

Preliminary results – 24.11.2014

OVIN 2012 is a disaggregate travel diary data set, includes all modes, purposes and levels of spatial resolution down to 4 digit postcode. The OVIN 2012 data consists of 117,881 journeys, but only 20875 journeys are between home/work. The survey authors do not recommend aggregating this data at too high resolution, at most municipality level. Post code level cannot give reliable results for the whole country because many cases just don't get enough data. As need for detail increases they suggest aggregating data from several years to get a bigger sample. There's an adjustment factor on every journey in OVIN for calculating aggregate data at national level. At other aggregation levels (province, municipality or post code) the factor is not guaranteed to work, but there isn't a way of checking that either.

The CBS travel data summary for mode share and distance travelled includes all travel purposes, not just commute to work. It does not exist at municipality level or below. But it's useful to check if the aggregation of OVIN data is being done correctly, since it's the summary published by the survey authors to give the most reliable/trustworthy results. CBS doesn't have distance per trip, but total distance travelled, which can be used to calculate distance share per mode. When aggregating all OVIN 2012 data at national and province levels and comparing to the CBS published results, the mode share results are identical, and the distance travelled per mode is very similar.

Mode share (National and Province)

CBS

	Car	Car passenger	Rail	Bus/Tram/Metro	Moped	Bicycle	Walk	Other
Nederland	0.33	0.14	0.02	0.03	0.01	0.28	0.18	0.01
Groningen (PV)	0.31	0.14	0.02	0.02	0.01	0.32	0.16	0.01
Friesland (PV)	0.33	0.13	0.01	0.01	NA	0.32	0.18	0.02
Drenthe (PV)	0.37	0.16	0.01	0.01	NA	0.29	0.14	0.02
Overijssel (PV)	0.35	0.15	0.01	0.01	NA	0.32	0.15	0.01
Flevoland (PV)	0.33	0.16	0.03	0.04	NA	0.22	0.19	0.01
Gelderland (PV)	0.35	0.14	0.02	0.01	0.01	0.29	0.17	0.01
Utrecht (PV)	0.30	0.14	0.04	0.02	0.01	0.30	0.18	0.01
Noord-Holland (PV)	0.27	0.12	0.03	0.04	0.01	0.30	0.20	0.01
Zuid-Holland (PV)	0.31	0.15	0.03	0.04	0.01	0.25	0.20	0.02
Zeeland (PV)	0.36	0.14	0.01	0.02	0.01	0.27	0.18	0.02
Noord-Brabant (PV)	0.36	0.15	0.01	0.01	0.01	0.26	0.17	0.01
Limburg (PV)	0.38	0.15	0.02	0.02	0.01	0.19	0.22	0.02

OVIN

	Car	Car passenger	Rail	Bus/Tram/Metro	Moped	Bicycle	Walk	Other
Nederland	0.33	0.14	0.02	0.03	0.01	0.27	0.18	0.01
Groningen (PV)	0.31	0.14	0.02	0.02	0.01	0.32	0.16	0.01
Friesland (PV)	0.33	0.13	0.01	0.01	0.01	0.31	0.18	0.02
Drenthe (PV)	0.37	0.15	0.01	0.01	0.00	0.29	0.14	0.02
Overijssel (PV)	0.34	0.15	0.01	0.01	0.01	0.32	0.15	0.01
Flevoland (PV)	0.34	0.16	0.03	0.04	0.01	0.22	0.19	0.01
Gelderland (PV)	0.34	0.14	0.02	0.01	0.01	0.29	0.17	0.02
Utrecht (PV)	0.30	0.14	0.03	0.02	0.01	0.30	0.18	0.01
Noord-Holland (PV)	0.27	0.12	0.03	0.04	0.01	0.30	0.20	0.01
Zuid-Holland (PV)	0.31	0.14	0.03	0.04	0.01	0.25	0.20	0.01
Zeeland (PV)	0.36	0.14	0.01	0.01	0.01	0.27	0.18	0.01
Noord-Brabant (PV)	0.36	0.16	0.02	0.01	0.01	0.26	0.17	0.02
Limburg (PV)	0.38	0.15	0.01	0.02	0.01	0.19	0.22	0.01

Distance share

CBS

	Car	Car passenger	Rail	Bus/Tram/Metro	Moped	Bicycle	Walk	Other
Nederland	0.50	0.22	0.08	0.03	0.01	0.08	0.03	0.06
Groningen..PV.	0.49	0.20	0.11	0.04	0.00	0.08	0.03	0.04
Friesland..PV.	0.54	0.22	0.06	0.02	0.00	0.08	0.02	0.06
Drenthe..PV.	0.57	0.22	0.05	0.02	0.00	0.06	0.02	0.05
Overijssel..PV.	0.53	0.20	0.07	0.01	0.00	0.08	0.02	0.07
Flevoland..PV.	0.53	0.24	0.07	0.04	0.00	0.04	0.04	0.05
Gelderland..PV.	0.53	0.21	0.07	0.02	0.00	0.08	0.03	0.07
Utrecht..PV.	0.49	0.22	0.11	0.03	0.01	0.08	0.03	0.04
Noord.Holland..PV.	0.44	0.21	0.11	0.04	0.01	0.09	0.03	0.05
Zuid.Holland..PV.	0.47	0.24	0.09	0.04	0.01	0.07	0.03	0.05
Zeeland..PV.	0.54	0.25	0.04	0.02	0.00	0.06	0.02	0.04
Noord.Brabant..PV.	0.52	0.23	0.07	0.02	0.00	0.08	0.02	0.05
Limburg..PV.	0.52	0.20	0.07	0.03	0.01	0.07	0.04	0.07

