Residential infill development

The connection between inhabitants’ attitude and areal characteristics

Martina Bendová & Dr. Saija Toivonen, Aalto University, School of Engineering Department of Real Estate, Planning and Geoinformatics, Finland

Anne Arvola, VTT, Technical Research Centre, Finland
Background and motivation

- The Helsinki Metropolitan Area is a growing region with rising demand for housing
  - Helsinki gains 7000 inhabitants each year (Statistics Finland)
- The low density of housing bears great potential for infill development
  - Currently 2921 inhabitants/km² (City of Helsinki Urban Facts 2015)
  - For example UN habitat recommends high density (15000 inhabitants/km²) as a strategy for sustainable neighbourhood planning
- Examples of possible benefits of infill development:
  - better use of existing infrastructure
  - diversification of population and land use, increased vitality and amount of services in the area
  - economic benefits to various parties
Research Project: Research on Resident-Driven Infill Development Possibilities (REPSU)

- The aim of the research project is to study and understand the preconditions for a resident-driven infill development, the main focus being on the needs of residents and housing companies
- Research partners: Aalto University and VTT Technical Research Centre of Finland
- Funded by The Academy of Finland
- Consortium project of the Future of Living and Housing (ASU-LIVE) Research Programme
- Responsible Professor Kauko Viitanen/ Aalto University
- Funding time: 1.9.2011 – 31.8.2015
Research by Real Estate Research Group

- **Sipilä, Tuomo** (doctoral dissertation - ongoing):
  - Promoting infill development – analysis of three emerging cities: Helsinki, San Diego, and Boston
  - Researching the ways to promote infill development especially from cities viewpoints

- **Puustinen, Tuulia** (doctoral dissertation - ongoing):
  - Infill Development on Collectively Owned Residential Properties:
  - Understanding the Decision-making Process – Case Studies in Helsinki

- Several other journal articles.
Previous study by Arvola & Penanen 2014

Research on Resident-Driven Infill Development Possibilities – Case Study in Urban Areas in Finland (REPSU) - Questionnaire

● Research area:
  o suburban areas with apartment buildings built between the 60s and 80s and located in the Helsinki Metropolitan Area (+ Tammela from Tampere) which have potential or preliminary plans for infill development

● Respondents
  o The questionnaire was sent by mail to 4 455 residents, who lived in the research area (in total 23 suburban areas)
  o N = 1114 (percentage of respondents 25%)
  o Final sample N = 906 (Owner occupied residents=decision making power, rental residents excluded from the sample)

● Timeframe: Jan-Feb 2014
Previous study by Arvola & Penanen 2014

- Attitudes towards infill development:
  - 32% opposed clearly
  - 44% opposed clearly or to some extent
  - 19% had neutral (in between) attitude
  - 35% were at least to some extent in favour

- General attitude towards infill development was not significantly related to respondents’ gender, level of education, attitude towards sustainable development nor previous experience with infill development

- Some statistically small correlations were found with age, level of income, and years spent living in the same neighborhood (older respondents with higher education, living in the same area for longer period of time are more likely to oppose the infill development)

- Generally negative were beliefs about consequences of infill development - residents believe that the neighborhood will not remain similar after infill and they will feel less home

- Elderly respondents who had lived long in the area were over represented in the sample
Aim and research questions of this study

The aim of this study is to understand inhabitants’ attitudes towards infill development by analysing the justifications they provided for their attitudes.

**Research question 1**: What are the reasons why are inhabitants against or in favor of infill development in their neighbourhood?

**Research question 2**: Do the justifications correspond to the actual areal characteristics?
Study design

Questionnaire:
- qualitative approach, case studies
- Question N5b: “Are you in favour or against infill development in your neighborhood?” - 804 answers in Helsinki
- Analysis of answers in different areas, division based on postcode
- Analysis of open-ended question following N5b - explanation, content analysis
- Categorising, searching for trends, comparing to areal characteristics
Data

- **data set from the questionnaire** - especially answers to these questions:
  N5a: *Are you in favour or against infill development in your neighborhood?*  
  *(Mark higher number the more you are in favour. 1-I am against --4- neutral-  
  -7- I am in favour),* 
  N5b: *If there is a specific reason why you oppose or support infill development,  
  you can write it here.*

- **SeutuCD**
  Annually published material package provided by Helsinki Region Environmental Services Authority HSY, which includes comprehensive register data from the Helsinki Metropolitan Area (annual cross-sectional data) and map and data for planning. All materials on the SeutuCD are in geographic information format and all data can be transferred to geographic information software for further processing.

