



City of
Gothenburg

GHG emissions - people in Gothenburg

VGR Workshop 7 June 2017

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Göteborg

- Sweden's second largest city
- 560 000 inhabitants
- Two universities
- Refinery industries
- Waste incineration
- No active landfills
- Municipally owned energy company, port and a large public housing sector



Summary

- Committed to Compact of Mayors in 2015, GHG inventory according to Greenhouse Gas Protocol (Community-scale)
 - Scope 3 emissions
- Climate programme of Gothenburg, adopted in 2014
 - Consumption based emissions
- There are no standard methods to calculate consumption based emissions
- Strategies to reduce GHG emissions include all emissions

Compact of Mayors, since 2015

- Comitted in September 2015
- GHG inventory in December 2016
- Reported emissions and targets in February 2017
- Inventory of climate hazards – work in progress

To become a fully compliant member:

- Report plan for GHG mitigation
- Complete and report climate change adaptation, targets and plan



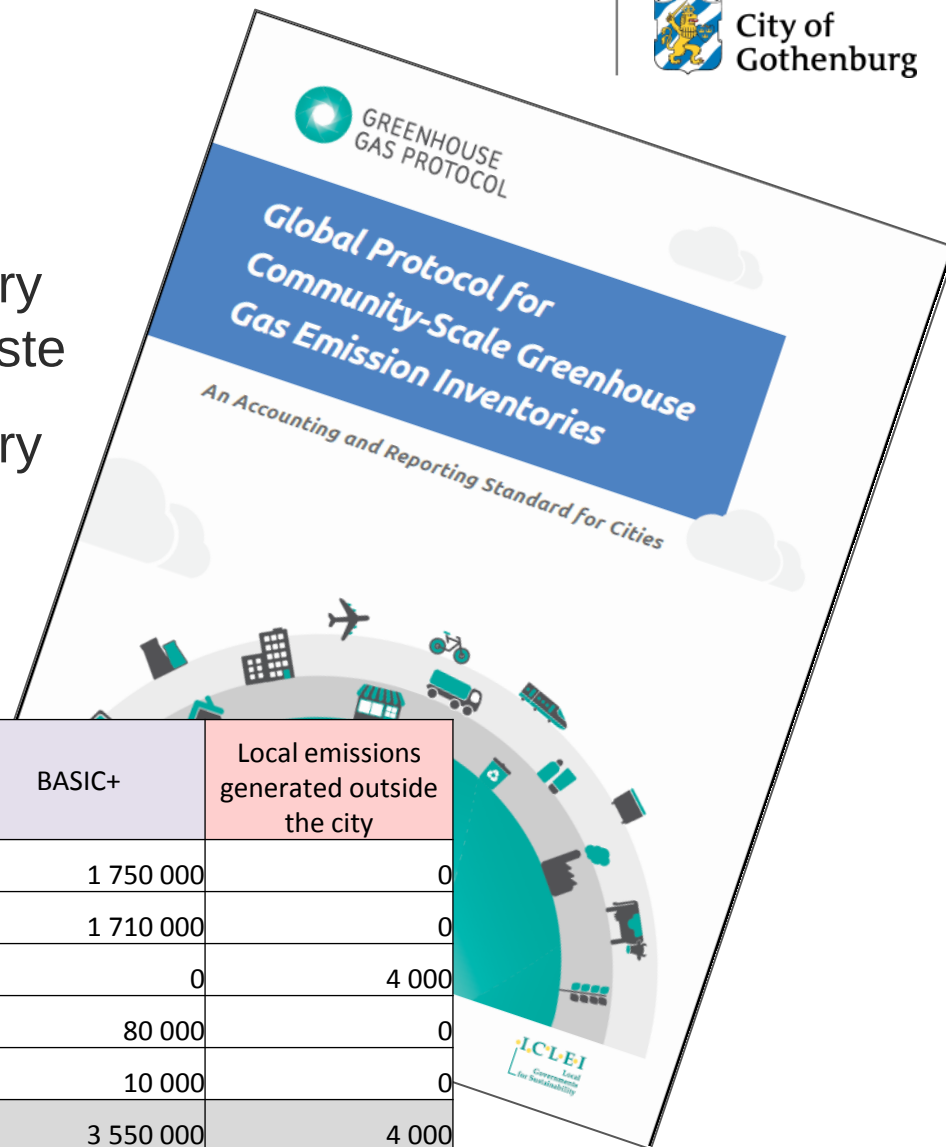
Compact of Mayors

Basic

- Scope 1 emissions for Stationary Energy, Transportation and Waste
- Scope 2 emissions for Stationary Energy and Transportation
- Scope 3 emissions for Waste