OVIN

	Car	Car passenger	Rail	Bus/Tram/Metro	Moped	Bicycle	Walk	Other
Nederland	0.52	0.21	0.10	0.03	0.01	0.08	0.02	0.03
Groningen..PV.	0.51	0.19	0.14	0.03	0.00	0.09	0.02	0.02
Friesland..PV.	0.58	0.22	0.05	0.02	0.01	0.08	0.02	0.02
Drenthe..PV.	0.59	0.21	0.06	0.02	0.00	0.07	0.02	0.02
Overijssel..PV.	0.57	0.19	0.08	0.01	0.00	0.09	0.02	0.03
Flevoland..PV.	0.54	0.23	0.09	0.04	0.01	0.05	0.02	0.03
Gelderland..PV.	0.56	0.19	0.09	0.01	0.01	0.09	0.02	0.03
Utrecht..PV.	0.50	0.21	0.14	0.02	0.00	0.08	0.02	0.03
Noord.Holland..PV.	0.46	0.19	0.14	0.05	0.01	0.10	0.03	0.03
Zuid.Holland..PV.	0.49	0.22	0.12	0.04	0.01	0.08	0.02	0.02
Zeeland..PV.	0.55	0.24	0.06	0.02	0.01	0.08	0.02	0.03
Noord.Brabant..PV.	0.54	0.22	0.09	0.02	0.00	0.08	0.02	0.03
Limburg..PV.	0.55	0.19	0.10	0.02	0.01	0.08	0.04	0.03

In a first analysis I did, the OViN results for car distance share were 5 to 10% higher than CBS results. A possible explanation was that OViN 2012 contains multimodal journeys. These account for only 5.28% of all journeys and are mostly public transport mode with either end being walking/cycling/other transit mode. In these cases, I've only considered the mode of the main part of the journey, that has a specific attribute in the survey data (it's based on the distance travelled on each leg of a multimodal journey). But apparently this small number of journeys has an impact on the distance of the less used modes, since they are widely used in multimodal journeys and get underrepresented. In fact, 85% of multimodal journeys use some form of public transport.

MON 2004-2009 data is the previous travel survey (that I used in my PhD) and is equivalent to OViN 2012 in most respects, just has a bigger data sample with 1,041,927 journeys of which 165,516 are commuter journeys between home/work. It is useful to test if an increase in sample size would give different results. But no, the result is more or less the same when comparing OViN 2012 to MON 2004-2009. We should stick to OViN 2012 only to have survey data that is most comparable to the UK NTS 2012.

CONCLUSIONS:

- Despite the smallish data sample in OViN 2012, the results seem reliable enough and we can use that data.
- The data set has all the disaggregate attributes that we need, and we now know how to aggregate them correctly to obtain the calculations to compare with the UK travel data.
- The results of the 2012 survey are very much in line with the previous results (2010, in the pdf) so the conclusions of the paper still hold.

TO DO:

- Calculate commuter energy use as in Figure 1 of the pdf. Need the mode efficiency E_f values.
- Calculate modal split per municipality. Need to deal with NA data for some modes in some municipalities. This is better shown on a map as there are 415 of these zones in the country.
- Calculate average trip distance per mode, as in Fig 3 of the pdf.
- Still need to import the map data (have maps of provinces and municipalities as shape files) and join with the results for visualisation. This data has the population numbers.
- Plot population density versus energy use, as in Fig 4

Intermediary work - 04.2015

Calculate commuter energy use

I couldn't figure out to calculate this from the information and data in this report:

CBS, 2014. 'Methods for calculating the emissions of transport in the Netherlands - Additional survey descriptions'

[<http://www.cbs.nl/en-GB/menu/themas/natuurmilieu/methoden/dataverzameling/overige-dataverzameling/2014-methods-for-calculating-the-emissions-of-transport-in-the-netherlands-pub.htm>]

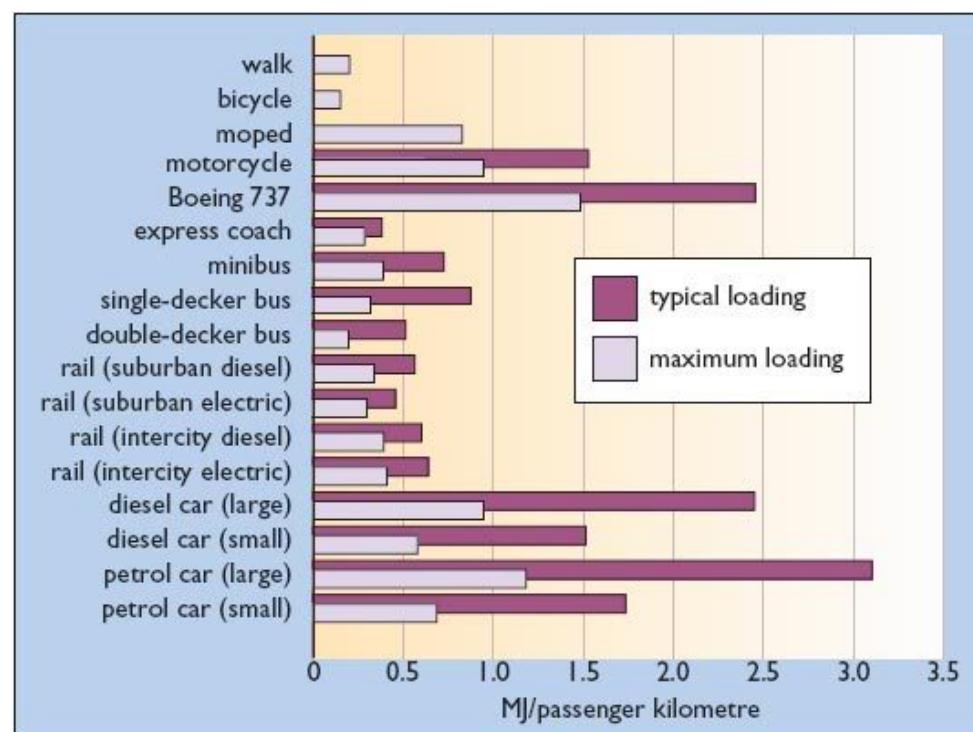
This report covers CO₂ and other emissions, but energy (in MJ/km) is not included. The same applies to the equivalent document from the UK:

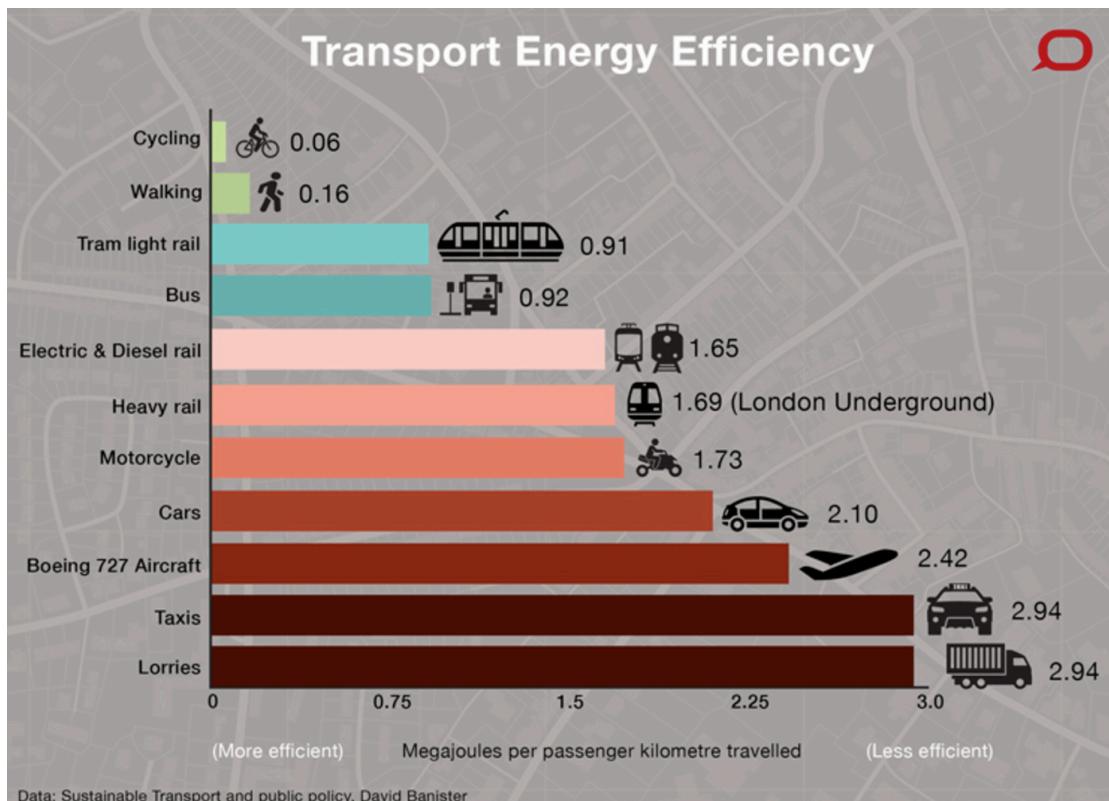
Department for Environment, Food & Rural Affairs (DEFRA), 2012. '2012 greenhouse gas conversion factors for company reporting'. London, UK.

[<https://www.gov.uk/government/publications/2012-greenhouse-gas-conversion-factors-for-company-reporting>]

The energy use in kWh or MJ is an input for the emissions estimation/calculation sheets, and not the output. We have distance travelled by mode and need some form of calculating the total energy used for commuting in MJ/km. Other reports specifically covering energy only present aggregate results with national totals (e.g. <http://www.clo.nl/nl0030>).

The following general guidelines (not UK or NL specific) present the energy (MJ) per passenger kilometre travelled for different modes. Not sure this is relevant, or if we must get country specific energy use.





From: Banister, D., 2012. Sustainable Transport and Public Policy. Encyclopedia of Life Support Systems.

To calculate energy use per trip I will be using the above figures from Banister for efficiency per mode, to calculate the energy per trip as in the paper:

$$E_{trip} = \sum(pm \times E_{fm} \times dRm)$$

We can easily change these parameters later on, if we find a way to get the values specific to the Netherlands.

