

HEAT-project (Participatory urban planning for healthier urban communities) in EU Central Baltic -programme

HEAT now in TURKU

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HEAT in Finland

Earlier HEAT guides in Finnish 2013 and 2015



KKI - LIKESresearchcenter
Network of Cycling Cities
The Finnish Transport Agency
WSP Finland
WHO

https://www.kkiohjelma.fi/filebank/1771-Heat_kayttajan_opas_2014_paivitys.pdf

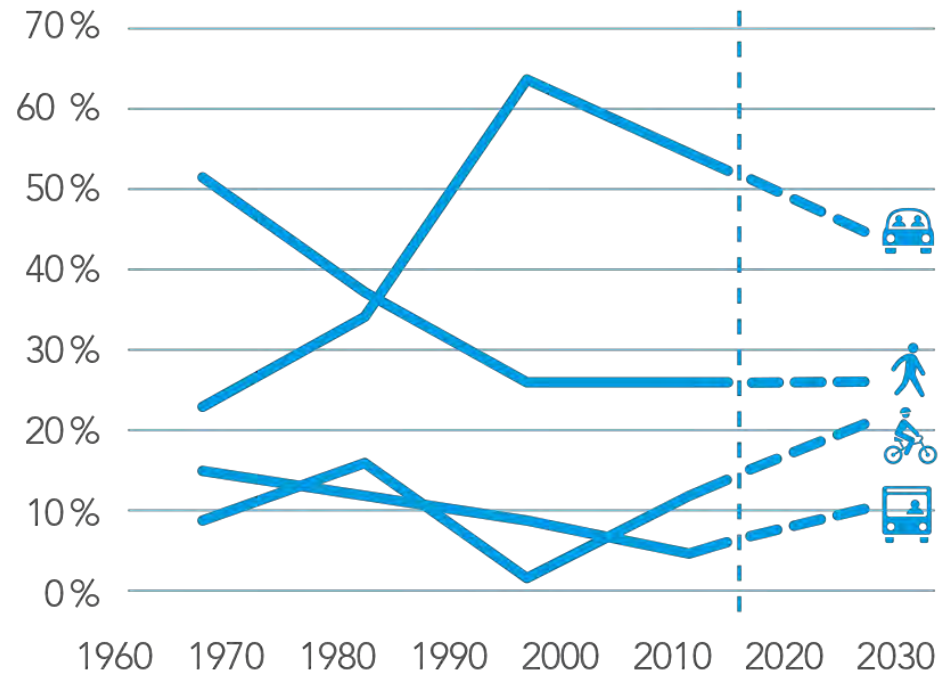
17.5.2018 Turku



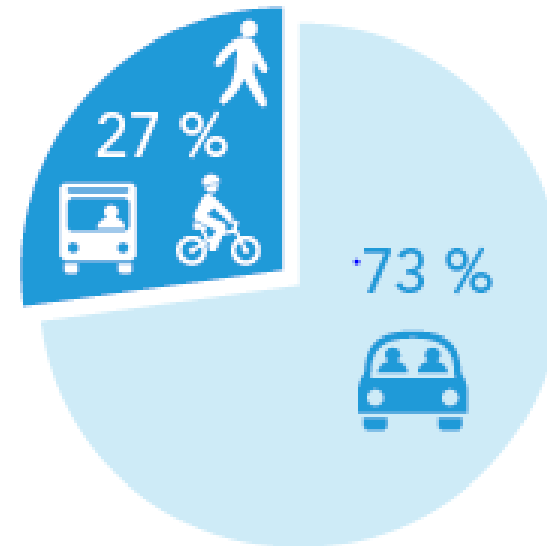
HEAT - examples of calculation

Background

The development of different modal shares, city of Lahti



The modal shares in short trips (3-5 km), city of Lahti



Different calculation methods

- 1) CBA (Cost benefit assessment), case Helsinki
- 2) Goal orientated benefits, multiple cases
- 3) Benefits from potential cyclists, case Helsinki

Needed data

- Estimate of the trips Surveys, counts – OBS! The reductions →
- The people who benefits Static centre, count →
- The effect of the action Goal, trafic model, estimate →
- Mortality rate Static centre →
- The statical value of death Value from NTA / country →
- The time period The solution's estimated effect period →
- The discount value /country →

City	Cycling milage (km/year) from NTS 2010	Cycling milage (km/year) (reductions 20-25 %)
Helsinki	270	203
Espoo	201	151
Kokkola	309	248
National average	274	206



1) CBA (Cost benefit assessment), Case Helsinki

Aim is to increase cycling from 8 % (2013) to 25 % (2020).

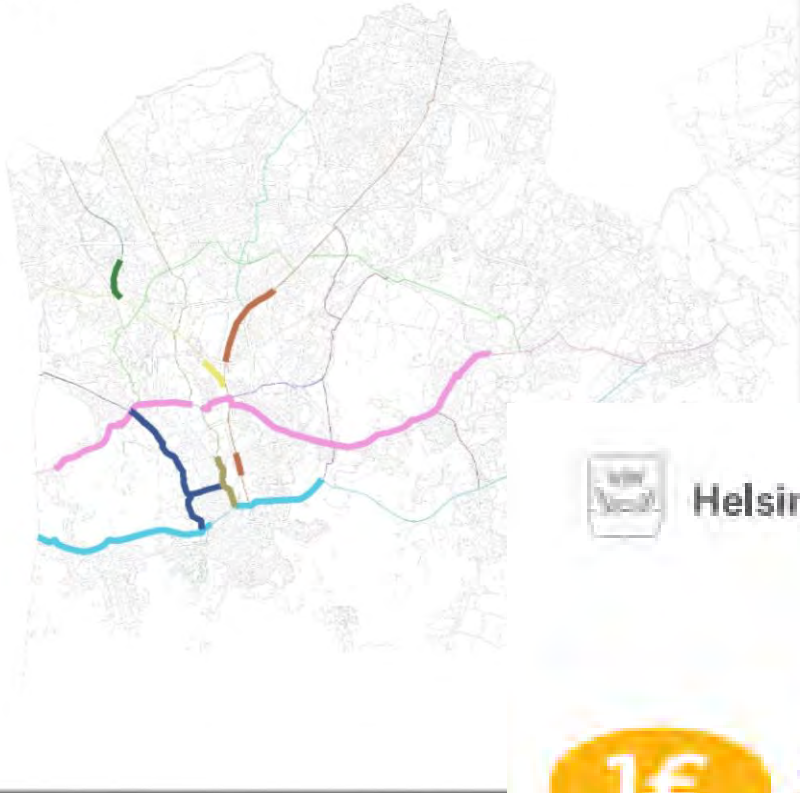
The main actions are based on the infrastructure and building cycling highways.

There was a need to convince the decision makers and rise the investment level from 3,5 M€ (2013).

(the good level of investments is ~ 20 €/ citizen/ year → Helsinki: ~ 13 M€/ year)

2024
10 M € / vuosi

— Rakennettu
— Rakentamaton



2024
20 M € / vuosi

— Rakennettu
— Rakentamaton



Helsingin kaupunki

1€

=



INVESTOINTI

HYÖDYT

Eight euros worth of benefits with just one euro

As the City of Helsinki grows ever denser, the amount of residents and jobs will increase substantially in the coming years, particularly in the inner city. The new residents and new jobs will create more traffic. The growing city needs to increase its share of space-saving transport modes, such as walking, cycling and public transport.

Cycling increases wellbeing

Cycling improves both mental and physical wellbeing. It has been shown that these advantageous effects are at their best, if cycling becomes a part of daily life, such as commuting. In such cases, it has been observed that cycling also extends the lifespan and decreases the risk

of many illnesses such as depression, type 2 diabetes and heart diseases.

Benefits from health effects and time savings

Based on a study that reviewed the benefits and costs of cycling, an investment of one euro into the cycle paths of Helsinki will generate nearly 8 euros worth of benefits. In addition to the health effects, benefits are received as saved time, since the more efficient and safer cycle path network makes cycling faster. Compared to typical

transport investments the benefits are several times higher.

Every kilometre counts

One cycled kilometre in Helsinki generates around €0.30 to €1.30 in benefits, depending on how much the city invests

○ An investment of one euro into cycle paths of Helsinki generates 7.80 euros in benefits.



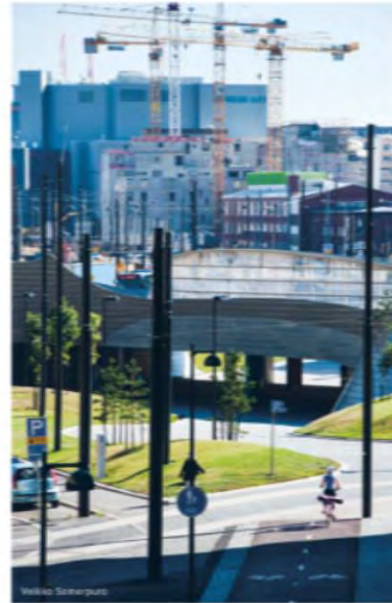
An annual cycling investment budget of 10 million between 2013 and 2024 would produce

310 million euros in benefits by 2054.

An annual cycling investment budget of 20 million would increase these benefits to

774 million.

in cycle lanes. Similar results have also been reached in studies carried out abroad. For example, Denmark has calculated that benefits generated by cycling are worth 1.22 Danish kroner per kilometre, whereas driving a car costs society 0.69 kroner per kilometre.



A more attractive Helsinki through cycling

Not only cyclists benefit from cycling. Traffic congestion decreases, when thousands of Helsinki residents choose to cycle to work and switch from standing in queues to a freer form of urban traffic. As cycling increases, the city will become even more pleasant and attractive. Noise decreases, air quality improves and more people decorate the city landscape instead of public transport vehicles and cars.