GHGs included: CO₂, CH₄ and N₂O

	Territorial emissions (scope 1)	BASIC	BASIC+	Local emissions generated outside the city
Stationary Energy	1 320 000	1 710 000	1 750 000	0
Transportation	1 020 000	1 030 000	1 710 000	0
Waste	30 000	30 000	0	4 000
IPPU	80 000	0	80 000	0
AFOLU	10 000	0	10 000	0
Scope total	2 460 000	2 770 000	3 550 000	4 000



Compact of Mayors

Scope 3

"All other GHG emissions that occur outside the city boundary a result of activities taking place within the city boundary."

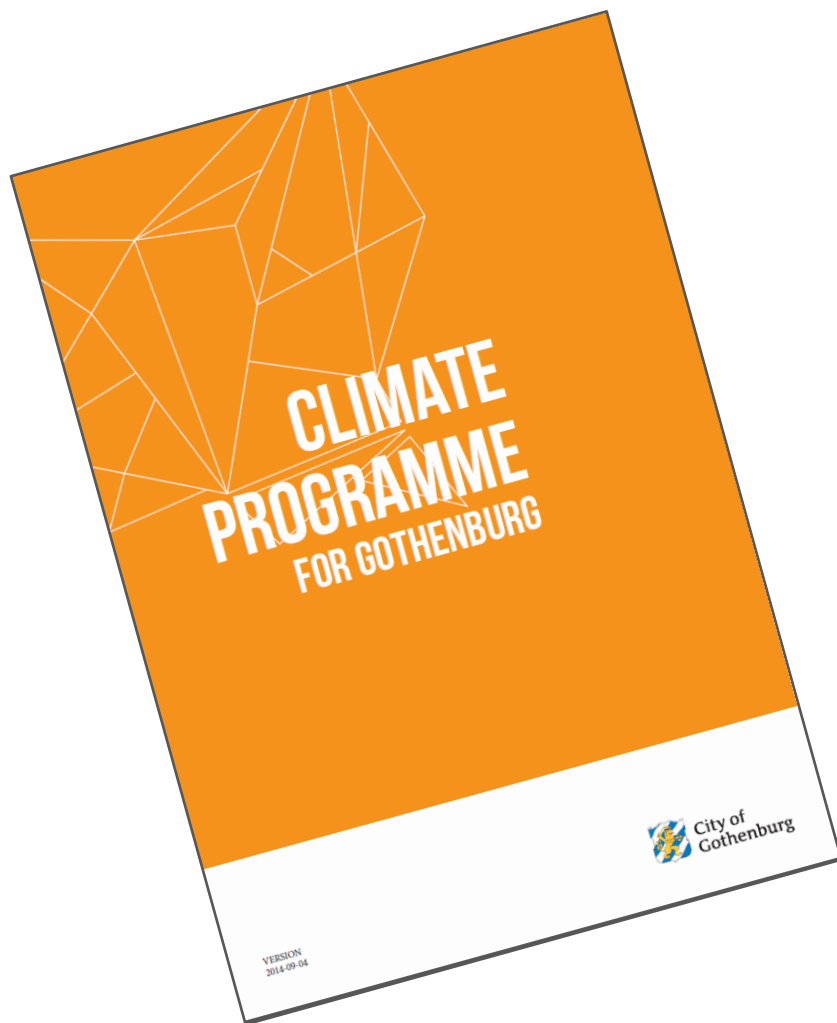
Stationary Energy: Transmission and distribution losses

