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Legal Perspectives on New Urban Quarters in Germany: Living the Dream of the Compact City? Exploring the legal framework and planning policies for high-density developments in practice

Perspectivas Jurídicas sobre Novos Bairros Urbanos na Alemanha: Vivendo o Sonho da Cidade Compacta? Explorando a estrutura jurídica e as políticas de planejamento para empreendimentos de alta densidade na prática

Perspectivas Legales sobre Nuevos Barrios Urbanos en Alemania: ¿Viviendo el Sueño de la Ciudad Compacta? Explorando el marco legal y las políticas de planificación para desarrollos de alta densidad en la práctica

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Abstract

The 'leitmotif' of the compact city has become a widely embraced template for sustainable urban development. Particularly infill and redevelopment areas, as well as many planned new settlements, have been built following the planning principles of urban compaction. Numerous positive effects are attributed to high-density settlements such as more efficient use of infrastructure and less reliance on automobile travel. Planning law and policies, in Germany as well as other countries around the world, regularly strive to advance high-density developments, but it is by no means clear whether the prescribed densities in planning policies actually lead to vibrant and healthy places which fulfill the expectations of their inhabitants with regards to their quality of life. The study aims to analyze the relation between binding land-use plans in Germany and individual perceptions of urban density through a case study-based survey. This paper contributes to providing new information on achieving compact urban form and quality of life in new urban quarters by analyzing the change of densities over the past three decades in 'large' urban developments across Germany, by an in-depth assessment of planned and built densities within an archetypal urban extension and finally by contrasting these 'objective' figures and findings with the 'subjective' feelings of inhabitants. For sources of information, this paper draws from literature, surveys and empirical analyses as well as desktop-studies.

Keywords: urban density; planning law; planning policy; quality of life; land-use; brownfield development

Resumo

O "leitmotiv" da cidade compacta tornou-se um modelo amplamente aceito para o desenvolvimento urbano sustentável. Áreas de preenchimento e reurbanização, bem como muitos novos assentamentos planejados, foram construídos seguindo os princípios de planejamento da compactação urbana. Atribuem-se numerosos efeitos positivos aos assentamentos de alta densidade, como o uso mais eficiente da infraestrutura e menor dependência do automóvel. A legislação e as políticas de planejamento, tanto na Alemanha quanto em outros países ao redor do mundo, buscam, regularmente, promover desenvolvimentos de alta densidade, no entanto não está de modo algum claro se as densidades prescritas nas políticas de planejamento realmente conduzem a lugares vibrantes e saudáveis que atendam às expectativas de seus habitantes em relação à qualidade de vida. Desse modo, o estudo visa analisar a relação entre os planos de uso do solo vinculante na Alemanha e as percepções individuais da densidade urbana através de uma pesquisa baseada em estudo de caso. Este artigo contribui para fornecer novas informações sobre como alcançar uma forma urbana compacta e qualidade de vida em novos bairros urbanos, analisando a mudança das densidades ao longo das últimas três décadas em grandes

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desenvolvimentos urbanos na Alemanha, através de uma avaliação aprofundada das densidades planejadas e construídas dentro de uma extensão urbana arquetípica e, finalmente, contrastando esses números e descobertas, bem como "objetivos" com os sentimentos "subjetivos" dos habitantes. Para fontes de informação, este artigo se baseia em literatura, pesquisas e análises empíricas, bem como em estudos de gabinete.

***Palavras-chave**: densidade urbana; legislação de planejamento; política de planejamento; qualidade de vida; uso do solo; desenvolvimento de áreas contaminadas.*

