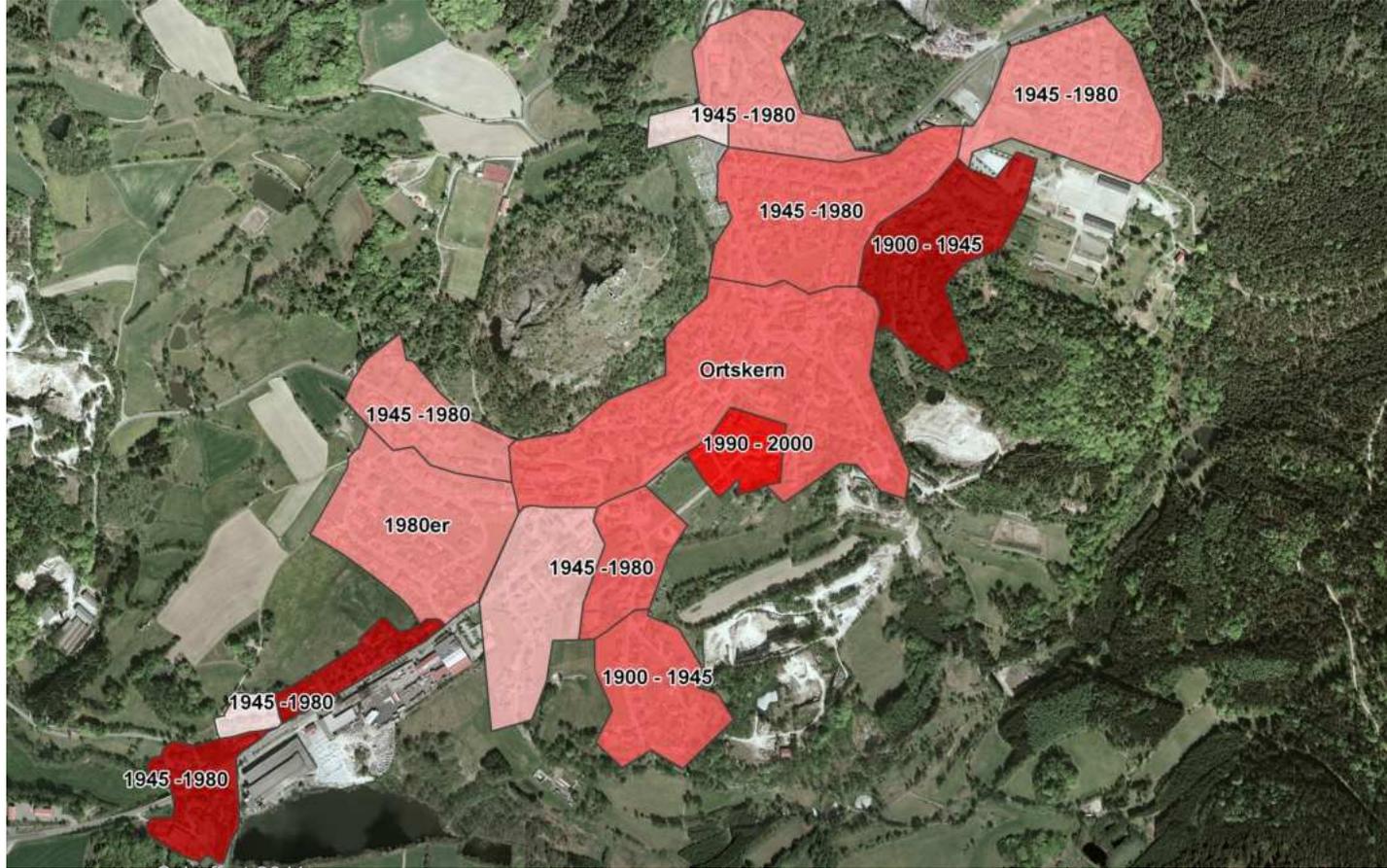
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neighborhood demographics



