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The prospects for urban densification: a place-based study

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Abstract
Study of the environmental outcomes of urban densification is a highly context-dependent task. Our study shows that collecting and processing place-based survey data by means of the softGIS method is clearly helpful here. With the map-based internet questionnaire each response remains connected to both the physical environment and the everyday life of the respondent. In our study of the Kuninkaankolmio area (located in the Helsinki metropolitan region) the survey data were combined with urban density variables calculated from register-based data on the existing built environment. The regression analysis indicated that the participants in the survey preferred the same density factors for their future residence as they enjoyed in their current neighbourhood. In the second analysis we related the densities of planned infill developments with the interest respondents had shown in these projects. The results show that new and even quite dense infill developments have been found to be rather attractive, with them often being viewed as interesting supplements to the current urban texture. These findings contribute to the ongoing scientific discussion on the feasibility of densification measures and encourage the Kuninkaankolmio planners to proceed, albeit carefully, with the planned infill developments.

Keywords: urban density, infill developments, perceived quality, future residence, Helsinki region

1. Introduction

The ongoing debate over the environmental sustainability of different urban forms is both high profile and contentious. In the context of urban planning (of the Global North) the discussion however seems to be primarily focused around the issue of densification. Some stress the salience of the compact city and mixed land use (Jabareen 2006, Jenks 2010, Norman *et al* 2006, Næss 1993, 2005) as 'important and ecologically relevant services require economies of scale and density' (Newman 2006, p 278) and reproach low-density suburban land use for the land loss and car dependence it tends to imply (Newman and Kenworthy 1999). For others, the compact city ideal is a fallacy (Bogunovich 2012, Neuman 2005): higher densities do not necessarily exhibit lower energy consumption (Mindali *et al* 2004) nor guarantee reduced personal vehicular mobility, at least not in large cities (Ferreira and Batey 2011).

Further concerns have centred on the perceived environmental quality of densified settlements: no form can be sustainable if people do not accept the ways it conditions their everyday life (Bramley *et al* 2010, Neuman 2005). The ecological benefits of a dense urban structure are questioned, or even dissolved, if people have conflicting experiences or behaviour patterns. The worst case scenario forwarded by

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such critiques sees densification, in effect, as 'ghettoization' where mobility increases as people seek their way out of the overly dense environment and thus end up spending most of their time outside of their own neighbourhoods (Fuhrer and Kaiser 1994; for contrary evidence see Næss 2006, Maat and de Vries 2006) or suffer from over-crowding in the recreational areas (Arnberger 2012). According to Bogunovich (2012), it is time for urban planners to stop preaching against urban sprawl and time for them to recognize the potential in rendering low-density suburbia environmentally benign. He suggested that people should be allowed to retain the qualities that attracted them in the first place (see also Kaplan and Austin 2004). Breheny (1995, 1997) and Couch *et al* (2004) also caution against automatically viewing densification as a *panacea* and point to possible compromises such as garden cities or so-called 'smart sprawl'.

The conclusions of these studies however rest upon a number of basic assumptions. For instance, when assigning responsibility for greenhouse gases to cities (for broad overviews see Dodman 2009, Hoornweg *et al* 2011), it is common to include production-based emissions in the comparisons between cities but to leave them out when comparing settlements. In their settlement level study in the Toronto region, VandeWeghe and Kennedy (2007) estimated emissions from building maintenance (esp. the energy used for heating/cooling down buildings) and from the energy consumed by transport. They found that the carbon-burden of dense urban structures is lighter (*per capita*) than in scattered suburban settlements due to the high share of car traffic and the higher consumption of heating energy *per capita* found in the latter type of environment.

The salience of dense structures in terms of carbon footprint has been challenged by pointing to the CO_2-burden of new construction (Heinonen *et al* 2011b, Säynäjoki *et al* 2012) and to the decisive role of personal/household consumption (Heinonen *et al* 2011a). In our view, these broader issues of mobility and lifestyle should receive much greater attention in the debate. There is also a need to further explore the interplay between urban structures, including their various functions and associated mobility patterns, and different types of lifestyles. As we will show, context-sensitivity is the key element here. Where local solutions exist, specifically, where densities and qualities meet in a sustainable way, should we not respect rather than jeopardize this (Vallance *et al* 2005)? And if sensitive densification can help to improve environmental outcomes and the perceived level of environmental quality, why not embrace it (Kyttä *et al* 2013b, Talen 2011)?

As the research literature notes, there is no simple correlation between urban density and perceived environmental quality. In a study by Bramley *et al* (2009) focusing on small and medium-sized British towns, the perceived quality decreased the denser the urban texture became. The same has been found to hold true in Finland for small towns on the fringes of the Helsinki region (Kyttä *et al* 2011). However, another recent study (Kyttä *et al* 2013a, Kyttä and Broberg 2013) that extended also to the urban core areas of Helsinki reveals another pattern: the relationship between urban density and the perceived overall quality of the living environment appeared to be curvilinear. The average perceived environmental quality increased until the density level reached around 100 housing units per hectare and after that it decreased again. As a possible explanation for this the authors suggest that the benefits of density only appear if the setting is 'just urban enough', but too high a density can reduce the perceived quality. A closer look revealed that the association between urban density and the perceived quality of environment is however complex and often context dependent. The same densities can have multiple spatial arrangements and functional profiles and may actually correspond to very different surroundings, from liveable downtown blocks to high-rise apartment complexes in dormitory suburbs (Boyko and Cooper 2011, Sivam *et al* 2012).

