ASSESSING THE HEALTH BENEFITS OF URBAN REGENERATION: A CASE OF TALLINN CITY CENTRE

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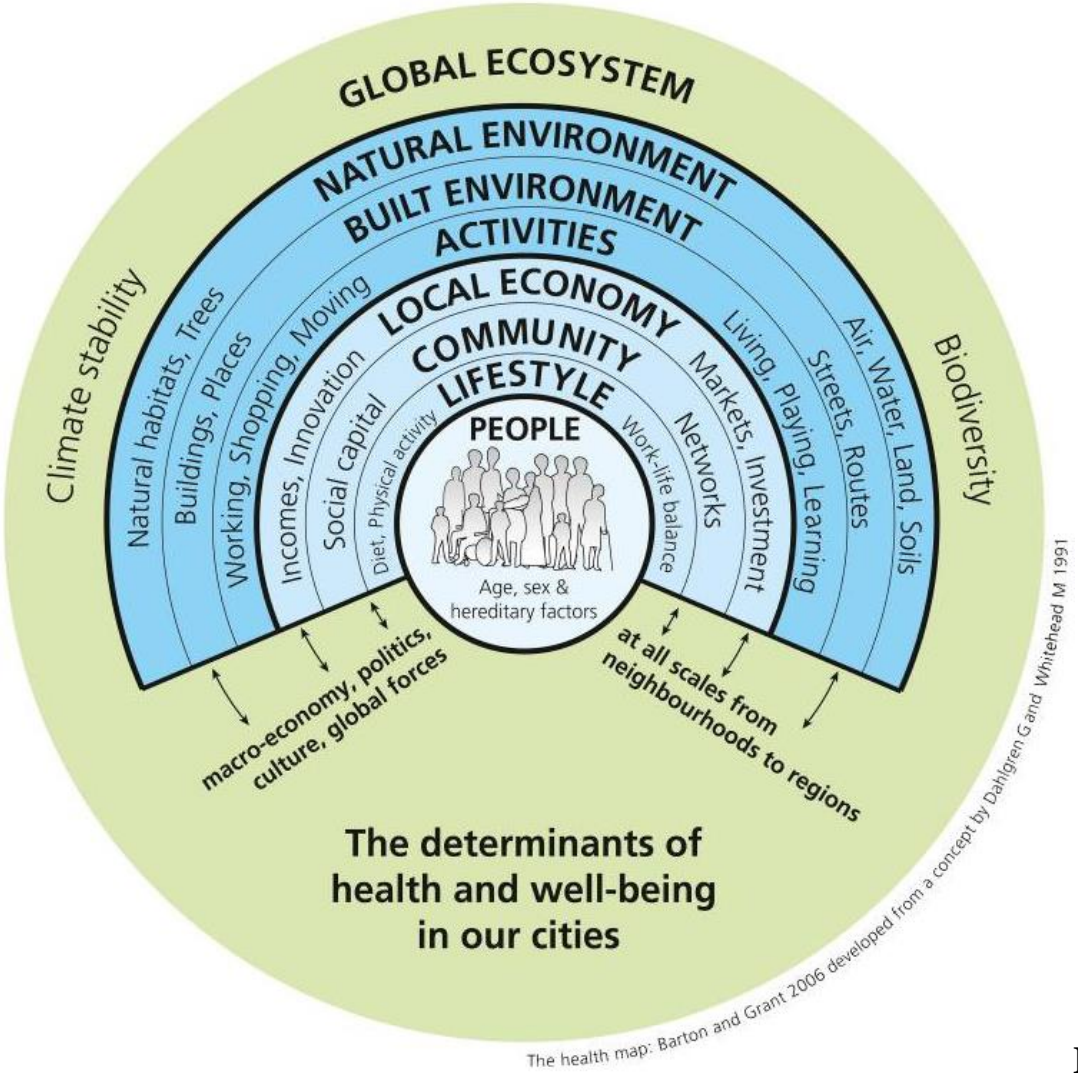
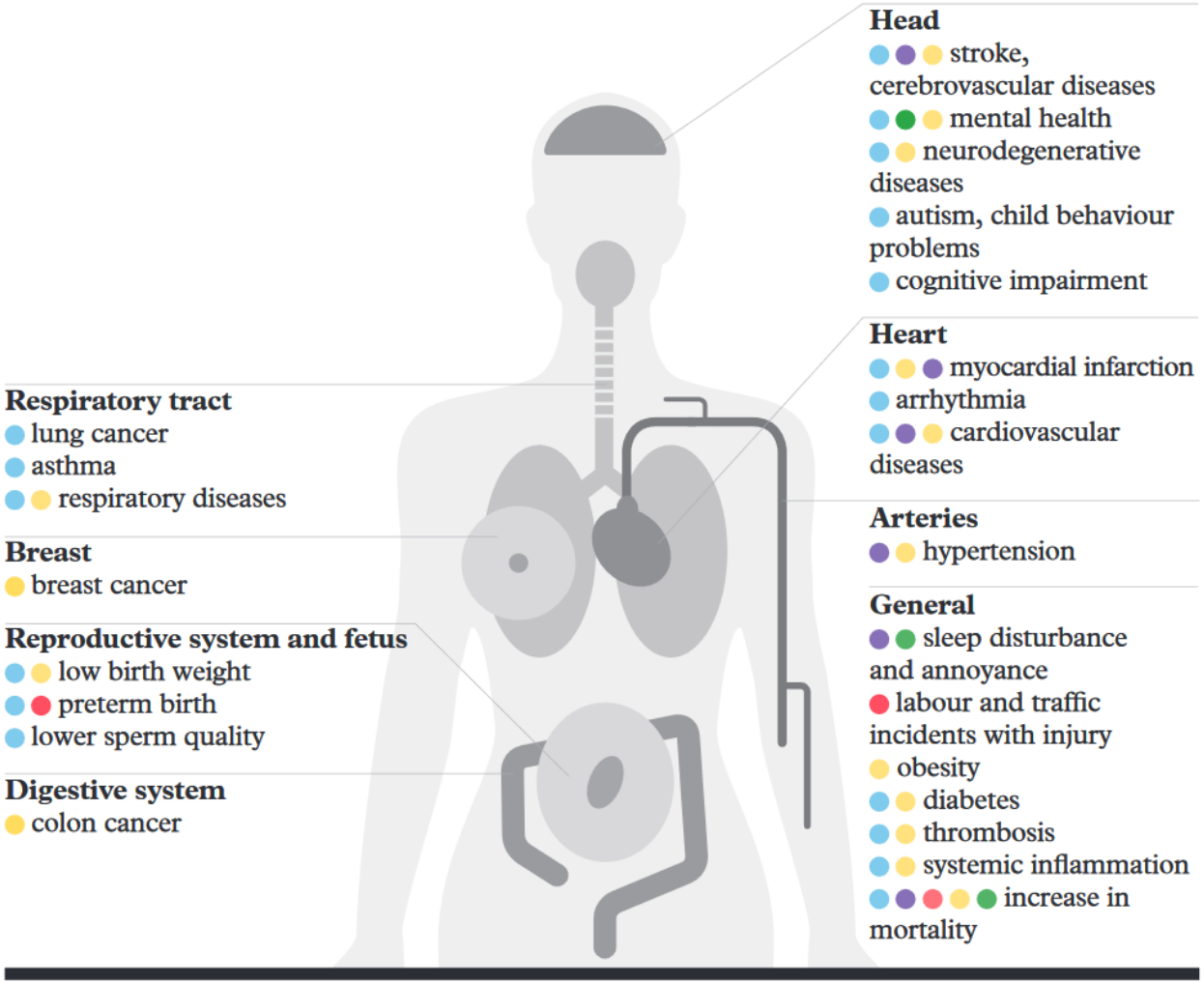
DETERMINANTS OF HEALTH AND WELL-BEING