Resumen

El 'leitmotiv' de la ciudad compacta se ha convertido en un modelo ampliamente aceptado para el desarrollo urbano sostenible. En particular, las áreas de relleno y reurbanización, así como muchos nuevos asentamientos planificados, se han construido siguiendo los principios de planificación de la compactación urbana. Se atribuyen numerosos efectos positivos a los asentamientos de alta densidad, como un uso más eficiente de la infraestructura y una menor dependencia del automóvil. Las leyes y políticas de planificación, tanto en Alemania como en otros países del mundo, buscan regularmente promover desarrollos de alta densidad, pero de ninguna manera está claro si las densidades prescritas en las políticas de planificación realmente conducen a lugares vibrantes y saludables que cumplan con las expectativas de sus habitantes en cuanto a su calidad de vida. El estudio tiene como objetivo analizar la relación entre los planes de uso del suelo vinculantes en Alemania y las percepciones individuales de la densidad urbana a través de una encuesta basada en estudios de caso. Este artículo contribuye a proporcionar nueva información sobre cómo lograr una forma urbana compacta y calidad de vida en nuevos barrios urbanos, analizando el cambio de densidades en las últimas tres décadas en grandes desarrollos urbanos en Alemania, mediante una evaluación exhaustiva de las densidades planificadas y construidas dentro de una extensión urbana arquetípica y, finalmente, contrastando estas cifras y hallazgos 'objetivos' con los sentimientos 'subjetivos' de los habitantes. Para las fuentes de información, este artículo se basa en literatura, encuestas y análisis empíricos, así como en estudios de escritorio.

***Palavras clave:** densidad urbana; legislación de planificación; política de planificación; calidad de vida; uso del suelo; desarrollo de terrenos baldíos.*

1 The compact city – potential positive effects and problems

Literature suggests that higher urban densities are linked to many positive effects. Among the advantages identified are economic, environmental and social benefits.

Direct economic benefits regarding dwelling costs and costs of living: Amongst other things the reduced land take required per dwelling unit offers economic benefits. In this context, a high number of dwelling units can reduce the cost of buying or renting considerably, as the proportion of the land cost, which is part of the total cost of a building, is reduced when more dwelling units – respectively their owners or tenants - share the cost of land (BBSR, 2018b; Weeber, Fritz, 2013). These effects are particularly prominent in areas of high development pressure and buoyant real estate markets, typical examples being Berlin, Munich or Stuttgart in Germany.

Efficient services and infrastructure provision: High building densities allow efficient road layouts and access as well as economical construction and maintenance of technical infrastructure such as sewers and other line-based infrastructure. This can also contribute to considerable cost reductions per dwelling – but also generate long term economic savings for local authorities.

The environmental impact of developments with a smaller footprint per dwelling offers potential in terms of both providing open space within developed areas and preserving natural areas, specifically on the urban fringe which otherwise may suffer from more urban sprawl (McDonald et al, 2023).

Further to this point, areas with high population densities allow efficient supply of goods as well as services. In fact, public transport systems such as trams, light rail and commuter rail are most viable in such areas (Mitter, 2011). Combined with mixed use developments, high densities can also help to increase the "walkability" or "bikeability" of neighbourhoods and to reduce the motorized traffic within these areas, and hence minimize the use of fossil fuels in transportation (Feldtkeller, 1998; Hall, 2014).

Last but not least, potential social benefits can be reaped. The provision of social infrastructure – just like transportation - is generally more efficient in a centralised or polycentric format in areas with high population densities. Additionally, the combination of density and accessibility leads to an increase in amenities and possible leisure activities as well as more opportunities for social interactions (Pfeilschifter, 2021).

A mixture of these positive effects, which are characterized by numerous interdependencies, may contribute to the highly desired sense of urbanity and vibrancy, offering an interesting as well as liveable urban environment (Verband Region Stuttgart, 2018).

Drawbacks to high urban densities: There appear to be, however, several conflicts which may arise from high urban densities. For example, 'town cramming' should be categorically avoided (BBSR, 2017; Burton, Jenks, Williams, 1996). Additionally, the (personal) perception and acceptance of urban density varies hugely. In this context, questions about human scale, the quality of public and private open space provision and sufficient privacy have to be answered (Ganser, 2012; Adams, Watkins, 2002).

In some instances, there may also be a negative correlation between population density and urban green spaces. Besides, there are competing trade-offs between the benefits of density for sustainability on the macro / city wide scale and the benefits of nature for human well-being at the micro scale / neighbourhood level (McDonald, 2023). Regarding the effects of climate change, it is also important to note, that the increased frequency and intensity of heavy rainfall events has to be considered when planning for high urban densities, as particularly impervious coverage (of soil) and the open space ratio have a significant impact on surface runoff volumes in micro-watersheds (Ganser, 2023; Wijayawardana, 2023).