As such, in order to guarantee the level of sensitivity to the context, we used the place-based softGIS tools for data collection and analysis in our study on Kuninkaankolmio. As with many other Public Participatory GIS (PPGIS) applications (see e.g. Brown and Weber 2011), the map-based softGIS questionnaires (see section 3 for a detailed description) use geo-coordinates to connect each response with its everyday context, as well as links the place-based data collected from the residents to a series of register-based data on urban density.

In this letter, we ask whether residents would stay in their current neighbourhood, or in close proximity to it, if they were to move house in the near future. We also ask whether that possible change of residence would imply a move to a denser or less dense area than the area in which they currently live. We will evaluate whether the people involved seem to accept the densification tendency in their everyday settings, and whether the density of the planned infill developments relates to the interest expressed by those currently living in the adjacent neighbourhoods.

In what follows we will introduce the study area (section 2) and the boundary conditions of urban densification in the Kuninkaankolmio development zone (located in Helsinki region, Finland), followed by the methods (section 3), including the aforementioned, place-based softGIS approach. After reporting on and discussing the results (in sections 4 and 5) we will conclude by highlighting the benefits of thorough contextualization and discuss the planning implications derived from our study. Are new developments exactly what the residents of Kuninkaankolmio have been hoping for? What would this mean in terms of acceptable density?

2. Densification measures in the Kuninkaankolmio context

While scholars debate about the interconnections between sustainability and density, cities continue to grow. Helsinki is one of the fastest growing urban regions in Europe (IGEAT 2010, Turok and Mykhnenko 2007), with considerable documented growth both outwards (see EEA 2006 on sprawl in Helsinki region) and inwards (see Jaakola and

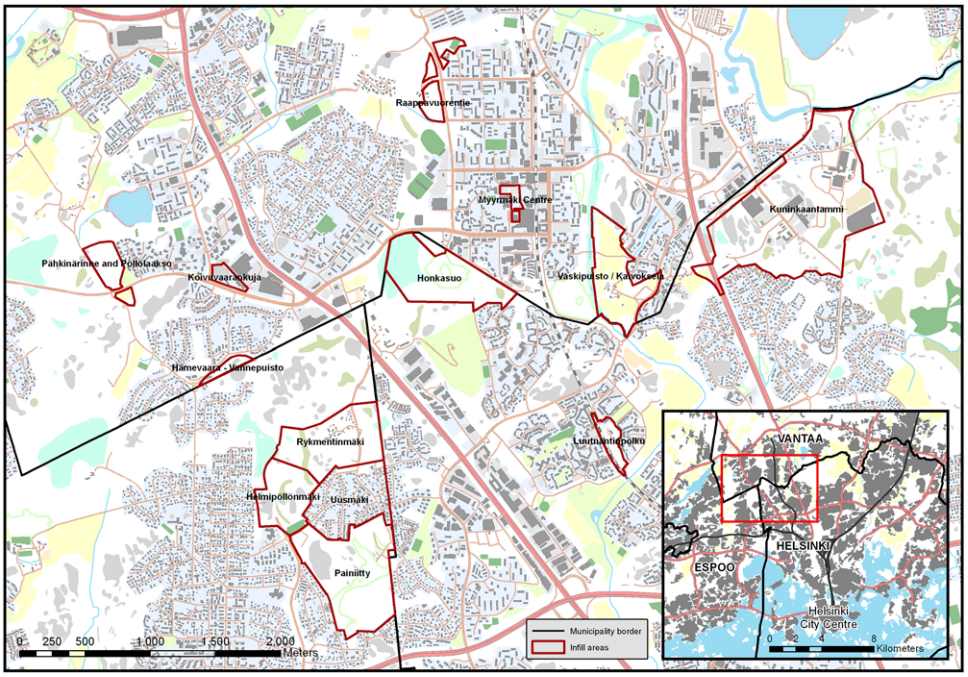


Figure 1. The infill projects of the Kuninkaankolmio development zone.

Lönnqvist 2007 on the parallel densification of the core). The City of Helsinki pursues an explicit densification policy[2] both through the assigning of brownfield sites to new development and by the promotion of smaller infill projects where practicable. These measures are often referred to as 'consolidation' or 'defragmentation' in a similar manner to the national level guidelines (VAT)[3] where the respective principle can be translated as either, 'When consolidating urban areas, the quality of the living environment shall be improved' or 'Defragmenting urban areas improves the quality of the living environment'[4]. The aim here is to identify and promote measures that both intensify land use *and* improve the level of environmental quality perceived by the residents.

As there is a considerable public debate about the implications of urban growth within the region it hardly comes as a surprise to the residents that planners are introducing densification. Planners are aware that they face something of a challenge when trying to reconcile the values of the existing built environment and the new urban densification goals. The research work reported upon in this letter itself represents an indirect outcome of this reconciliation process, as the planners of the 'Kuninkaankolmio' development zone had expressed their interest in deepening their understanding of the area in question. They showed a particular interest in the mobility patterns within this development zone as well as in the willingness of its current residents to continue to live in the area in the future. As we found these interesting also as research questions and suited for a study of the residents' perspective with the help of internet-based questionnaires (see the next section for a thorough explanation), we could launch a joint project[5].