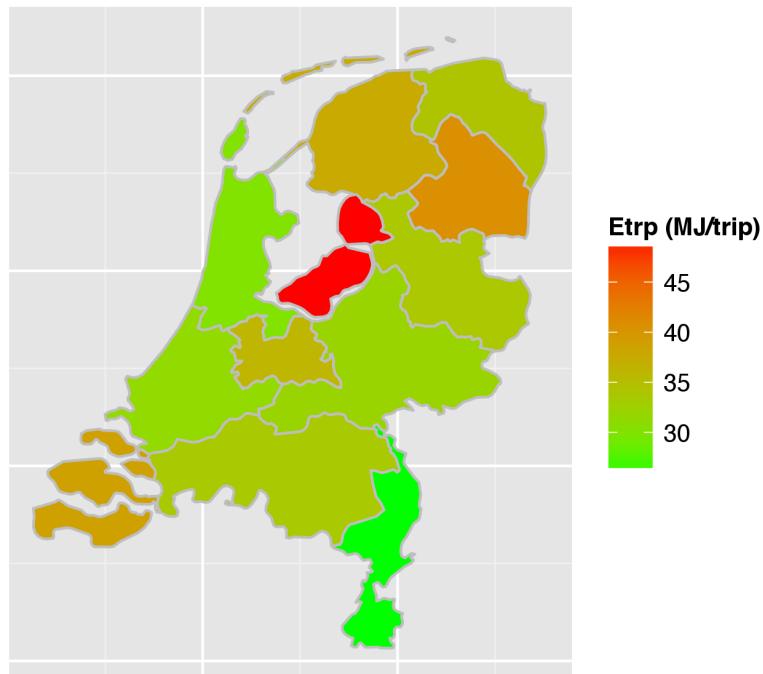
Completing the To Do list - 12.2015

At this stage I will focus on the OVIn 2012 data at the municipal level, completing the tasks left to do from the previous stage, reproducing the results of the draft paper, and extending it with results at the municipal level.

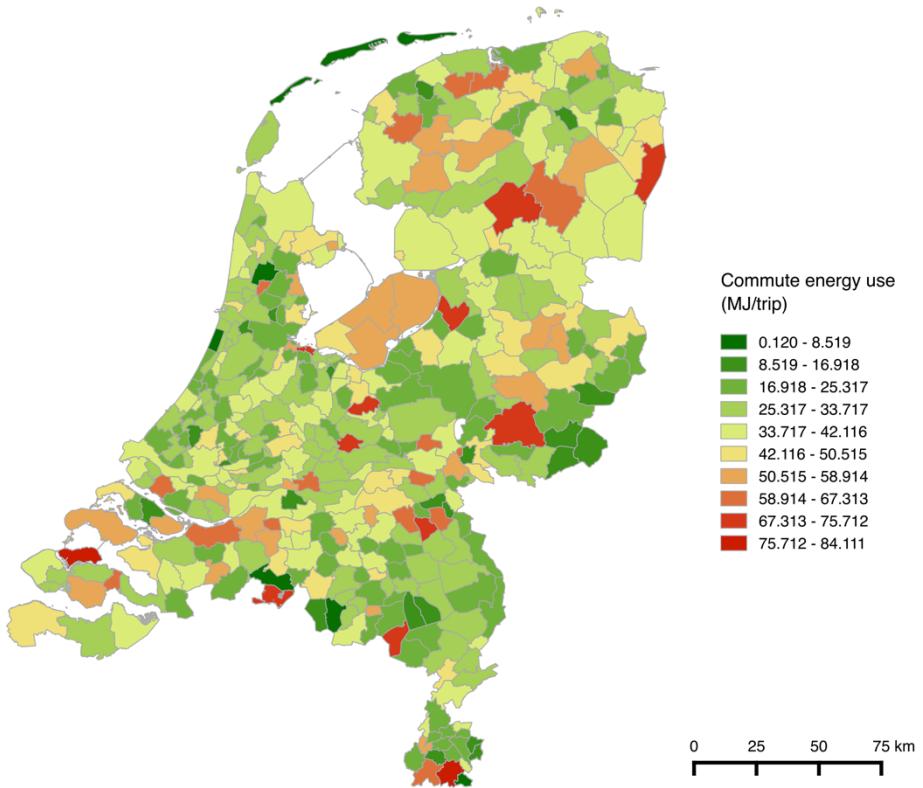
Energy Use

As mentioned in the previous page, I use the energy efficiency values from Banister to calculate total energy use in commute trips.

