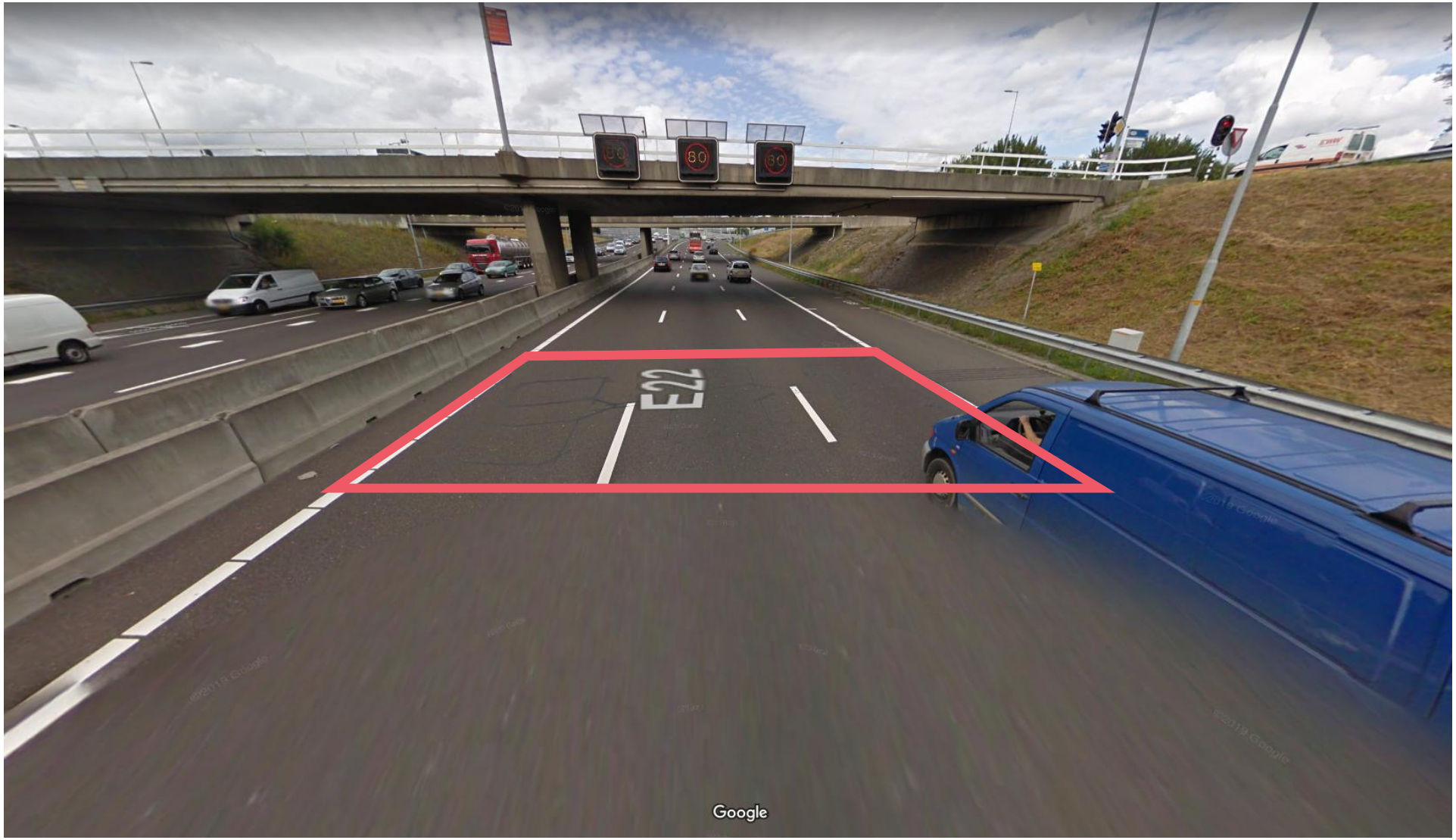
TNO innovation for life

USING NDW LUSDATA TO ESTIMATE HOURLY MOTORWAY EMISSIONS IN THE NETHERLANDS

B. KELLY

WHAT IS LUSDATA?