Barton & Grant, 2006

HOW URBAN ENVIRONMENT IMPACTS OUR HEALTH



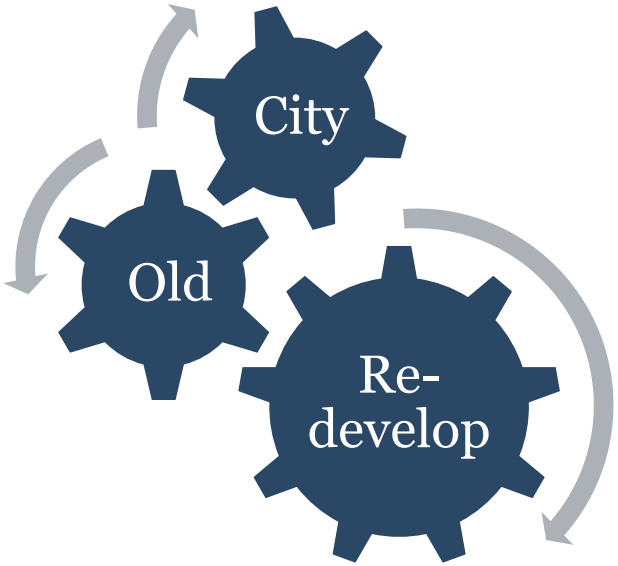
Müeller et al., 2017

NOT ONLY BAD THINGS – URBAN ADVANTAGES

- Best possible medical care
- Better sanitary services
- Active social life
- Better access to public services
- Better strategic planning

URBAN GERENERATION

- The process of improving derelict or dilapidated districts of a city, typically through redevelopment



HERALD SQUARE, NEW YORK

HERALD SQUARE, NEW YORK

LONDON, UK

LONDON, UK

NOT ALWAYS SUCCESSFUL – KANGBASHI, CHINA

TALLINN „NEW MAIN STREET“ IN 2020

Paaver et al., 2016

AIMS

- Assess the health benefits through:
  - Improved air quality
  - Reduced noise levels
  - Enlarged active commuting