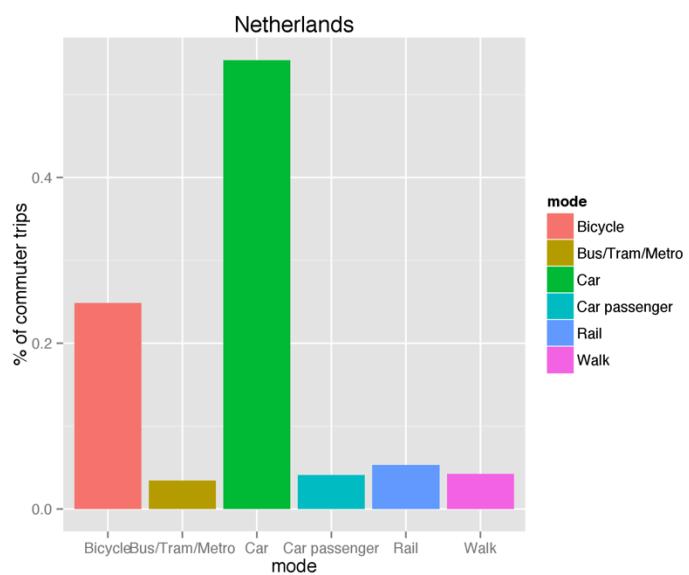
Province energy per commuter trip

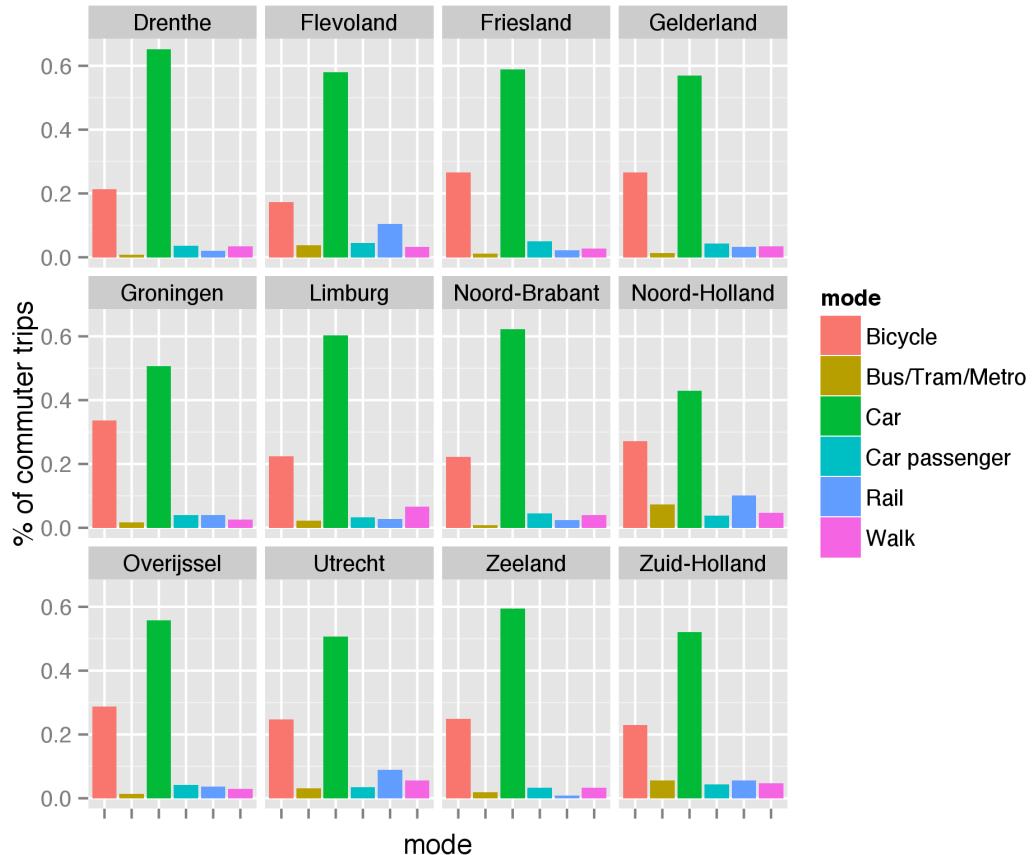


	name	Total	Bicycle	Bus/Tram/Metro	Car	Car passenger	Rail	Walk
1	Groningen	34.35527	0.083783	0.324304	28.11309	2.144149	3.372185	0.006540
2	Friesland	37.64032	0.057562	0.272482	31.35883	3.847529	1.948342	0.007083
3	Drenthe	40.59923	0.047668	0.096986	34.88404	2.989226	2.460535	0.009683
4	Overijssel	33.78206	0.066414	0.113986	27.34194	2.210019	3.899382	0.007692
5	Flevoland	48.95813	0.035176	0.530897	38.94854	2.515583	6.614214	0.017923
6	Gelderland	32.07809	0.056959	0.119617	27.19503	1.651090	2.722609	0.009169
7	Utrecht	36.14558	0.059069	0.326689	27.66567	1.714947	6.195129	0.013150
8	Noord-Holland	30.14740	0.073893	0.828233	20.39130	2.523381	5.935992	0.012011
9	Zuid-Holland	31.36880	0.060770	0.582359	24.88783	1.560882	3.896946	0.013757
10	Zeeland	38.73173	0.049434	0.410364	35.20392	1.309055	1.260123	0.008812
11	Noord-Brabant	33.65753	0.058199	0.112390	28.61281	2.281304	2.456588	0.010682
12	Limburg	26.10797	0.058894	0.296112	22.50124	1.058645	2.027859	0.016899