- PneumaticLoop Data
- Processed byTaoufik Bakri in SUMS
- Available in real-time every minute

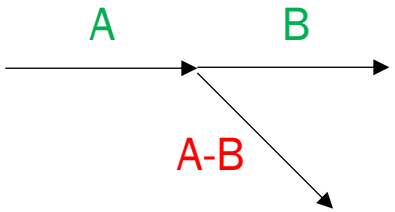
HIGHWAY NETWORK

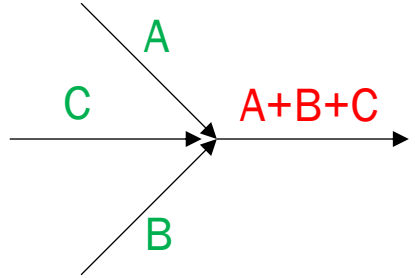
- 7000km of motorway and motorway slip road in Netherlands
- LE 5km grid domain used to break down the processing

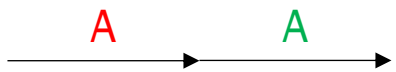
MATCHING DATA

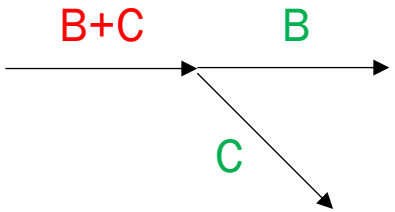
- Classification assigned to all measurement points using nearest classification site
- Measurement Points matched with OSM geometry
- Missing links identified

