Diversity in density: Looking back and forth

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Density has been used to diagnose an ailing city, to prescribe solutions and as part of the ideological agenda of urban professionals, ranging from the Garden City Movement at the beginning of the twentieth century, striving for a more healthy and social city, over to the modernist planners of CIAM and their preference for high-rise developments in a green and functionally organized city, via Jane Jacobs's advocacy for a compact city of medium height in the 1960s, and on to the late twentieth-century pursuit of urbanity in New Urbanism.

In this essay, the history of cities through the lenses of density will be shown using examples from European cities to mirror the urban development of Seoul. The Spacematrix model[1] will be used to describe densities in relation to building types and planning policies and ideologies dominant at the time. Besides looking in the back mirror of urban development, we will look forward relating density to two questions central to urban development in the 20th century. The first concerns the general consensus that sprawling cities, private mobility and high levels of energy consumption go hand in hand and that more dense and compact cities are at least part of the solution. The second concerns diversity and is related to the old but still relevant argument of Jane Jacobs that modern planning had ignored the complexity of the city and had forgotten that social and economic vitality were essential ingredients for achieving a city that functions well. Although this has been part of urban development discourse ever since, the question how this actually can be achieved and what kind of vitality that is thrived for remains unanswered.

We will in the second part of this essay use the Gangnam area in Seoul as a possible alternative approach to create conditions for diversity, building further on the arguments by John Peponis in his essay 'The city and an interface of scale: lessons from Gangnam'. But before *looking back* at density developments and *looking forward* how density interacts with diversity, the essay starts off with a description of the Spacematrix model used for the analysis and the argument.

Spacematrix model

Urban density usually refers to measures of how much of some entity is found within a fixed amount of space. In urban planning and design it mostly describes the relationship between a neighbourhood and the number of dwellings or amount of floorspace that is found in that neighbourhood. How this in a second step relates to building types has been debated and many scholars have argued that the use of density for anything but statistical purposes is questionable, as it is a too elastic concept that poorly reflects the spatial characteristics of an urban area. They warn to not confuse density with building type and assume, for example, that detached houses have a lower density than attached housing types because "...while this is generally true it is not always the case. A high-rise tower with large units set on a park-like site may have a lower density than a set of detached houses on small lots"[2].

The Spacematrix model treats density as a *multivariable* phenomenon because the difference between high, spacious and compact developments with one and the same building mass can only be made when density is viewed as a *composite of indicators*. The model includes four density variables: Floor Space Index (FSI)[3], Ground Space Index (GSI), Open Space Ratio (OSR) and building height (L). FSI expresses the relation of the amount of built floor area to the area of the site and GSI expresses the

[1] Berghauser Pont, M. and P. Haupt, 2010, *Spacematrix. Space, density and urban form,* Rotterdam: NAi Publishers.

[2] Forsyth, 2003, Measuring density: Working definitions for residential density and building density. *Design Brief*, 8 (4), p. 4.

[3] A comparable term for Floor Space Index (FSI) used in the USA is Floor to Area Ratio (FAR).

relation between built and non-built land, often casually referred to as the built footprint or ground coverage. Berghauser Pont and Haupt have empririically shown that different building types cluster at unique positions in the Spacematrix.

Looking back: mirroring Seoul with European cities
Three periods have been studied to describe the European urban development from the late 19th century until today with three examples for each period. The first three examples (figure 1 and 2) represent urban development in three 19th century extension plans: plan Kalff in Amsterdam (De Pijp), Barcelona's extension plan (Eixample) and the Hobrecht-plan in Berlin (Hackesche Höfe). These plans all dealt with problems of housing shortage in a rapidly industrializing and urbanizing Europe and tried to improve living conditions without the direct public investments and is therefore often described as a compromise between state-managed and market-oriented development.

The second cluster of examples represent the first half of the 20th century where coordinated planning and public investments played an important role, especially after the Second World War when housing shortage again was a major problem. Local Government Departments and Housing Associations became not only responsible for the layout of streets and the required infrastructure, but also for large social housing developments which constituted a qualitative break with the past. Three areas are chosen to exemplify this period: Märkisches Viertel and Siemenstadt in Berlin and Kolenkit in Amsterdam.

During the 1960s, people such as José Luis Sert and Jane Jacobs came to criticize what they saw as the failure of modern planning and architecture. The titles of their publications expressed the urgency of their ideas: *Can Our Cities Survive?* and *The Death and Life of Great American Cities*.[4] Sert reached the conclusion that high density was often mistaken for overcrowding and that the solutions of the Garden City Movement and the high-rise solutions promoted by Le Corbusier and Gropius were to blame for much of the decline of city life. The dense and compact city was back in focus which the three examples in the third cluster represent: Hammarby Sjöstad in Stockholm , Landtong in Rotterdam and Java island in Amsterdam.