Kuninkaankolmio is a development zone and not an administrative or functional area. It has been defined by three municipalities (Helsinki, Espoo and Vantaa) with a view to their desire to coordinate inter-municipal planning issues and to discuss certain joint concerns. The formal target area of the Project Group[6] currently houses 28 000 inhabitants, but altogether 62 000 inhabitants live within the broader sphere of its influence. Commuting to the central parts of the Helsinki region is very common from Kuninkaankolmio, particularly alongside the rail connection that links the largest centre within the Kuninkaankolmio zone (Myyrmäki in Vantaa, see figure 1) with Helsinki City Centre. The vast majority of the current building stock has been built during the last 50 years[7] and includes a mixture of apartment blocks and semi-detached and detached housing. The project area also includes several industrial and other workplace areas, as well as a number of broad recreational areas.

[2] The principle of consolidation/defragmentation was agreed upon by the City Council in its Strategic Programme in 2009. It is also one of the key principles in the agreement that the municipalities of the Helsinki region made with the Finnish Government in 2012 in order to improve coordination of the land use relevant decisions made within the region.

[3] VAT (Valtakunnalliset alueidenkäyttötavoitteet, national land use objectives) constitute a general type of objective concerning land use and regional structure. The current objectives were approved by the Finnish Government in 2008.

[4] In Finnish: 'Taajamiaeheytettäessä parannetaan elinympäristön laatua'.

[5] Kuninkaankolmio was thus one of the pilot areas of this larger project 'Everyday urbanity' carried out by Aalto University and Tampere University of Technology during the period 2010–2013.

[6] The Finnish title being 'Kehittämisryhmä', Development group.

[7] For instance, the broader Myyrmäki area with its current 50 000 inhabitants had little more than 2000 inhabitants in 1950.

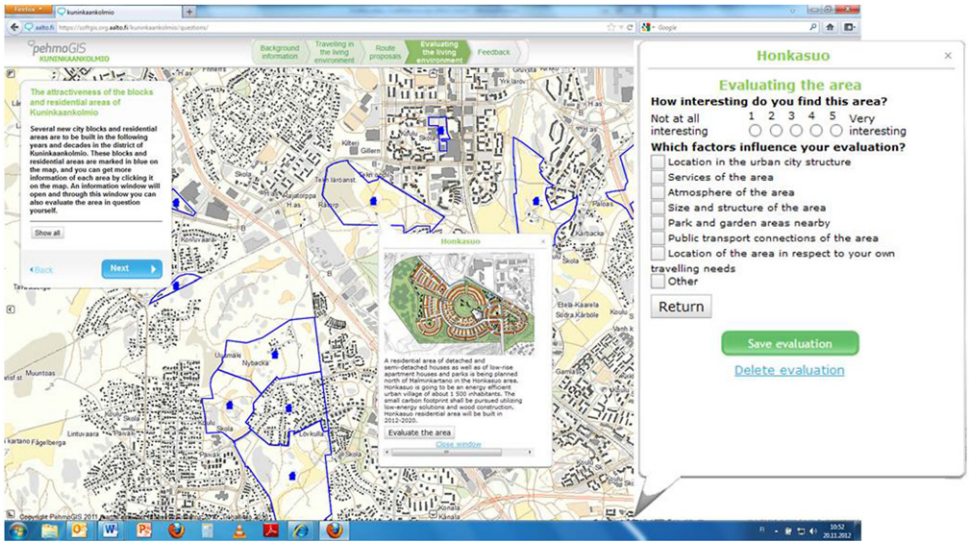


Figure 2. Evaluation of infill developments—the area of Honkasuo within the softGIS user interface. In the questionnaire, the evaluation window (on the right) appeared on top of the description of the area.

3. Methodology

3.1. Data collection and analysis utilizing softGIS

To aid data collection, the Kuninkaankolmio development zone had to be delineated according to the district borders. It was thus decided to cover nine statistical districts (with a total population of 57 000 in the target group of 15–74 year-olds): two districts from Helsinki, one from Espoo and six from Vantaa. As a random selection, the Population Register Centre produced a sample of altogether 14 500 inhabitants living in these districts[8]. These people received a postcard sent to their home address and inviting them to respond to the questionnaire at a given internet address. The postcard provided a short introduction to the research project and also included greetings from the participating municipalities. More information about the research task, including the ethical standards to be followed in relation to data handling, was available from the online questionnaire pages.

The questionnaire utilized the softGIS method, which is an example of the PPGIS approach. The softGIS method has been developed at Aalto University since 2005 and is used for the collection of experiential knowledge concerning various environments (Kyttä and Kahila 2011). This method has enabled the collection, with user-friendly applications, of large data sets. The method has been developed in close co-operation with urban planners and tested in several Finnish cities as well as in Japan and Australia. The collected database makes systematic GIS and statistical analyses possible (Kahila and Kyttä 2009). The user interface includes a set of questionnaire pages where conventional survey question and mapping pages alternate.