ALTERNATIVES

- V0 – **0-alternative**, where traffic management as today (2+2 lanes for cars/buses and in the middle 1+1 lanes for trams)

- V1 – **Main alternative**, where 1+1 lanes for cars and public transport counts as today with separate 1+1 lanes

- V2 – **Additional alternative**, where main street closed for car traffic (only public transportation)
- V3 – **Future car technology alternative** (2030)
- V4 – **Future car technology and buildings alternative** (2030)
- V5 – **Future cars/buildings/residents alternative** (2030)

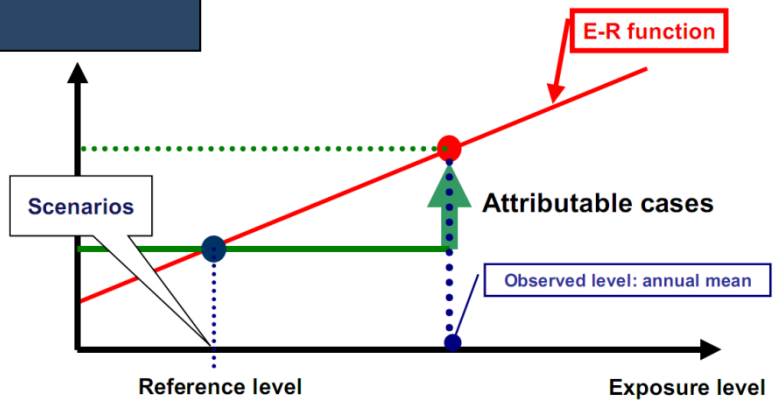
HEALTH IMPACT ASSESSMENT CONCEPT

Exposure	+	Baseline mortality & morbidity	+	Exposure/ response function	=	Number of attributable (premature) cases

Health impact assessment

Mortality & morbidity difference	+	Exposure difference	=	Exposure/ response function

