

Chapter 12

The Salzburg Quality of Urban Life Study with GIS Support

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Introduction

Contemporary studies about quality of urban life (QOUL) outlined and presented in this book usually deal with communities, towns, cities, megacities, or urban regions. As quality of life (QOL) and, more specifically, QOUL, is a subjective, context-dependent, transactional phenomenon, it will show different domain-specific features when – to use Bronfenbrenner’s terminology (1977) – studied in the environment of a social-behavioral micro-, meso- or exo-system. For the meso- or exo-system of a whole urban area, methodology and evaluation will involve highly aggregated data, whereas QOUL analysis on the microlevel of individual households can include phenomena of local geography and small-group sociology. This was the reason why the Salzburg QOUL study which is discussed in this chapter took a bottom-up instead of a top-down approach. It started with a 1-km² test area, and was later widened to include six city districts for purposes of comparison.¹

¹Further details of the Salzburg project are available in Prinz et al. (2007) and Keul et al. (2007a, b).

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Context for the Study

In European research, QOL is a colorful topic. Noll (2004) lists seven main avenues of research related to QOUL, including the EC Eurobarometer, the International Social Survey Program, and the European Values Study. Maderthaner (1995, 1997) expressed methodological caution since QOL and well-being have short- and long-term components that are triggered rationally and emotionally, with heuristics and errors well known in decision theory. In his QOL Atlas for Germany, Korczak (1995) included 44 objective QOL indicators relating to six dimensions. In total, he listed nine QOL dimensions: Environment, welfare, culture, safety, provision, health, leisure, nutrition, and freedom.

As discussed in Chap. 4, the investigation of QOUL can be enhanced by making use of the Geographic Information Systems (GIS) technology, which is already widely used to enhance data in studies of public health (see, for example, Pearce et al. 2006), biology, criminology, political science, and in environmental protection. In environmental psychology, GIS has only been recognized more recently as providing an opportunity to enhance investigations in that field (called “open door” by Golledge 2002), but its use seems to have been limited to studies investigating spatial orientation and environmental cognition. However, in QOUL studies the use of GIS is very recent and is still relatively rare. In a U.S. study of QOUL in the Detroit region, Marans (2003, 2004, 2007) has promoted an interface of unit record based subjective measures of QOUL with GIS-based spatial objective measures of QOL.

In investigating subjective QOL, the various domains that make it up may assume different levels of importance for different people and it has received varying emphasis by researchers in different disciplines. For example, in Austria, housing satisfaction has been studied separately by psychologists, sociologists, economists and geographers, but without GIS support. The latest and biggest QOUL survey studied Linz, Upper Austria (Stadtforschung Linz 2005), with a sample of 21,069 respondents. But it did not geocode the data set so the visualization of results gives no spatial information, which limits the usefulness of the data for city planning and for political purposes.

The study discussed in this chapter evolved in the following way. After a pilot study in Salzburg and Linz in 2004, which involved the questionnaire used in the Detroit region study (referred to above), and following a 2006 visit to the Institute for Social Research at the University of Michigan by the first author, the authors tried to incorporate geo-informatics analysis into their research design and data analysis. GIS research had already created a set of quantitative spatial indicators for the urban area of the Salzburg City Council. A QOUL-GIS project with student interviewers was started in 2006 in the implementation phase of the new Salzburg Spatial Development Concept (Magistrate Salzburg 2007). It followed a bottom-up approach exploring the subjective assessment of QOUL seen by local residents. A project with the Salzburg City Council then commenced in 2007 investigating QOUL in six Salzburg urban districts (Keul 2008).

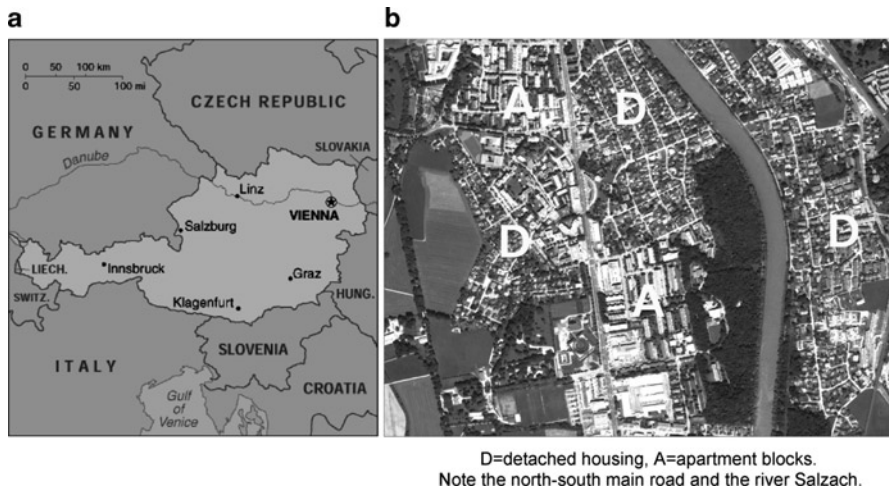


Fig. 12.1 The location of Salzburg in Austria (a), and a satellite image of south east Salzburg (b). *D* detached housing, *A* apartment blocks. Note the north-south main road and the river Salzach (Source: CIA The World Factbook (a) and iSPACE (b))

The Study Area

Austria is situated mostly in the Alpine region of Central Europe (see Fig. 12.1a) and consists of nine Federal Provinces. It has long had a rather constant population of about eight million inhabitants – 16% aged under 15 years, 62% 15–60 years, and 22% 60 years and over. Life expectancy for Austrians born in 2000 was 75 years. The mean net annual income in 2003 for employees was 17,148 Euros (Statistik Austria 2009).

