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Degree of Urban Sprawl in Switzerland

Quantitative analysis 1940-2002 and implications for regional planning

Jochen Jaeger, Chair for Nature and Landscape Protection, ETH Zurich, jochen.jaeger@env.ethz.ch
René Bertiller, dipl. Forstingenieur ETH, Planung und Naturschutz, Zurich, rene.bertiller@bluewin.ch
Christian Schwick, Die Geographen Schwick & Spichtig, Zurich, schwick@hispeed.ch
Felix Kienast, Swiss Federal Research Institute WSL, Birmensdorf, felix.kienast@wsl.ch

How can the degree of urban sprawl in a landscape be measured? What is the degree of urban sprawl in Switzerland today? How quickly has the degree of urban sprawl increased over the last 60 years? What are the current trends? What will the degree of urban sprawl in Switzerland be in the years 2020 and 2050? What are the relationships between urban sprawl and landscape fragmentation due to transportation infrastructure? What are the implications for regional planning in the future? The project provides answers to these questions.

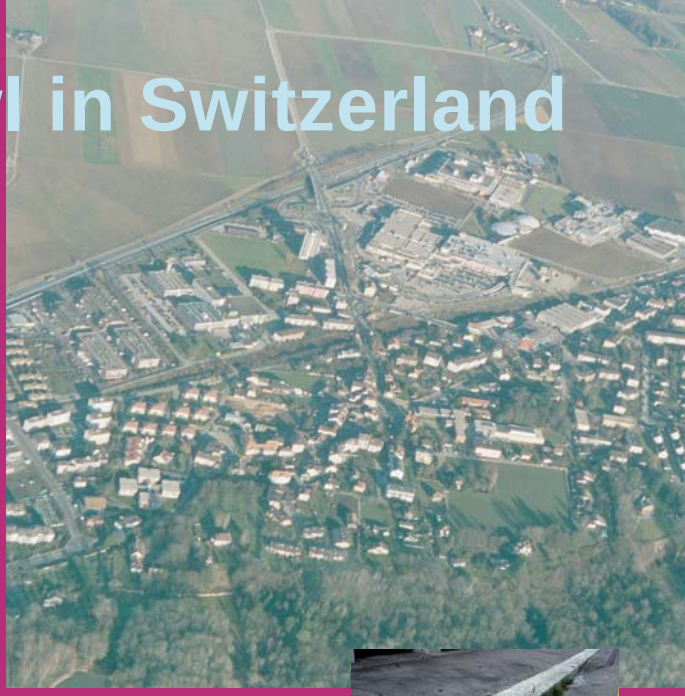

Fig. 1: Many landscapes in the Swiss Lowlands are subject to urban sprawl and to the removal of hedges and trees. Urban sprawl leads to the sealing of the surfaces of soils and to shrinkage and loss of habitats for plants and animals.

Problem

Urban sprawl (dispersed urban development, »*Zersiedelung*«) is problematic not only from a landscape-aesthetic perspective but also from an ecological and economic view: loss of habitats, generation of additional traffic, high costs of infrastructure development. Therefore, data on the state and historic development of the degree of urban sprawl are needed. To this end, a quantitative measure needs to be developed that takes into account the spatial configuration of the settlement areas (not just total amount). In the year 2002, the Swiss Federal Council has declared the objective of stabilizing the current take-up of land of almost 400 m^2 per person at this level. However, this objective does not address the question of the spatial arrangement of the settlement areas.

Research Questions

- How can the degree of urban sprawl be measured (development of a quantitative measure)?
- What is the degree of urban sprawl in Switzerland today?
- How quickly has the degree of urban sprawl increased since 1940 (time series)?
- What differences exist among the various ecoregions, cantons, and districts?
- How will the settlement areas be spatially distributed in the years 2020 and 2050 (see scenarios in Fig. 4)?
- What recommendations for future planning and decision-making can be made?

Project

The project investigates the historical development of urban sprawl in Switzerland since 1940 to 2002 and reveals the prevailing trends for the future development. Based on the results, the project draws conclusions for regional planning and proposes new measures for controlling the future urban development according to the principles of sustainable development.