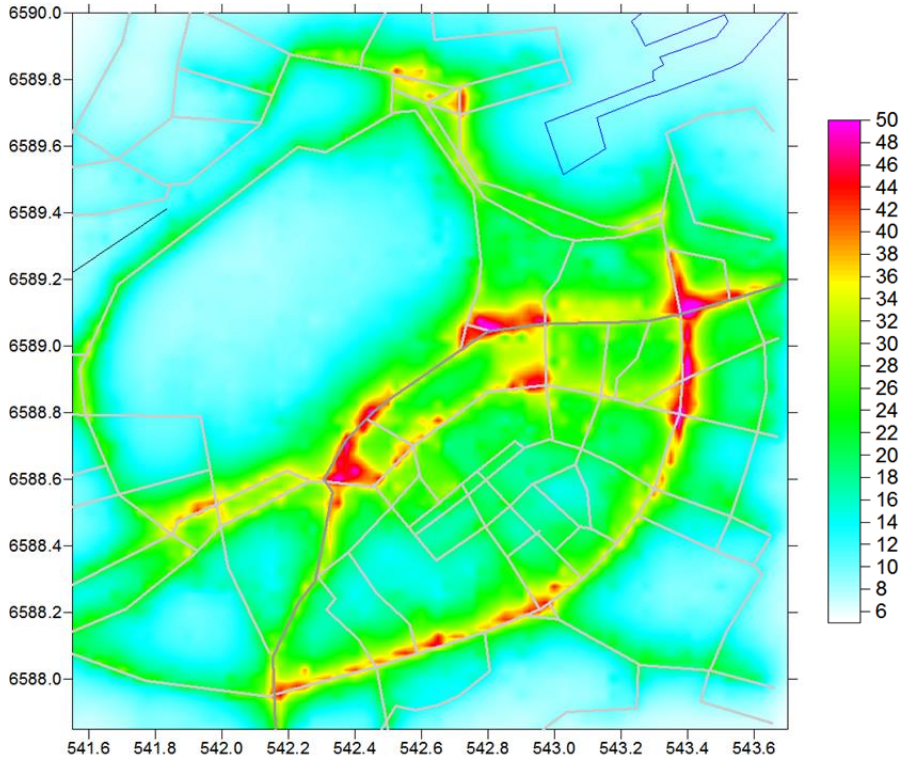
Epidemiological study



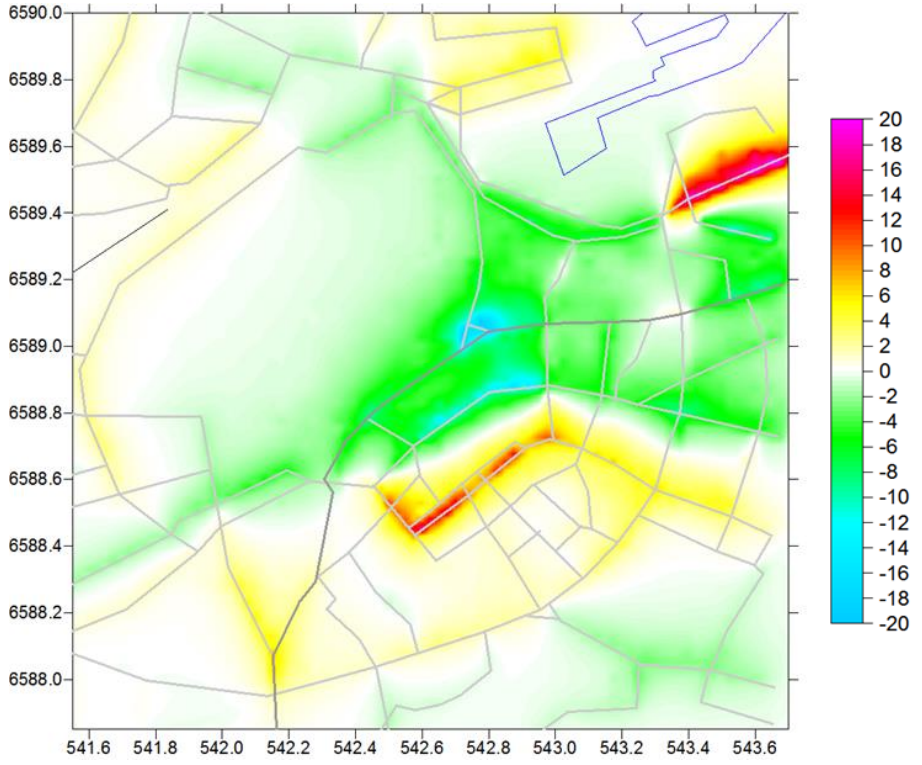
METHODS – HIA CALCULATIONS

- Health risks were calculated based on HIA principles using equations and AirQ+ and software and HEAT-tool (*health economic assessment tools*)
- For air pollution exposures the micro-environmental exposure concept was applied (Kornartit et al., 2010)
- For air pollution and non-external mortality the following E-R coefficients were used:
  - 5.5% per 10 μgm^{-3} increase of NO_X (WHO, 2013)
  - 1.68% per 10 μgm^{-3} increase of coarse (non-exhaust) PM_{10} (Meister *et al.*, 2012)
- For noise and non-external mortality the following E-R coefficient was used:
  - 4.0% increase in areas with noise levels 60 dB compared to areas 55 dB (Halonen *et al.*, 2015)
- For active commuting and mortality the following E-R coefficient was used:
  - 10-16% decrease in mortality cycling 11.25 MET-hours per week or walking 11.25 MET-hours per week

AIR POLLUTION MODELLING (NO_2*)