Salzburg City, the capital of the Federal Province of Salzburg, covers 65.6 km² at 424 m altitude. In 2009, it had a population of 149,108 (Magistrate Salzburg 2009), and the population density was 2,273 per km² – which is about half the density of Vienna (the Austrian capital) with 1.7 million inhabitants. Salzburg City has 68,693 households. In Salzburg Province, 30% of the population is single and 30% are two-person-households. In Salzburg City, there are more single households. The mean number of children was 1.1 in 2007 for the Salzburg Federal Province, and 37.3% had no children. Salzburg City residents have fewer children. In 2007, 20.5% foreign citizens lived in Salzburg City. The unemployment rate for Salzburg Province was 6.0% in 2009 (Salzburger Landesregierung 2009). In a consumer survey on household budgets in 2000, it was found that 23.5% of expenditure was used for housing, 15.0% for transportation, 13.2% for food, and 12.3% for leisure (Statistik Austria 2009).

First mentioned in the year 1120, Salzburg is probably Austria's oldest city. Known internationally for its classical composer Wolfgang Amadeus Mozart, the Salzburg Festival, and the scenery of the movie "The Sound of Music," it is organized

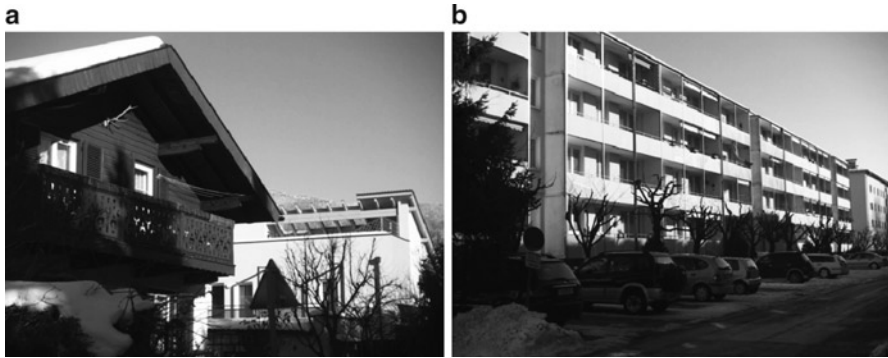


Fig. 12.2 (a) Typical traditional and modern detached housing, and (b) multistory in the Salzburg-South study area (Source: The first author)

in 24 urban districts, some old, some new, such as Liefering which joined the city in the twentieth century (Medicus 2009). The Salzburg outskirts are a mixture of green spaces (wood, meadows), detached housing areas, and apartment blocks.

The study area location in Salzburg-South is shown in Fig. 12.1, and typical examples of housing in the area are illustrated in Fig. 12.2.

Methodology

The study was conducted in two phases:

- (a) The first phase (Study 1) followed a bottom-up research strategy and focused on a 1-km² area in southern Salzburg, representing about 3.6% of the city's population. A random sample design was used for the QOUL survey, and socio-demographic data and spatial indicators should be matched on a micro-system level with local geographical features.
- (b) The second phase (Study 2) continued with the sample survey approach conducted in six districts of Salzburg (out of a total number of 24 city districts), representing one-third of the city's population. But this QOUL survey moved from the micro- to the meso-system, comparing social and spatial features at the district level.

Study 1: QOUL and GIS Analysis

The QOUL-GIS test area situated in Salzburg City is referred to as Salzburg-South, and its center is defined by the map reference N 47°47' E 13°04', east and west of the

southern main road Alpenstrasse. It covers an area of 1 km² (0.386 square miles) and has 100 grid squares of 100 m×100 m. The grid structure is identical with the new GIS system of the Salzburg spatial indicators. Aggregated socio-demographic data (the number of inhabitants, gender, age structure, etc.) and quantitative spatial indicators (including housing structure, child welfare, leisure areas, and greenery) already existed for the grid squares. The total population is 5,307 people. Of the 100 grid squares, 56 have a population density of more 30 inhabitants.

From an address-based master list, a random sample design was used to select dwellings in which interviews were conducted. The survey questionnaire focused on 22 QOUL items mostly derived from the Marans Detroit region QOUL 2001 study (which has been discussed in Chap. 7). That included questions collecting information on the socio-demographic characteristics of respondents (gender, age, profession, education, household size, housing type), and qualitative data on their subjective assessment of QOUL domains. Information on the residential address was later used for geocoding. Fourteen questions collected information relating to the following:

- Years of residence at the address
- Subjective assessment of QOUL
- Public transport quality
- Distance to public transport
- Housing satisfaction
- Food shops and food shop quality
- Use of green space
- Leisure space accessibility
- Neighborhood quality
- Assessment of safety and threats

A 5-point Likert scale was used to collect data on peoples' subjective assessments. In addition, the interviewer rated the quality of the visible residential building on a 5-point scale.

With the address data list and the instructions for the random sampling of dwellings, 293 personal doorstep interviews were conducted, representing a sample of 5.5% of the residential population. Those interviews were conducted in the mild winter of 2006/2007 in 55 ha².