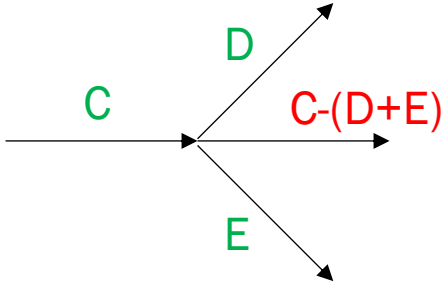
FILLING GAPS
FLOWS



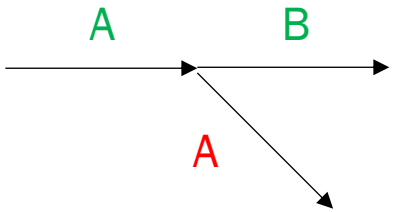


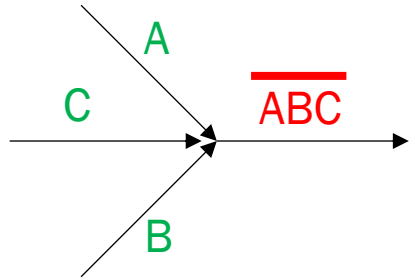


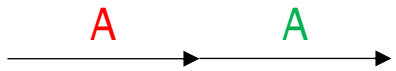