Transportation: Emissions from transboundary journeys occurring outside the city

Waste: Emissions from waste generated in the city, treated outside the city



Climate Programme, adopted in 2014

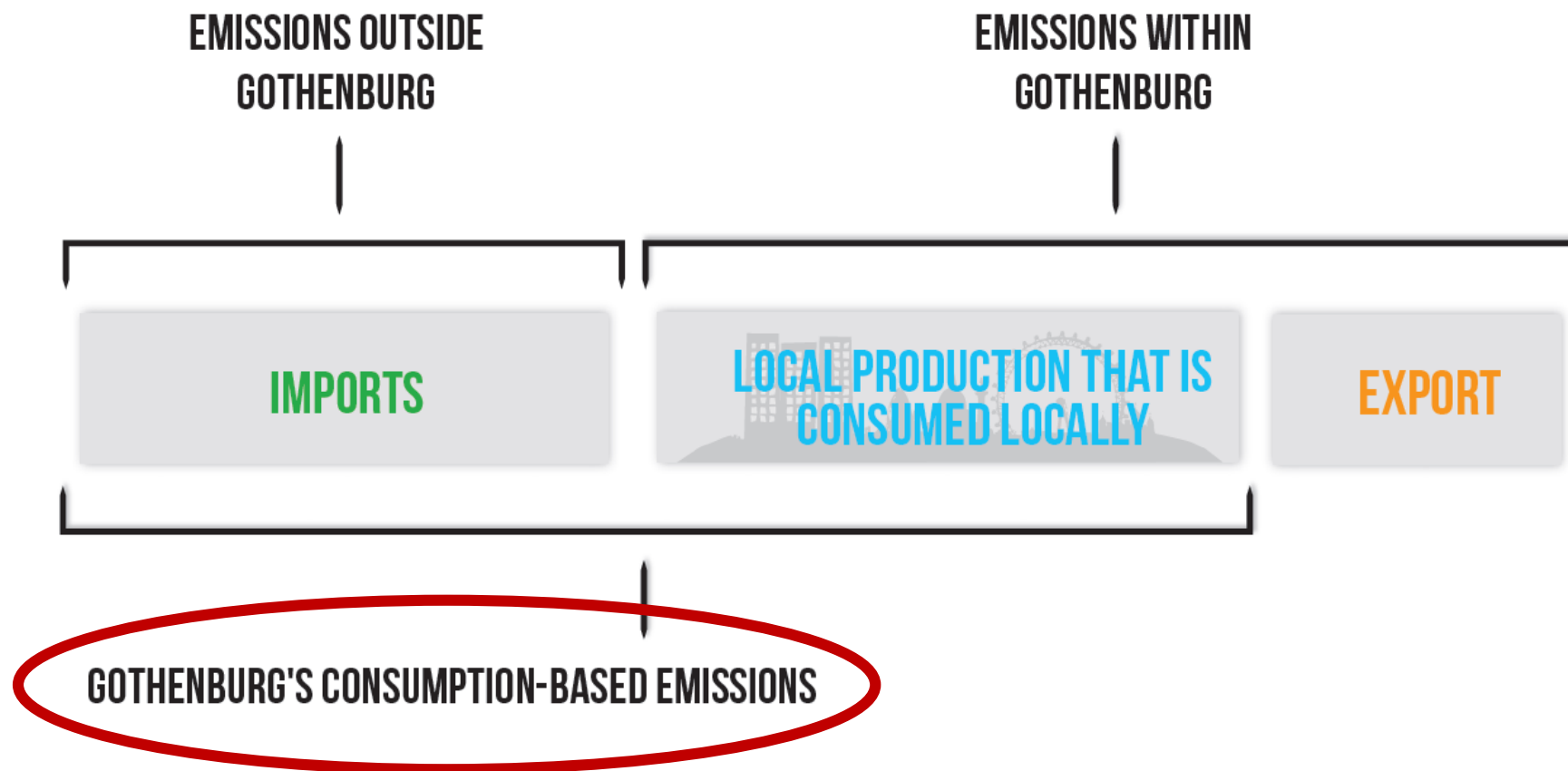


- roadmap to reach the target:

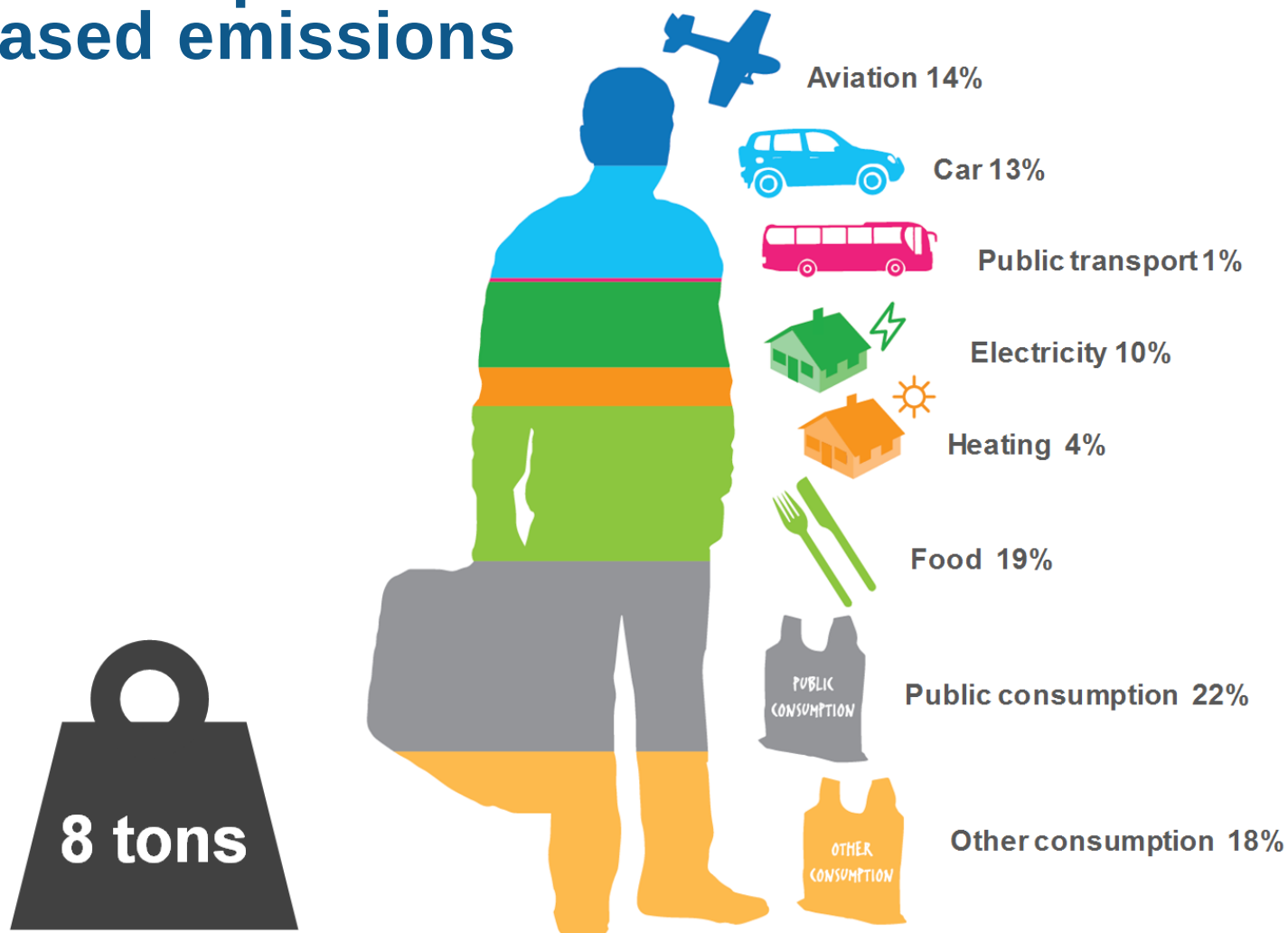
Sustainable and fair level of greenhouse gas emissions in 2050

- includes targets to reduce consumption based GHG-emissions

Consumption based carbon footprints



Consumption-based emissions



Methods – Aviation

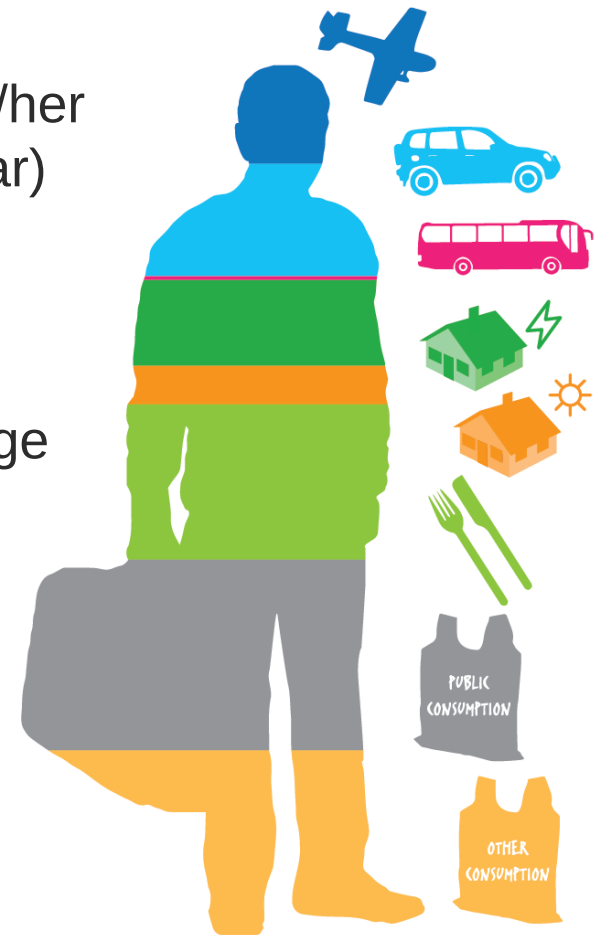
- Journeys on duty are not included
- An average inhabitant in Gothenburg flies as much as an average Swede (1 060 km/year in 2010)
- Increased effect of radiative forcing accounted for, $\times 1.9$
- Amount of fuel needed for flying the average distance
- Emission factors for the fuels used