The Kuninkaankolmio softGIS survey consisted of four parts. In this letter, we will concentrate on the data from the first and the fourth parts. The first part consisted of questions concerning background information, including a page where the respondents were invited to locate their current place of residence on the map[9] and then evaluate the level of service provision in their areas. In the second part they were asked to mark the places they tend to visit in their everyday lives as well as the routes they consider important. In the third part, it was possible, utilizing the same drawing tools, to suggest new routes for pedestrian and bicycle traffic and for public transport. In the fourth part, respondents were asked first to mark those places which they considered to be possible places of future residence and then to recount, in their own words, why they would consider moving to these specific places. Finally they were invited to evaluate a selection of the planned and ongoing infill projects in the Kuninkaankolmio area. In this section, the infill projects were delineated on the background map and, with a mouse click, they were superimposed on the map with information and prospective illustrations of the respective areas as they are ultimately envisaged. The respondents were then asked to indicate how interesting they find these developments (on a scale of 1–5) and what factors led them to this conclusion, either by ticking from pre-given criteria or by adding their own feedback (see figure 2).

The main benefit of utilizing the softGIS surveys in data collection is the explicit connection maintained with the context. Based on the geo-coordinates, the data stays ‘rooted’, i.e. we know which everyday spheres of life the respondents talk about and which kinds of physical environments they interact with. Another key advantage is that the data provided

[8] In Helsinki and Vantaa the sample corresponded to 25% of the target population within their targeted districts, but in Espoo the share was raised to 31% to ensure that a sufficient number of marked locations within the slightly less-densely populated districts were included.

[9] The respondent was advised that a fully accurate response to this question was not mandatory and that locating a home e.g. in a near-by street would also be fine. On the start page, it was made clear that the project applies the highest standards of practice protecting the anonymity of the respondents in both storing and visualizing the data.

by the residents can be related to the abundant register-based GIS-data concerning the built environment; the area and population densities, land use patterns and many other layers.

Some of the potential drawbacks of utilizing softGIS had however to be anticipated, based on previous studies with similar internet- and map-based questionnaires (Brown and Weber 2011, Kahila and Kyttä 2009, Raymond and Brown 2007, Raymond *et al* 2009). The identified drawbacks included low response rates due to the internet being the only channel for participation (Pocewicz *et al* 2012) and the possible low correspondence of the respondents with the total sample (Brown and Reed 2009). Despite the relatively low response rate (1238 responses[10] from the sample of 14 500) the data actually proved to represent rather well the sample in terms of gender and age groups. Female respondents predominated slightly (with a 55.5% share) among the participants as a whole. Young adults were somewhat underrepresented as a respondent group but, somewhat contrary to expectations, in the age group of 65–74 the share of respondents nearly corresponded with the sample population[11].

3.2. Data pre-processing

For the analysis of the density levels in present and possible future places of residence (section 4.1), the data collected by the softGIS questionnaire was combined with the register-based data on urban densities. The physical environment of the localizations was studied by building a 250 m buffer zone around each mapped home location (819 in total) and possible place of residence (863).[12] Four density measures were calculated within this buffer from the register-based data: number of dwellings (NRDW), floor space (FLSP), residential floor space (RFLSP) and number of people living (NRPL). These measures within the 250 m buffer around the localizations were assigned as the density values of the mapped localizations. The register data were obtained from the City of Helsinki[13].

For the analysis of the ongoing infill projects (section 4.2), the density information of each project was received from the various contact persons of the Kuninkaankolmio development zone. All three municipalities use area density (relation of floor space to the size of the infill area) as their main density indicator when planning infill developments. As area density represents a wider professional standard in Finland this indicator is likely to remain consistent across the cases. For one infill area we chose to change the delimitation of the area, i.e. we excluded a recreational area of regional significance as it would have distorted the comparability of the density values.

[10] The vast majority of these was received within seven days after sending out the invitations. No reminders were sent.

[11] Regarding the occupational type, 60.8% were employed, 22.5% retired, 7.6% were students, and 4.1% were unemployed.

[12] Some of the respondents marked several possible future places of residence and some did not mark any. Approximately 55% of the respondents marked at least one possible future place of residence.

[13] Specifically, from the SeutuCD dataset, which is not freely available.

The statistical analysis, using IBM-SPSS version 21, included a set of regression analyses to exclude non-significant demographic variables as well as hierarchical regression analysis to test whether the current places of residence, after controlling for the demographic variables, would predict the possible future places of residence. Other analyses included ANOVA and correlation analyses, supported by mapping and GIS-analysis utilizing Mapinfo.

4. Results

The analysis had two main *foci*. The first aim was to test whether the respondents would seek to live in an area where urban density clearly differs from the density of their current living environment. We tested whether the indicators of current urban density, calculated separately for each individual's current place of residence, would predict the corresponding density indicators of the possible future places of residence. As also noted in section 3.2, the data includes all marked current and possible future homes although all respondents did not mark both locations on the map. Then we checked whether the capacity to predict would include a systematic shift between different density levels. The second aim of the analysis was to relate the interest the respondents had shown towards the selected infill developments to the planned density levels of these developments.