The HEAT method, developed by the World Health Organisation WHO, was used to evaluate the health effects of cycling. This tool takes into account the benefits created by the decreasing mortality rate of working age people. In addition to this, decreasing illnesses generate benefits that are not taken into account in this method. Socio-economic effects were reviewed in accordance with the Finnish Transport Agency's guidelines by using the same criteria that are applied to evaluating the profitability of public transport and road projects. In addition to time savings and health effects, the review calculated the monetary value of road maintenance, accidents, environmental impacts and investments, for example.



+27 %

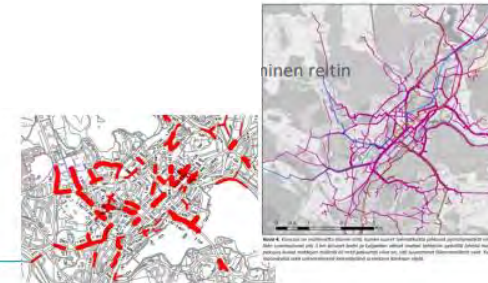
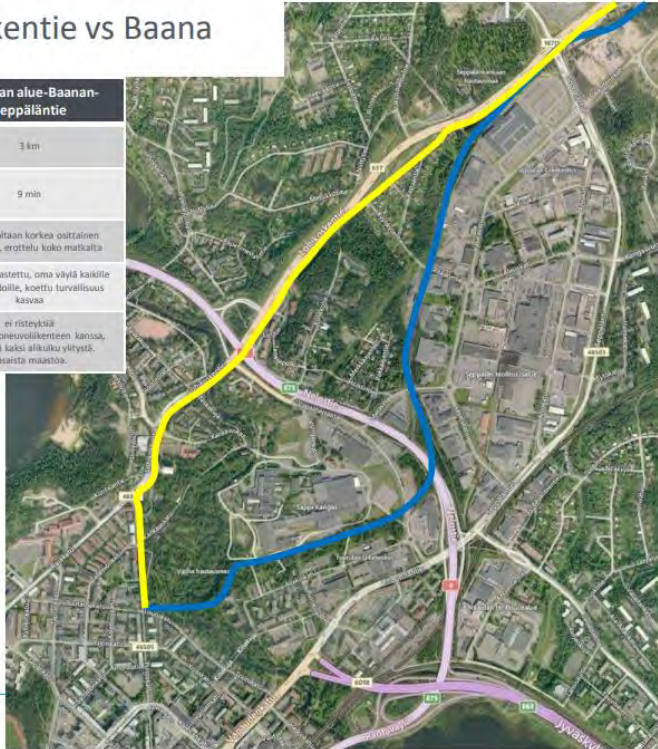
HELSINKI



1) CBA (Cost benefit assessment), Case Jyväskylä

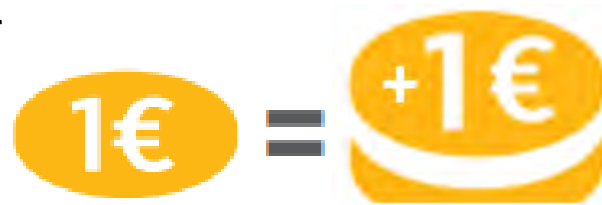
Seppäläntielle: Lohikoskentie vs Baana

	Puistokatu-Laukaantie-Seppäläntie	Kankaan alue-Baanan-Seppäläntie
Pituus	2,6 km	3 km
Arvioitu matka-aika (laskettu 24 km/h, Baana nopeus 20 km/h, väliajat ja määrittelyt mukaan)	11 min	9 min
Laatu	Moottorijonoväliliikenteen vieressä, yhdistetty jii-pp	Laatutasoltaan korkea oisittainen viherreitti, erottelu koko matkalta
Turvallisuus	Valaistu, erotettu moottorijonoväliliikenteestä	Valaistu, opastettu, oma väylä kaikille kulkumuodoille, koettu turvallisuus kasvaa
Sujuvuus	4 risteystä moottorijonoväliliikenteen kanssa (3 liikennevalot) ja yksi aikuku, maasto melko mäkistä	ei risteyksiä moottorijonoväliliikenteen kanssa, silta sekä kaksi aikuku ylitystä, tasaista maastoa



Two alternatives to plan a cycling highway
 Calculated costs: 7,5/ 4,7 M€
 Benefits: 6.6 / 5.6 M€/ year

Model the cycling flows, potential cyclist, travel times. Estimated the shift from car traffic (65 %).



2) Goal orientated, multiple cities

There was a need to convince the decision makers and get the political support to promoting cycling and walking.

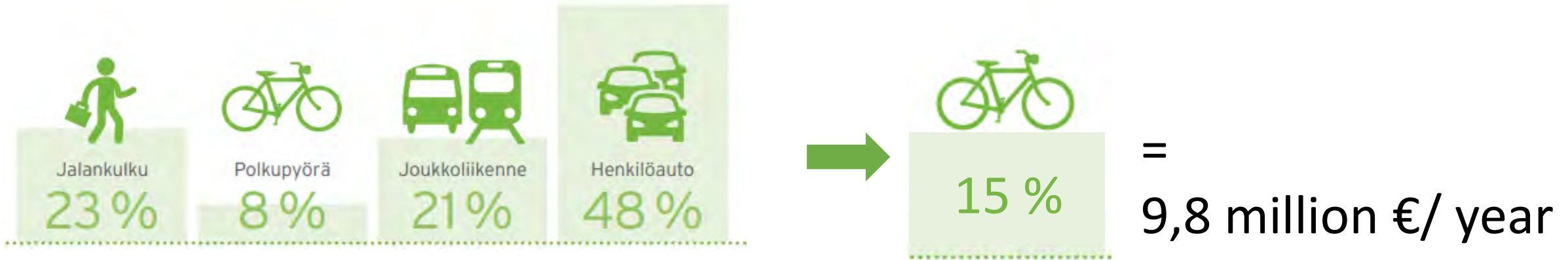
The economical benefit is mainly used in marketing.

The challenge in these calculations is to calculate the shares for different modals
→ how do we know the effects on car traffic, public transportation etc.?

Used solutions:

- 1) We have referred to national, regional or local strategy
- 2) We have estimated the cycling potential from different data sources

Case Espoo, population ~300 000



City strategy



Climate program



Cycling master plan



Case Kokkola, population ~50 000

The Aim is to increase the modal to 15 % in 2020. The economical benefits 3,4 M€

What does it mean?

- Average 2,5 new cycling trips once a month / every citizens
- "Two kilometers in week is enough"
- Challenge: "Walk or cycle a short trip insted of driving once a week"

Startsida Nyheter Tema Väder För prenumeranter A till Ö -

nyheter:lokalt



Redan i dag tar sig resoriv många till jobbet på cykel, cirka 18 procent. Foto: ArkivMarkku Jokela

Samhället sparar miljoner då vi cyklar till jobbet

Ifall Karlebyborna följer strategin att få fler att cykla när samhället stora inbesparningar.

Likar: 12.9.2013 klo 15:18 | päivetty 12.9.2013 klo 15:18

Pyörä päihittää pikkumatkalla auton – polkeminen voi tuoda myös miljoonasäästöt

Onko pyörä vai auto kätevämpi, kun kyseessä on lyhyt matka kaupunkiliikenteessä? Keskkökoisen kaupungin saama rahallinen hyöty pyöräilyä lisäämisestä on vuositasolla miljoonaluokkaa, mutta miten on ihmisen ajansäästöä laita? Yle Keski-Pohjanmaan toimittajat etsivät vastausta käytännön testistä.



Nina Koskela auton ratissa ja Petri Kulikka pyörän selässä valmiina testaamaan, kummalla apukä on aiemmin peillä. Kuva: Yle

Petri Kulikka ja Niina Koskela lähtivät testaamaan, kumpi on nopeampi väline, kun työmatkan pituus on reilut kolme kilometriä.

Mistä on kyse?

City (population)	Goal to increase cycling	Benefits/ year (million/€) current value
Espoo (260 753)	15 % → 2024	9,8
Kokkola (47 031)	20 % → 2020	1,6
Tampere (220 446)	10 % → 2021	5,4
Joensuu (74 471)	20 % → 2030	6,2
Kangasala (30 345)	15 % → 2030	3,4
Ylöjärvi (31 743)	15 % → 2030	3,3
Utajärvi (2 793)	30 % → 2020	0,9
Vantaa (203 000)	15 % → 2024	7,5
Jyväskylä (136 000)	25 % → 2025	4
Lahti (119 395)	20 % → 2030	4

3) Benefits from potential cyclists, case Helsinki

The goal was to increase the employees sustainable commuting (The city of Helsinki) and find out the potential of people willing to change their behaviour.

The calculation was based on a survey that was conducted to the employees.

The potential was calculated based on how the employees felt:

" How easy you could commute to work with a car/ foot/ cycle/ bus?"



Value of increased walking 3,9 milj€ / y
cycling 7,8 milj € / y
(annual average)

Finnish NTS 2016

Finnish National Travel Survey 2016 (NTS = HLT 2016)

The Finnish National Travel Survey has been conducted about every six years since 1974. The survey provides an overview of the mobility of Finns and demographic, regional and temporal variations of passenger trips.

NTS is a population level travel survey of each day of the year. The most recent survey was conducted in 2016 as a multimode survey. The respondents were able to participate in the survey by phone, online or by mail. Previous surveys were conducted by mail until 1992 and as phone interviews since 1998. The method change causes a break in the time series and the results are thus not fully comparable with the previous survey.