Updated method, 2016 (local data for distance/year):

- Surveys at Landvetter Airport, asking for final destination
- Data from “Turistdatabasen”: number of passengers, living in Gothenburg, travelling from different airports

Methods – Private cars

- Journeys on duty are not included
- An average inhabitant in Gothenburg drives his/her car as much as an average Swede (1297 km/car)
- Number of cars is based on local data (341 cars/1000 inhabitants)
- Emission factors is assumed to be for an average car (200 gCO₂-eq/km)
- Emissions from production and transportation of the fuel is included in the emission factor



Methods – Electricity and Heat

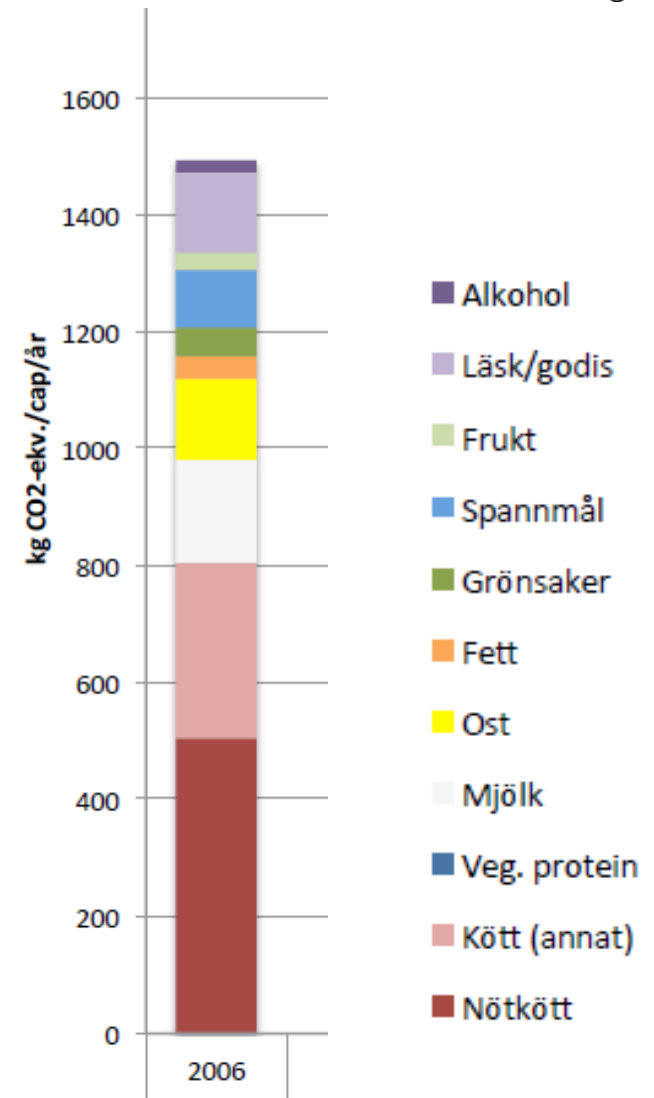
- Commercial and public buildings are not included
- Use of electricity are based on local data
(2 500 kWh/household)
- Emission factors for electricity are for the Nordic market
(127 gCO₂-eq/kWh)
- Demand for heating is based on national data
(147 kWh/m²)
- An average inhabitant in Gothenburg lives in a two-room flat of 76 m²
- Emission factors for heating are based on fuel usage for production of district heat in Gothenburg (92 gCO₂-eq/kWh)