Research also indicates that sustainable lifestyles cannot be taken for granted as a quasi-automatic response to living in an urban quarter, which was planned adhering to sustainability principles (Williams, Dair, 2007). To the contrary, rebound effects are conceivable, if the inhabitants strive to compensate perceived deficits in the urban quarter with unsustainable behaviour – e.g. frequent car trips to destinations with open landscape, in order to escape from an urban structure offering insufficient sanctuaries for everyday retreat and relaxation.

Further to this point, the height of and distance between buildings can have significant influence on the potential active or passive use of solar energy. This includes the future installation or retrofitting of solar panels on roofs and facades.

In summary: building density, positioning of structures as well as orientation of buildings will therefore be decisive factors for the long-term flexibility and sustainability of urban areas – predominantly in the context of climate change. Consequently, getting to know the objective parameters but also the individual perceptions of urban density appear to be of particular importance, in order to avoid negative impacts on the one hand and maximise potential synergies on the other.

2 The basic role of planning law - with a focus on the German legal system

In addition to technical, design related and subjective issues, planning law and statutory planning documents play an important role for the realization of high-density developments (BBSR, 2018a).

In Germany, and many other countries, there is a general presumption that making effective and efficient use of land is a crucial element of the wider sustainability agenda. Under this premise overarching planning objectives to limit greenfield development on the one hand and support urban (re)development within existing urban areas - preferably on suitable previously used land – on the other, are embedded as basic principles in planning law (section 1a of the Federal Building Act).

At the same time, there is a shortage of housing, particularly of affordable homes, in prosperous city regions, which currently leads to an ongoing push for a substantial increase of housing completions. Local planning authorities therefore often face the dichotomy of high development pressure and the requirement to safeguard greenfield sites, which is very difficult to resolve. Higher densities are seen as part of the solution.

Although national German planning law and policy support high densities as an important element of sustainable urban development in general, developing high-density policies as part of a binding land-use plan is by no means a trivial bit of plan making. In the past, several local planning documents, which aimed at higher densities than prescribed as standard in the Federal Land Utilisation Ordinance, had been repealed on the basis of court rulings. Although the Federal Land Utilisation Ordinance regulated possibilities to exceed standard urban densities in exceptional cases, many legally binding land-use plans that stipulated such a higher building density have been declared invalid by the courts as a result of lawsuits filed primarily by affected property owners. In many of these decisions, the courts either saw no necessity for the high-density policies in the specific case, or the explanation given in the binding land-use plan was ruled to be insufficient (Schneider, G., 2011; examples: Federal Administrative Court (BVerwG), Sentence from Nov. 25th, 1999 – 4 CN 17.98 – NVwZ 2000, 813 concerning a designated core area; more recently: Higher Administrative Court (OVG) of Hamburg, sentence from Dec.10th, 2016 – 2 E 24/18 – NVwZ 2020, 639, concerning a designated mixed-use area with designations of high-density; Higher Administrative Court (VGH) of

Baden-Württemberg, sentence from Nov. 7th, 2017 – 5 S 1003/16 – BauR 2018, 636 dealing with a designated special-use area). However, this situation was finally changed with the 2021 amendment to the aforementioned Ordinance ("Baulandmobilisierungsgesetz" dated 14th June, 2021, BGBl. I 2021, 1802), which made it easier for local authorities to prescribe higher densities in their binding land-use plans and will probably prevent similar court decisions in the future.

In the light of conflicting interests and planning objectives as well as demands on the planning system explained above, it appeared timely to take a closer look at the potential of high-density developments, which seem to offer an answer or at least part of a solution in areas of high demand and low allocations of housing land.

3 Building densities in a nationwide survey of new urban quarters in Germany

The author surveyed – as a member of a larger research team - concepts and completions of new urban quarters in a nationwide, systematic overview. In the last three decades, numerous new urban quarters have been built, mostly on previously developed land, but also as urban extensions.