The examples in the first cluster are both dense (high FSI) and compact (high GSI), the examples from the first half of the 20th century have a more spacious layout with only half the density (both in terms of FSI and GSI) and the most recent examples in the third cluster are on the way back to high FSI and GSI values.

Figure 1. Examples from Europe and Seoul in the Spacematrix: **1.** Märkisches Viertel (Berlin); **2.** Kolenkit (Amsterdam); **3.** Siemenstadt (Berlin); **4.** Hammarby Sjöstad (Stockholm); **5.** Landtong (Rotterdam); **6.** Java Island (Amsterdam); **7.** De Pijp (Amsterdam); **8.** Hackesche Höfe (Berlin); **9.** Eixample (Barcelona); 1. Banpo-Dong 1; 2. Jamsil-Dong 1; 3. Jamsil-Dong 2; 4. Banpo-Dong 2; 5. Mak-Dong; 6. Banpo-Dong 3; 7. Yuoksam-Dong 2; 8. Yuoksam-Dong 1; A. Sodermalm 1 (Stockholm); B. Södermalm 2 (Stockholm).

Figure 2. Figure-ground of the examples from Europe: **1.** Märkisches Viertel (Berlin); **2.** Kolenkit (Amsterdam); **3.** Siemenstadt (Berlin); **4.** Hammarby Sjöstad (Stockholm); **5.** Landtong (Rotterdam); **6.** Java Island (Amsterdam); **7.** De Pijp (Amsterdam); **8.** Hackesche Höfe (Berlin); **9.** Eixample (Barcelona).

Figure 3. Figure-ground of the examples from Seoul: 1. Banpo-Dong 1; 2. Jamsil-Dong 1; 3. Jamsil-Dong 2; 4. Banpo-Dong 2; 5. Mak-Dong; 6. Banpo-Dong 3; 7. Yuoksam-Dong 2; 8. Yuoksam-Dong 1;

To see how the developments in Europe relate to the development in Seoul we analysed nine areas in Gangnam grouped in three cluster in the Spacematrix (Figure 1 and 3). The first cluster represents

[4] Sert, J.L., 1942, *Can Our Cities Survive? An ABC of Urban Problems, Their Analysis, Their Solutions Based on Proposals Formulated by the CIAM*, Boston: Harvard University Press; Jacobs, J., 1992 (originally published 1961), *The Death and Life of Great American Cities*, New York: Random House.

projects resulting from the Land Readjustment (LR) policies that promoted urbanization since the 1930s peaking in the 1960s and 70s[5]. LR is a planning tool used to consolidate disparate and fragmented land parcels into contiguous tracts while building public infrastructure. Kim (2013) describes LR as a bottom-up planning tool as the involvement of the government is mainly in the organisation of the public structure and the infill is left to private land owners in a similar way as the 19th century extension plans in Europe. LR was an effective tool to transform irregular urban and agricultural lands into development areas for single detached houses, but has also been used for large-scale developments. These large scale LR projects show similarities in density and type with the more top-down developments financed and developed by the state, the so called Housing Site Development (HSD) introduced in the 1980s. These cluster in the Spacematrix and overlap with the European cluster with developments from the first half of the 20th century. The third cluster represents more recent developments following the Housing Reconstruction (HR) policy where existing urban fabrics are replaced by new ones with high-rise in high densities.

There are obvious similarities between the extension plans of the 19th century in Europe and the early LR projects in Seoul. The later state financed and managed large scale expansion in Europe show clear similarities to the HSD projects in Seoul. In both cases the reason for the change in policy was housing shortage and rampant speculation which was solved with top-down planning policies. As a result of these new policies and guidelines, housing production increased, but densities (both FSI and GSI), interestingly, decreased. More recent developments in Europe and Seoul both return to high FSI values, but also show huge differences: the European examples are dense and *compact*, but in Seoul the developments are dense and *spacious*. In other words, Europe seems to have chosen the direction proposed by Jane Jacobs in the 1960s and often is described as the Urban Renaissance as the projects in Seoul follow le Corbusiers plea for high rise solutions as a way to combine high density with enough spaciousness. A third answer might be to combine qualities of *compactness* and *spaciousness* and so creating a diversity.

