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The impact of Noise & Air Pollution on property prices in Stockholm

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A. WHY NOISE & AIR POLLUTION ARE RELEVANT FOR URBAN TRANITIONS

- More people choose to live in cities; causing sound levels in urban areas to increase.
- Urbanization increasing demand for transport services; simultaneously increasing the production of noise and air pollution in urban areas.
- Growth of transport services also demands more land; arable land in cities is limited, thus resulting in traffic bottlenecks, with elevated levels of noise and air pollution.
- Noise & Air Pollution have adverse effects on public health & the economy.
- High investment costs for low-carbon transport can carry benefits; such as reduced exposure to air pollution and noise in urban areas, improving livability in cities.

B. LINKING NOISE & AIR POLLUTION TO PROPERTY PRICE DEVELOPMENTS

Air quality and noise levels can be considered property attributes. Increased and/or increasing levels of air and noise pollution could devalue property prices, thus leading to economic losses.

(i) Increased or increasing noise exposure and air pollution in the Stockholm inner city have a significant, price devaluing impact on property prices for the market of owner-occupied residential apartments.
(ii) The effect of noise and air pollution depends on the characteristics and/or amenities associated with them. The impact is thus spatially dependent and differs from one location to the other.
(iii) Because noise is a more physical annoyance when compared to air pollution, the negative impact of noise on property prices is higher.

Hedonic Regression analysis

\[ D = \frac{\text{reduction in property value from noise exposure or air pollution}}{\text{difference in noise exposure or air pollution}} \]

\[ NSDI = \frac{D}{\text{property value}} \times 100 \]

\[ ASDI = \frac{D}{\text{property value}} \times 100 \]

ON AN AGGREGATED LEVEL:
- A unit increase PM10 depreciates mean transaction prices with 2.2%** whereas, a unit increase in NO2 deprecates transaction prices with 0.2%, Noise i.e. urban acoustics are positively correlated with transaction price. A unit increase in A-weighted sound levels improves transaction prices 0.8%***
- Residential hotspots are intertwined with main transport corridors. Results show spatial dependency towards the underlying road network.
- The market for owner-occupied residential apartments has a ‘hidden’ property value. The hidden value in the market for residential apartments could be as much as 35 MSEK – 450 MSEK

D. IMPLICATIONS OF RESULTS

- In our case study: apparent higher tolerance i.e. acceptance towards traffic-related noise exposure when compared NO2 and PM10 as proxies of air pollution.
- Impacts of Noise & Air pollution is spatially dependent. Location factors are determining.
- There is reason to prioritize some areas over others – for quick wins / demo projects.
- Inclusion of low-carbon transport solutions and reduction of traffic related air pollution and noise exposure could translate into significant economic benefits.
- The potential of integrating the energy dimension in traffic and urban planning should be given more attention towards an integrated aspects for spatial planning.

C. THE MEASURED IMPACTS OF TRAFFIC RELATED AIR & NOISE POLLUTION IN THE CASE OF THE STOCKHOLM INNER CITY

Stockholm road network is intertwined with residential zones representing transaction hotspots. Reason to prioritize particular areas with high WTP for improved environmental conditions related to emissions

<table>
<thead>
<tr>
<th>OBSERVATIONS</th>
<th>R²</th>
<th>Adjusted R²</th>
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</thead>
<tbody>
<tr>
<td>9296</td>
<td>0.928</td>
<td>0.927</td>
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</tbody>
</table>

Owner occupied residential apartments in Stockholm city data collected for full year 2015

Variable Coeff. Sign Std. E t Sign. Min Max Mean

PriceToday 0.0981 0.0152 18.9444*** 1 9 2
SIZE 0.7761 0.006 125.9313*** 15 382 52
FEE -0.0683 0.0400 -17.0239*** 1 9 6 2 436
FLOOR 0.0412 0.0043 9.3666*** 1 1 1 7 2
FLOORS 0.0125 0.0049 2.5182 1 1 8 5
dummy-TOPFloor 0.0363 0.0042 8.5558*** - - -
dummy-BOTTOMFloor 0.0030 0.0052 0.1087 - - -
dummy-Till 1890 0.0007 0.0053 11.7128*** - - -
dummy-From 1920 0.0260 0.0057 4.5400*** - - -
dummy-From 1950 0.0072 0.0061 1.1743 - - -
dummy-From 2000 0.0000 0.0000 - - -
DISTANCE TIBANA 0.0082 0.0020 0.1371 - - -
DISTANCE CBD 0.0172 0.0020 0.4119*** 1 4 966 1 275
DISTANCE Highway 0.0371 0.0025 14.8945*** 22 4 572 1 463
DISTANCE Corridor 0.0113 0.0014 8.0059*** 6 1 122 0 175
PM10Day 0.0022 0.0089 0.2873** 59 27 4
NO2Day -0.0002 0.0004 -0.5124 80 40 10
NOISE 0.0008 0.0002 5.1018*** 78 59 4

 Dummy - Gamingholmen 0.0390 0.0074 -2.6433
 Dummy - Norrmalm 0.0630 0.0385 -1.6581
 Dummy - Östermalm 0.0546 0.0373 1.4631
 Dummy - Vasastan 0.0306 0.0374 -0.8394
 Dummy - Gärdet 0.0896 0.0375 2.3885***
 Dummy - Södermalm 0.0650 0.0373 -1.7430
 Dummy – Gamlan Stan 0.0000 0.0000 0.0000

Statistical Significance levels: * P < 0.05 ** P < 0.01 *** P < 0.001

Reference:

The division of Energy and Climate Studies (ECS) has an interdisciplinary charaster with a strong systems approach, linking issues related to energy technology and policy, climate change and sustainable development.

At present, ECS works with five defined research themes:
- Bioenergy Systems
- Energy for Sustainable Development
- Energy systems efficiency
- Urban Sustainability
- Energy and climate policy

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Reason to prioritize particular areas with high WTP for improved environmental conditions related to emissions

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Investment in low carbon transport solutions and reduction of traffic related air pollution and noise exposure could translate into significant economic benefits.

The potential of integrating the energy dimension in traffic and urban planning should be given more attention towards an integrated aspects for spatial planning.