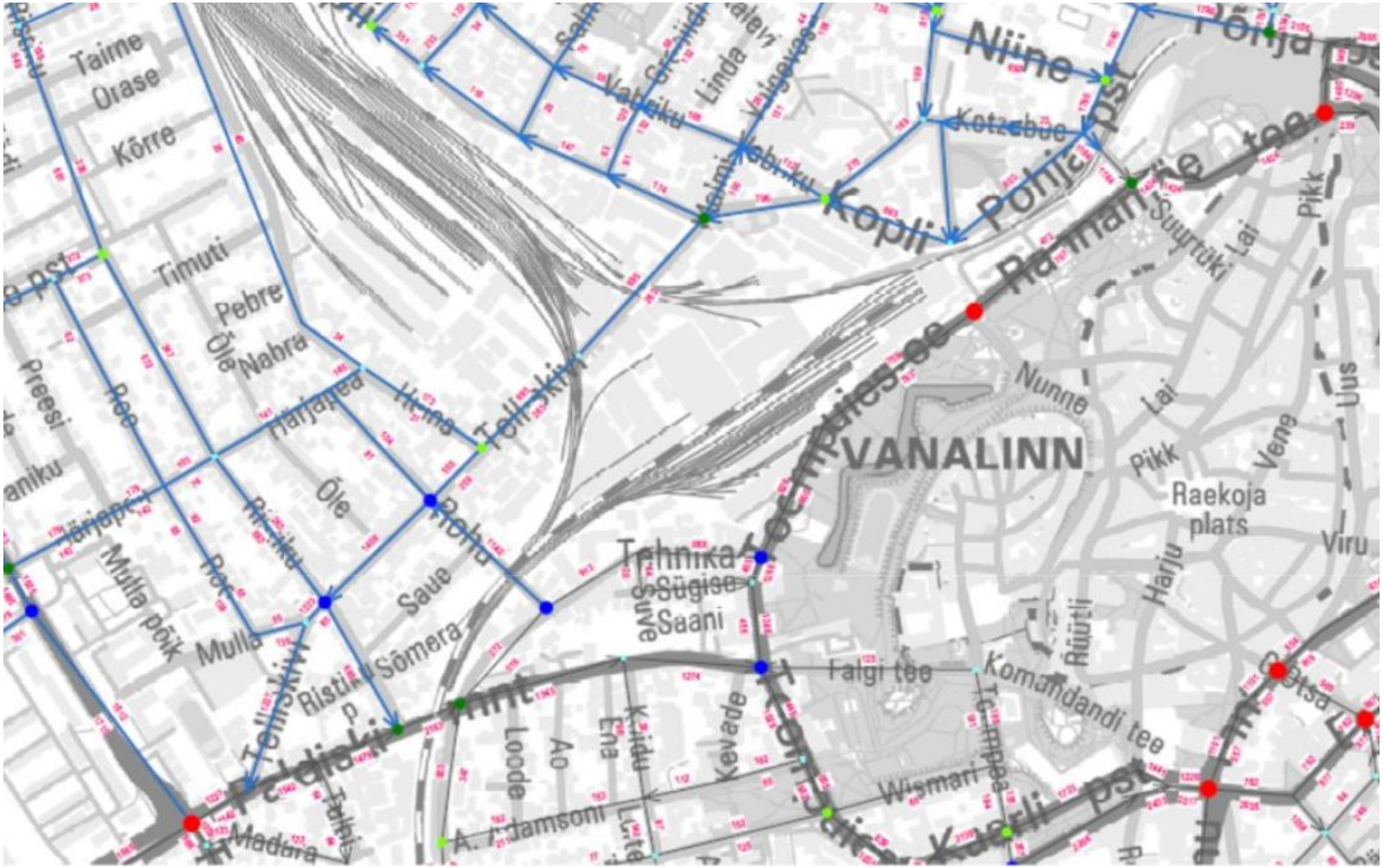
Current situation



Difference between current situation and main-alternative

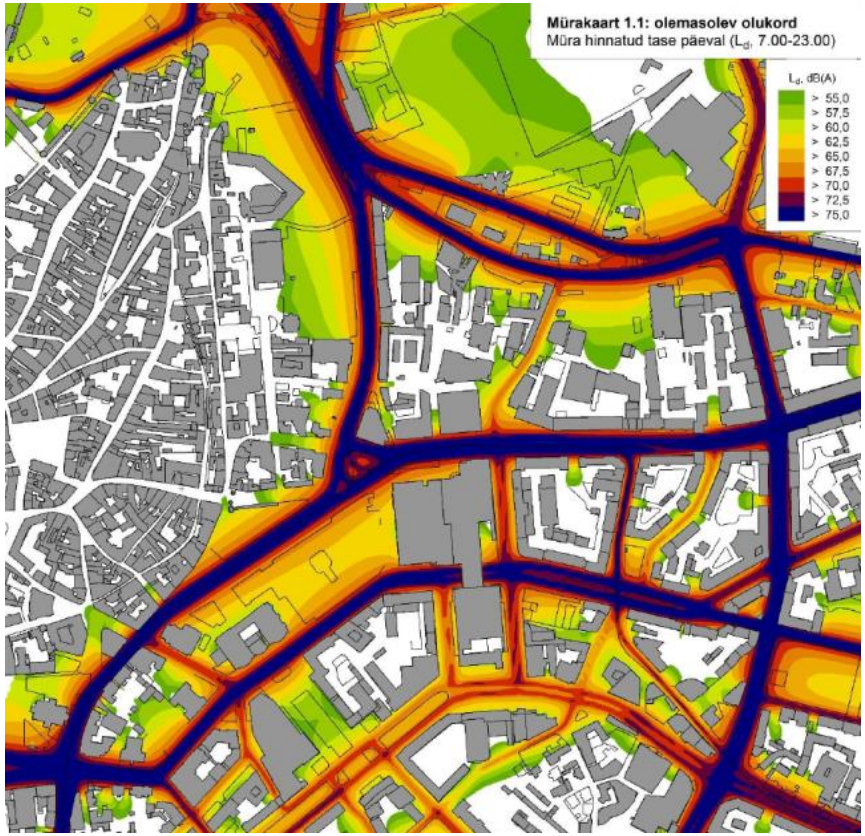
*annual average concentration (µg/m³)