The interview address data were later geocoded, and the QOUL data were analyzed using SPSS as well as a GIS map (a satellite-based orthophotograph).

Methodically, geocoded psychological field data are a relatively new field without traditional rules of scientific data processing. From everyday knowledge it is obvious that people or families living in detached houses will appear as single dots on a GIS map whereas people from a multi-story housing block – although possibly with different QOUL values – occupy almost the same location on the GIS map.

In geocoding spatial positions of QOUL values by local residents (see Fig. 12.6a), multiple occupants of the same geographical position were indicated by the total number of all residents per grid square. A different way of visualizing this might



Fig. 12.3 Position of Salzburg districts, Salzburg-South highlighted (Source: iSPACE)

have been to enlarge the respective position dots. In a next step, QOUL values per resident were transformed into mean grid (hectare) values by dividing the sum of QOUL values through the number of grid (hectare) residents.

The two main (ad hoc) research hypotheses for the QOUL-GIS test were:

- Local QOUL is a transactional product of person *and* environment. Person- and environment-based effects can be distinguished.
- Geocoded QOUL follows environmental “quality gradients” (for example, QOUL has a maximum in high-greenery areas and gets lower with decreasing green environment).

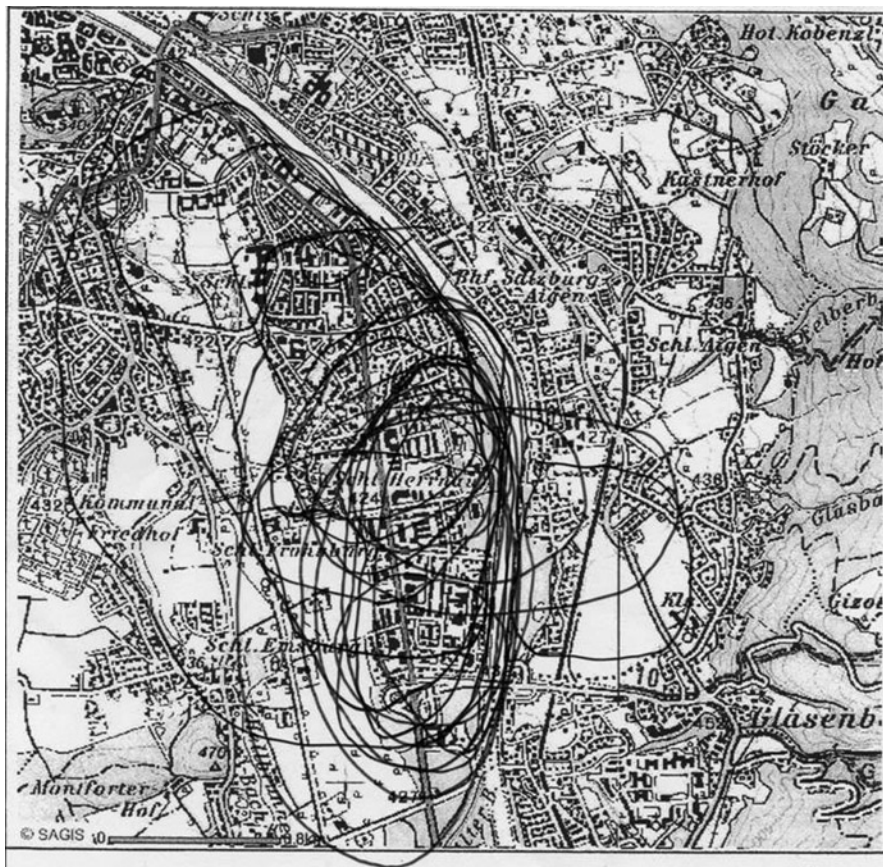


Fig. 12.4 Superimpositions of mental maps of Salzburg-South inhabitants, age 30–50 (Source: First author, result of a 2007 student’s survey; background map SAGIS)

On the official City Council map, the district of Salzburg-South is a compact block along the river Salzach and along the main road Alpenstrasse (see Fig. 12.3). Drawn as a “mental map” (that is, as represented in the heads of its residents), the same area can look quite different to different people and may vary from the spatial objective reality. In a 2004 seminar, students asked 26 inhabitants to draw mental map sketches of their “home area” on an unmarked map of southern Salzburg. The results are shown in Fig. 12.4. The superposition of the individual mental maps does not merge into a well-defined structure, but falls apart into totally different shapes from a line around the whole city quarter to isolated activity islands. A generally accepted “edge” (as in the terminology of Lynch 1960) is the river Salzach. At its western edge, the city district merges into green spaces.

Study 2: QOUL by Districts

In collaboration with the Department of City Planning in the Salzburg City Council, six of 24 Salzburg districts were selected for this phase of the study. The intent was to collect information from a survey approach to potentially support the discussions about the new Salzburg Spatial Development Concept (REK; Magistrate Salzburg 2007). The city districts Gnigl, Gneis, Leopoldskron-Moos, Liefering, Parsch, and Salzburg-South (the latter being familiar from Study 1) are located on the city outskirts to the northwest, northeast, and south. Figure 12.5a shows their positions on a city map, and Fig. 12.5b overlays a GIS hectare cell population density map.