Benefits of the Project

- Development of a quantitative measure of urban sprawl (not just total amount of the settlement areas)
- Historical analysis of urban sprawl in Switzerland
- Use of the measure as an environmental indicator in the project »Monitoring Sustainable Development in Switzerland« (MONET), regular updates are intended
- Investigation of the relationships between urban sprawl and landscape fragmentation due to transportation infrastructure

Development of a measure for the degree of urban sprawl

1. Development of a clear definition of »urban sprawl« (see definition at the right)
2. Collection of suggestions to measure urban sprawl from the literature
3. Formulation of suitability criteria for a systematic comparison of the various measurement methods
4. Development of a model of urban sprawl (based on the definition)
5. Derivation of a quantitative expression by a formula
6. Examination of all measures (from 2. and 5.) according to the suitability criteria (from 3.)
7. Application of the new formula to examples from reality (see Fig. 2)

Fig. 2: Urban areas (in black) of the three agglomerations Zurich (left), Basel (centre) and Berne (right) within a circle radius of 6 km (all from the year 2000) (Jaeger & Bertiller, in prep.).

Towards a definition of »urban sprawl«:

»*Urban sprawl* is a phenomenon that can be visually perceived in a landscape. The more a landscape is interspersed with buildings the higher its degree of urban sprawl. The degree of urban sprawl denotes both the amount of buildings in a landscape and their dispersion. The more area is built over and the more dispersed the buildings the higher the degree of urban sprawl« (Jaeger et al. in prep.; Fig. 3).

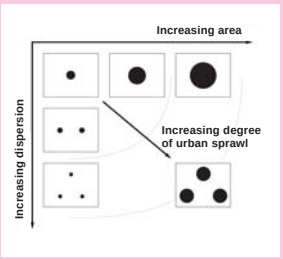

Fig. 3: The degre of urban sprawl increases with increasing area and increasing dispersion of urban development.

The notion »urban sprawl« describes both a state (i.e., the degree of urban sprawl in a landscape) and a process (increasing urban sprawl). The causes and consequences of urban sprawl are distinguished from the notion of »urban sprawl« itself and therefore are not part of the definition.

The causes of urban sprawl include the unsystematic construction of buildings in a landscape, the wish for building homes in the countryside, and the hunt for inexpensive building land.

The consequences of urban sprawl comprise the loss of open spaces and recreational areas, low densities of buildings and inhabitants, the spatial separation of the locations for dwelling and working, and high amounts of commuter traffic.

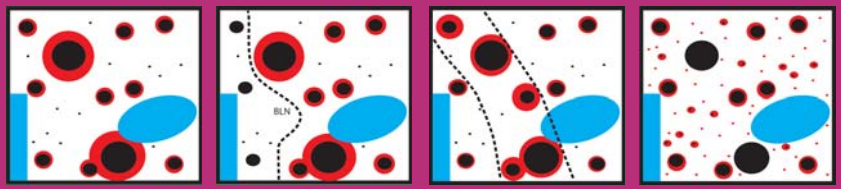

Fig. 4: Four scenarios (out of a total of seven): Shown in black are the existing urban areas, in blue the areas that are unsuitable for development (e.g., lakes and mountains), and in red the future urban development.

Elaboration of scenarios: Scenario ***Urbanisation*** (Fig. 4, at the very left) with 80% of the increase of urban areas at the fringe of the large cities and 20% in small towns. Scenario ***Landscape Protection*** (left) with the same increase of urban areas but permitted only outside of the BLN-areas (BLN = *Bundesinventar der Landschaften und Naturdenkmäler von nationaler Bedeutung* = protected landscapes of national importance). Scenario ***Suburbanisation along Corridors*** (right) with 20% of the increase of urban areas at the fringe of the large cities and 80% in small towns. Scenario ***Extreme Urban Sprawl*** (very right) with 20% of the increase of uban areas in the small towns, 40% next to the existing solitary buildings and 40% built newly all over the landscape. Based on these scenarios, maps of the potential distribution of the settlement areas for the years 2020 and 2050 are produced.

Project Organisation

Research project within the National Research Program NRP 54 »Sustainable Development of the Built Environment«. Time frame: 7/2005 – 12/2006.

National networking: Swiss Federal Office for Spatial Development ARE; Swiss Federal Agency for the Environment, Forests and Landscape BUWAL; Swiss Ornithological Institute Sempach; Swiss Federal Institute for Forest, Snow and Landscape Research WSL.

International networking: Institute for Alpine Environment (EURAC Bozen, Italy); Institute for Landscape Planning and Ecology at the University of Stuttgart, Germany; Geomatics and Landscape Ecology Laboratory at Carleton University, Ottawa, Canada.

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