This survey was funded by the Federal Institute for Building, Urban and Spatial Research - BBSR. Urban quarters which were built after 1990, have more than 500 residential units or more than 1,000 inhabitants or cover an area larger than 10 hectares, and which include a residential component based on an urban planning concept were surveyed (BBSR, 2021). In doing so, the research focused on the development of large and medium-sized cities as well as on selected small towns - either in the vicinity of high-growth metropolitan areas or with military conversion projects. The data compiled on new urban quarters is based on several sources – including the existing database of the BBSR, a full postal survey addressing all large and medium-sized towns and selected small towns, as well as an in-depth detailed survey of selected urban quarters. With the completion of this project, the expanded database includes a total of 751 new urban quarters in 263 municipalities (BBSR, 2021).

4 Building densities are increasing – particularly in major cities

The survey showed that urban density is increasing. While new urban quarters, which were planned before the year 2000, show an average of 29.9 dwelling units per hectare (dph), those planned after 2009 have a density that is more than twice as high (63.0 dph) (BBSR, 2021). Especially large cities have seen a huge increase from 39.9 to 93.4 dph (*ibid*).

However, it should be noted that these figures refer to the so called 'gross building land' which includes access roads as well as public green spaces.

Given that over the same period of time a decrease in project area sizes occurred in the surveyed developments, this could lead to different conclusions. One possible interpretation could be that fewer new urban quarters with large integrated green spaces and transport facilities have recently emerged, which would have an effect on density – measured in dph. However, this cannot be verified with absolute certainty based on the available survey data – in fact, other findings of the survey point in a different direction: The building typologies have a direct influence on the achievable urban density (in dph). - The survey results show clearly that the proportion of developments in which predominantly single and two-family houses are being built and which achieve an average density of 19.8 dph is rapidly declining in favour of developments which consist mostly of larger multi-family houses, showing an average density of 77.3 dph (*ibid*).

5 Population densities are also increasing

Over the years under consideration, the population density of new urban quarters has increased significantly, especially from 2010. While urban quarters where planning began before the year 2000 show a density of 72.5 inhabitants per hectare, this increased slightly to 74.1 inhabitants per hectare between the years of 2000 and 2009. In contrast to this, from 2010 onwards the population density rose significantly to 123.1 inhabitants per hectare (BBSR, 2021). The fact, set out above, that this density parameter is dependent on the reference value (gross building land) also applies here. However, both parameters point to the same trend: urban density in new urban quarters is increasing. This result was also confirmed by an external group of experts which was invited to critically examine and discuss the survey results as part of a validation exercise.

The survey results and their interpretation also highlight that the question of measuring urban density is far from trivial. While the parameters of dph and inhabitants per hectare appeared to be practicable for a large nation-wide survey in order to detect major trends, they are too crude to provide an in depth understanding of urban densities and they also do not give an insight to density perceptions by the inhabitants themselves.

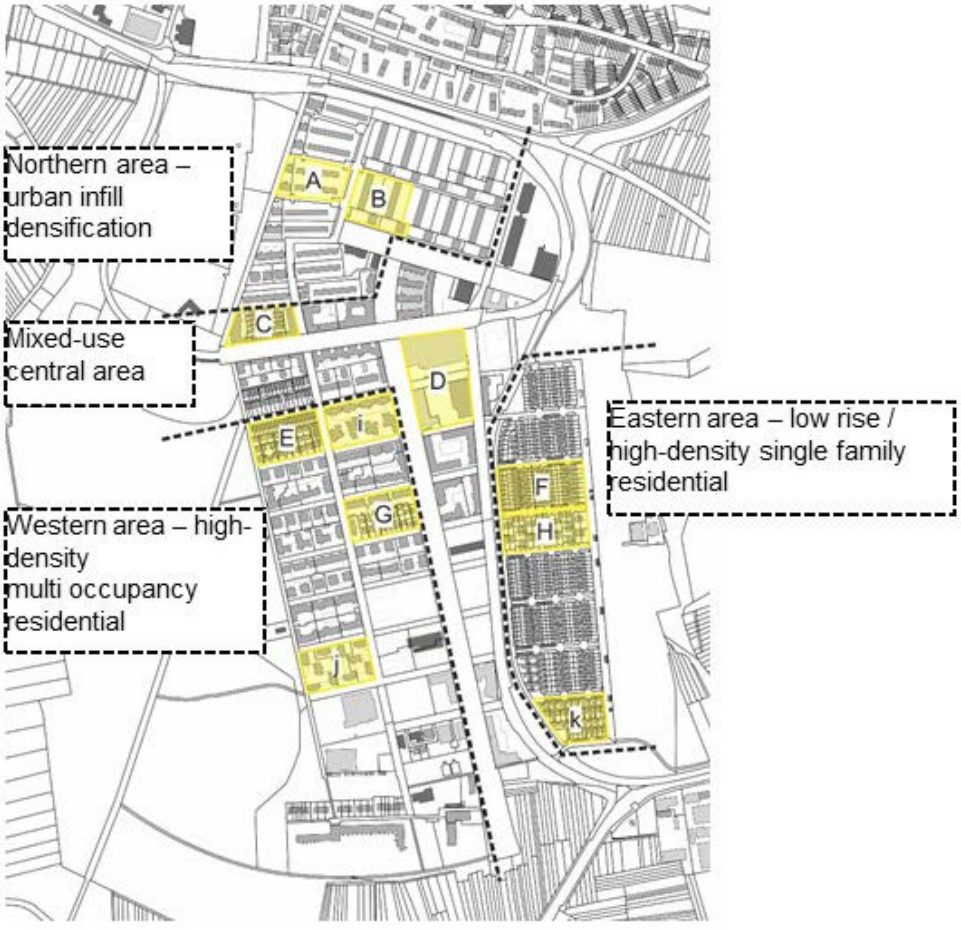
Given this, the necessity to engage in a more detailed analysis of planning practice and local planning policy is obvious. The remainder of this paper will turn to desktop studies of statutory local planning documents and a survey of inhabitants of a typical high-density new urban quarter, in order to provide the foundation for a more integrated evaluation of a completed high-density development.