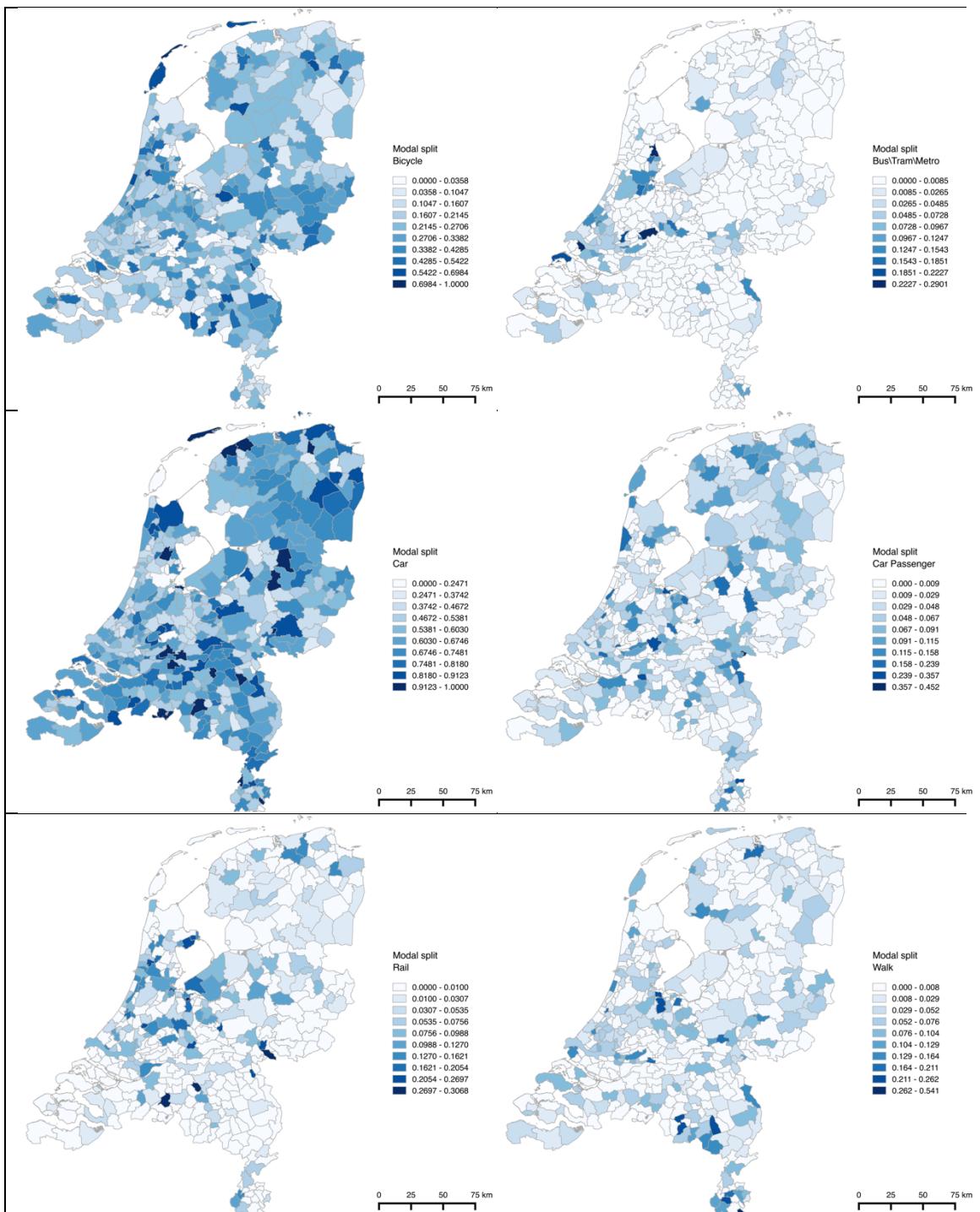
Modal Split



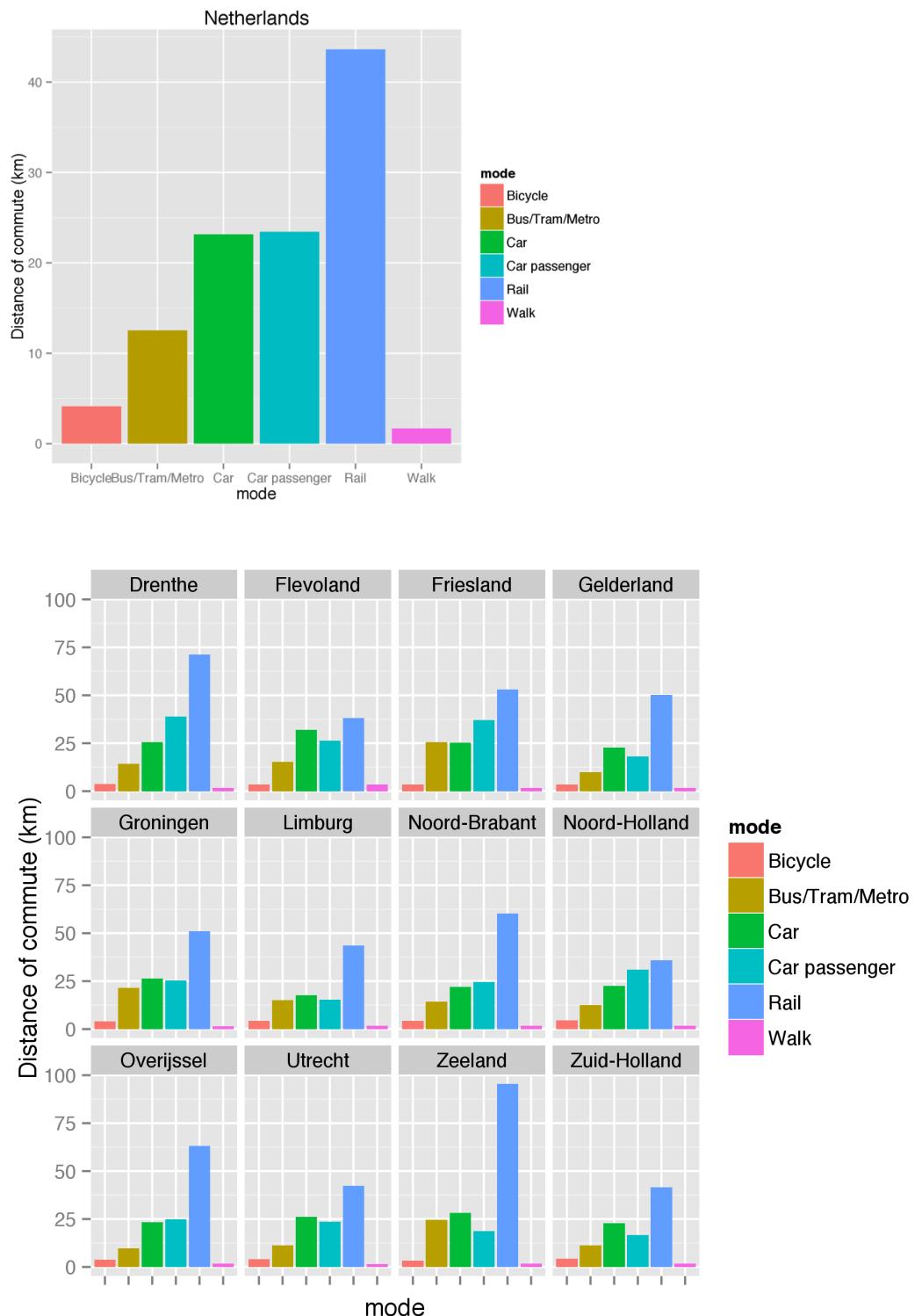


	Province	Car	Car passenger	Rail	Bus/Tram/Metro	Bicycle	Walk
1	Groningen	0.5072017	0.04047963	0.040137265	0.016534758	0.3366710	0.02617965
2	Friesland	0.5887606	0.04949989	0.022230480	0.011671643	0.2659048	0.02814104
3	Drenthe	0.6526406	0.03668151	0.020929147	0.007413135	0.2126535	0.03466422
4	Overijssel	0.5585869	0.04228085	0.037471598	0.013031489	0.2881610	0.02914863
5	Flevoland	0.5805270	0.04564182	0.105359846	0.038279263	0.1728252	0.03204094
6	Gelderland	0.5700890	0.04329728	0.032889039	0.013147703	0.2662974	0.03396940
7	Utrecht	0.5060638	0.03445164	0.088571444	0.031856885	0.2469869	0.05610961
8	Noord-Holland	0.4302321	0.03884976	0.100467741	0.072966969	0.2708688	0.04639570
9	Zuid-Holland	0.5207264	0.04432208	0.056765653	0.056415786	0.2303424	0.04801872
10	Zeeland	0.5947383	0.03343719	0.007996021	0.018310991	0.2492703	0.03304520
11	Noord-Brabant	0.6218460	0.04434456	0.024677585	0.008671340	0.2229505	0.03903220
12	Limburg	0.6029492	0.03267602	0.028229452	0.021550035	0.2233813	0.06531130