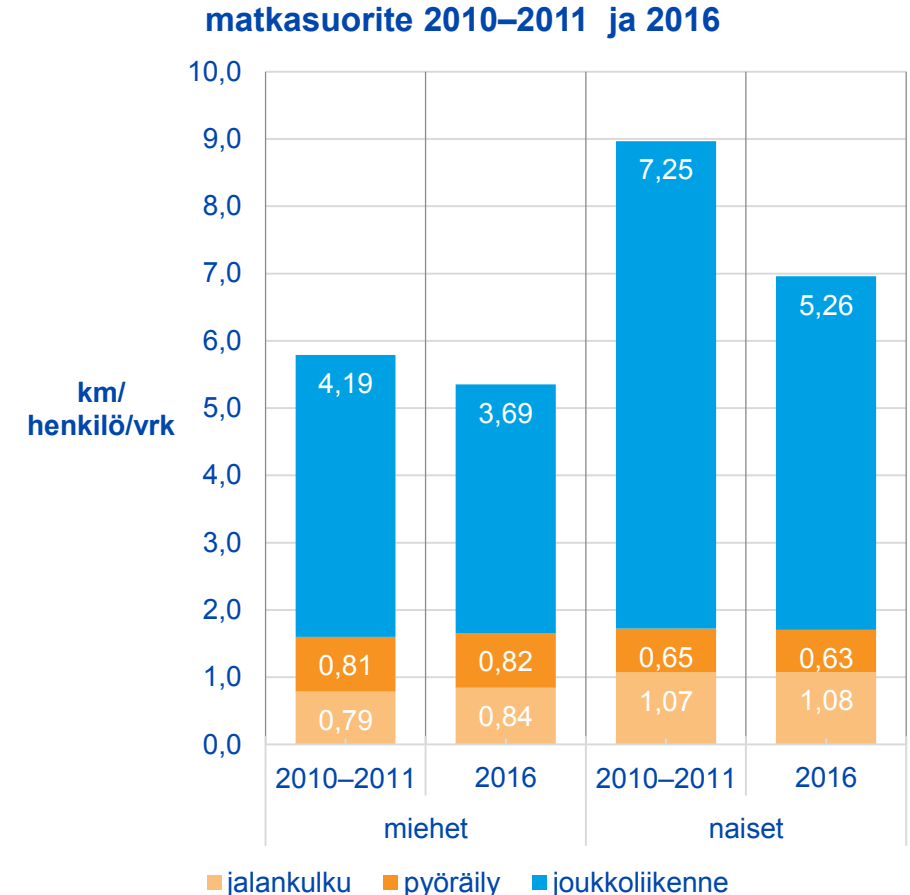
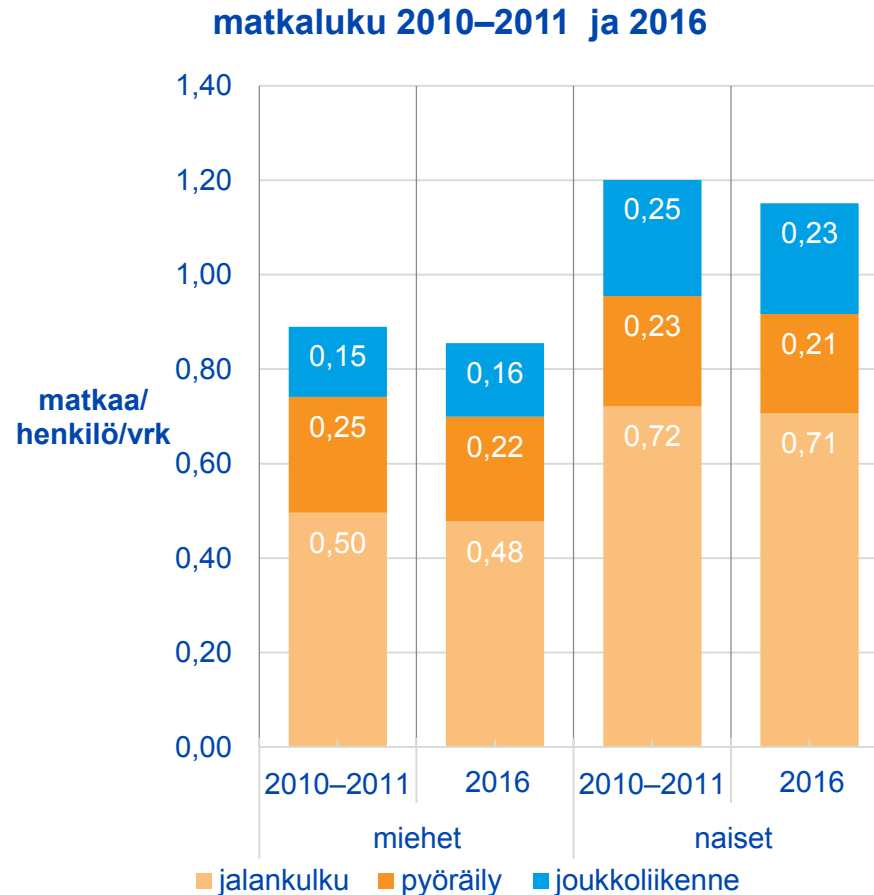
In 2016 the survey involved for the first time several regions with their own additional samples. Altogether, more than 30,000 Finns participated in the survey. The target group of the study included all Finns who were at least six years old, with the exception of residents of Åland.

<http://hlt.fi/>

Finnish National Travel Survey 2016
The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>

NTS – domestic travel, number of trips and kilometres per person per day

<u>kulkutapa</u>	<u>travel mode</u>
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
<u>matkan tarkoitus</u>	<u>trip purpose</u>
työ	work
työasia	professiona
koulutus	education
vapaa-aika	leisure
kyyditseminen	escorting
ostos-asia	shopping & pers.business
matkaluku	trips/person/day
matkasuorite	km/person/day
matka-aikasuorite	min/person/day
kaikki	all
yhteensä	total
miehet	men
naiset	women



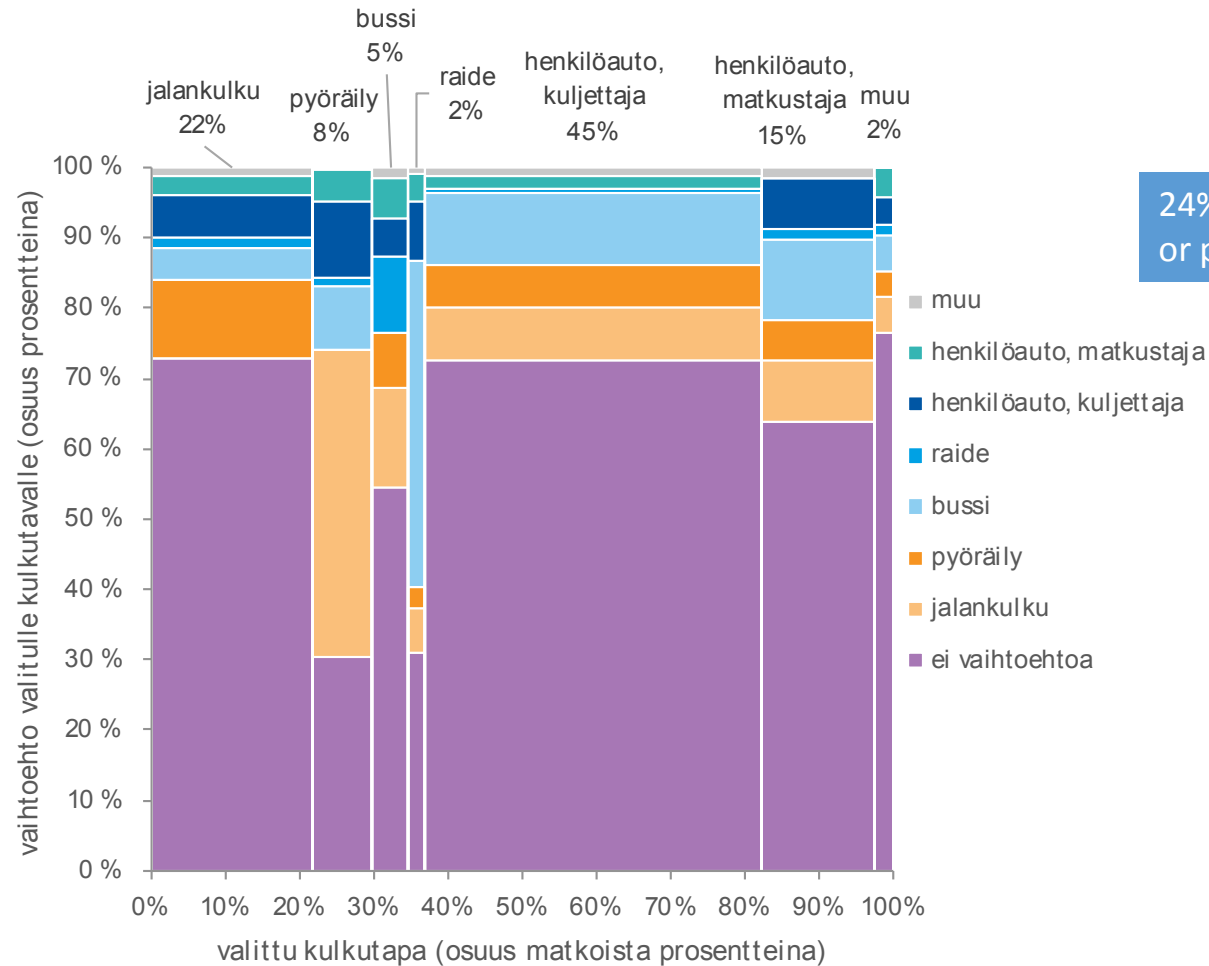
Finnish National Travel Survey 2016

The Finnish Transport Agency

<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>

NTS – alternative main mode

kulikutapa	travel mode
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
matkan tarkoitus	trip purpose
työ	work
työasia	professiona
koulutus	education
vapaa-aika	leisure
kyytseminen	escorting
ostos-asia	shopping & pers.business
matkaluku	trips/person/day
matkasuorite	km/persom/day
matka-aikasuorite	min/person/day
kaikki	all
yhteensä	total
miehet	men
naiset	women
valittu	actual (main mode)
vaihtoehto	alternative (mode)