- **other open data sources**
  Paavo- Open data by postal code area (Statistics Finland), OpenStreetMap
15 areas in Helsinki

1 Ruskeasuo
2 Munkkivuori
3 Konala
4 Pohjois-Haaga
5 Lassila
6 Itä-Pasila
7 Merihaka (Kallio)
8 Maunula
9 Pihlajamäki
10 Pukinmäki
11 Tapulikaupunki (Puistola)
12 Yliskylä (Laajasalo)
13 Kontula
14 Keski - Vuosaari
15 Mellunmäki
How did the respondents answer to N5a in different areas?

N5a: Are you in favour or against infill development in your neighborhood? (Mark higher number the more you are in favour. 1-I am against --4- neutral--7- I am in favour),

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>Column Labels</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>00960 Keski-Vuosaari</td>
<td>41% 15% 20% 2% 12% 7% 2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00390 Konala</td>
<td>40% 7% 7% 13% 0% 7% 27%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00530 Kallio</td>
<td>29% 12% 7% 8% 17% 10% 17%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00940 Kontula</td>
<td>28% 11% 13% 11% 11% 11% 13%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00400 Pohjois-Haaga</td>
<td>24% 8% 8% 23% 15% 15% 6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00840 Laajasalo</td>
<td>22% 10% 10% 19% 24% 10% 3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00750 Puistola</td>
<td>21% 12% 6% 21% 24% 9% 9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00710 Pihlajamäki</td>
<td>20% 14% 9% 27% 19% 9% 3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00520 Itä-Pasilä</td>
<td>19% 9% 14% 16% 16% 12% 14%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00970 Mellunkylä</td>
<td>16% 7% 10% 22% 16% 16% 12%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00280 Ruskeasuo</td>
<td>14% 10% 14% 14% 10% 29% 10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00350 Munkkvuori-Niemenmäki</td>
<td>13% 15% 8% 18% 13% 21% 13%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00440 Lassila</td>
<td>10% 16% 10% 19% 19% 10% 13%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00720 Pukinmäki-Savela</td>
<td>7% 12% 12% 27% 19% 14% 10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00630 Maunula-Suursuo</td>
<td>0% 20% 16% 12% 20% 24% 8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grand Total 20% 12% 11% 18% 17% 13% 10%
Percentages of respondents opposing infill development (answer alternatives 1 – 3).
N5b open-ended question

“If there is a specific reason why you oppose or support infill development, you can write it here.”

Every third respondent added an explanation to his/her answer.

7 categories have been made based on the most often mentioned themes:

- Nature (forest, park and recreation)
- Economy (financing reparations, value of the property)
- Density (is there enough space, view..)
- Arch (image of the area, unity of urban planning, feeling)
- Transportation (public, traffic, parking)
- Services (quality and amount of services)
- Implementation (mainly the construction phase)

Each category could have been mentioned in positive or negative way.- this was also taken into account
**N5b open-ended question**

Example of categorizing:

N5a: 5, N5b: “If the infill development is not done in place of a park or some other recreational area, then I think it is a very good idea. It is also very important to respect the appearance/outlook of the area.”

-->Nature -neg, arch - neg (respondent is worried, that infill development might take away parks or destroys the image of the area)

N5a: 7, N5b: “Dense urban environment is cozy, vibrant and stimulating.”

-->Density-pos, arch-pos (respondent supports densification and thinks infill development will positively influence his neighbourhood)

N5a: 1, N5b: - “The reason I have moved to this area was the space between houses. Infill development would take the original reason to live here away, I would probably move to some other loosely built area.”

-->Density-neg (respondent doesn’t support densification)
Which categories were mentioned the most?

<table>
<thead>
<tr>
<th>Categories</th>
<th>Count</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count of density-neg</td>
<td>109</td>
<td>25%</td>
</tr>
<tr>
<td>Count of nature-neg</td>
<td>103</td>
<td>23%</td>
</tr>
<tr>
<td>Count of arch-neg</td>
<td>54</td>
<td>12%</td>
</tr>
<tr>
<td>Count of arch</td>
<td>28</td>
<td>6%</td>
</tr>
<tr>
<td>Count of services</td>
<td>27</td>
<td>6%</td>
</tr>
<tr>
<td>Count of economy</td>
<td>24</td>
<td>5%</td>
</tr>
<tr>
<td>Count of implem-neg</td>
<td>21</td>
<td>5%</td>
</tr>
<tr>
<td>Count of trans</td>
<td>17</td>
<td>4%</td>
</tr>
<tr>
<td>Count of trans-neg</td>
<td>17</td>
<td>4%</td>
</tr>
<tr>
<td>Count of economy-neg</td>
<td>16</td>
<td>4%</td>
</tr>
<tr>
<td>Count of density</td>
<td>13</td>
<td>3%</td>
</tr>
<tr>
<td>Count of services-neg</td>
<td>10</td>
<td>2%</td>
</tr>
<tr>
<td>Count of implem</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>441</td>
<td></td>
</tr>
</tbody>
</table>
Frequency of categories - positive