TRAFFIC MODELLING

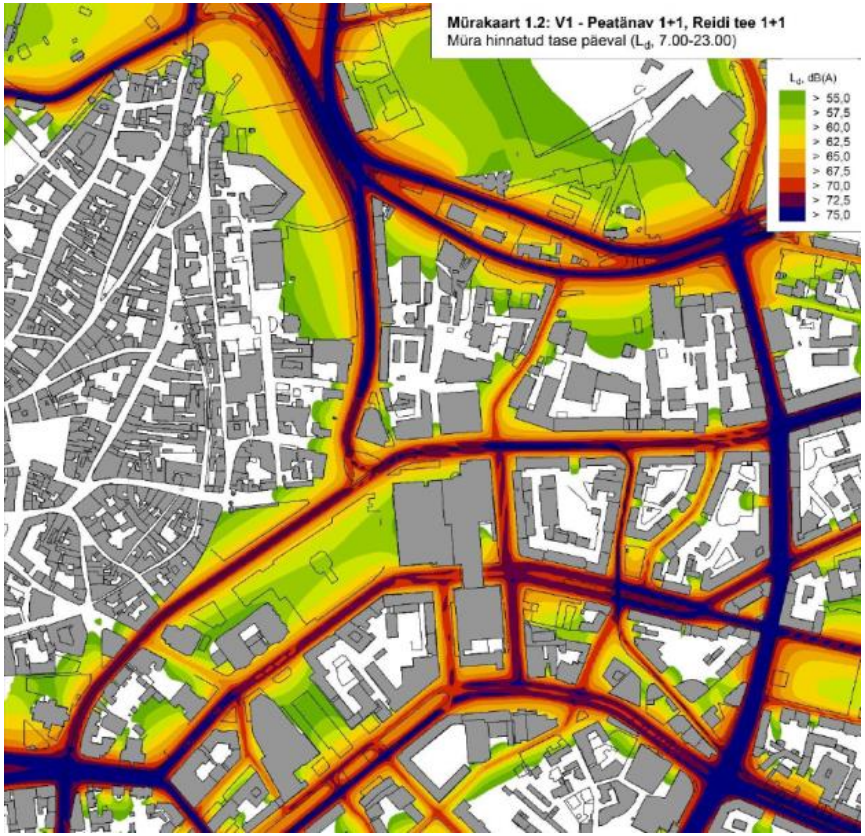


Stratum, 2016

NOISE MODELLING*



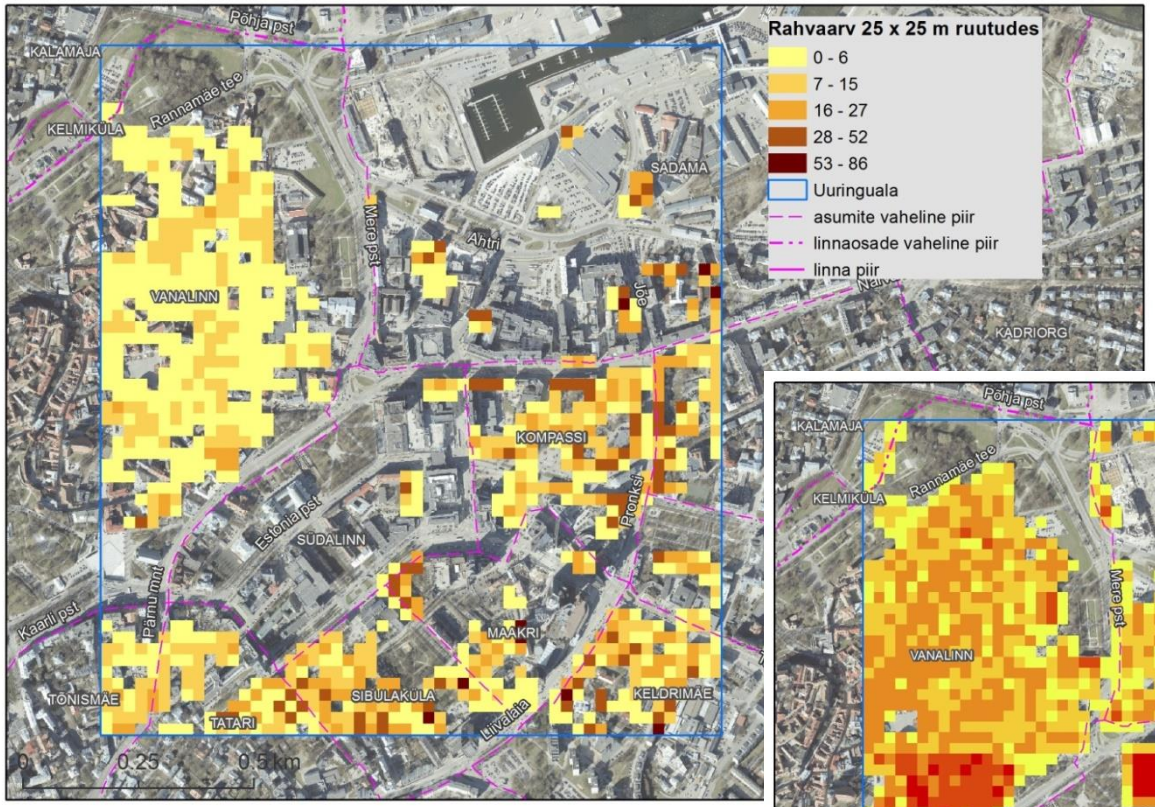