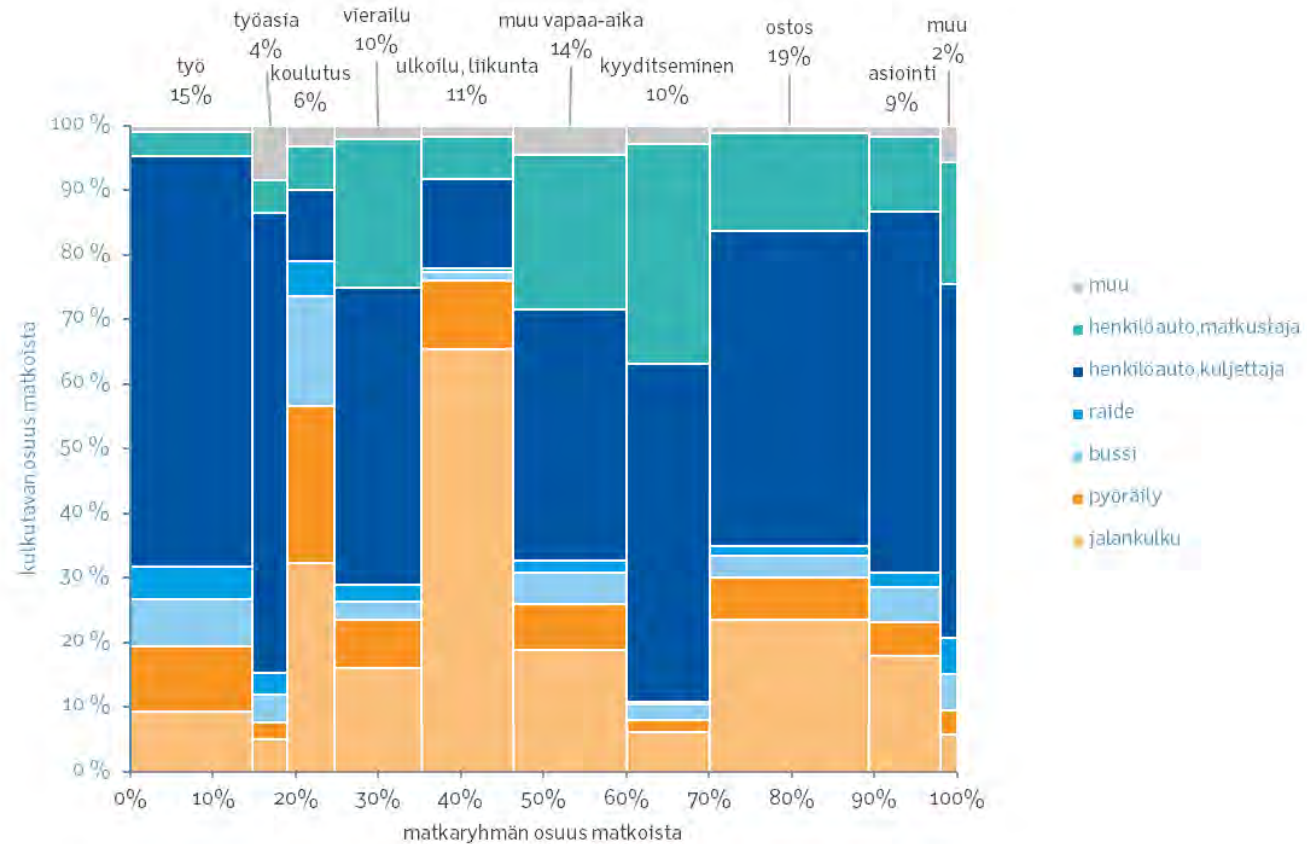
24% of car drivers viewed walking, cycling or public transport as an alternative mode.

Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvVQZmcUmRs>



NTS – domestic travel, main trip modes and purposes, share of trips

kulikutapa	travel mode
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as as passenger
raide	rail
muu	other
joukkoliikenne	public transport
matkan tarkoitus	trip purpose
työ	work
työasia	professiona
koulutus	education
vierailu, ulkoilu, vapaa-aika	lesure
kyyditseminen	escorting
ostos & asiointi	shopping & pers.business
matkaryhmän osuus matkoista	trip purpose share of number of trips
matkaluku	trips/person/day
matkasuorite	km/persom/day
matka-aikasuorite	min/person/day



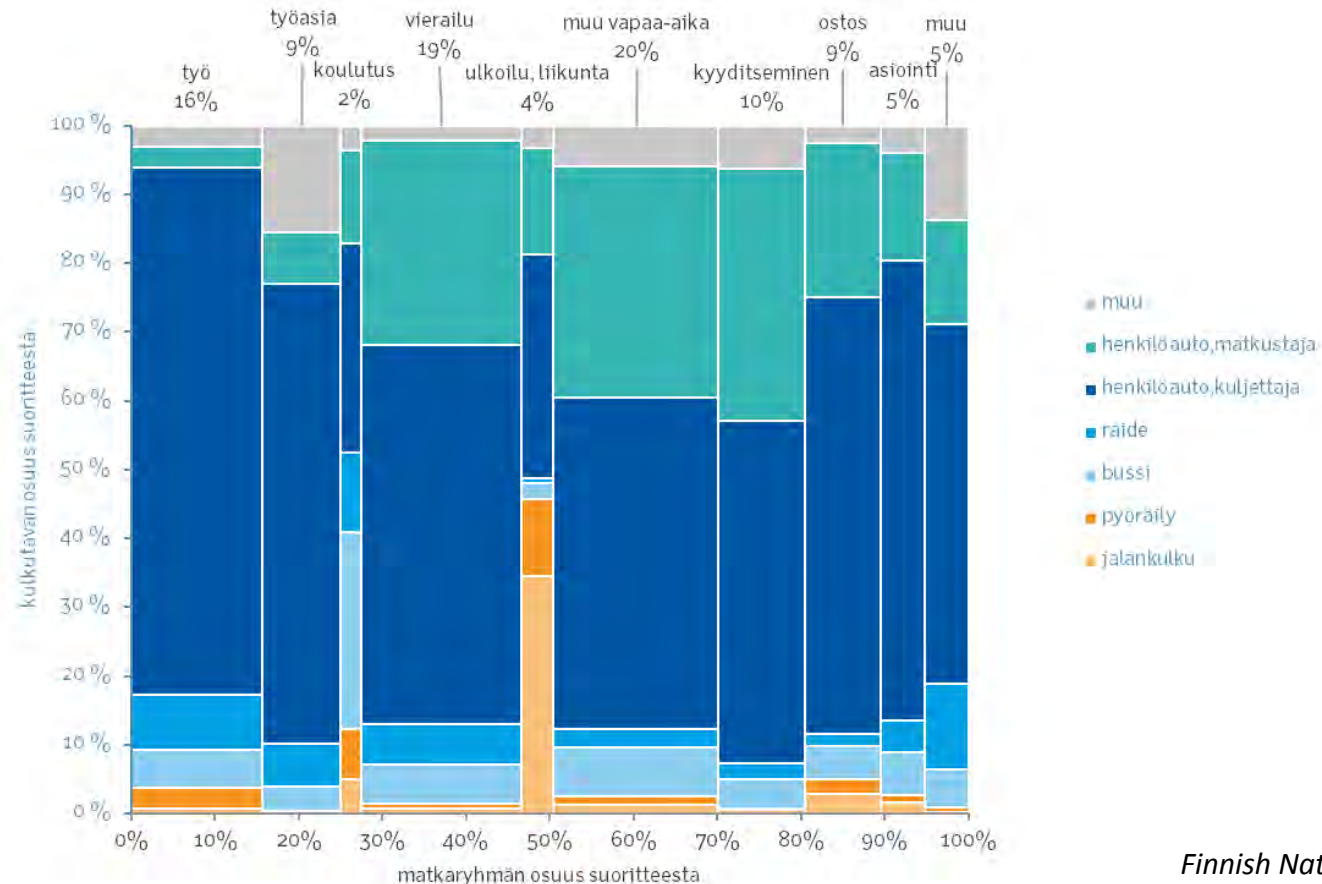
Finnish National Travel Survey 2016

The Finnish Transport Agency

<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvVQZmcUmRs>

NTS – domestic travel, trip modes and purposes, share of travel distance per day

<u>kulkutapa</u>	<u>travel mode</u>
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as as passinger
raide	rail
muu	other
joukkoliikenne	public transport
<u>matkan tarkoitus</u>	<u>trip purpose</u>
työ	work
työasia	professiona
koulutus	education
vapaa-aika	lesure
kyyditseminen	escorting
ostos-asia	shopping & pers.business
matkaluku	trips/person/day
matkasuorite	km/persom/day
matka-aikasuorite	min/person/day



Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>



NTS – share of non trip-makers during the survey day

<u>kulkutapa</u>	<u>travel mode</u>
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
<u>matkan tarkoitus</u>	<u>trip purpose</u>
työ	work
työasia	professiona
koulutus	education
vapaa-aika	lesure
kyyditseminen	escorting
ostos-asia	shopping & pers.business
matkaluku	trips/person/day
matkasuorite	km/persom/day
matka-aikasuorite	min/person/day
kaikki	all
yhteensä	total
osuus	share
miehet	men
naiset	women
ikäryhmä	age group
väestö	population