Schaffert 2011

Indicator: 1 or 2 senior inhabitants (empty nesters) / address

Visualization: neighborhood

empty-nest homes / neighbourhood

-  0
-  1-2
-  3-4
-  5-6
-  7-8
-  9 and more

* Gebäude mit 1 oder 2 Einwohnern im Alter von 65 Jahre oder Älter

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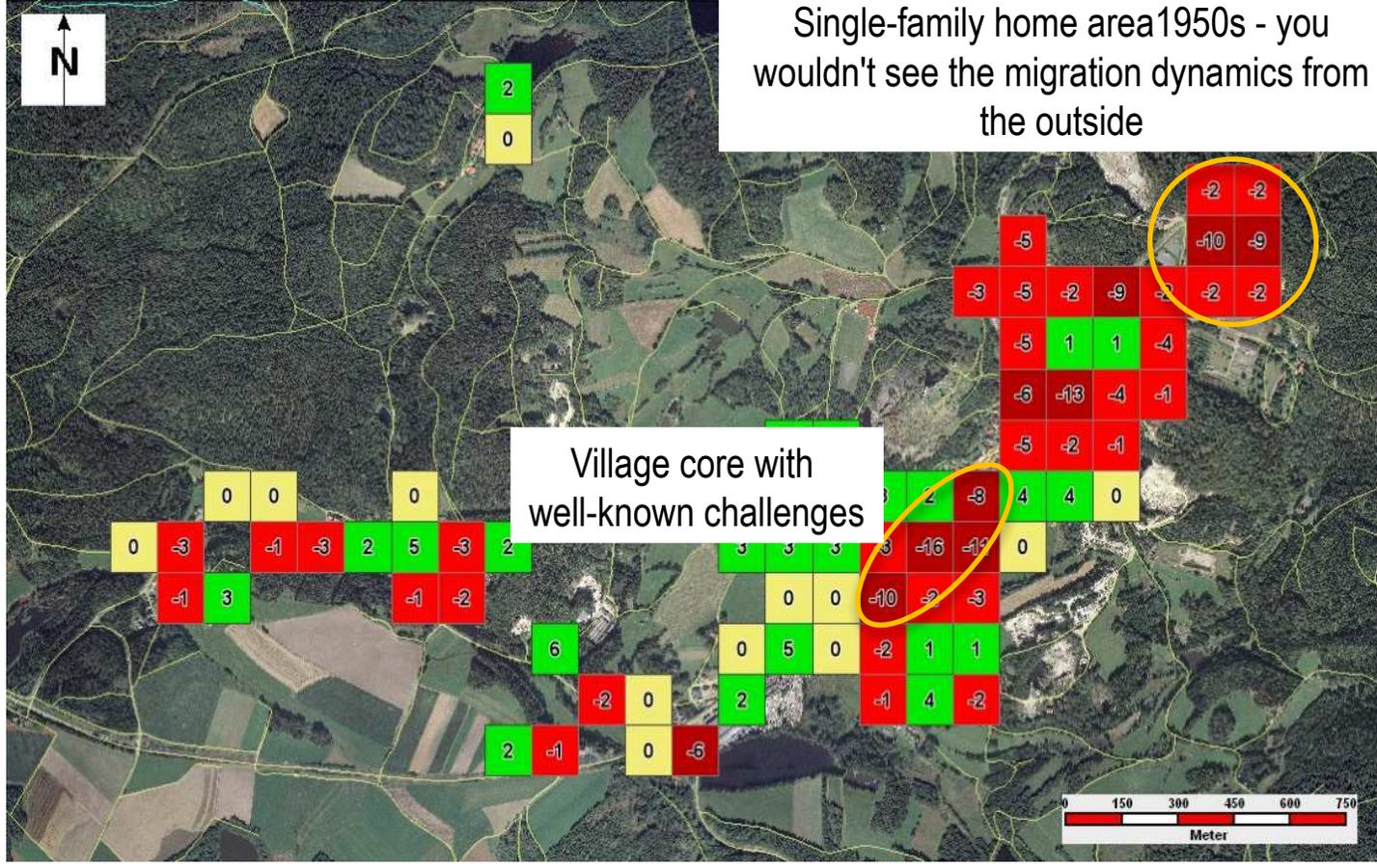
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neighborhood demographics