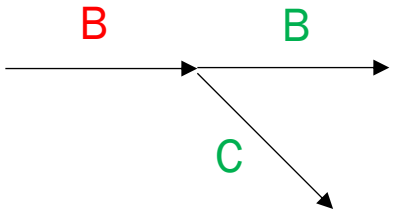


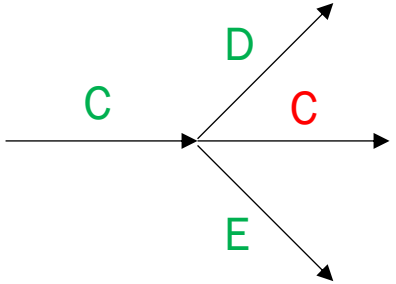
FILLING GAPS
SPEEDS



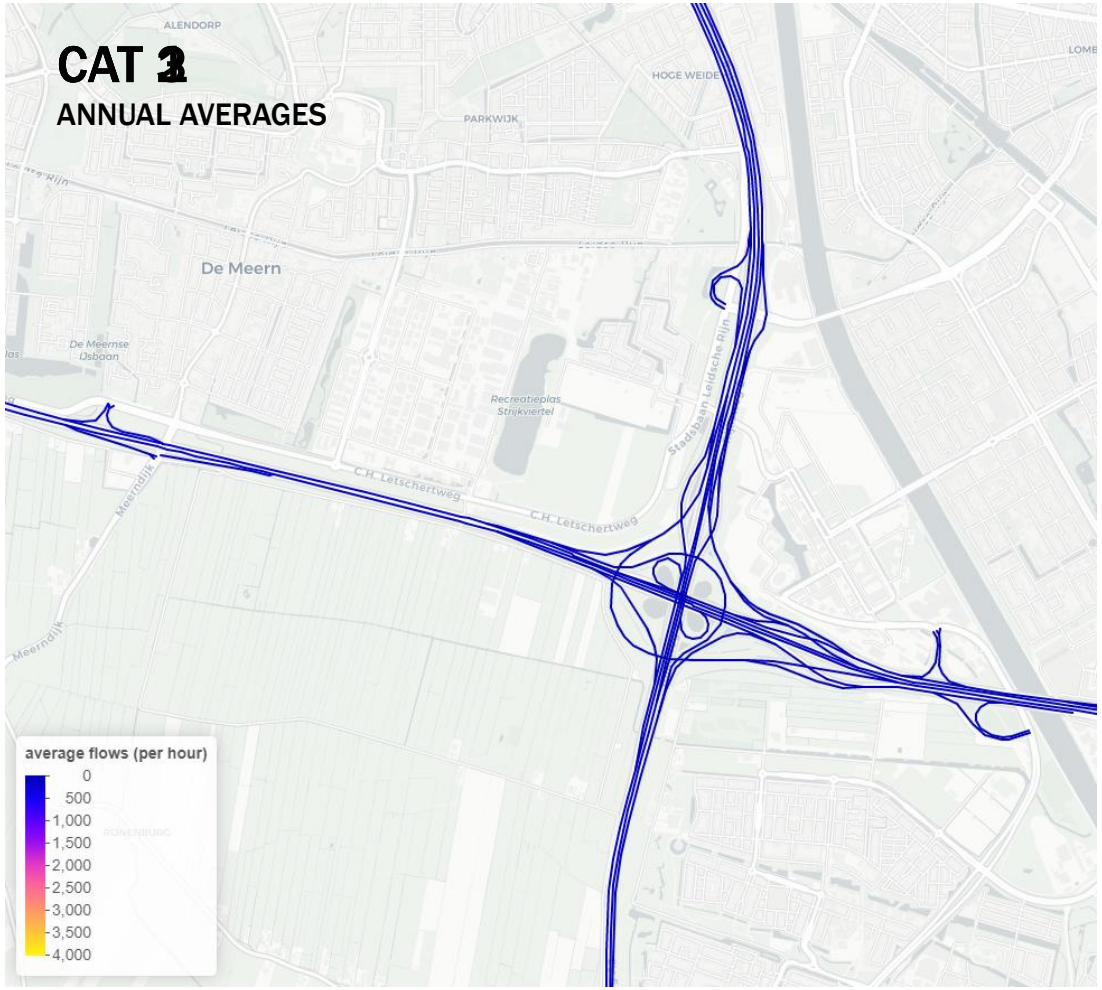


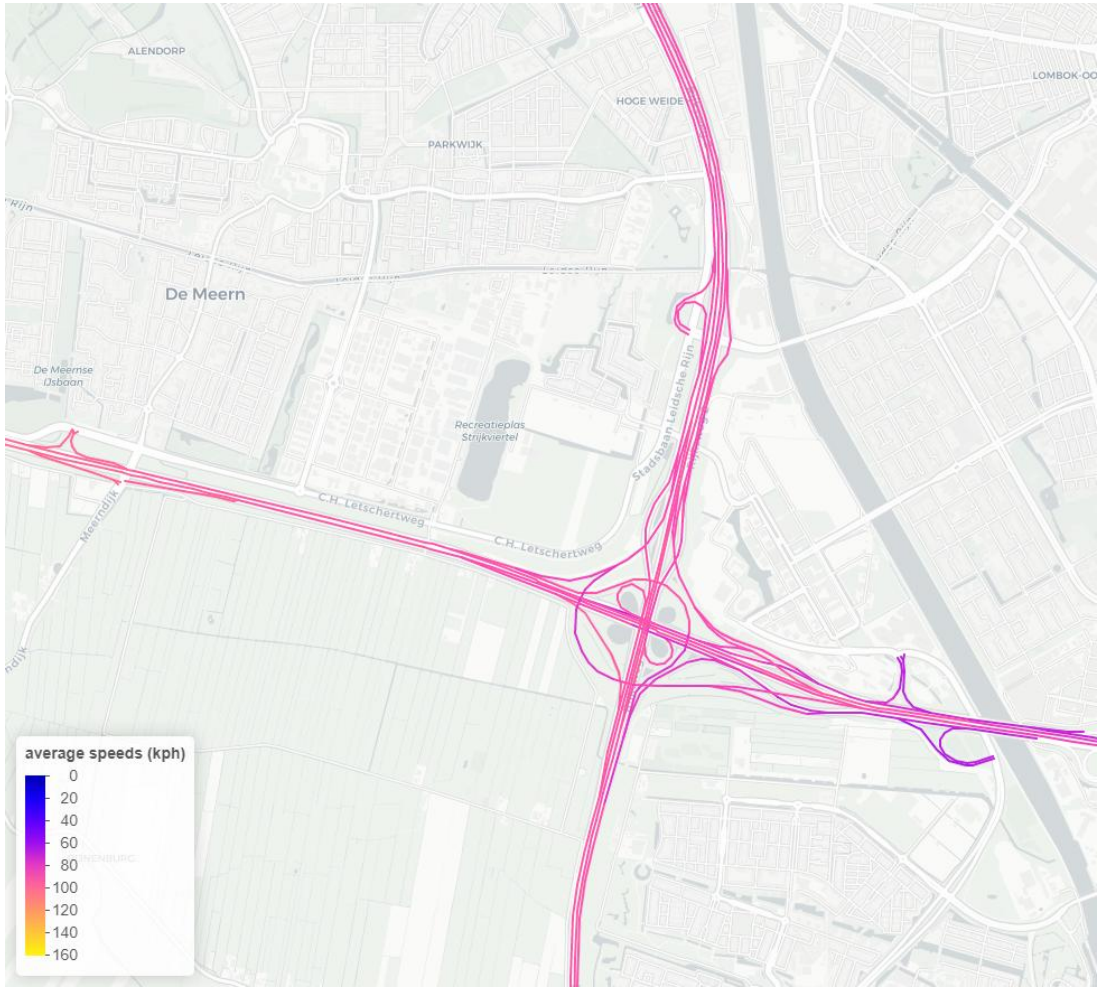






FLOW & SPEED DISTRIBUTION