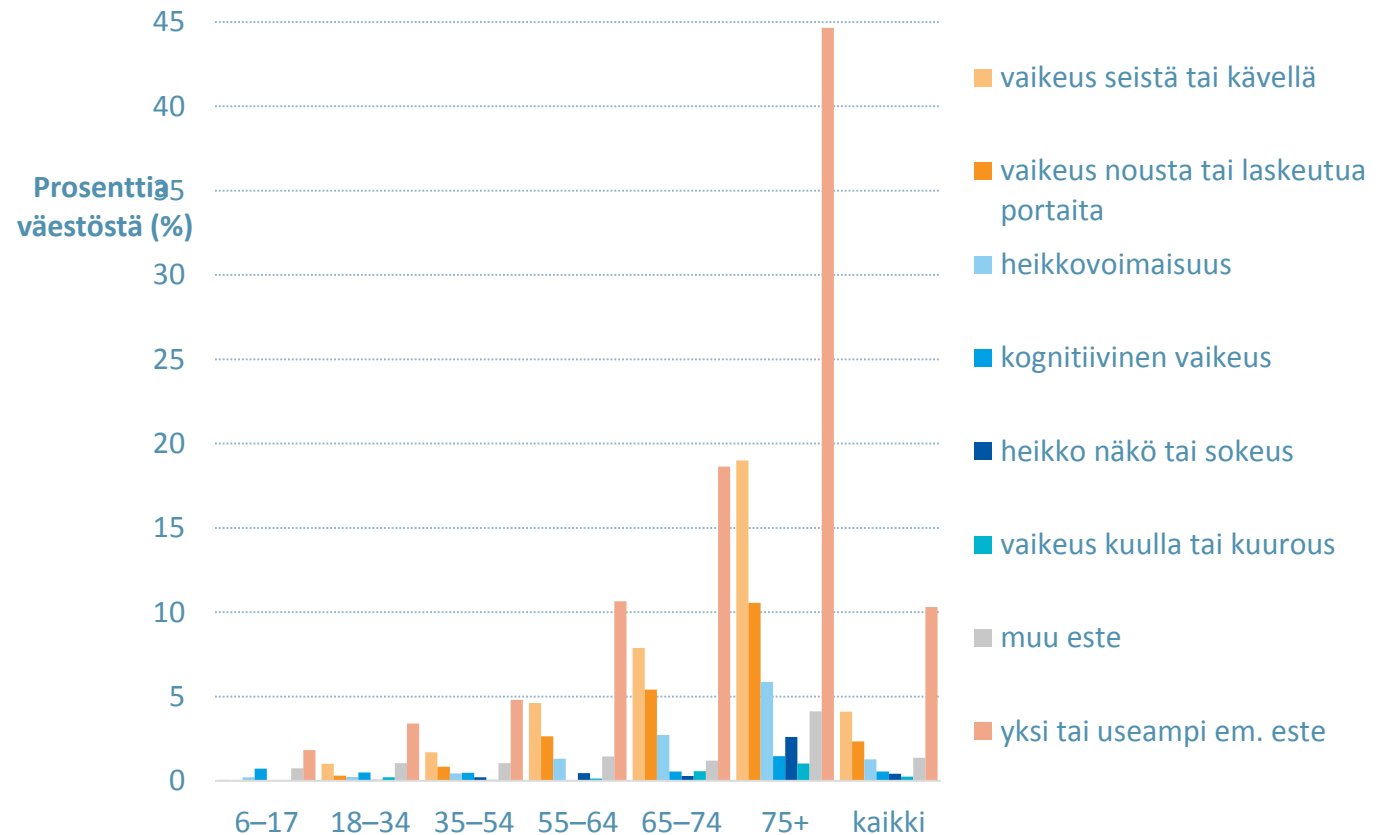
	osuus väestöryhmästä (%)		
	ikäryhmä	miehet	naiset
	6–17	18	19
	18–34	16	18
	35–54	16	12
	55–64	18	17
	65–74	22	24
	75+	33	41
	kaikki	19	20

Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>



NTS – share of population with one or more physical disabilities that affect mobility, three at most selected

vaikeus seistä tai kävellä			
difficulty standing or walking			
vaikeus nousta tai laskeutua portaita			
difficulty ascending or descending stairs			
heikkovoimaisuus			
muscle weakness			
kognitiivinen vaikeus			
difficulty with comprehension; memory difficulties			
heikko näkö tai sokeus			
weak eyesight or blindness			
vaikeus kuulla tai kuurous			
difficulty hearing or deafness			
muu este			
other disability			
yksi tai useampi em. este			
at least one or more disabilities above			
kaikki	all		
ikäryhmä	age group		
prosenttia väestöstä (%)	% of population		