Single-family home area 1950s - you wouldn't see the migration dynamics from the outside

Indicator: net migration

Visualization: grid

Population change (numbers) 1999 to 2009

- - 6 persons and more
- -1 until - 5 persons
- +/- 0 persons
- +1 until + 5 persons

Schaffert 2011



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Walkability

- Demographic analyses can indicate a generational change in residents. Although small-scale analyses are necessary, they should be interconnected. For example, given the large number of residential areas in an entire county district, those with immediate problems can be prioritized
- When an acute transition is imminent, the question of resilience arises - and then additional indicators of housing / location quality come into play (like: how far is it to the next supermarket, ...)
- Walkability calculations must also work on a small scale: In Flossenbürg, the distance from residential addresses to shopping facilities often exceed 500 metres, but public transport reduces the challenge (bus stations < 500 metres)

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GEOSA
Geographic Information
System for Surveying
and Geospatial Information



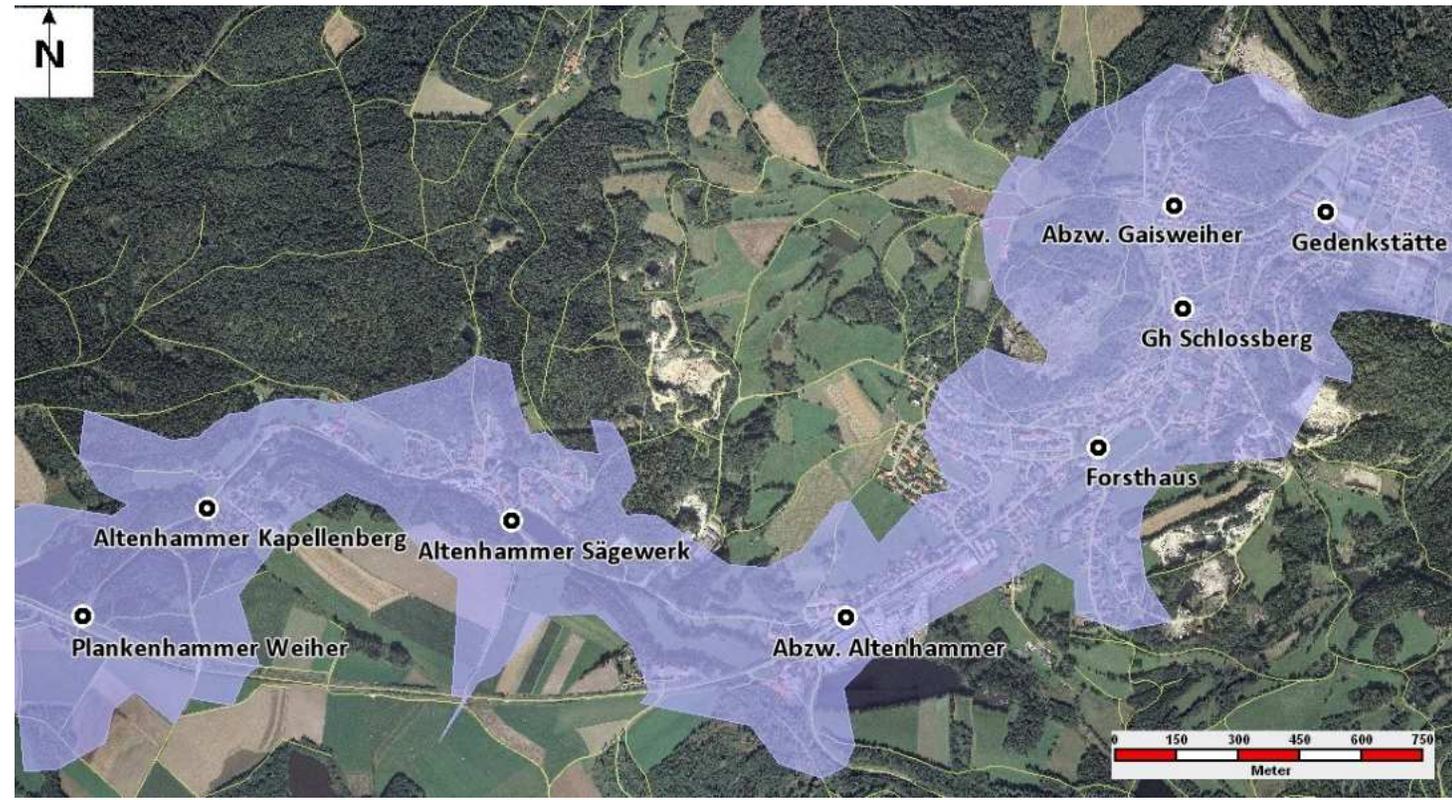


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Indicator: Distances to bus stations

Visualization: isochrones

- bus station
- 500 m or less to the next bus station

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- However, there are several road inclines of five percent or more between bus stops, shopping facilities, and detached houses, which are frequently inhabited by older individuals