<table>
<thead>
<tr>
<th>Category</th>
<th>Count of arch</th>
<th>Count of services</th>
<th>Count of economy</th>
<th>Count of trans</th>
<th>Count of density</th>
<th>Count of imp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>00280 Rukkakuo</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>00350 Mukkivuo</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00390 Koriaa</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>00400 Pohjois-Haaga</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>00440 Lassila</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00520 Falas-Pasla</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00530 Kallo</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>00630 Maunula-Suursa</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00710 Pinjaamaki</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00720 Puistikka-Savikko</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00750 Puistola</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00840 Laajassa</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00940 Kontula</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00960 Vuosini</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>00970 Melunkylä</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Frequency of categories - negative
Categories mentioned in negative sense - percentage

<table>
<thead>
<tr>
<th>area</th>
<th>dens-neg</th>
<th>nature-neg</th>
<th>arch-neg</th>
<th>implem-neg</th>
<th>trans-neg</th>
<th>economy-neg</th>
<th>services-neg</th>
</tr>
</thead>
<tbody>
<tr>
<td>00260 Ruskeasuo</td>
<td>33 %</td>
<td>11 %</td>
<td>56 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>00360 Munkkivuori-Niemenmäki</td>
<td>26 %</td>
<td>44 %</td>
<td>11 %</td>
<td>11 %</td>
<td>0 %</td>
<td>0 %</td>
<td>6 %</td>
</tr>
<tr>
<td>00360 Konea</td>
<td>21 %</td>
<td>29 %</td>
<td>7 %</td>
<td>7 %</td>
<td>14 %</td>
<td>14 %</td>
<td>7 %</td>
</tr>
<tr>
<td>00400 Pohjois-Haaga</td>
<td>27 %</td>
<td>39 %</td>
<td>9 %</td>
<td>5 %</td>
<td>6 %</td>
<td>9 %</td>
<td>3 %</td>
</tr>
<tr>
<td>00440 Lassila</td>
<td>25 %</td>
<td>33 %</td>
<td>21 %</td>
<td>17 %</td>
<td>0 %</td>
<td>0 %</td>
<td>4 %</td>
</tr>
<tr>
<td>00520 Itä-Pasila</td>
<td>44 %</td>
<td>22 %</td>
<td>16 %</td>
<td>3 %</td>
<td>9 %</td>
<td>3 %</td>
<td>3 %</td>
</tr>
<tr>
<td>00530 Kallio</td>
<td>63 %</td>
<td>21 %</td>
<td>13 %</td>
<td>0 %</td>
<td>20 %</td>
<td>10 %</td>
<td>10 %</td>
</tr>
<tr>
<td>00630 Maunula-Suvanto</td>
<td>30 %</td>
<td>30 %</td>
<td>0 %</td>
<td>20 %</td>
<td>10 %</td>
<td>10 %</td>
<td>0 %</td>
</tr>
<tr>
<td>00710 Pihlajamäki</td>
<td>35 %</td>
<td>29 %</td>
<td>27 %</td>
<td>2 %</td>
<td>2 %</td>
<td>4 %</td>
<td>0 %</td>
</tr>
<tr>
<td>00720 Pukinmäki-Savela</td>
<td>22 %</td>
<td>44 %</td>
<td>11 %</td>
<td>0 %</td>
<td>11 %</td>
<td>0 %</td>
<td>11 %</td>
</tr>
<tr>
<td>00760 Puistola</td>
<td>13 %</td>
<td>75 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>13 %</td>
<td>0 %</td>
</tr>
<tr>
<td>00840 Laajasalo</td>
<td>30 %</td>
<td>33 %</td>
<td>15 %</td>
<td>6 %</td>
<td>6 %</td>
<td>6 %</td>
<td>3 %</td>
</tr>
<tr>
<td>00940 Kontula</td>
<td>30 %</td>
<td>22 %</td>
<td>22 %</td>
<td>7 %</td>
<td>11 %</td>
<td>4 %</td>
<td>4 %</td>
</tr>
<tr>
<td>00960 -Vuosaari</td>
<td>32 %</td>
<td>23 %</td>
<td>23 %</td>
<td>9 %</td>
<td>0 %</td>
<td>5 %</td>
<td>9 %</td>
</tr>
<tr>
<td>00970 Mellunkylä</td>
<td>32 %</td>
<td>42 %</td>
<td>0 %</td>
<td>11 %</td>
<td>5 %</td>
<td>11 %</td>
<td>0 %</td>
</tr>
</tbody>
</table>