6 In depth evaluation of a representative high-density new urban quarter

The selected case study for this in-depth evaluation is the so called ‘Scharnhauser Park’, which is the redevelopment of a former military site situated on 140 hectares of brownfield land for a population of around 9,000 and for approximately 2,500 new jobs in the town of Ostfildern, to the South of Stuttgart in Germany and therefore situated in a region with aforementioned high development pressure and buoyant real estate markets.

This case study was selected on the basis that it is an archetypal urban extension of the 1990s and 2000s, with already clearly defined planning objectives of realizing high densities and striving to achieve wider sustainability objectives. The planning and development phases also meant that the surveyed residents had sufficient time to live and experience everyday life, problems, and success factors after completion of the development. Further to this, the binding land-use plans prescribe different zones with specific density parameters, land-use classes and building typologies, thereby covering a range of different neighbourhoods with varying densities, physical urban structures and mix of land-uses.

Figure 1: Figure-ground plan of Scharnhauser Park – Survey areas A – K



Source: based on Jansen, 2020

In addition to the desktop analyses of binding land-use plans, which provided the statutory basis for this development, a complementary survey was conducted, in order to assess the individual opinions and perceptions of the local population. This involved personal interviews of a weighted and randomized population sample. In doing so, the research which focused on building densities was embedded in a holistic evaluation of the entire development.

To guide the study, the following central hypothesis was developed with a view to either falsify it, or to find evidence which supports it: 'There is a correlation, or even causality, between building densities and the density perception of the population living in the area as well as the perceived quality of life.'

7 Local statutory planning documents supporting high-density

German planning law entails specific density definitions and objectives which also strive to avoid overly high densities, that might have a negative impact on a healthy residential or work environment. On the other hand, objectives, and incentives to make the most efficient use of housing land through high building densities are vested in national law and regulations.

In order to clearly specify and measure densities, the following density indicators are legally defined and have to be applied in plan making as well as in considering planning applications:

A central indicator is the ratio between the size of the building footprint and of the building site ("Grundflaechenzahl", section 19 of the Land Utilisation Ordinance). It defines the percentage of land, which may be covered by the footprint(s) of main and ancillary buildings. For example, given a site of 1000 square meters and a footprint to site ratio of 0.4, it would be possible to complete 400 square meters of building footprint(s) – including ancillary buildings, parking spaces, driveways etc.

This is complemented by the so-called floor space to site ratio, which sets out the amount of floor space that may be completed in relationship to the size of the development site (section 20 of the Land Utilisation Ordinance). Again, given a site of 1000 square meters and a floor space to site ratio of 1.2, it would be possible to complete 1200 square meters of floor space – possibly spread over a number of prescribed storeys.