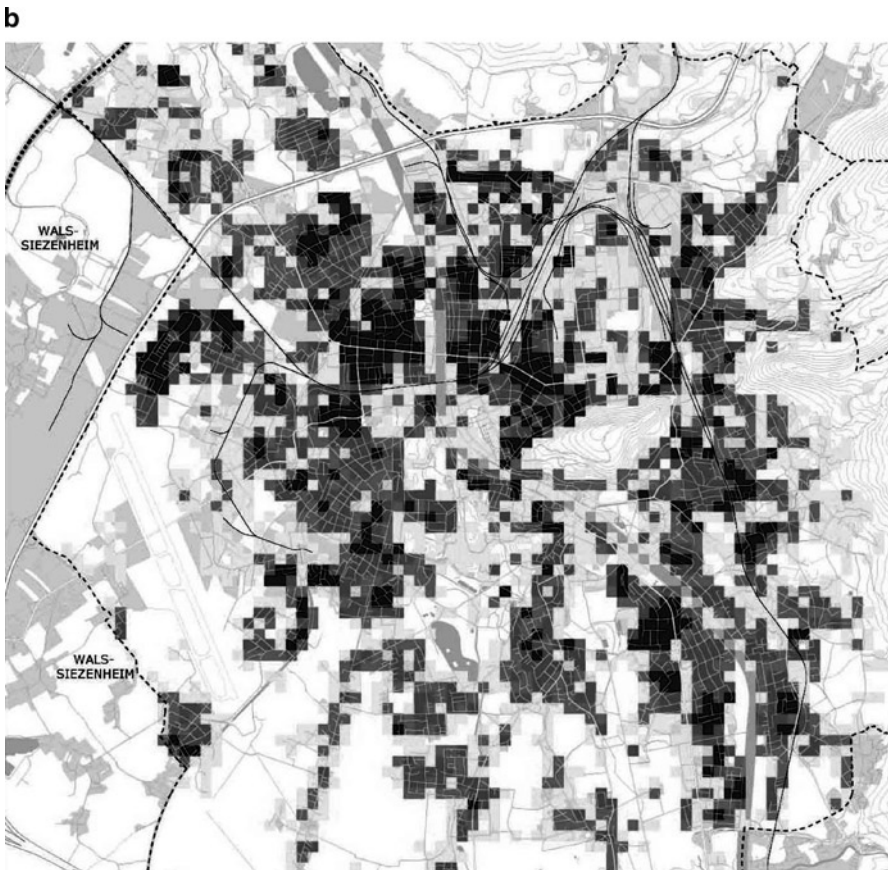


Fig. 12.5 Grid overlay of population density per hectare within Salzburg (Source: iSPACE)

Parts of Gnigl, Liefering, Parsch and Salzburg-South are densely populated, whereas Gneis and Leopoldskron are not. As “new” districts from the historical point of view, the social borderlines of the six city districts are not so pronounced as those of the old Salzburg city center.

To compare local QOUL and its domains and characteristics in the six different areas, a questionnaire was compiled, pre-tested and delivered by interviewers face-to-face with respondents. For the sampling, no address-based master list was used but interviewers were instructed to select inhabitants of single houses in a street or of tenants in multi-story housing according to a random number list. A sample of 372 was thus selected and the questionnaires were administered in late 2007. For an area with a total population of about 49,000 inhabitants (33% of the city of Salzburg population) this represents a 0.75% sample.

The questionnaire gathered the following information:

- Address of survey respondent for geocoding
- Eleven socio-demographic variables (gender, age, education, profession, household size, number of children, family status, housing square meters, housing type, birthplace location, and residence time in district)
- A sketch of the subjective outline of the home district on an unmarked Salzburg 1:50,000 SAGIS map
- Four qualitative variables (benefits/drawbacks of life in the district, elements of the district center, cultural events/supply)
- Fifty-seven quantitative variables, each on a 5-point Likert scale (personal selection of district or not; modal mix of personal mobility walking/bicycle/public traffic/car; 6 on overall district quality; 3 on image, 9 on social issues; 2 on social infrastructure; 2 on social plus culture; 5 on quality for children/youth; 2 on quality for old people; 6 on environment; 4 on infrastructure - for example, shopping-; 2 on culture; 1 on future of district; 5 on place attachment; 5 on meeting points)

This gives a total of 74 items/variables on the respective city district.

The three (ad hoc) research hypotheses/propositions to be tested were:

- Mean Salzburg QOUL values, when different for the six city districts (as defined by the City Council), follow objective geographical differences (such as maximum building density).
- QOUL in the six Salzburg city districts studied is a combination of image (e.g. safety) and behavioral components (e.g., leisure quality) which can be distinguished.
- Variables of statistical influence on mean district QUOL are person- and environment-based and may be analyzed separately.

Results for Study 1: QOUL and GIS Analysis

On the small scale of Study 1, a test field of 1 km², QOUL phenomena can be shown in fine grain within hectare cells of 100×100 m. With the aid of GIS, the transactions environment-QOUL were visualized as being changes in building density, green spaces, and infrastructure.

Mean Scores for QOUL

Figure 12.6a shows the locations of the 293 field interviews geocoded onto the iSPACE GIS map. A mean QOUL value was computed for every grid hectare square (100×100 m). Fifty five grid squares with a population over 30 inhabitants were sampled.