Methods – Food

- National data for food consumption
- National/International emission factors, based on life cycle emissions

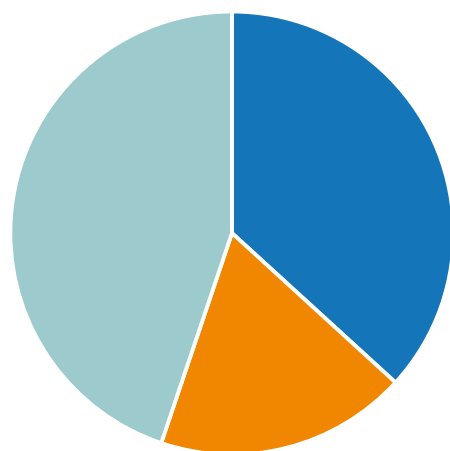
⇒ 1.5 ton/inhabitant

Bryngelsson, Hedenius, Larsson, 2013: "Scenarier för klimatpåverkan från matkonsumtionen 2050"



Methods – Public consumption

- National, regional and community level activities
- National data for consumptions of goods and services at regional and national level
- For the City of Gothenburg all purchases are categorized using SNI-codes and GHGs are based on Input-Output analysis.



■ City of Gothenburg

■ VGR

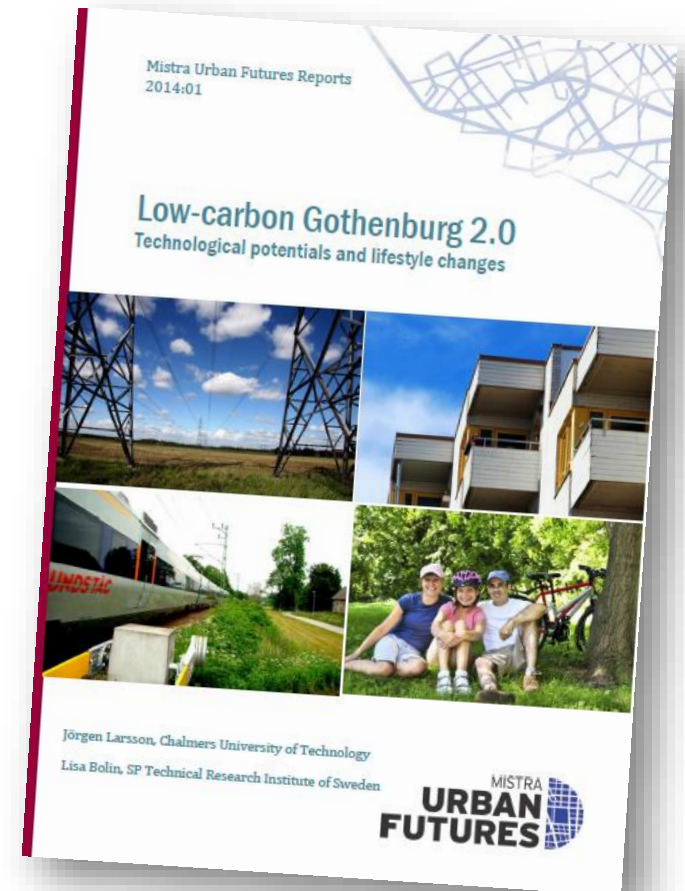
■ National public emissions



Local scenarios from the WISE project

Future scenarios to 2050:

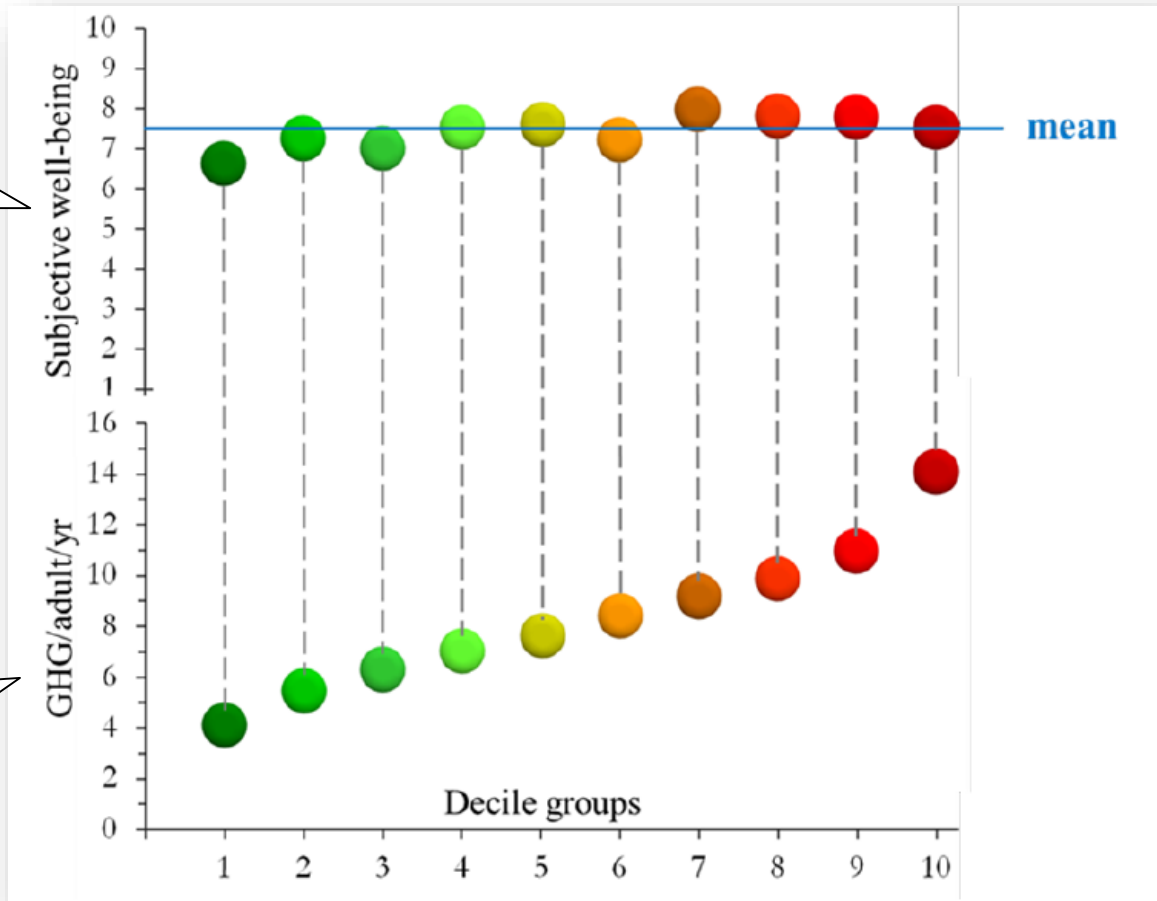
1. Business as usual (BAU)
2. Current climate policy scenario (CCP)
3. Low-carbon transition (LC)
 - 50% reduction in residential energy consumption
 - 50% reduction in the consumption of beef and pork
 - Air travel at year 2000 levels
 - A greater proportion of service-based consumption
 - 25% reduction in working hours.



Impact of a low-carbon transition on quality of life

How satisfied the respondent is with life as a whole and how happy they feel in general

GHG-emission from transport, heating, electricity, food and other consumption



Greenhouse gas emissions and wellbeing classified by emission deciles

Low-carbon Gothenburg 2.0, Mistra Urban Futures (2014)

Links between well-being and greenhouse gas emissions

- No obvious trade-off between a low-emission lifestyle and a high level of wellbeing.

No statistical effect on wellbeing for any of following factors:

- air travel (number of flights per year)
- red meat (number of times a week)
- car usage in addition to commuting (km/year)
- dwelling size (square metres per person)