4.1. Urban density in present and possible future neighbourhoods

In order to test whether the indicators of the current urban density would predict the corresponding indicators of future urban density, separate hierarchical regression analyses were performed. Because the number of the demographic variables in the original dataset was high, and most were in multi-nominal measurement level, we included only those categories of the demographic variables in step 1 (see table 1) which shared significant variance explanations on the dependent variables. Therefore, prior to performing the hierarchical regression analysis, we excluded, in a stepwise manner and using different regression analyses, those non-significant demographic variables. Thus according to the obtained results we included the demographic dummy variables (residence type, occupation type, and family type) in the first step as control variables, predicting the indicators of future urban density. As shown in table 1, standardized beta coefficients denote whether the demographic variables significantly predict the indicators of future density. Step 2 in turn, indicates whether each current density variable predicts its future counterpart.

The results indicated that all of the indicators of the current urban density, after controlling for demographic variables, predict their future counterparts positively and significantly. That is, the denser the current living environment, the denser the possible future place of residence, and vice versa. However, the results for the current number of dwellings (NRDW) as well as the floor space (FLSP) within the 250 m range predicting their future counterparts (above

Table 1. The results of the regression analyses for current urban density predicting their counterparts' indicators of future residence urban density.

Predictors	(I) NRDW future		(II) FLSP future		(III) RFLSP future		(IV) NRPL future	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
	β	β	β	β	β	β	β	β
Step 1								
Reside type[a]	−0.103[b]	−0.092	−0.116[b]	−0.100	−0.085	−0.077	−0.092	−0.083
Occupation type[c]	0.105[b]	0.099	0.149[d]	0.148[d]	0.098	0.094	0.102	0.097
Family type[e]	−0.131[d]	−0.113[b]	−0.120[b]	−0.108[b]	−0.118[b]	−0.105[b]	−0.120[b]	−0.109[b]
Step 2								
Corresponding variable for current density		0.131[d]		0.129[d]		0.109[b]		0.097[b]
F model	7.227[d]	7.226[d]	9.622[d]	9.081[d]	5.628[d]	5.432[d]	6.128[d]	5.559[b]
R^2	0.053	0.069	0.067	0.083	0.042	0.053	0.045	0.054
ΔR^2	0.053[d]	0.017[d]	0.067[d]	0.016[d]	0.042[d]	0.012[b]	0.045	0.009[b]

[a] Residence type was a dummy variable with values 1 = owner and 0 other.
[b] $p < 0.05$.
[c] Occupation type was a dummy variable with values 1 = student and 0 = other.
[d] $p < 0.01$.
[e] Family type was a dummy variable with values 1 = a parent with child(ren) and 0 = other. NRDW stands for 'the number of dwellings', FLSP for 'the floor space', RFLSP for 'the residential floor space', and NRPL stands for 'the number of people living'—all within the 250 m range from the indicated place of residence.

and beyond the effects of control variables ($\beta = 0.13, p < 0.01$, and $\beta = 0.13, p < 0.01$ respectively) were stronger than those obtained for the current residential floor space (RFLSP) or number of people (NRPL) predicting their future counterparts ($\beta = 0.11, p < 0.05$, and $\beta = 0.10, p < 0.05$ respectively).

Having established that the indicators of current urban density predict the corresponding indicators of future urban density positively and significantly, we checked whether these effects include a shift between density levels. Comparing the means of the current urban density with the future density through ANOVA indicated no significant differences between the current and the future densities. These results corroborate the tendency shown in table 1 and indicate that the participants in the survey significantly preferred the same density factors in respect of their future residency as they had in their current neighbourhood. In other words, when considering moving house, there seems to be clear continuity, as people tend to seek out areas that correspond to the densities they have in the vicinity of their current place of residence.

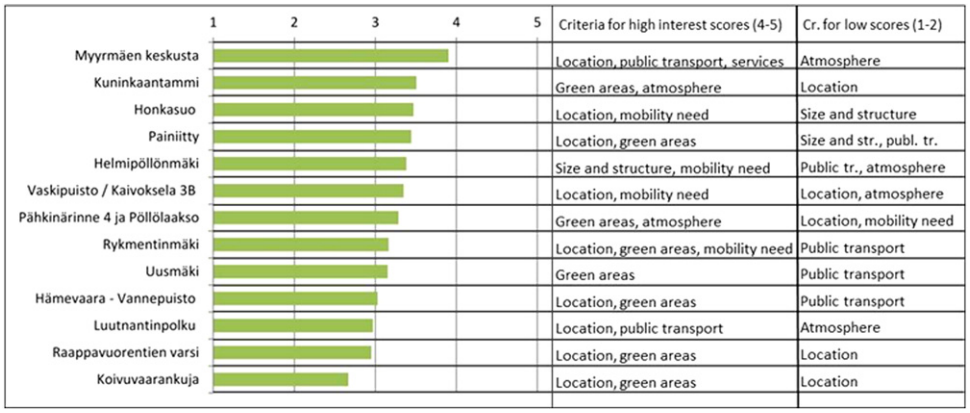
4.2. Interest in new infill areas in relation to their density

The second analysis set related the expressed interest of the respondents in the selected new housing areas with the planned density levels of these developments. This was an attempt to approach the question of the attractiveness of different planned densities to the people, and to provide planners with more than an educated guess as to whether the current population of Kuninkaankolmio would consider moving to these areas, and on what grounds. The planned developments include both entirely new residential areas (planned for up to 5000 inhabitants) and smaller projects some of which are the size of some blocks only. In most of the areas, the planned densities, calculated as *e*-values, vary from approximately 0.15–0.7 [14]—the only exception being the infill development within the regional sub-centre Myyrmäki with the current and future densities for the whole area being approximately 1.1.