On the 5-point Likert scale, the resulting QOUL values have a left-skewed distribution between 1.0 and 4.0. Thirty six squares are QOUL 1<2, 17 are 2<3, and 2 are 3–4. In Fig. 12.6b, all QOUL hectare areas are marked with white dots and are coded as follows:

- “+” represents a mean QOUL value of 1.0
- “O” represents a QOUL value between 1.1 and 1.9
- “-” represents a mean QOUL value between 2.0 and 4.0
- The lowest QOUL between 2.5 and 4.0 is indicated with “- -.”

Nine squares have top QOUL (1.0) ratings; 27 squares have an average QOUL rating (1.1–1.9); and 19 squares have a reduced QOUL rating (2.0–4.0). Of the latter, five squares have the lowest QOUL rating (2.5–4.0). The minimum rated QOUL square (mean 4.0) is in the left hand upper corner. Low and highest rated QOL hectare cells are clustered irregularly.

Variations in QOUL Mean Scores

It was found that there are QOUL differences related to type of housing and to some environmental factors. The following is evident from the QOUL mean scores:

- (a) There is no QOUL gradient from negative to positive away from the main road Alpenstrasse which intersects the area almost vertically down the middle.
- (b) Apartment houses have a tendency to have a more negative QOUL and detached houses a more positive QOUL, but with some exceptions. A negative QOUL square with a mean of 3.0 is found in a green detached housing area east of Alpenstrasse, and the most negative square (4.0) is a low-rise apartment housing, not high-rise blocks.

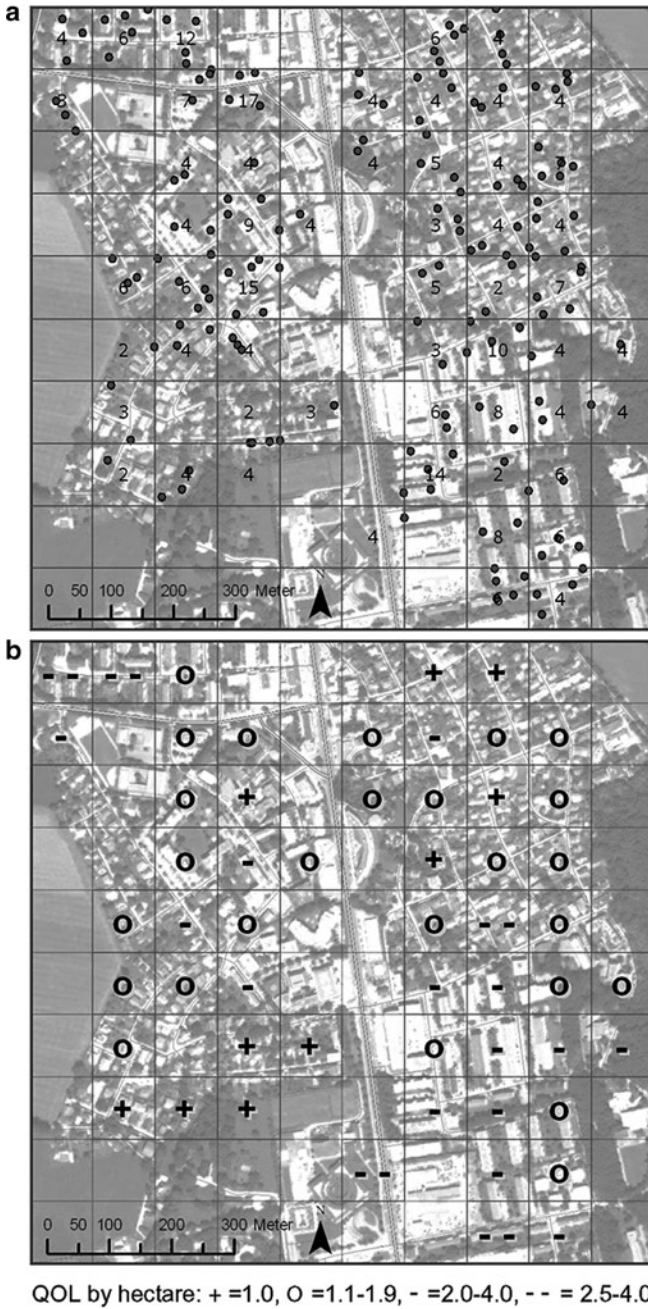


Fig. 12.6 (a) Location of QOUL interviews in Salzburg-South; and (b) the mean scores on QOUL for *grid squares* (QOL by hectare: + =1.0, O =1.1-1.9, - =2.0-4.0, -- =2.5-4.0; Source: The authors; aerial map by iSPACE)

- (c) A GIS overlap (not reproduced here) of geocoded satisfaction with the green environment versus percent of categorized green space per hectare does not show a gradient of rising dissatisfaction from “garden landscape” towards the main, treeless road.

As a consequence, subjective QOUL seems to be a function of more than geography, not only reflecting the actual (static) spatial situation, but also the (dynamic) time-aggregated experiences with the surrounding housing landscape. In a housing quality map of a real estate agent, you will find a quality gradient from positive to negative when approaching a main road and proportional to the local greenery. In the subjective QOUL of the resident, the distinctions are not so pronounced and the resulting values are – like housing satisfaction – rather a compromise product of cognitive dissonance than a product of sharp local quality analysis.