Looking forward: linking density to connectivity

An interesting example of a combined strategy for diversity is discussed by John Peponis in relation to connectivity[6]. He describes Gangnam as a "planned version of the organically grown city" where streets of varying connectivity create "differentiated localities". The question we will address, is whether this diversity in connectivity corresponds to a diversity in density and, in extension, building types. This relates to the classical idea of attraction radiating from a hierarchy of centralities. Some recent studies have demonstrated that the total number of people walking in an area is a function of land use and density, but the distribution of movement is linked to connectivity[7]. In other words, the three variables land use, density and connectivity should be studied and designed in combination where a match will contribute to what is called the 'multiplier effect'[8]. A mismatch creates unbalanced locations which can be described as either 'overdeveloped' or 'overconnected' in a similar way as is proposed in Bertolini's place-node model for train stations[9]. The model reaches equilibrium when a

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[5] Kim S H, 2013, "Changes in urban planning policies and urban morphologies in Seoul, 1960s to 2000s" *Architectural Research* 15 133-141.

[6] See John Peponis essay 'The city as an interface of scales: lessons from Gangnam' in this book.

[7] Berghauser Pont, M., L. Marcus, 2015, *Wh*at can typology explain that configuration can not? *The 10th Space Syntax Symposium* (SSS10), 13-17 July 2015 at UCL, London; Ozbil A, Peponis J, Stone B, 2011, "Understanding the link between street connectivity, land use and pedestrian flows" *Urban Design International* 16 125–141.

[8] Hillier describes the multiplier effect that as a shift from a linear to a logarithmic correlation between the syntactic integration of individual streets into the network and the densities of movement observed on them.

[9] Bertolini L, 2007, "Station areas as nodes and places in urban networks: an analytical tool and alternative development strategies", in *Railway Stations and Urban Dynamics,* Eds F Bruinsma, E Pels, H Priemus, P Rietveld B van Wee (Physica, Heidelberg) pp 35–58.

station area is as well connected as its physical characteristics warrant and as unbalanced in case of a mismatch between the two.

Returning to the examples discussed in the first part of this essay, one can conclude that the large scale top-down design schemes often disregard the relation between density and connectivity and apply one and the same building type, distributed evenly over a whole site, ignoring variations in localities and so creating overdeveloped (i.e. parcels with high densities but low connectivity) and overconnected (i.e. parcels with high connectivity but low density) locations. However, two examples (Yuoksam-Don) we have discussed earlier are different both in terms of the development process, block and parcel sizes and the diversity of connectivity as described by John Peponis as the Gangnam model.

First of all it is important to repeat that the FSI of these two examples in Yuoksam-Dong are similar to the more recent high-rise developments in Jamsil-Dong. However, density is distributed evenly over the whole site in Jamsil-Dong as in Yuoksam-Dong a large variation of densities can be found. The variation in parcel density (FSI) in Yuoksam-Dong I is 1,91[10] and in Yuoksam-Dong II 2,35 while in Jamsil-Dong the variation is only 0,84. Two cases in Södermalm in Stockholm where we know variation in density should be high (small parcels and developments from various periods) have values of 1,36 resp. 1,04 and confirm that the variation in the Yuoksam-Dong areas are very high also from a European perspective.

To better understand the match between connectivity and density, an analysis where the interior-parcels of the fabric is separated from the edge-parcels was conducted. Both in Yuoksam-Dong and Södermalm, the edge-parcels are located along the streets with the highest syntactic centrality. In Yuoksam-Dong the edge densities (FSI) are 5,79 resp. 6,81 and the interior densities 1,71 resp. 3,16 and thus show a large variation with higher densities along the syntactically most central streets (see figure 4 and 5). In Södermalm, the variation between edge and interior is almost non-existing. In other words, in Yuoksam-Dong the variation in connectivity match the variation in density, in contrast to the examples in Södermalm where we find locations of overdevelopment in the interior of the urban fabric and locations of overconnectedness (or maybe better defined as underdevelopment) at the edges of the urban fabric, not taking advantage of “differentiated localities”.

Figure 4. Density calculated for the edge parcels respective interior parcels: **1.** Yuoksam-Dong 2; **2.** Yuoksam-Dong 1; **3.** Södermalm 1; **4.** Södermalm 2.

Figure 5. Diversity in density: **1.** Yuoksam-Dong 2; **2.** Yuoksam-Dong 1; **3.** Södermalm 1; **4.** Södermalm 2.

Whether zoning has a role in this variation of densities is not studied, but even if this is the case, an important message still holds, which is that urban planning and design must realise how the intricate balance between connectivity, density and land use is the starting point for a conscious design of a variety of urban qualities.

Acknowledgment: We would like to thank Sung Hong Kim and Seungbum Kim who helped us with the selection of cases in Seoul and with the data and maps used for the analysis.

[10] Variation is calculated as standard deviation. A standard deviation close to 0 indicates that the data points tend to be very close to the mean (also called the expected value) of the set.