Current situation

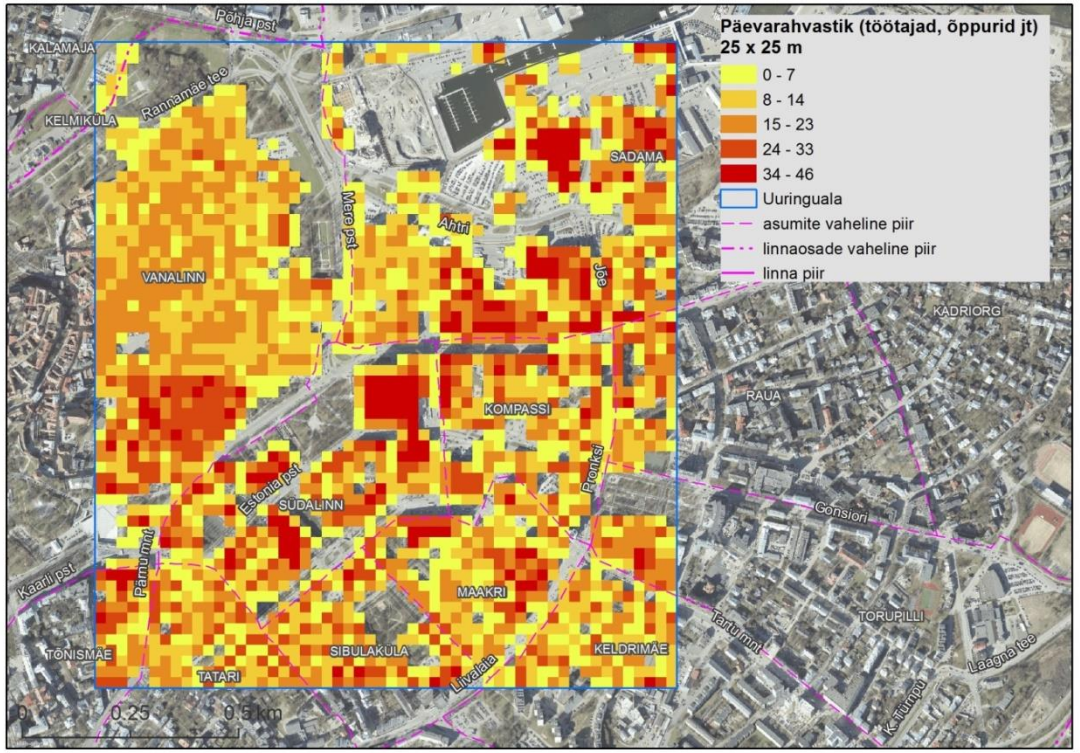


Main alternative

*Day-time noise, 7.00-23.00 (dB)