When respondents evaluated the selected areas they did so having not been shown explicit figures in relation to the planned densities. However, both the written descriptions and the visualizations characterized the planned structure and character of the area: i.e. what types of buildings were planned and what kinds of settings they were meant to create. If some particular feature (e.g. strong ecological orientation) was planned, this was also noted in the description. The planners of Kuninkaankolmio provided source material for the descriptions and commented on what the researchers had drafted based on this material. The descriptions were also cross-read by the planners to guarantee both a certain consistency and a sufficient diversity across the cases. In addition to being as informative as possible, the visualizations were chosen on the basis of being delineated in a similar way, e.g. in relation to adjacent green areas and recreation possibilities.

The infill areas were found in general to be quite interesting (see figure 3). The Myyrmäki infill project, in the heart of the largest urbanized centre within Kuninkaankolmio, received the highest mean value (3.9), followed by Kuninkaantammi and Honkasuo (3.5), which are planned as entirely new residential areas of considerable size.

[14] The *e*-value is calculated as the ratio of building floor space to land area, with both using the same unit of measurement. The data on the estimated densities of the new residential areas and infill developments was received from the planners of the respective areas.



Criteria for high interest scores (4-5)	Cr. for low scores (1-2)
Location, public transport, services	Atmosphere
Green areas, atmosphere	Location
Location, mobility need	Size and structure
Location, green areas	Size and str., publ. tr.
Size and structure, mobility need	Public tr., atmosphere
Location, mobility need	Location, atmosphere
Green areas, atmosphere	Location, mobility need
Location, green areas, mobility need	Public transport
Green areas	Public transport
Location, green areas	Public transport
Location, public transport	Atmosphere
Location, green areas	Location
Location, green areas	Location

Figure 3. The interest shown towards the selected infill developments of Kuninkaankolmio and the most frequently chosen predefined criteria as the grounds for both low and high interest (see figure 2 for the corresponding questionnaire page).

We calculated the correlation coefficients between the interest shown in these areas (utilizing the mean of the ratings that each area had received[15]) and the three variables received from the planners: area density, total floor space and the number of inhabitants. The interest variable had a significant relationship with the floor space variable ($r = 0.74, p < 0.01$), showing that people seemed to favour larger projects. Regarding the number of inhabitants, although it had a relatively strong relationship with the interest variable, Pearson's correlation coefficient was not significant ($r = 0.40$ ns). Finally, the interest variable had no significant relationship with the area density variable ($r = 0.08$ ns). This might partially derive from the pattern shown in figure 3: the 'location' criteria was allotted a very high importance in comparison with the 'size and structure' of the area, for instance, and could thus dominate the ranking. In order to elaborate further on the above results, we calculated the possible future moves on the map of the Helsinki region. The results are presented in the following.

4.3. Mapping the interest shown

Figure 4 shows the possible future places of residence[16] according to whether they imply a move towards a denser or less dense structure (utilizing the 250 m density buffer). The grid-based background map represents the current urban density (as floor space per grid area). Within Kuninkaankolmio, we can see how large parts of the existing dense structures are included in these possible future places of residence (red dots on reddish ground). This holds for both Myyrmäki, the largest sub-centre of Vantaa within the Kuninkaankolmio area, and for Leppävaara, which is a similar sub-centre in Espoo, adjacent to Kuninkaankolmio. The broader picture here is clearly that the urban zone between Kuninkaankolmio and the centre of Helsinki is rather popular.

The concentrations of possible future places of residence, indicating moves towards areas of lower densities, deserve closer scrutiny. Some are, for instance, to be found within the future infill development projects[17]. Were the gird data already to include the future floor space figures, many of the green spots on bright ground would be likely instead to present as red spots (to indicate a move towards a denser area than the respondent's current residence) on reddish ground. This would be in keeping with the respondents' choices, as the open feedback (on why they had marked these spots) confirms the message. In Honkasuo, for instance, it is precisely the future infill development area that most of the respondents in this concentration of markings consider as a possible future place of residence, not the Honkasuo in its current, nearly unbuilt form. For the 22 markings that fell within the borders of the Honkasuo infill area, 19 responses in the open feedback included reasons for these choices. Fifteen were very explicit about the new project area being the lure while two others could be construed to point in the same direction. The same is true for many other green spots, e.g. to the north-east of Leppävaara.