Complementary density indicators comprise the number of storeys and the height of buildings as well as the number of individual dwelling units, which may be completed on an allocated site.

The Land Utilisation Ordinance states that floor space to site ratio or the size of the floor areas of the buildings as well as the maximum number of the storey or the maximum height must be regulated by a "qualified" legally binding land-use plan. Commonly and exceeding these regulations, local authorities often designate a combination of these and other density indicators in binding land-use plans, thereby providing a detailed framework for the permissible density of development, which has to be explicitly addressed when seeking planning permission or building permit. The statutory plan typically uses the above indicators to set out a 'density corridor' of minimum and maximum densities within which development may take place. As described above, German planning law used to set a range of upper density limits, which were linked to specific land-use classes, and still tried to provide sufficient flexibility. It also offered certain deviations as well as possibilities of transgressions. These will not be further explored here in order to reduce the complexity of the already intricate narrative. Suffice it to say that the binding nature of these limits was lifted in 2021 in order to provide more flexibility for urban density.

In order to evaluate the densities set out in the so called legally binding local land use plans, a range of neighbourhoods within the new urban quarter Scharnhauser Park were selected – each representing a specific density, mix of building types, of land-uses, of demographics and ownership as well as different completion phases. The detailed analysis of the relevant binding land-use plans shows density allocations, which are either at or near the upper limits within the respective land-use classes prescribed by planning law (back then binding and today only valid as a guiding density value). The following fotos give an impression of the range of built densities and building types.

Figure 2: Different densities and building types in Scharnhauser Park

Source: photos by authors

None of the binding land-use plans ruled out the use of the legitimate deviations and transgressions of density allocations described above. In fact, some plans had explicit policies in place, encouraging the use of such deviations. This in turn means, that planning applications may propose higher densities, provided that they are explained and justified in detail and on the condition that so called 'cut-off limits', which were still mandatory at the time and set out in national planning law, are respected. The required justification regularly involves an explanation of how healthy living and working environments (in the legal sense, as prescribed by section 1 para 6 Federal Building Act) are safeguarded, including - amongst other things - sufficient provision of green and open space.

All of the above planning policies clearly follow the compact city idea and strive to achieve the associated benefits.

The analyses of completions based on these binding land-use plans revealed, that all of the developments made good use of the relatively high-density allocations. The completed densities are either near the upper limits allocated in the plans or transgress these by making use of possible deviations and transgressions. All of the latter proved to adhere to the (then binding) legal cut-off limits set by national planning law.

In spite of the fact that the analysed developments therefore comply with the legal framework, still the question arises, whether the resulting environment is negatively perceived as 'town cramming', or whether these land-use plans were able to achieve one of the most important objectives of the Federal Building Act (section 1 par. 6 no. 1), namely healthy living and working conditions. To verify this, in addition to the objective analysis, the subjective perceptions of the inhabitants, who live in the resulting high-density neighbourhoods, were explored.

In the following sections, results from a population survey – organized by the author on behalf of and funded by the municipality - are reviewed and revisited. The survey tool included personal interviews of a weighted sample of 150 (n) inhabitants mirroring the local demography. The survey questions focused on the following topics which allow quantitative as well as qualitative aspects of density perceptions and perceived quality of life to be explored:

- Personal living situation
- Perceived Urban density
- Utilities and infrastructure and their accessibility
- Public and private spaces
- Public transport as well as private motorized traffic and parking
- Coexistence of different cultures
- Townscape

The questionnaire was subjected to a pre-test to ensure the efficiency of the survey and the quality of the results. The personal survey was carried out in 2015 and 2016 by professionally trained future urban planners (students of the urban planning course at Nuertingen Geisingen University). The interviewees were either visited at home or contact was established in public places. The survey was prepared by a preliminary direct mailing from the Ostfildern town planning department, in which the population was asked to help with the survey.

For the systematic collection and evaluation of the raw data, an evaluation matrix was created for open and closed questions in the questionnaire, which allowed the comparison of all relevant parameters.