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3D Walkability

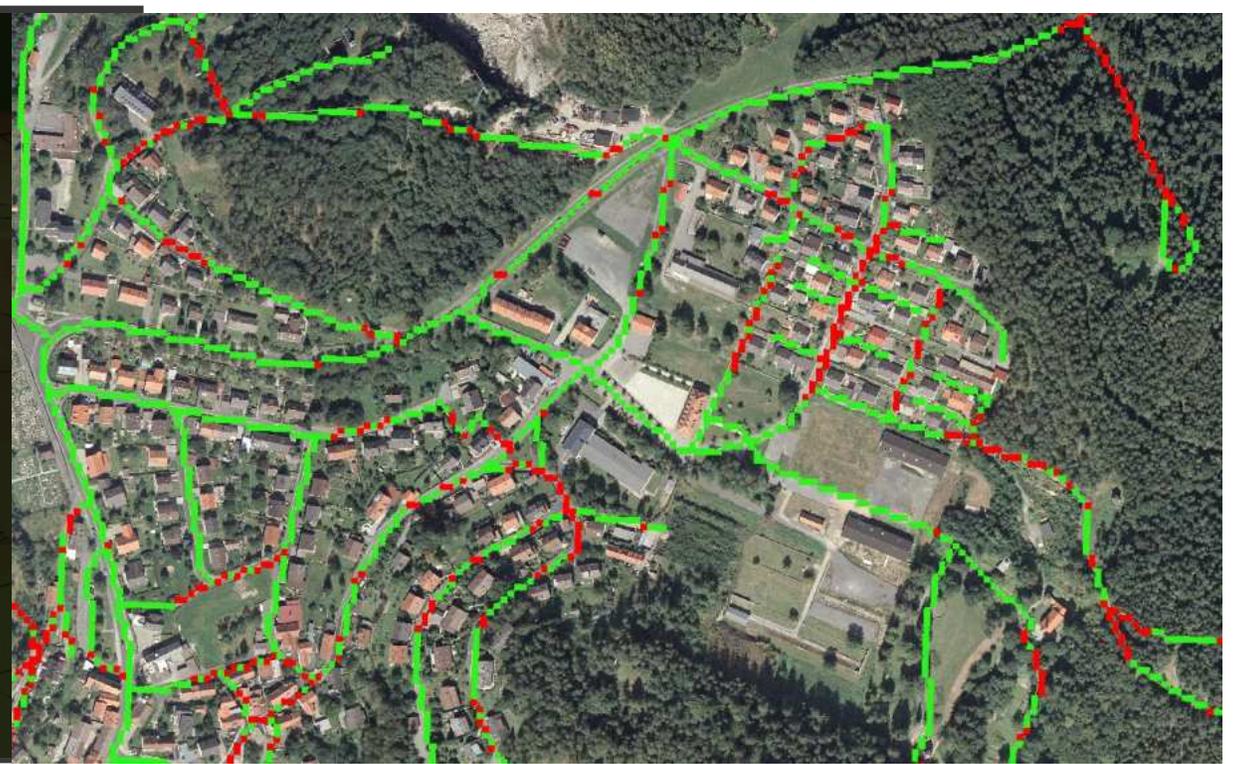
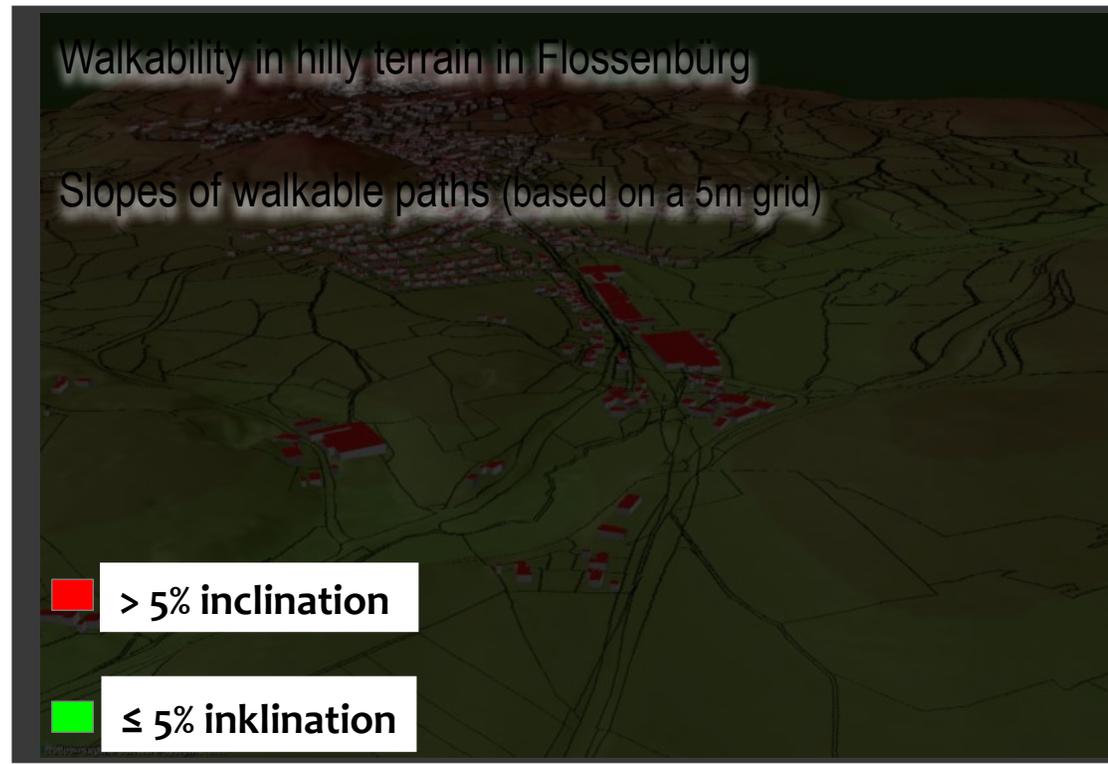




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Conclusion

- The conclusion drawn from the previous considerations is that the establishment of a register-based monitoring system for all SFH areas in a rural district, such as Neustadt an der Waldnaab, and the municipalities comprising it, including, for example, Flossenbürg, is feasible. This is valid from technical, indicator-, and privacy-related perspectives.
- Nonetheless, additionally, it is essential to gain public and stakeholder support and recognition of the benefits of such a system.
- the evolution from analyses to permanent monitoring needs the automation of calculations. A housing market is not limited to one municipality, so regional cooperation is needed (backbone: SDI)
- Urban planning also needs a 3D perspective and a willingness to work on a small scale

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SUSTAINABLE DEVELOPMENT GOALS

Advancing SDG 11: smart cities, communities and regions,
explicitly including a smart countryside and urban-rural linkages

Thank you!



Schaffert, M.; Steensen, T. (2024). Demographic Transition in Aging Neighborhoods: A GIS-Based Analysis from Germany's Countryside, Survey Review