Using Correlation Analysis to Explore Relationships Between Assessed QOUL and Environmental and Person Factors

The relationships between spatial QOUL mean scores and environmental and personal characteristics were analyzed using the non-parametric correlation analysis (Kendall's t). That revealed further interrelations, including the following:

- (a) For respondent ratings of their satisfaction with six factors – housing, food shops, greenery, leisure, neighbors and safety, four of the ratings – housing ($\tau=+0.314$), greenery ($\tau=+0.310$), neighbors ($\tau=+0.307$), and safety ($\tau=+0.193$) – correlate positively and highly with the general QOUL rating, whereas leisure quality and food shops do not.
- (b) There were positive correlations between greenery and leisure satisfaction ($\tau=+0.427$), and between neighbors and safety ($\tau=+0.232$).
- (c) Housing satisfaction significantly increases with dwelling duration ($\tau=+0.235$) and age ($\tau=+0.279$) – a reflection of rootedness to the local community – and is inversely related to the distance to public transport ($\tau=-0.214$).
- (d) Population density is relevant for QOUL. Hectare cell QOUL mean scores correlate positively with the number of inhabitants ($\tau=+0.280$, $p<.006$). Different housing types have a different population density, and high-density multistory housing needs a compensatory leisure environment for a good QOUL.
- (e) Significant correlations were found for some person-based characteristics. This was the case for gender ($\tau=-0.141$, $p<.012$) – that is, women assessed QOUL to be higher than did men – and for age ($\tau=-142$, $p<.002$) – that is, older people assessed QOUL to be higher.

Thus, QOUL in Salzburg-South is clearly both person- and environment-based.

Also, environmental esthetics play a role. A Likert scale value for shabby/well-kept buildings (coded by the interviewers) correlates positively with inhabitant-reported QOUL ($\tau=+0.335, p<.000$).

Hypotheses Tested

Summing up, for the Salzburg QOUL Study 1, the two research hypotheses have been tested with the following results:

- (a) Local QOUL is a product of person-based *and* environment-based effects that can be identified/analyzed independently. This proposition was found to be *true* as both gender and age are significant, as are housing, greenery, population density.
- (b) Geocoded QOUL follows environmental “quality gradients” – for example, QOUL has a maximum rating in high-greenery areas and gets a lower rating with a decreasing green environment. This proposition was found to be *false*, and such a simple relation is not present as QOUL is a function of more than geography.

Results for Study 2: QOUL by Districts

As a first step, in Study 2, the QOUL data and the 74 socio-demographic and district-related image and behavior variables were statistically evaluated using the SPSS package. Some means, percentages and nonparametric correlation results are shown in Tables 12.1–12.3 for the six city districts.

QOUL, Socio-Demography and Housing

Table 12.1 shows that city district QOUL mean scores on the Likert scale varied from between 1.24 in the Gneis district to 1.81 in the Salzburg-South district. For comparison, the results of the test area in Salzburg-South (project 1) were also put into Table 12.1.

The results indicated the following:

- (a) Participant mean age and age ranges do not show large differences for the six city districts.
- (b) High QOUL/housing satisfaction and percentages of people born in Salzburg City do not match. Only Salzburg-South, the lowest-rated-QOUL and housing satisfied district, has the lowest local birth rate.

Table 12.1 QOUL, socio-demography and housing for six Salzburg city districts

Criteria/measure	Gneis	Leopoldskron-Moos	Liefering	Gnigl	Parsch	Salzburg-South	GIS area Sbg-South
District population	6,500	2,500	14,500	6,500	10,000	11,000	11,000
Sample size <i>n</i> =	50	50	75	50	73	74	293
QOUL mean	1.24	1.48	1.56	1.58	1.71	1.81	1.69
QOUL sd	0.45	0.71	0.76	0.76	0.74	0.80	0.80
HS mean	1.22	1.58	1.35	1.50	1.49	1.76	1.69
HS sd	0.42	0.76	0.60	0.77	0.73	0.92	0.80
Age years	18–87	21–74	20–82	20–84	20–87	20–84	14–88
Mean age	45.5	41.0	48.6	50.4	48.0	41.8	47.7
Born Salzburg-city	46%	36%	50%	46%	36%	16%	–
HH no children	80%	84%	58%	64%	79%	88%	73%
Mean square meter	83.6	82.4	96.0	89.2	76.0	68.2	–
Residence mean	16.0 years	12.5 years	25.1 years	24.6 years	17.7 years	11.7 years	15.5 years
Residence range	1–60	1–35	1–70	1–84	1–48	1–45	1–67
Detached housing	10%	12%	35%	24%	6%	3%	21%
Apartment blocks	76%	60%	35%	52%	82%	85%	62%
Max. building density ^a	1.1	0.5	> 1.1	1.1	> 1.1	> 1.1	> 1.1

Source: First author, 2007 students' project

sd standard deviation, *HS* housing satisfaction, *HH* household^aGFZ values from REK 2007, Salzburg City Council

Table 12.2 QOUL and residential image/behavior variables for six Salzburg city districts