8 Personal density perceptions of inhabitants

When assessing density perceptions, it is of principal interest to gauge the significance of (private) open space to the surveyed population - e.g. gardens - in order to understand the context of opinions on densities stated in the investigation. The survey of the local population therefore strived to assess this particular significance and its underlying values.

The aggregated results showed that nearly 83 percent of the surveyed population deemed the size of private open space to be either ‘important’ or ‘very important’. Nearly a third (29.3 percent) stated that the size of private open space was very important to them.

Given this outcome, it appears safe to assume that the surveyed population would react in a sensitive manner to negative impacts from urban density – particularly in terms of perceived inadequate provision of open space.

When asked to appraise the completed density in the entire development on a specified scale ranging from ‘high’ to ‘low’, a proportion of 46 percent of the interviewees found the density to be ‘high’, 34 percent considered it to be ‘rather high’ and only 19.3 percent answered with ‘average’ or even ‘rather low’ (0.7 percent).

In contrast, across all of the neighbourhood study areas, the interviewees estimated the density of their respective neighbourhoods to be lower than the density of the entire development.

This result is surprising, or even paradox. One possible explanation may be that completed densities in a very well-known neighbourhood environment appear lower to the inhabitants due to its familiarity. Other, less well-known parts of the development on the other hand may be perceived as having higher densities because the local population had less opportunity to get used to completed densities in this ‘more alien’ environment.

Further to this, the survey results show that a clear correlation between the density perceptions described above and the completed densities in terms of footprint and floor space to site ratio is not apparent.

9 Balance of buildings and open space in neighbourhoods

The mix of buildings and open spaces and particularly their combined spatial impact may also be decisive for the perception of density. In this respect, the opinions given across the neighbourhood study areas were fairly heterogeneous. However, a clear correlation between the perceived virtuousness of the balance of buildings and open spaces on the one hand, and of completed density, in terms of footprint to site ratios on the other, did not occur. Although high footprint to site ratios might be reflected in the most negative opinions, the study area, which shows the highest footprint to site ratio of all surveyed neighbourhoods sports one of the lowest proportions of negative opinions of the entire survey (only 15 percent negative). A possible explanation may be connected to the completed building types. While some areas are characterized by high-density single family terraced housing, others are dominated by flats in multi-storey buildings. It is therefore conceivable, that a combination of density parameters and building types influenced the interviewees’ assessment of the balance of buildings and open spaces.

10 Satisfaction with residential environment, size of dwellings and privacy

Overall, the survey showed a very high satisfaction with the residential environment. Some heterogeneity between the study areas could be detected, but this only occurred at a generally high level of satisfaction. Nearly 89% of the interviewees are ‘rather satisfied’ (34%) or ‘very satisfied’ (54.7%) with the personal living environment in their respective neighbourhoods. Again, there is no stringent correlation between completed density and satisfaction with the residential environment.

Generally, the interviewed households were very satisfied with the dwelling size available to them. A remarkable 90% of the interviewees stated they were either 'satisfied' (31.3%) or even 'very satisfied' (58.7%) with the amount of space within their individual dwelling units.

Once more, some heterogeneity became evident across the study areas. However, the generally very high satisfaction ratings suggest, that high-density does not necessarily entail diminishing sizes of dwelling units. In fact, it appears that high-density can go hand in hand with commensurate provision of personal living space.

11 High quality of life in spite of or because of high densities

So far, no clearly negative correlation between densities or density perceptions were established. Eventually, the question whether high densities or differences in densities have an impact on the perceived quality of life, is of key interest for spatial planning.

Overall, the views of the surveyed population on the quality of life specifically in their respective neighbourhoods (as opposed to the whole of the development) were overwhelmingly positive. Only a small proportion of survey participants (3.3%) deemed the quality of life to be 'low' or 'rather low', while 56.7% believed it to be 'high' and 22% even thought it was 'very high'. Again, there is some heterogeneity between the surveyed neighbourhoods.

With respect to the entire new urban quarter Scharnhauser Park, the opinions of survey participants paint an equally clear picture. Only a proportion of 1.3% of the answers falls within the 'rather low' quality of life category, with no answers at all in the 'low' bracket. Overall, a proportion of 62% found the quality of life to be 'high' and 17.3% even answered with 'very high'.