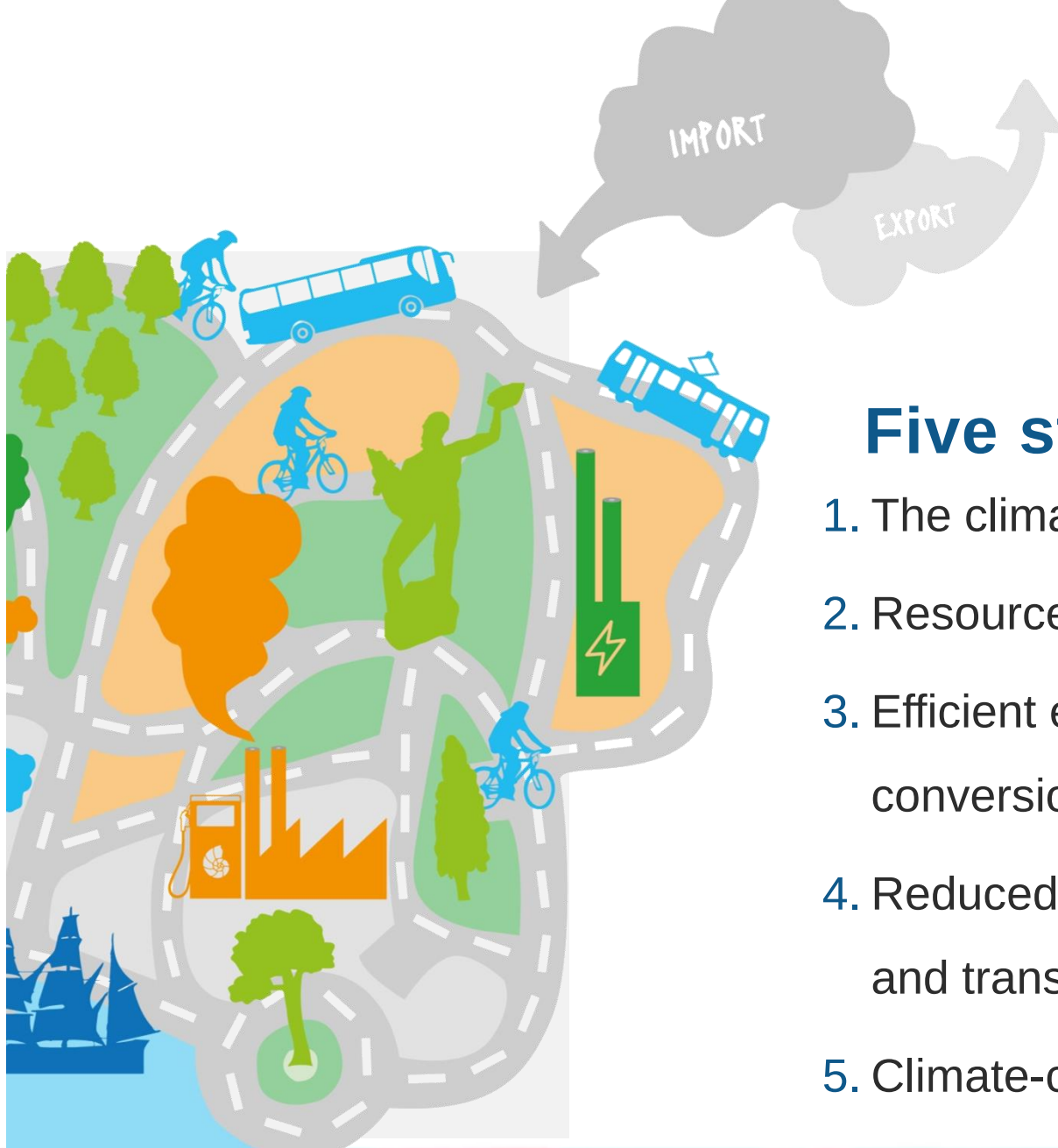
Following factors had an statistical effect on wellbeing:

- Having a job, having a partner, good health, less time pressure and the opportunity to spend a lot of time with family and friends

Nine strategic targets for 2030

1. Resource efficient district heating
2. Increased energy efficiency
3. Renewable electricity and biogas
4. Fossil independent transports
5. Shipping with lower climate impact
6. Aviation with lower climate impact
7. Food - reduce municipal emissions
8. Purchase of material and goods - reduce
9. Reduced amount of household waste





Five strategy areas

1. The climate smart citizen
2. Resource efficient urban planning
3. Efficient energy use and conversion to renewables
4. Reduced climate effect from travel and transport
5. Climate-conscious consumption



City of
Gothenburg

Thank you!
www.goteborg.se

hanna.ljungstedt@miljo.goteborg.se

<http://e-lib.iclei.org/>

<http://www.mistraurbanfutures.org>

Lessons learned 1 (2)

- Before you start – plan the work
 - Why do you report and follow up GHG-emissions? Focus on your own needs as an organisation.
 - How much resources are available to manage the inventory?
 - What help could you get?
 - Who are the stakeholders?
 - What will you do with the result?
- Data gathering:
 - Time consuming process
 - Ask the right questions – GPC-guide have all the answers

Lessons learned 2 (2)

- Documentation of data
 - Source of data
 - Quality of data
 - Contact persons, name and position
- Documentation of methods
 - Source of method
 - Main assumptions
 - Emission factors and other input values
- Documentation of lessons learned
 - What could you have done differently?