Municipal modal split

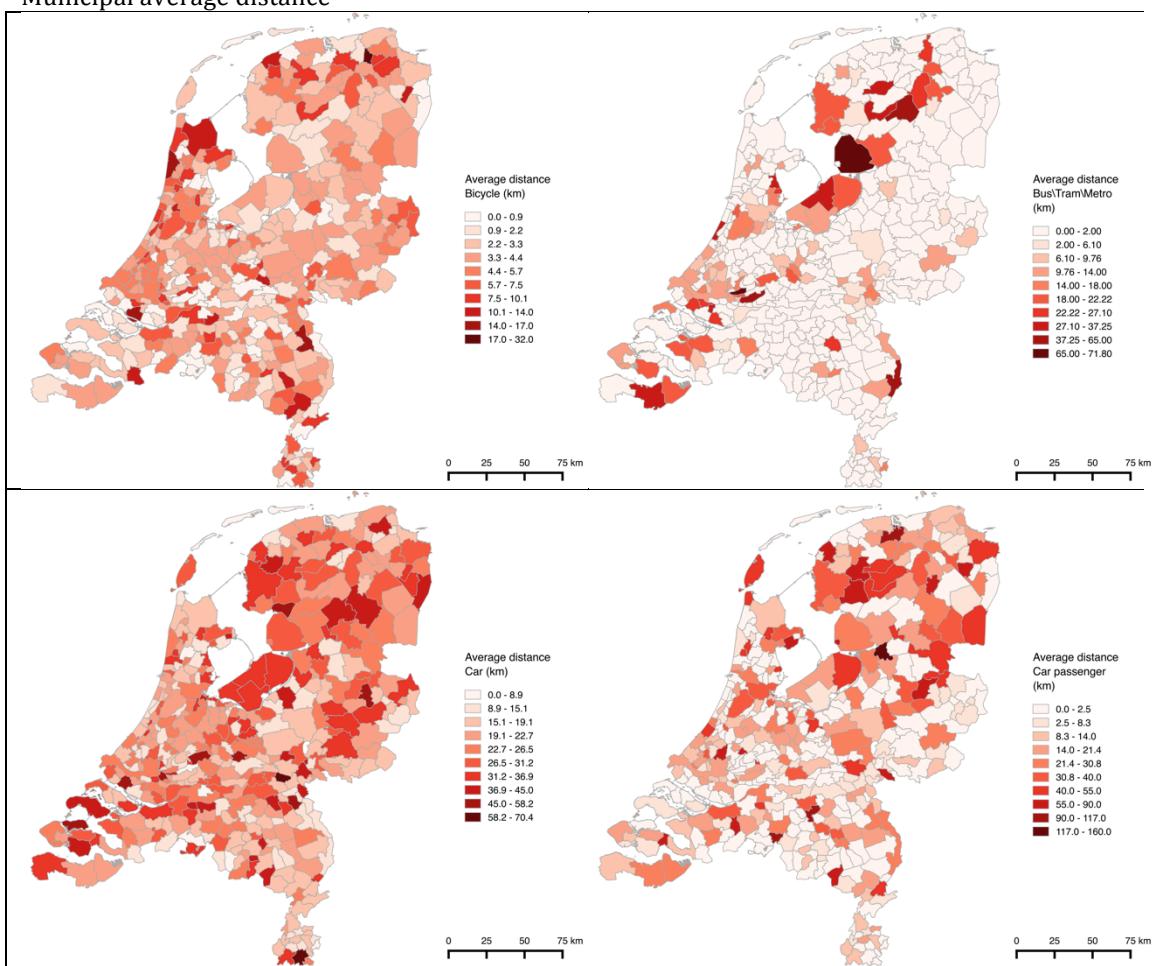


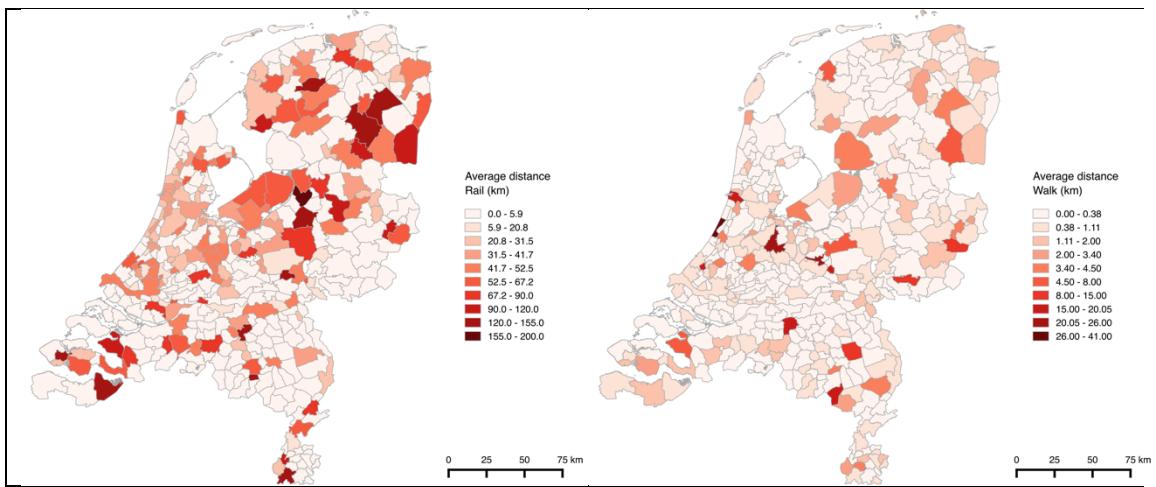
Average Trip Distance



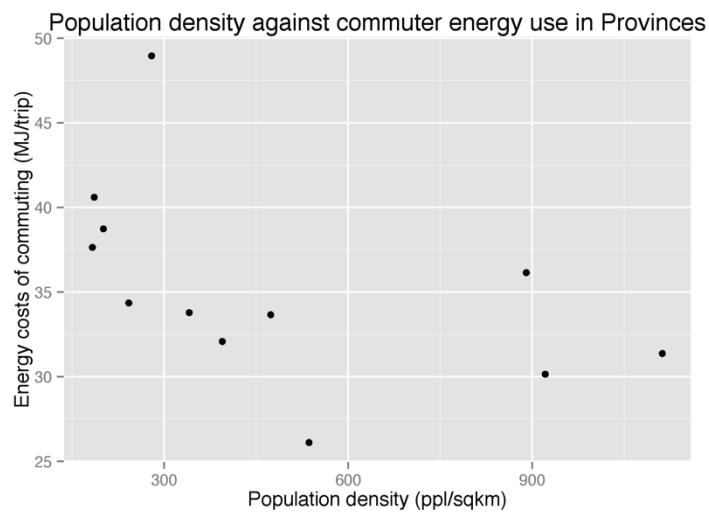
	Province	Car	Car passenger	Rail	Bus/Tram/Metro	Bicycle	Walk
1	Groningen	26.39420	25.22313	50.91898	21.553244	4.147605	1.561421
2	Friesland	25.36307	37.01335	53.11686	25.654521	3.607906	1.573002
3	Drenthe	25.45267	38.80540	71.25150	14.376910	3.735967	1.745921
4	Overijssel	23.30876	24.89046	63.06808	9.612034	3.841227	1.649355
5	Flevoland	31.94843	26.24559	38.04689	15.240728	3.392254	3.496033