The mapping exercise and the area-based link to the open feedback fields shed more light on the results reported in section 4.2, showing a correlation with the absolute floor space of the infill project. When studying the free feedback from those who have spotted their possible future home within the Myyrmäki infill area, which has the greatest amount of floor space across the projects, we find that the urban facilities (service hub, rail connection) are viewed as being very important. This is in line with the findings shown in figure 3, as the grounds for showing a high level of interest in the infill project were similar. Some respondents have also highlighted the way the new infill developments in Myyrmäki are 'pleasing to the eye' and support their commitment in the area. Many respondents probably feel that larger infill projects are more likely than the small ones to include reasonable options for them to remain within the studied area.

[15] The *N* of evaluations per area varied between 34 and 116: many respondents skipped this part of the questionnaire and few evaluated all areas.

[16] Respondents were asked to 'mark one or several neighbourhoods' where they 'could imagine moving in the future'. The question for the open field was: 'Why in particular would you like to move to this area?'.

[17] The questionnaire page that invited the respondent to indicate a possible future place of residence did not yet highlight the infill areas. They were introduced to the respondent only in the next phase in the way shown in figure 2.

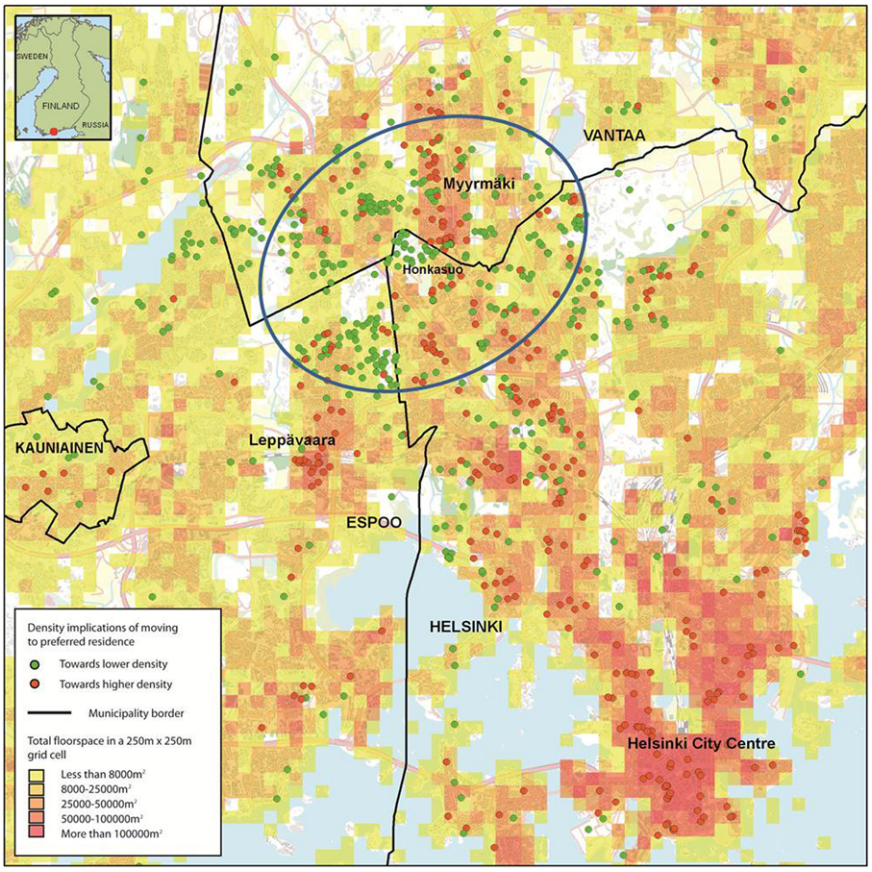


Figure 4. Possible new places of residence for the Kuninkaankolmio (ringed area) respondents within the Helsinki region. The colours indicate a move towards a lower (green) or higher (red) density than each respondent has in his/her current living environment.

5. Discussion

The results contribute to the debate currently raging within international scientific community on preferred urban densities and their context-sensitivity. The study reveals that people who are considering moving house would like to move to areas which correspond with the density of their current neighbourhood. This indicates that, were the citizens given a free (albeit hypothetical) choice, there would be no predetermined migration flow to less dense areas.

The basic finding, that—in terms of urban density—people considering a move seem to remain quite consistent in respect of their previous housing choices, is in line with previous studies. The so called 'self-selection' issue refers to the tendency of people to choose places of residence that represent their values and lifestyles (Litman 2005, Handy *et al* 2006). High density fits well with certain lifestyles while lower density with other lifestyles. Although in Kuninkaankolmio we found that residents wanted to retain their current density level this does not mean that all inhabitants want the same thing. Future studies should therefore take a closer look at the various lifestyle profiles of residents and especially the fit or mismatch between lifestyles and the characteristics of the urban fabric. Instead of simply arguing that a certain density level automatically leads to certain ecological outcomes, a more sensitive approach is needed that recognizes both the varying ways people use urban space and the varying potentials different urban settings provide.

We see that anti-sprawl measures, taking the form of delicate infill developments, can actually be rather welcome in urban areas experiencing population growth (see also Ryan and Weber 2007). They offer new options, 'more choice' (Talen 2011, 975), in particular for those who can afford them. Moreover, they might free living space for those who, in search of affordable housing, would otherwise be pushed towards the fringes of the metropolitan regions, away from their current everyday life settings. Moreover, the interest people expressed in the new areas that are already planned for the Kuninkaankolmio area supports this interpretation. In reference to Vallance *et al* (2005) who wish to place in the foreground the socio-cultural dimensions of the environment, we show that urban densification does not necessarily jeopardize this goal.