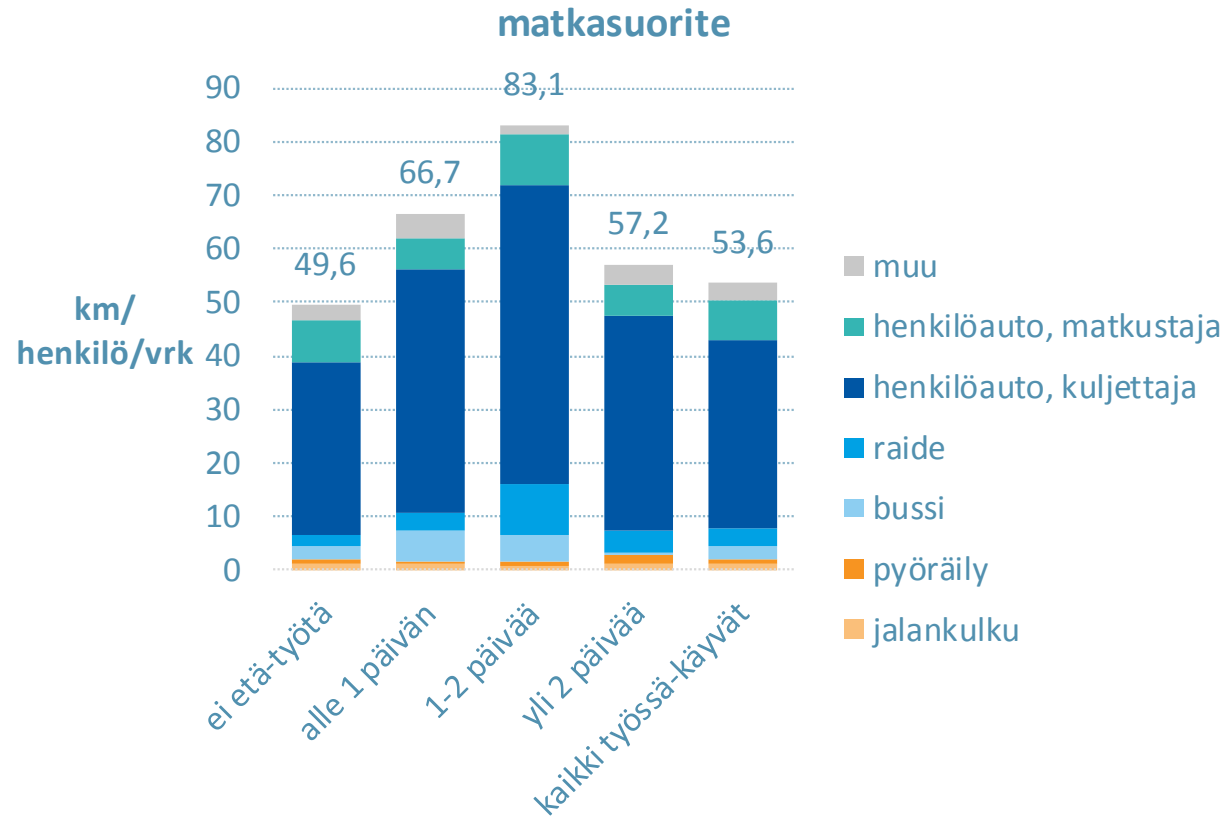


Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvVQZmcUmRs>



NTS – remote work during last 7 days by mode and remote work duration

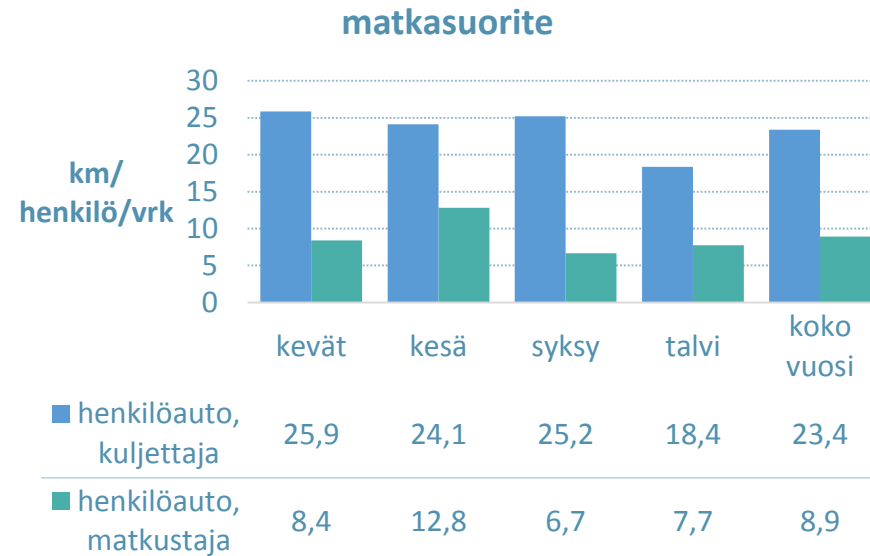
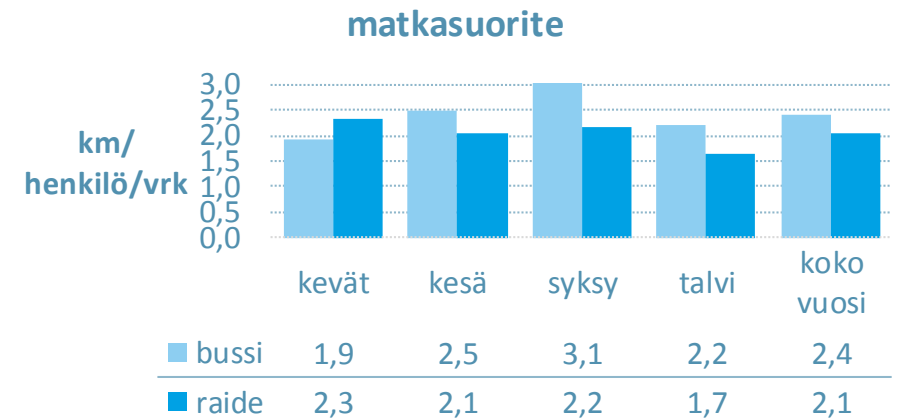
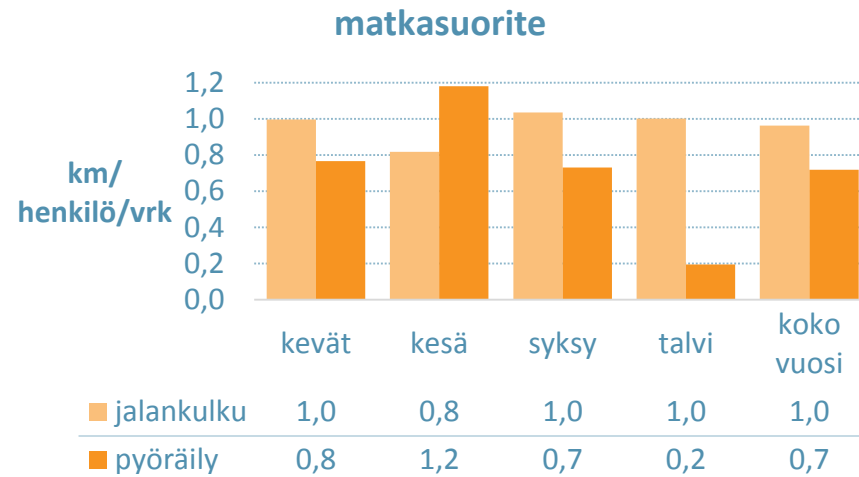
<u>kulkutapa</u>	<u>travel mode</u>
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
matkasuorite	km/persom/day
<u>etätyö</u>	<u>remote work</u>
ei etätyötä	not at all
alle 1 päivän	less than 1 day
1-2 päivää	1-2 days
yli 2 päivää	more than 2 days
(kaikki työssäkäyvät)	(all employeeed)



Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>

NTS – variation of daily travel distance by mode and season

<u>kulikutapa</u>	<u>travel mode</u>
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
matkasuorite	km/person/day
<u>vuodenaika</u>	<u>season</u>
kevät	spring
kesä	summer
syksy	autumn
talvi	winter

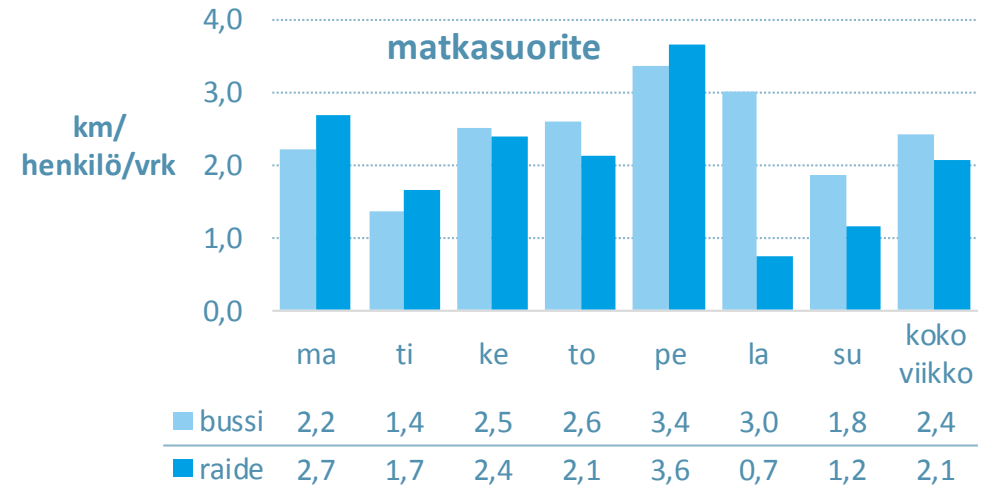
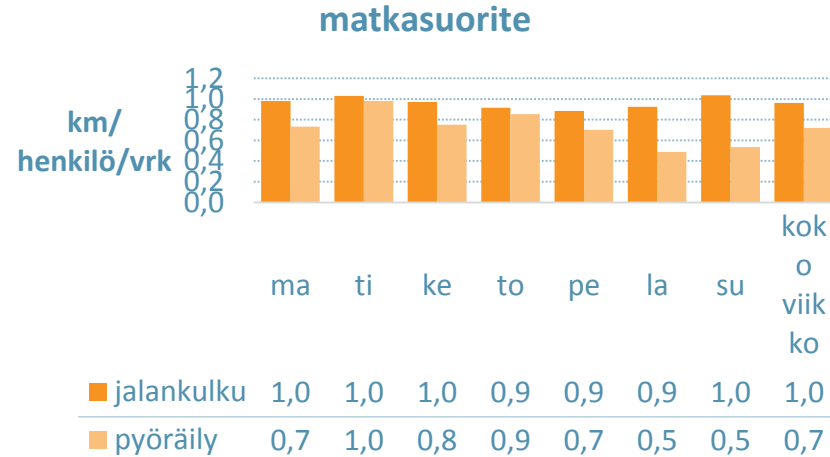


Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>



NTS – variation of daily travel distance by mode and day of the week

kulikutapa	travel mode
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
matkasuorite	km/person/day
viikonpäivä	day of the week
ma	Monday
ti	Tuesday
ke	Wednesday
to	Thursday
pe	Friday
la	Saturday
su	Sunday



Finnish National Travel Survey 2016

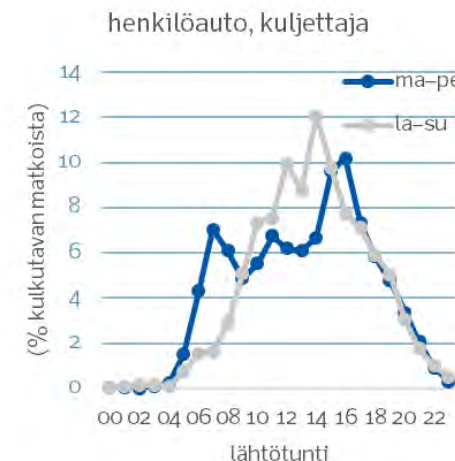
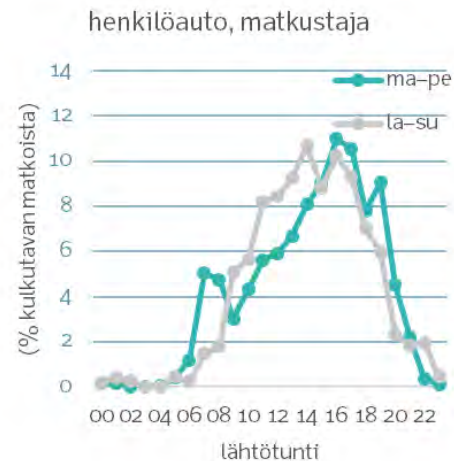
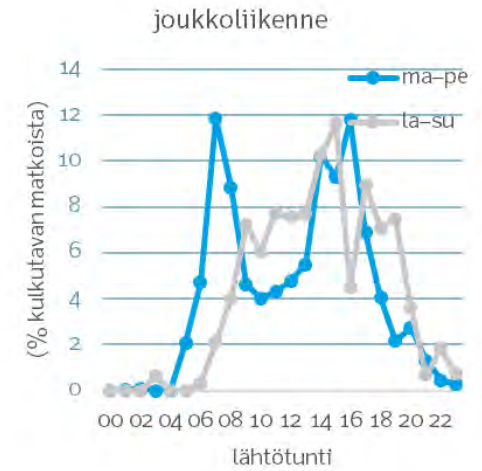
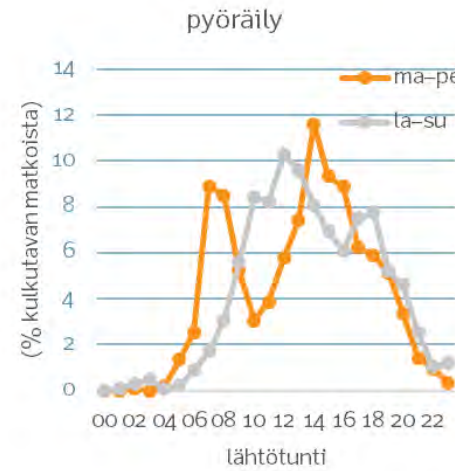
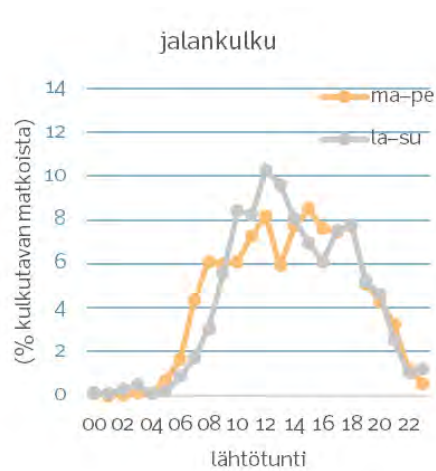
The Finnish Transport Agency

<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvvQZmcUmRs>



NTS – hour of departure by mode and day of the week

kulkutapa	travel mode
jalankulku	walking
pyöräily	cycling
henkilöauto	car or van
kuljettajana	as driver
matkustajana	as passenger
raide	rail
muu	other
joukkoliikenne	public transport
matkasuorite	km/person/day
lähtötunti	hour of departure
viikonpäivä	day of the week
ma-pe	from Mon. to Fri.
la-su	Saturday and Sunday



Finnish National Travel Survey 2016
 The Finnish Transport Agency
<https://www.liikennevirasto.fi/web/en/statistics/national-travel-survey#.WvVQZmcUmRs>



HEAT 4.0

HEAT – What and why?