6	Gelderland	22.71578	18.15895	50.17070	9.997752	3.564887	1.686975
7	Utrecht	26.03254	23.70399	42.39091	11.269101	3.985981	1.464762
8	Noord-Holland	22.56955	30.92966	35.80822	12.473393	4.546646	1.618057
9	Zuid-Holland	22.75927	16.76991	41.60589	11.343538	4.397097	1.790603
10	Zeeland	28.18680	18.64270	95.51135	24.627267	3.305225	1.666738
11	Noord-Brabant	21.91081	24.49760	60.33171	14.242956	4.350677	1.710481
12	Limburg	17.77078	15.42772	43.53628	15.099629	4.394122	1.617146

Municipal average distance

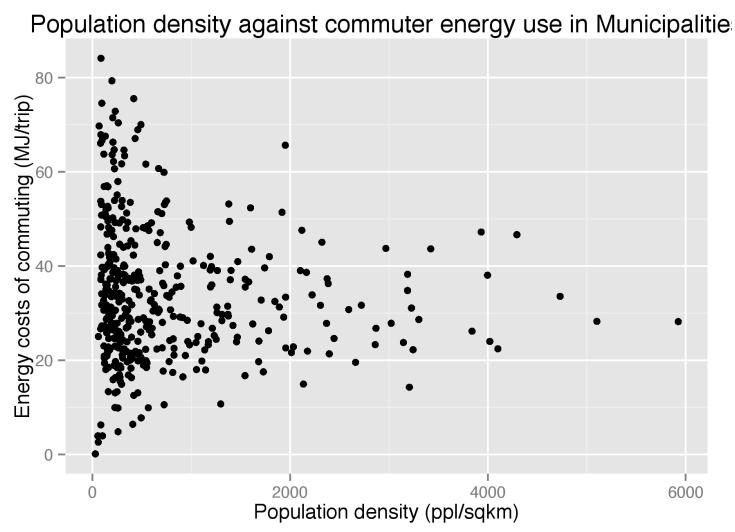




Population Density and Energy Use



$r = -0.49$



$r = -0.096$