Criteria/measure	Gneis	Leopolds- kron-Moos	Liefering	Gnigl	Parsch	Salzburg- South	GIS area Sbg-S
Sample size n=	50	50	75	50	73	74	293
QOUL mean score	1.24	1.48	1.56	1.58	1.71	1.81	1.69
District self-selected	56%	42%	28%	46%	44%	45%	–
District has center	48%	42%	72%	56%	51%	52%	–
Bike use	56%	30%	52%	54%	36%	41%	–
Car use	42%	54%	49%	42%	47%	32%	–
Very friendly	52%	56%	68%	62%	38%	34%	–
Very green	67%	78%	56%	49%	36%	34%	1.3 ^a
Very safe	48%	71%	49%	48%	23%	30%	1.7 ^a
Very good leisure	27%	20%	24%	20%	8%	12%	1.2 ^a
Very good for kids	52%	54%	62%	48%	30%	25%	–
Very good shopping	12%	18%	60%	24%	41%	47%	1.5 ^a
Social problems	25%	12%	32%	30%	80%	73%	–
Very positive development	25%	17%	48%	33%	16%	15%	–
District a part of the city	20%	42%	77%	62%	51%	55%	–

Source: First author, 2007 students' project

^aScale 1–5

Table 12.3 QOUL interrelations (non-parametric correlations, Kendall's τ) for six city districts

Criteria	Gneis	Leopolds- kron-Moos	Liefering	Gnigl	Parsch	Salzburg- South	GIS area Sbg-South
Sample size n=	50	50	75	50	73	74	293
QOUL mean score	1.24	1.48	1.56	1.58	1.71	1.81	1.69
Feeling at home	.001	.000	.000	.000	.005	.000	–
Housing satisfaction	.002	.000	.008	.000	.012	.000	.000
Friendly district	n.s.	.000	n.s.	.001	.000	.002	–
Green district	n.s.	.000	.000	n.s.	n.s.	n.s.	.000
Safe district	.002	n.s.	n.s.	n.s.	n.s.	n.s.	.000
Good leisure quality	.001	.000	n.s.	n.s.	n.s.	n.s.	.011
Good for old people	n.s.	.000	.000	.002	n.s.	n.s.	–
Good neighbors	n.s.	.000	.000	n.s.	n.s.	n.s.	.000
Gender	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.012 ^a
Age	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.002 ^b
Building quality rating	–	–	–	–	–	–	.000

Source: First author, 2007 students' project

^aQOL higher for female residents

^bQOL higher for older people

- (c) Mean housing floor spaces are higher in districts with higher QOUL means and smaller in the two districts with lower QOUL means.
- (d) The length of residence and the percentage of detached houses show no relation with QOUL.
- (e) Apartment blocks were more frequent (over 80%) in the lower rated QOUL districts.
- (f) Maximum building density (measured as GFZ, which is the sum of built space for every story divided through the ground space of the site) also shows no simple relation, however, for two of the three highest-GFZ districts, mean QOUL was lowest.

QOUL and Residential Image/Behavior Variables

Table 12.2 shows the mean QOUL ratings and several residential image/behavior variables for the six districts under study.

The results showed the following:

- (a) Gneis, the district with the highest QOUL mean score, self-selected as their homeplace by 56% of the survey respondents, had 56% bike use, and was rated “very good for leisure” by 27%.
- (b) Other image variables – district center, friendly, green, safe, good for kids/shopping, social problems, very positive development, part of the city – were not the highest at Gneis.
- (c) Gneis had the lowest mean percent values for good shopping and being part of the city.
- (d) Nevertheless, Salzburg-South, the district with the lowest QOUL mean score, is also assessed lowest for being friendly, green, good for children, and very positive development.

QOUL Interrelations

Non-parametric correlations (Kendall’s τ) were run to test whether QOUL is statistically related in all six districts to main image and socio-demographic variables. Results are listed in Table 12.3.

Interpretations of the results are as follows:

- (a) It becomes obvious that –when comparing district QOUL rating mean scores– feeling at home and housing satisfaction are the only key factors in relation to QOUL, as they correlate highly with QOUL in all six city districts.
- (b) Other important image items (friendly, green, safe, leisure, for old people, neighbors) interrelate with QOUL only in some or few districts, not in all six.

- (c) For the six districts with their sample sizes of 50–75, gender and age do not correlate with QOUL, but for the GIS grid test area and its big sample of 293, they do.
- (d) The interviewer-coded assessment of building quality (which was only collected in the Salzburg-South GIS grid test area) also correlates with the QOUL values.

The highly significant correlations (Kendall's τ) for the mean score ratings of QOUL for the six districts the following image items were found to be significant:

- (a) *Gneis district*: safe, safe at night, leisure, knowing people, getting news quickly
- (b) *Leopoldskron district*: friendly, green, leisure, church, for children, environment, beautiful, for old people, neighbors
- (c) *Liefering district*: positive development, for old people, finding ones way in the district, neighbors, green
- (d) *Gnigl district*: friendly, good environment, parks, walking, beautiful, for old people
- (e) *Parsch district*: friendly, for children/youth, beautiful
- (f) *Salzburg-South district*: friendly, church, positive development, beautiful

Hypotheses Tested

Summing up the Salzburg QOUL project 2, the three research hypotheses have been tested with the following results:

- (a) QOUL rating mean values for six different districts in Salzburg follow objective geographical differences (such as maximum building density). This proposition is shown to be *false*. For the meso-systems of the districts, no geographical relations were noticeable.
- (b) The six Salzburg districts show different image and behavior components resulting in different QOUL ratings. This proposition is shown to be *partly true and partly false*. Feeling at home and housing satisfaction is related to QOUL rating in all six districts (*false*). QOUL shows no general (that is, is present in all six districts) relation to other image and behavior variables (*true*).
- (c) Variables of statistical influence on district QOUL rating means are person-based *and* environment-based and may be identified/analyzed separately. This proposition is shown to be *false*.