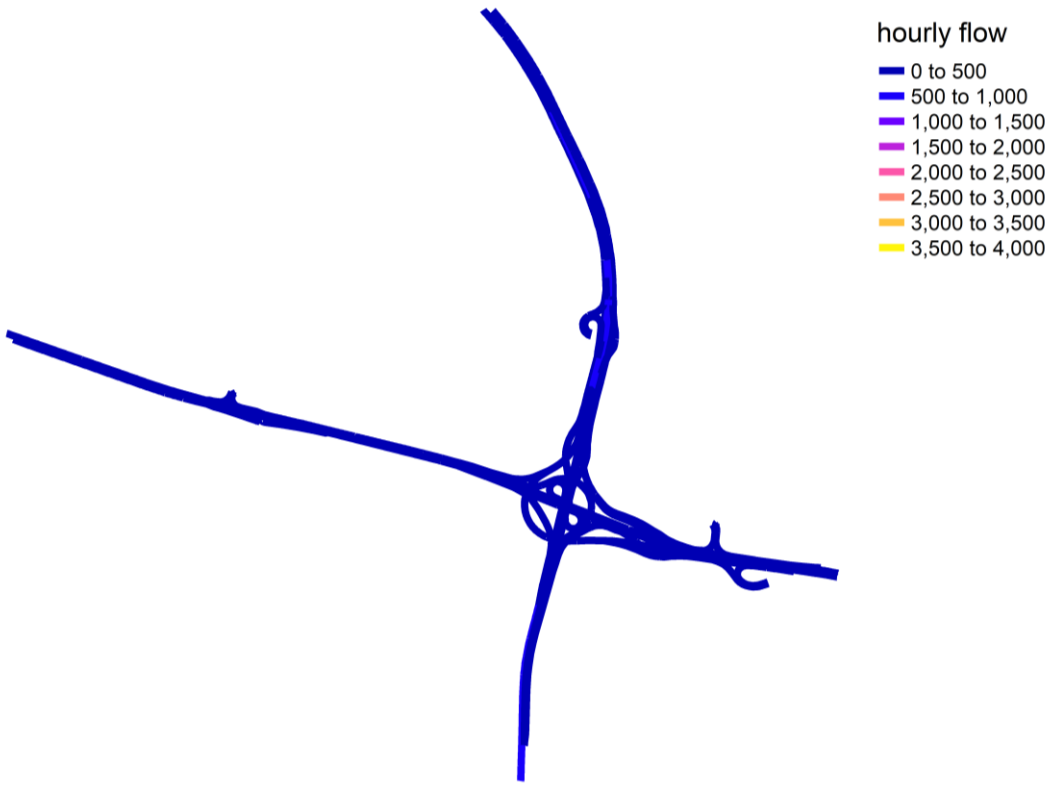




FLOW & SPEED DISTRIBUTION

HOURLY

2014-01-21 00:00:00



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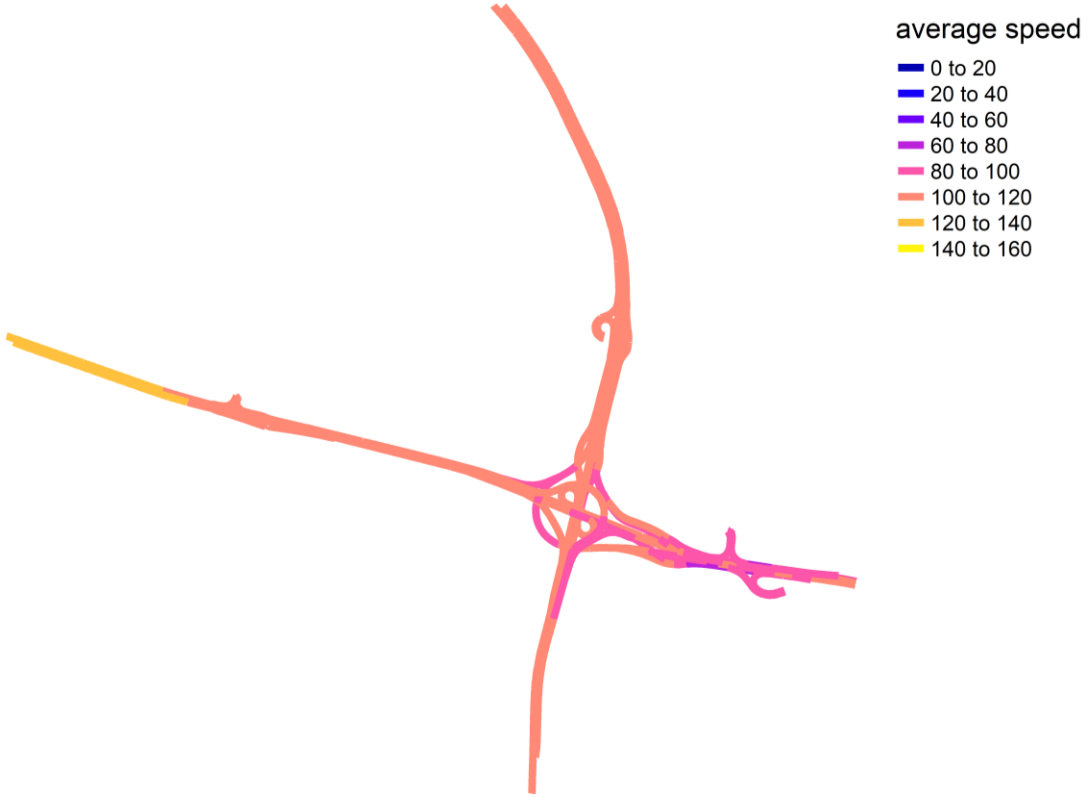