If x people regularly walk or cycle an amount of y , what is the economic value of the health benefits that occur as a result of the reduction in mortality due to their physical activity?

Disclaimer

Please bear in mind that HEAT does not calculate risk reductions for individual persons but an average across the population under study. The results should not be misunderstood to represent individual risk reductions. Also note that the "value of statistical life" does not assign a value to the life of one particular person but refers to an average value of a "statistical life".

It is important to remember that many of the variables used within HEAT are estimates and therefore liable to some degree of uncertainty.

You are reminded that the HEAT tools provide you with an approximation of the order of magnitude of the impacts. To get a better sense for the robustness of the results, you are strongly advised to rerun the model, entering low and high values for variables where you have provided a "best guess".

HEAT – steps

The HEAT tool is composed of 5 main steps:

1. defining **your assessment**,
2. providing **input data**,
3. providing information for **data adjustments**;
4. review of **calculation parameters**; and
5. **results**.

NTS 2016 – Actual cycle HEAT data in age groups by PX-WIN

PX-Win

Tiedosto Muokkaa Laske Työkalut Kieli Ohje

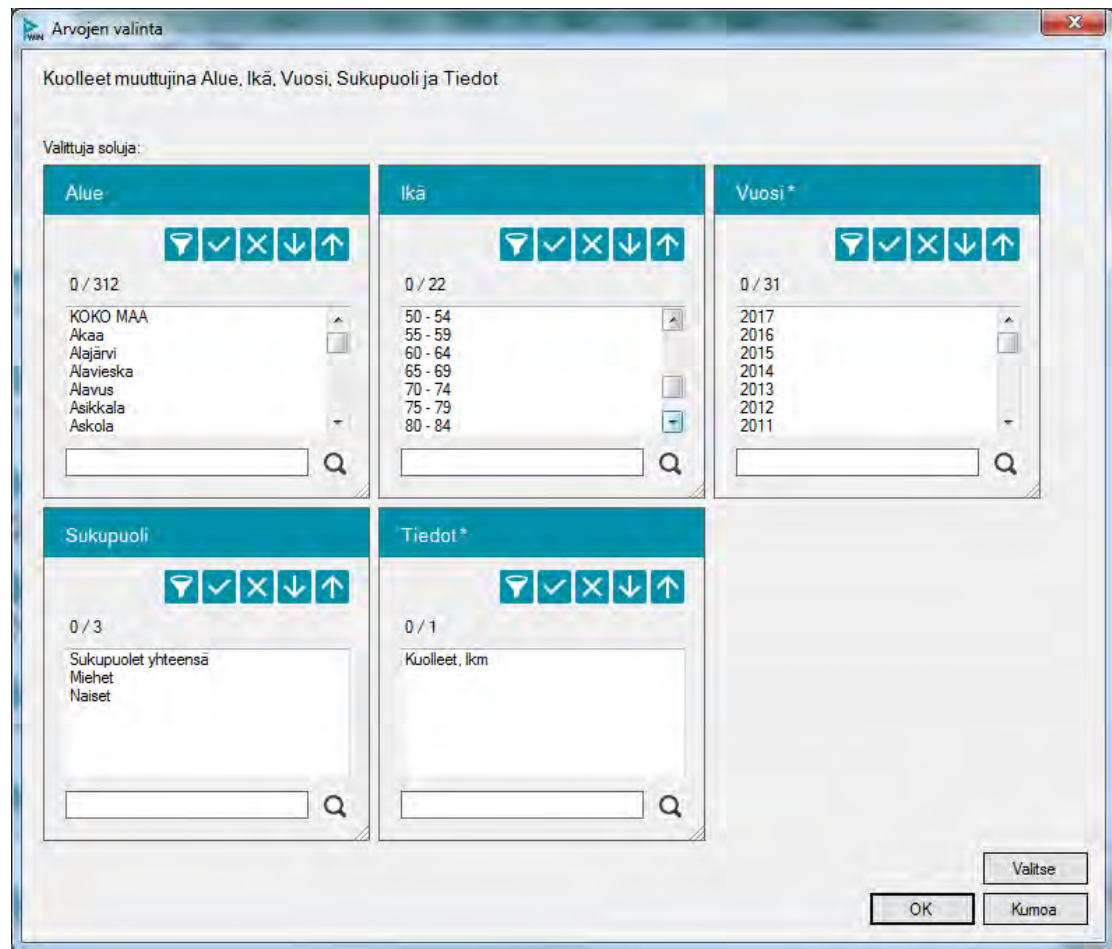
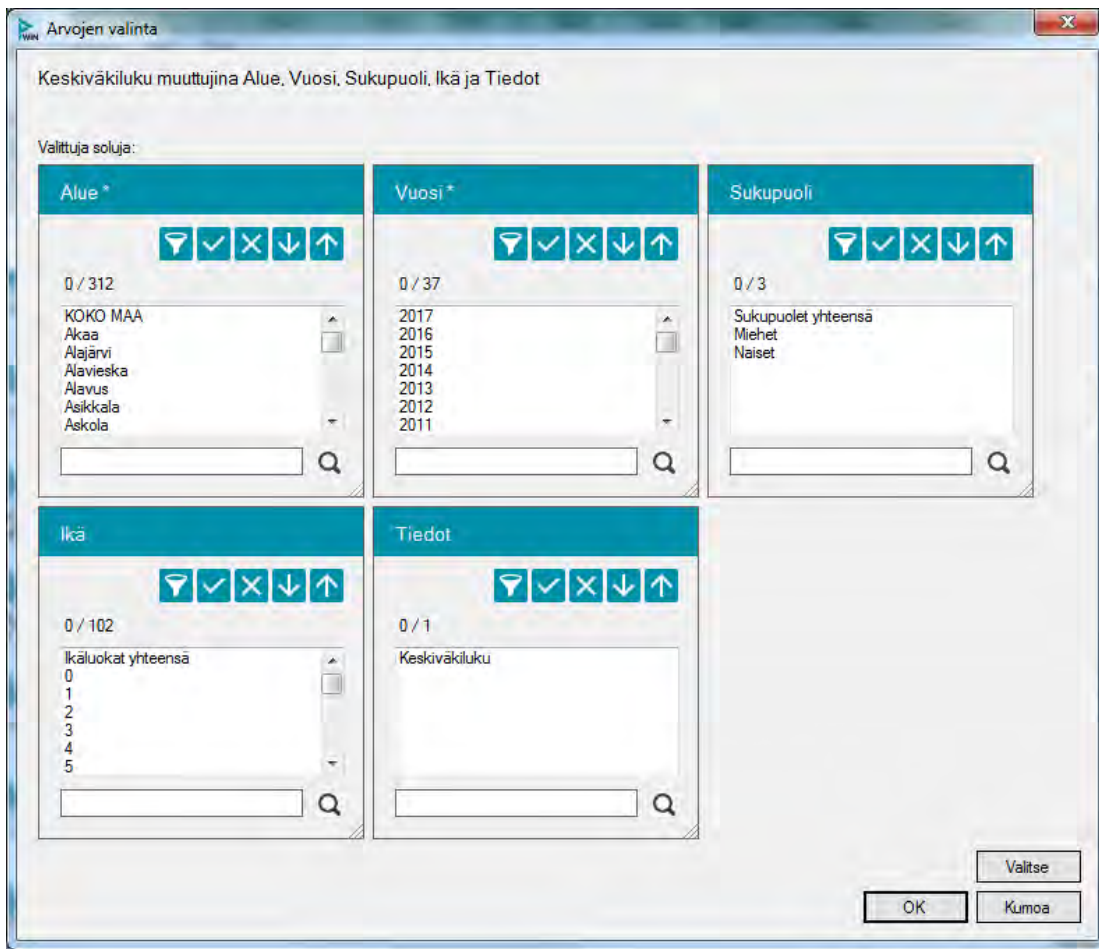
HLT16_PX1_KR_kulikutapa.px Avaa taulukko

PX-file
Matkat kotimaassa tulosmuuttujittain: kulkutapa, kuntaryhmä, sukupuoli ja ikä muuttujina kuntaryhmä, sukupuoli, ikä, kulkutapa ja tulosmuuttuja

Taulukko Alaviitteet Tietoja

			pyöräily		
			matkaluku/pv	matkasuorite km/pv/henkilö	aikasuorite min/pv/henkilö
kaikki kunnat	miehet ja naiset	18-34	0.197	0.524	2.907
		35-54	0.175	0.774	4.051
		55-64	0.177	0.962	4.742
pääkaupunkiseutu	miehet ja naiset	18-34	0.117	0.419	2.025
		35-54	0.202	0.988	4.808
		55-64	0.216	1.872	7.702
suuret kaupungit	miehet ja naiset	18-34	0.380	1.034	5.485
		35-54	0.244	0.820	4.189
		55-64	0.268	1.702	8.445
keskisuuret kaupungit	miehet ja naiset	18-34	0.195	0.425	2.720
		35-54	0.218	1.046	5.369
		55-64	0.156	0.472	2.338
pienet kaupungit	miehet ja naiset	18-34	0.163	0.381	2.444
		35-54	0.130	0.682	4.234
		55-64	0.179	0.728	3.949
muut kunnat	miehet ja naiset	18-34	0.104	0.234	1.395
		35-54	0.107	0.417	2.125
		55-64	0.112	0.467	2.933