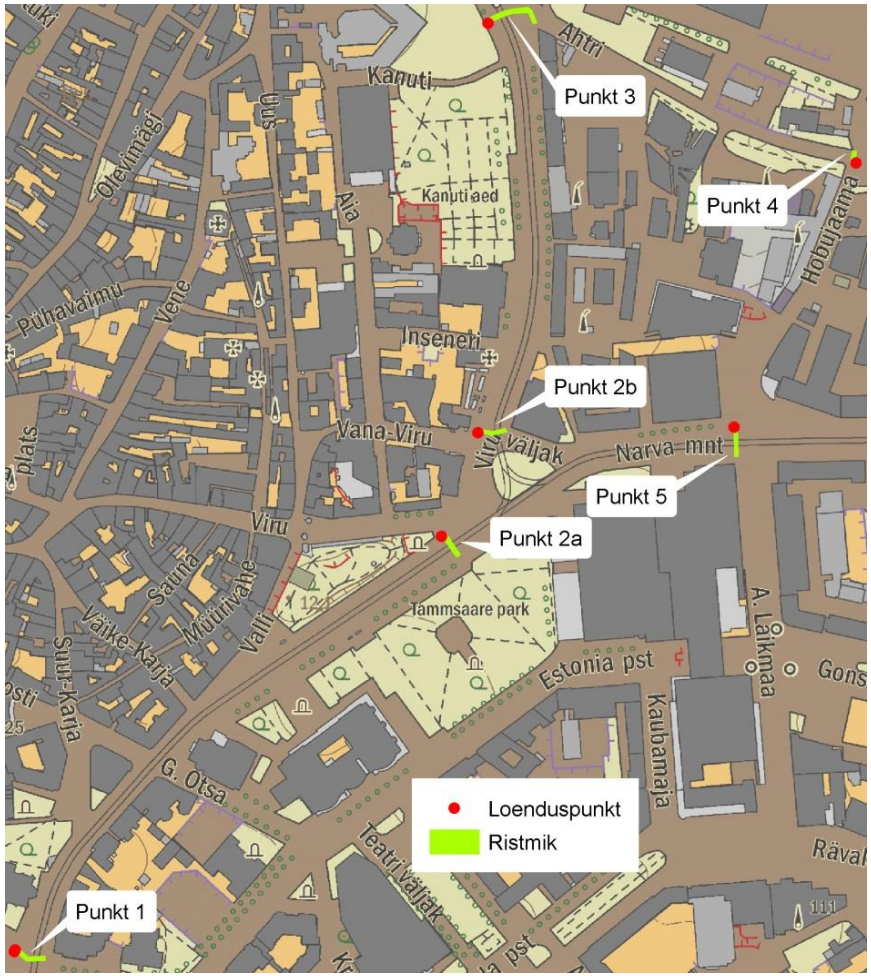
RESIDENTS AND DAILY POPULATION*

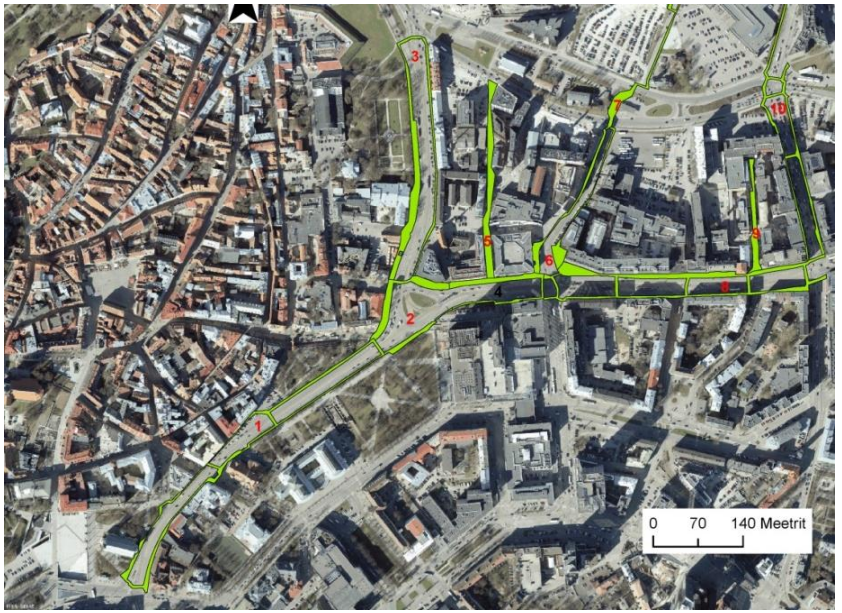




*Based on 2011 population count data

PEDESTRIANS AND PEOPLE IN PUBLIC TRANSPORTATION*





*Time in public transport based on Rannala, 2016, number of passengers based on Transport Board data

PREMATURE DEATHS ANNUALLY (95% CI)

	NO_2 exposure	$PM_{2,5-10}$ exposure	Noise exposure
Residents			
V0 – 0-alternative	9,48 (5,56–13,26)	1,19 (0,14–2,15)	1,94 (0,24–3,16)
V1 – Main alternative	9,28 (5,43–12,98)	1,15 (0,14–2,07)	1,86 (0,23–3,02)
Daily population			
V0 – 0-alternative	14,02 (8,21–19,62)	1,66 (0,20–3,00)	2,21 (0,28–3,60)
V1 – Main alternative	13,59 (7,95–19,00)	1,59 (0,19–2,87)	2,09 (0,26–3,40)
Pedestrians			
V0 – 0-alternative	0,64 (0,37–0,90)	0,21 (0,04–0,38)	0,39 (0,05–0,64)
V1 – Main alternative	0,53 (0,31–0,74)	0,17 (0,03–0,31)	0,34 (0,04–0,55)
People in public transportation			
V0 – 0-alternative	0,09 (0,05–0,13)	0,03 (0,01–0,05)	0,01 (<0,00–0,02)
V1 – Main alternative	0,07 (0,04–0,11)	0,02 (0,01–0,04)	0,01 (<0,00–0,02)

DECREASE OF PREMATURE DEATHS ANNUALLY (95% CI)

	Decrease of premature deaths compared to inactivity
Pedestrians	
0-alternative 6000 pedestrians, each active 15 minutes daily	2.97
Increase number of pedestrians by 50% 9000 pedestrians, each active 15 minutes daily	4.47
Increase walking time by 33%, 6000 pedestrians, each active 20 minutes daily	3.96
Cyclists	
0-alternative There were 4 cyclists on Google Street View. At spring/summer this would mean 100 cyclists daily	0.02
5%-alternative Increase bikers to 5% of commuters (900 cyclists), each active 15 minutes at spring/summer seasons	0.22
10%-alternative Increase bikers to 10% of commuters (1800 cyclists), each active 15 minutes at spring/summer seasons	0.44

CONCLUSIONS

- Tallinn New Main Street will decrease air pollution and noise
  - Even air pollution and noise will increase in areas bordering Main Street the total effects is positive
- Currently air pollution and noise is inducing in Main Street area up to 30.0 (95% CI 15.0–43.7) premature deaths annually
  - Realization of main-alternative would decrease the number of premature deaths by 1.1 cases, most of which is due to the decrease in the traffic exhaust exposure
- Currently every day 6,000 people are crossing the street in Tallinn Main Street areas
  - If those people would be one third more physically active or the number of pedestrians would increase by one third, one more premature death cou

THANK YOU!