Another broader issue stemming from our results is that future project areas in familiar places and close to current everyday life settings are considered interesting options[18]. This is clearly in line with housing and migration

[18] Among those that would possibly move to Honkasuo, for instance, the average distance to current home was 1.2 km. Among those interested in the Myyrmäki infill area it was only 0.9 km. The mean distance figure to future homes for all possible future moves was 3.4 km.

studies showing the relative immobility of settled, particularly middle-class, families (Fischer and Malmberg 2001) and that the majority of moves are short-distance (Aro 2007; for Finland see Häkkinen 2000, Nivalainen 2004). Similar to the study by McCrea and Walters (2012), many Kuninkaankolmio residents seem to focus on the potential improvements in services and infrastructure instead of solely pondering the possible negative impacts of densification.

The results reported on here also connect into the current Finnish scholarly debate in a rather interesting way. Many scholars have echoed the belief that the Finns are rather uniform in their housing preferences and aspire primarily to low-rise, detached housing (Kortteinen *et al* 2005) that is located 'close to nature' (Juntto 2007). The fact that this letter suggests that new, even larger developments maybe found interesting by the population could be seen as a yet new attempt to ignore the preferences of the majority (Lapintie 2010). We would, however, rather steer the discussion in the direction of real-life choices to ask whether the previous studies were too detached from the everyday conditions of people like the respondents to our survey. If preference studies are to be used in decision making they have to be solid and well contextualized.

There are however two aspects of the study that we wish to flag as representing potential limitations. Firstly, several parts of the analysis were carried out with a considerably lower number of responses than the total figure of 1238 given. In particular, the last part of the questionnaire, the evaluation of the planned infill areas, contained a large number of missing values[19]. This limitation did not create a problem in respect of the quantitative analysis, but might be challenging for the reader that tries to follow which datasets were used in each part.

The second point is that in the questionnaire there were no explicit questions concerning 'preferred urban densities'. Although this derived more from the research design of the larger project than from conscious choice, it seems that keeping the density questions implicit has worked rather well. In our estimation it was legitimate that the respondents got to concentrate on issues that concerned them directly, through a map-facilitated connection with their everyday life networks. Another point is that the way we used 'objective' density values, calculated from the register-based data sources for each respondent individually, made the comparisons across areas more feasible than what could be expected from a collection of density perceptions from the residents alone. As Mitrany's study (2005) shows, subjective estimations and objective density data can often differ considerably from each other. In addition, Sivam *et al* (2012) demonstrated that the perception of density is often influenced by the built form (and its image) rather than by the actual density. On the other hand, Mitrany's study, which used maps to combine subjective and objective density variables, does provide a possible direction for future softGIS studies. The possible non-concordance between objective and perceived measures of density could thus emerge as an additional challenge in the public debate on urban densification.

[19] Most of the people who took the time to evaluate at least some of the areas did however do it rather carefully, considering that most of them also provided an open feedback contribution.

6. Conclusion

The question of whether urban density should be increased in the name of environmental gains is multi-dimensional. There is clearly a need here to weigh a large number of factors, including the perspectives of the people actually living in the area. We claim that it is useful to effectively reduce the complexity by letting the notion of'context' play its full part. When the Kuninkaankolmio residents mapped their possible future places of residence using the softGIS tools, they anticipated a possible move to a specific, concrete area, and did not have to think through abstract categories to express their preferences. This mapping process thus facilitated a study of what these moves would imply in terms of urban density, separately for each individual.

The first part of the study revealed that when considering moving house, the residents of Kuninkaankolmio desire to move to areas which correspond to the density of their current neighbourhoods. The second main part, which measured the interest in future infill areas, supported the first by showing how the interest expressed in planned infill developments related to urban density. The analysis showed that density as such did not play a major role: larger projects were preferred but the level of density did not correlate with the level of interest shown towards the planned projects. This may speak for the urbanity of the projects. Kyttä *et al* (2013b, 2013a) found that in the urban context the degree of urban density was not an experiential problem nor did it have negative wellbeing outcomes. In the suburban context, nevertheless, increasing density did have these negative consequences. Perhaps the respondents saw that the evaluated projects would be likely to pay off in terms of appreciated urban features.

In light of these results it appears that we can be hopeful about the prospects of urban densification in the study area. As far as the Kuninkaankolmio development zone is concerned, the starting point is favourable as the residents do not necessarily desire areas with lower density levels but rather show a preference for settings similar to those that they currently inhabit. In particular the open feedback given by these respondents points in the direction of new and attractive infill developments being welcomed to Kuninkaankolmio by a considerable number of its residents. The impression received here is that new and even quite dense options are likely to be met with considerable interest even if they add to the density of the broader development zone. It is especially interesting to see where respondents have shown interest in the infill areas despite them being located in close proximity to their current residences. If infill developments are introduced in a sensitive manner, respecting the local points of view, densification need not be seen to be a bad scenario for the residents. This is good news indeed for a region that is currently experiencing a continuing rapid growth while, simultaneously, trying to limit urban sprawl.

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