Chosen for case-study:
Density: Kallio, Itä-Pasila, Pihlajamäki, Vuosaari
Nature: Puistola, Munkkivuori, Mellunkylä, Pohjois-Haaga
Arch: Ruskeasuo, Pihlajamäki
Density - Area (% neg density category mentioned)

Merihaka (Kallio) 63%

Itä-Pasila (Alppila-Vallila) 44%

Pihlajamäki 35%

Vuosaari 32%
Density - Area (% neg density category mentioned)

Merihaka (Kallio) 63%
11 553 inhabitants/km²
plot ratio 1.57
100% of apartments are in apartment houses

Itä-Pasila 44%
5159 inhabitants/km²
plot ratio 0.58
100% of apartments are in apartment houses

Pihlajamäki 35%
4410 inhabitants/km²
plot ratio 0.14
94% of apartments are in apartment houses

Vuosaari 32%
2776 inhabitants/km²
plot ratio 0.27
85% of apartments are in apartment houses
Nature - Area (% neg nature category mentioned)

Puistola 63%
Munkkivuori 44%
Mellunkylä 42%
Pohjois-Haaga 39%
Nature - Area (% neg nature category mentioned)

Puistola 63%
- 3,067 inhabitants/km²
- Plot ratio 0.11
- 59% of apartments are in apartment houses

Munkkivuori 44%
- 4,134 inhabitants/km²
- Plot ratio 0.19
- 98% of apartments are in apartment houses

Mellunkylä 42%
- 3,040 inhabitants/km²
- Plot ratio 0.13
- 85% of apartments are in apartment houses

Pohjois-Haaga 39%
- 5152 inhabitants/km²
- Plot ratio 0.29
- 99% of apartments are in apartment houses
Arch - Area (% neg arch category mentioned) + street view

Ruskeasuo 56%

Pihlajamäki 27%
Conclusion

RQ1: Why are inhabitants against or in favor of infill development in their neighbourhood?

Based on the content analysis of answers to the open-ended question, which was answered by approx. $\frac{1}{3}$ of all respondent of the questionnaire: The density related issues were the most commonly used justification for opposing or not supporting fully infill development. (25% of all explanations) Nature, parks and recreation were mentioned in 23% of all answers, only in negative sense. Fear that infill development would destroy the unique architecture or influence the atmosphere in the area negatively was also very common - 12% of all answers. On the other hand, category architecture was mentioned positively in 6% of answers, among improving services (6%) and finance (5%).
Conclusion

RQ2: Do the reasons correspond to the actual areal characteristics?

Yes, in case of density.

In the issue of nature and recreations the correspondence is not that clear. Puistola, the area where the most justifications were considering the nature, is among the most loosely built areas, with the lowest amount of apartments in apartment buildings, e.g. most housing is in detached houses compared to other study cases. The area is also in the biggest distance from CBD Helsinki. No coefficient for comparing green areas in different areas has been established yet.

The architecture and neighborhood image worries the most inhabitants from areas, where buildings were built in the same style, with for the area unique urban plan. Residents of Pihlajamäki were also arguing with bad experience with previously done infill.
Further research

- setting a coefficient for ‘nature’, which would describe how much forest, parks and recreational areas is in the area and also private gardens, which cannot be publicly used/per amount of inhabitants/built environment.
- setting a coefficient for ‘arch’ which could be based on percentage of houses built in same period, utility of an area.

- Among with other variables (such as density, plot-ratio), these additional information could be input back into the original dataset under the areal postcode and regression analysis could be perform in search whether it is possible to predict the respondent’s attitude towards infill development with any of these variables.

The knowledge of the reasons behind negative attitude can be useful in promoting infill development. The positive notions should be promoted more and the inhabitants should be informed what exactly the infill development will be like in their neighbourhood, so maybe some of their fears can be minimalised.
Thank you!