There are marked discrepancies in some areas between the perceived quality of life in the neighbourhood and the Scharnhauser Park as a whole. However, a comparative analysis between the surveyed study areas, in order to assess the influence of density, in terms of footprint to site ratio and floor space to site ratio, on the quality of life perceptions did not show a clear correlation between these parameters. As an interim conclusion, it therefore appears safe to argue, that no negative effects due to high densities on different parameters of urban life and the built environment were detected.

Whilst this central research question could be answered to a large extent, new questions relating to the detected discrepancies and heterogeneity between the study areas arose.

One potential answer may lie in the proportion of home ownership as opposed to rental accommodation. However, more in-depth research on this particular topic is required to support such a conclusion.

In addition to the results of closed survey questions discussed thus far, the survey also comprised open-ended questions, in order to capture unrestricted individual opinions. The analysis of these results included thematic clustering. The emerging themes on the one hand and the number of recorded answers within each topical cluster on the other hand support the quantitative empirical findings presented above. When asked 'How would you describe the urban extension with one term or one sentence?' the largest cluster, which emerged by far, could best be described with the heading of 'High quality of life and high satisfaction'. Typical individual comments within this cluster include: 'wonderful; high quality of life; very liveable; good urban living; nice urban quarter; nice and green; high residential quality …'.

12 Conclusions for urban planning

Findings from the literature review and Germany wide survey of new urban quarters first: Literature indicates many potentially positive effects linked to high-density urban developments. At the same time, findings from literature also suggest it is by no means guaranteed that high-density development automatically delivers these positive outcomes and translates them into a desirable quality of life.

The survey of new urban quarters in Germany showed that the urban density as well as population density increased over the past three decades. Especially large cities have seen a significant increase in dwellings per hectare. It appears safe to conclude that the scarcity of land and ongoing settlement pressure, as well as high building and land costs contribute to this trend as well as overarching planning objectives vested in German planning law.

This paper has filled a further gap in research by providing a case study based survey which allows to assess individual density perceptions. An essential result from this research is that the binding land-use plans, which define

the central density parameters, allow high densities within the legal framework set by national planning law. The analysis of completions based on these statutory plans showed even higher densities, as developers obviously made use of possible deviations within the adopted local planning framework. In this context, it is clear that these completions do not violate planning law, in fact, they are all undoubtedly placed within the statutory planning framework and legal limitations.

The perceptions of density in different neighbourhoods showed a certain degree of heterogeneity. Interestingly - and ostensibly paradoxically - the survey results showed that across all neighbourhoods the local population believed that densities in their own neighbourhood were lower than in the entire urban development area. A possible explanation is that the familiarity of their own residential street and neighbourhood had an influence in this context.

As described above, a large proportion of interviewees were satisfied with their residential environment and the floor space available to the individual household. Further to this point, a large majority of the interviewees proclaimed a high quality of life in the entire urban extension.

Therefore, the extension to the above hypothesis, that high-density may have a negative influence on residential quality, could be proved incorrect based on the perceptions of long-term inhabitants. In this case study, the findings indicate that high densities can result in a high quality of life, based on the factors and indicators applied.

Furthermore, it was interesting to observe, that the case study results across the surveyed neighbourhoods showed a higher proportion of satisfied interviewees with the quality of life in the entire urban extension, thereby regularly surpassing the results regarding the individual neighbourhoods. A possible conclusion may be that the urban extension in its entirety offers more qualities than merely the sum of its parts. The individual answers to the open-ended questions, which were part of the survey, also support the empirical findings and this conclusion. The definitions brought forward by the interviewees themselves, such as ‘rural life in an urban environment’, bear a striking resemblance to the ideas linked to the garden city movement or the new urbanists of the 1990s: They all strived to combine the best elements from town and country, while avoiding the more problematic elements. It appears that the chosen case study Scharnhauser Park resembles - to a large extent - a successful modern interpretation of these apparently timeless ideas for good spatial planning and urban development.

However, it is also apparent that – especially with ongoing climate change - a sufficient quantity but also the quality of public and private open spaces is of growing importance. Further to this point, the adaptation to climate change e.g. to avoid heat islands and to control the surface runoff during increased heavy rain events have to be included in the compact city of the future. This in turn will require more research and innovative planning practice.

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