<u>kuntaluokitus</u>	<u>municipality classification</u>
kaikki kunnat	all counties total
pääkaupunkiseutu	Capital Region
suuret kaupungit	other major cities
keskisuuret kaupungit	medium sized cities
pienet kaupungit	small sized cities
muut kunnat	other counties
miehet ja naiset	total genders
matkaluku	trips/person/day
matkasuorite	km/person/day
matka-aikasuorite	min/person/day



year		2013	2014	2015	2016	2017
all cause mortality rate		285	269	257	256	248
deaths	20-64	9091	8553	8139	8098	7835
population	20-64	3191266	3181666	3172093	3163746	3153907

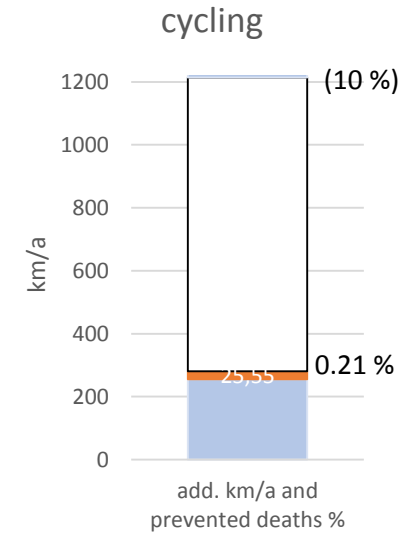
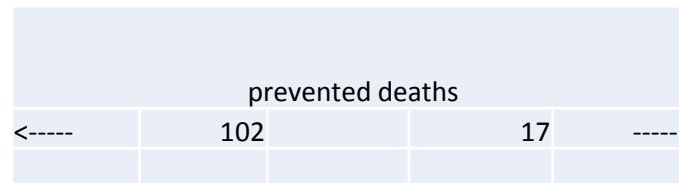
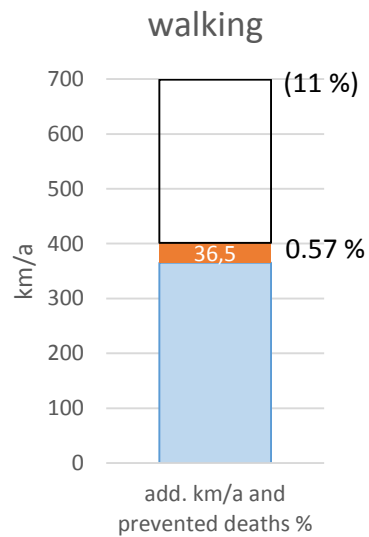
year		2013	2014	2015	2016	2017
all cause mortality rate		479	468	460	468	464
deaths	20-74	18066	17702	17469	17834	17717
population	20-74	3770005	3785485	3801051	3810026.5	3817732.5

Finnish population and mortality in age 20-64 and 20-74

HEAT – walking versus cycling

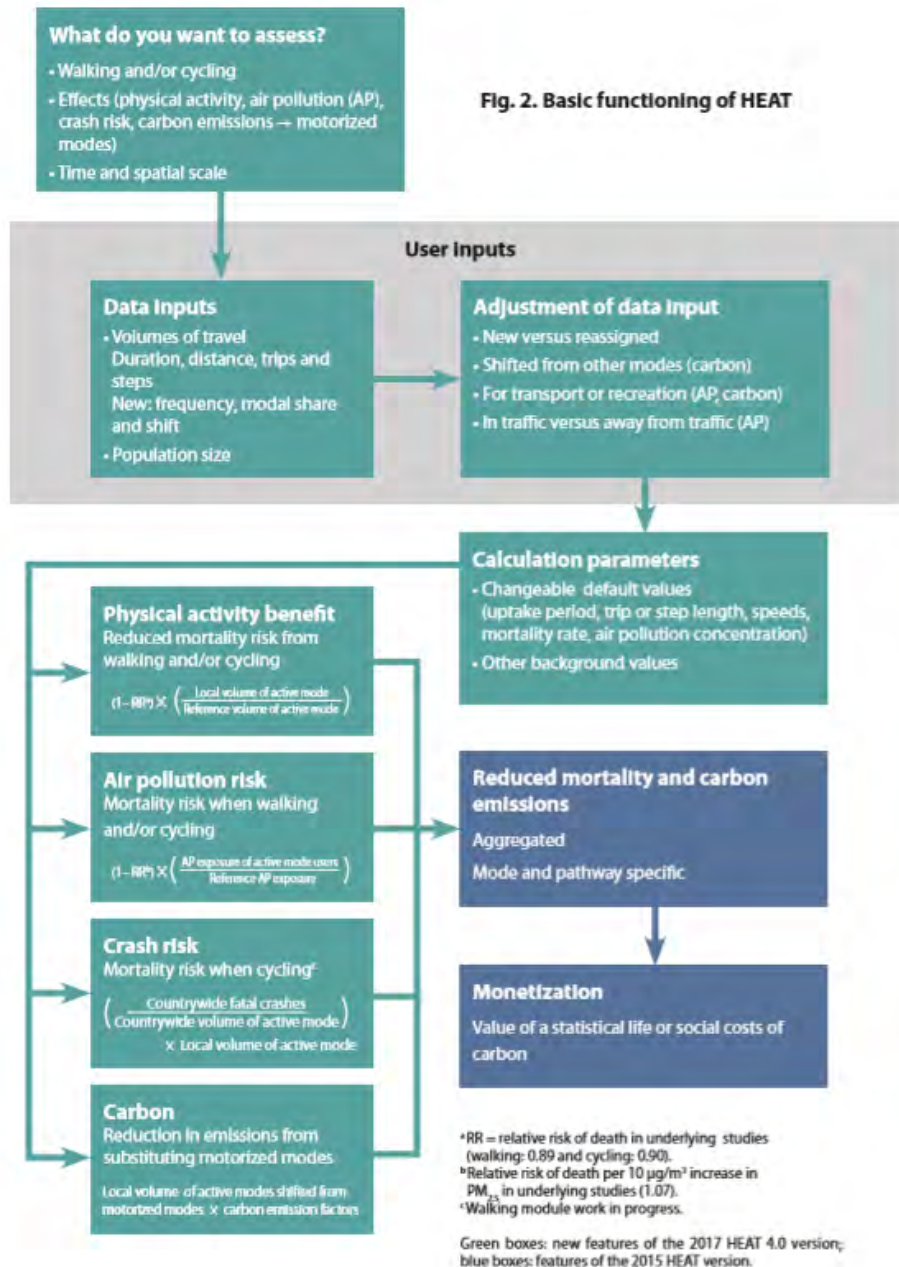
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HEAT – how

Fig. 2. Basic functioning of HEAT



- Physical activity benefit
- Air pollution risk
- Crash risk
- Carbon

1. defining your assessment,
2. providing input data,
3. providing information for data adjustments;
4. review of calculation parameters; and
5. results. print

Case Turku

Calculation parameters

The table below provides an overview of the default values used for your assessment. If you would like to use other values, you can edit column "Editable value".

	Parameter description	Default value	Editable value	Unit	Parameter name
1	Average cycling speed	14	14	km/h	speed_bike
2	Discount rate	5	5	%	discrate
3	Value of statistical life in euro by country (value for Finland in 2015)	3619664.7075	3619664.7075	euro/death	vsl
4	All cause mortality rates by country and age group for bike in reference case (value for Finland and age group 20-64)	254.3634	254.3634	deaths/inhab	mortality_rate:
5	PM2.5 concentration by city (value for Turku)	7.5474	7.5474	ug/m3	pollution_conc
6	Fatality rates by country for bike (value for Finland)	0.016	0.016	fatalities/mio.km	fatalityrates_n

The table below shows the background values that the tool uses for your assessment. These cannot be modified.

	Parameter description	Background value	Unit	Parameter name
1	Time needed to obtain full health impacts in single case assessment	0.00	years	builduptime_onecase
2	Time needed to obtain full health impacts in crash module	0.00	years	builduptime_crash

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Discount rate

HEAT uses a rate of 5% per year as the default value, which can be changed by the user if a different common discount rate is being used in the country. If the HEAT results are being integrated into a wider economic transport assessment that applies discounting, then the HEAT rate should be set at 0

Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020:

M. Florio, E. Sirtonio (2013). The social cost of capital: recent estimates for the EU countries: SRTP 1.1 – 6.7 % (average 2.9%)

FINLAND	Finnish Transport Agency (Investment Projects CBA)					average	+riskpremium %
						2013-2017	2
StateTreasury	2013	2014	2015	2016	2017	2018	2018
nominal interest rate	1.2	0.8	0.6	0.2	0	0.6	2.6

Adjustments

3.14.1 General adjustments of data on active travel

3.14.1.1 Proportion excluded because of unrelated factors (two-case assessment only)

3.14.1.2 Temporal and spatial adjustment HEAT requires long-term average input on active travel (such as annual means).

3.14.1.3 Uptake time for active travel demand (two-case assessments only)

3.14.1.4 Investment costs (two-case assessment only)

3.14.2 Information characterizing the contrast between the reference and comparison cases

3.14.2.1 Proportion of new trips (two-case assessment, carbon emissions only)

3.14.2.2 Proportion of reassigned trips (two-case assessment, sub-city level only)

3.14.2.3 Proportion of trips shifted from another mode (single-case assessment, carbon emissions only)

3.14.3 Other adjustments

3.14.3.1 Proportion of active travel carried out in traffic (air pollution assessment only)

3.14.3.2 Proportion of travel carried out for transport (air pollution and carbon emission assessment only)

3.14.3.3 Traffic conditions (carbon emission assessment only)

3.14.3.4 Change in road crash risk (two-case assessment, road crashes only)

3.14.3.5 Substitution effect (two-case assessment, physical activity only)