Conclusion

Contemporary spatial planning faces the challenge of simultaneously taking account of ecological, social and economic issues in the planning process. QOUL needs to be tested and spatial development should meet sustainability criteria. Socially

responsible urban planning requires a feedback on environmental and infrastructural resources, and this may be enhanced through having access to subjective QOUL data collected from local populations.

What makes up housing areas with a high QOUL? What are the right infrastructure decisions to enhance QOUL? These are important questions. Public discussions on housing and residential quality and on residents' subjective evaluations of QOUL typically run on a number of levels (citizens, planners, politicians, etc.), and are characterized by different interests and languages.

In Salzburg City in Austria, an evaluating GIS tool has already been designed and tested in conjunction with the City Council. It uses a set of quantitative spatial indicators operated by methods of Applied Geo-informatics. This indicator set has been matched in Study 1 reported in this chapter with qualitative data collected through a sample survey of 293 geocoded respondents interviewed as part of a local QOUL survey in the same grid (that is, in high resolution). The QOUL spatial indicator set used at Salzburg City – in an analogy with the Detroit Area Study conducted by Marans (see Chap. 7) – contained variables of basic everyday life value like play areas, public transport, green leisure areas, shops, among and others. Also, QOUL and its constituent domains have been tested, but not geocoded, in six different Salzburg districts in Study 2. With 46 district image items and 15 district knowledge/familiarity/transport items, the 372 field interviews tested local QOUL using a total of 61 variables.

From the two studies involving 665 field interviews with Salzburg residents collected by 25 trained psychology students for their seminar work, the following conclusions can be drawn:

- (a) In a GIS fine grain analysis of Salzburg-South, the rating of local QOUL revealed a close relationship with population density and housing type (detached house versus apartment blocks). However, no spatial interrelations with “good” versus “bad” environmental conditions (green areas versus main road) were found. QOUL reflects aggregated experiences with the landscape and its resources, and, like housing satisfaction, seems to depend on the personal level of expectation and habituation.
- (b) Variations in the rating of QOUL in the areas of Salzburg that were studied are both person- and environment-based. Housing satisfaction, greenery, neighbors, and safety influence QOUL rating, as do the gender and age of the survey respondents.
- (c) In a comparison of local QOUL rating in six Salzburg outer districts, QOUL mean scores were closely correlated with housing satisfaction and with “feeling at home,” but not with other important image and behavior items.

For the user-oriented evaluation of local residential attraction, the combination of different indicators is important. One research possibility is a top-down approach; that is, an expert-rating of the overall importance of singular indicators. A bottom-up approach looks more promising as local residents have to express subjective QOUL using different aspects of residential quality. This is an innovative view of

the city through the eyes of local inhabitants as true location experts and it is able to improve the diagnostic value of top-down GIS spatial indicator systems. The full potential of the comparative use of spatial indicators from geo-informatics and QOUL rating has yet to be unfolded, and synergies with other fields – like urban ecology bio-indicators – have only been pointed out in discussions. In a century of online citizen participation, sustainable planning goals and sophisticated data mining, the investigation of QOUL must incorporate GIS technology to merge environmental and health psychology with the research on urban well-being (Keul 1995). Evaluating subjective QOUL and overlapping it with GIS QOUL indicators is of vital political interest as Guideline 5 of the Salzburg Spatial Development Concept (Magistrate Salzburg 2007) demonstrates, the aim of all urban planning actions is the promotion of overall quality of life. The manifold urban functions are to be further developed and improved.

Future Work

During the planning time of the QOUL book project, geocoding of the 2007 Study 2 data set was realized in cooperation with iSPACE Salzburg. Compared with the Study 1 km² and its 293 data points, the six Study 2 test spaces were each of about the same general size, but only filled with 50–70 data points (i.e. population samples of 0.5–2.0%). With the smaller population samples, in some districts (Leopoldskron-Moos, Gneis, and Parsch) there were not enough hectare cells left for a statistical evaluation. In the best GIS sample at district Gnigl, 26 of 65 population hectare cells with population size over 10 per hectare showed a non-significant correlation (Kendall's $\tau = -.145, p < .430$) of QOUL with population density, contrary to Study 1. What has to be concluded from this is not the invalidity of Study 1 findings but the inability to replicate a fine-grain sample phenomenon (293 data points per km²) with a coarse-grained sample. In future QOUL studies, close attention has to be paid to the spatial data density.

Fine-grain micro-system (Bronfenbrenner) surveys demand plenty of field working time and energy, similar to Roger Barker's *behavior setting* approach (1968), and it is economically unlikely that they will be realized very often outside academic testing grounds. Nevertheless, a system theory perspective of environmental psychology asks the researcher to keep in mind that phenomena unfolding through empirical field research will always depend on the complexity level of the system studied – which is different for a street, a city district, a whole city and geographical units beyond that. As in social networks theory, more complex systems are governed by other rules as simpler systems. Realizing this will help to use QOUL as a calibrated tool for innovative social research.

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