SEGMENTS NEED CHECKING FOR BUGS

RIVM 'SNELWEG' EMISSIONS FACTORS

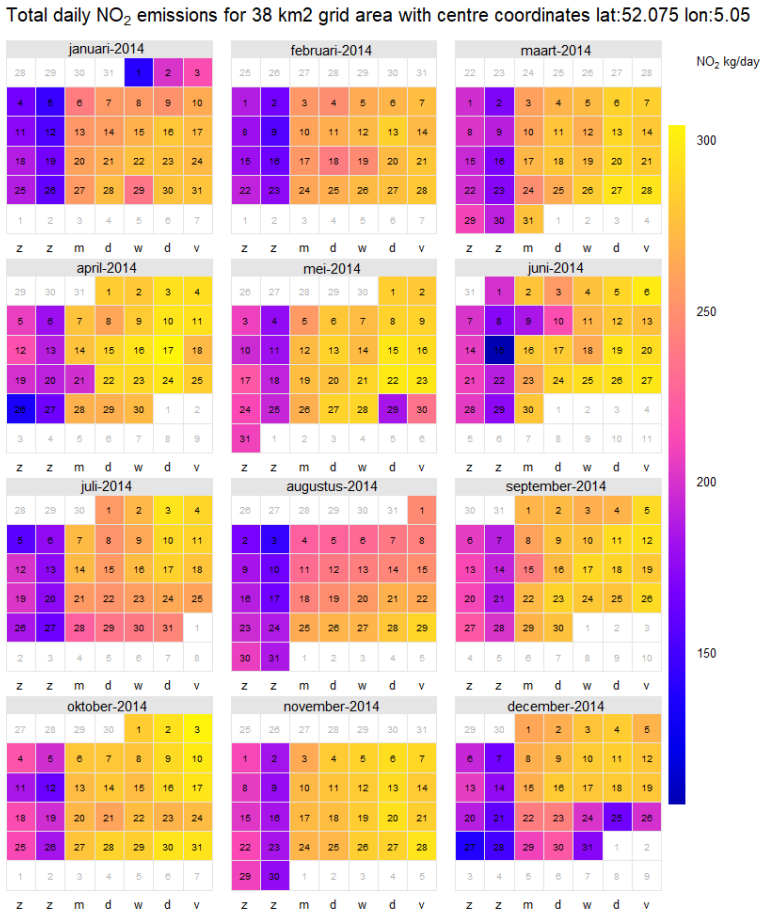
2021 EMISSIONS FACTORS

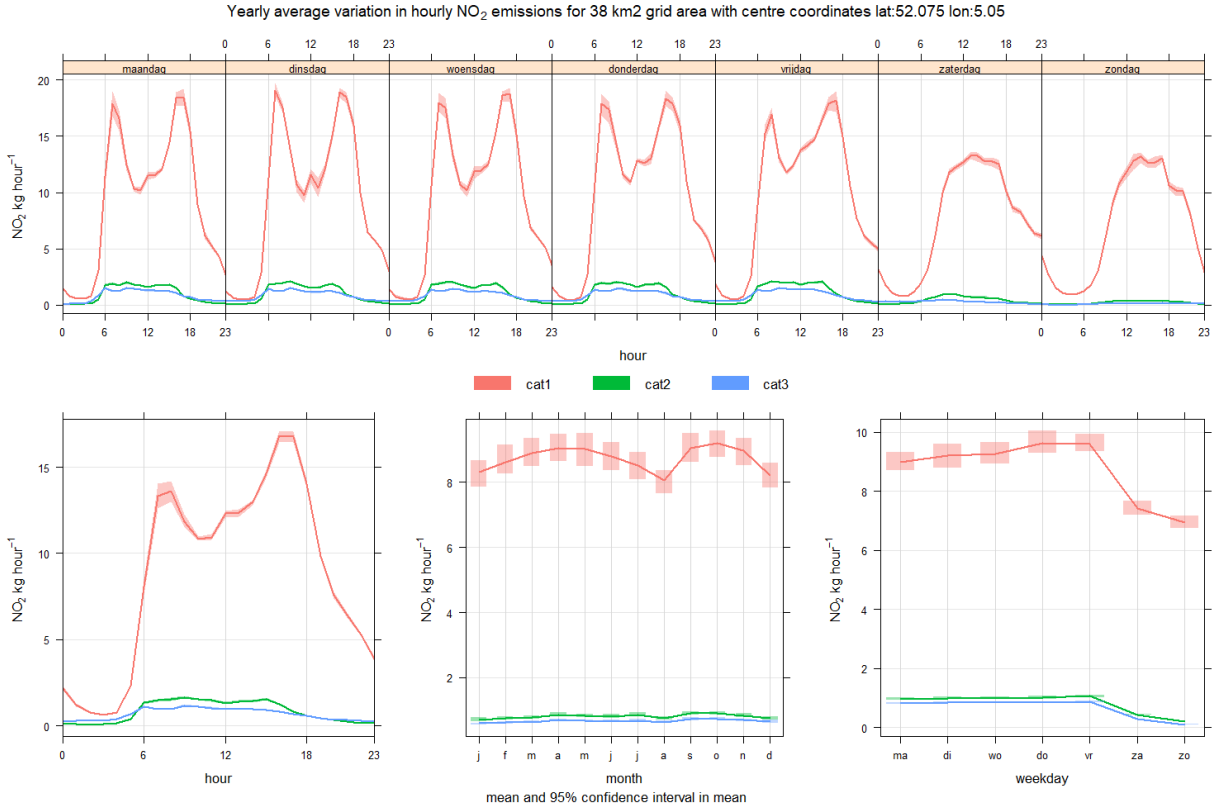
- Based on average speed COPERT Euro 1-6 standards
- Binned speeds
- Split by cat1, cat2 and cat3 vehicles for 5 speed ranges and 7 pollutants: EC, NOx, NO_2 , CO, $PM_{10,}$ $PM_{2.5}$, NH_3
- 2014 has been calculated with 2021
- 2021 EF have latest metholdolgies (e.g. 2014 are pre Dieselgate) but will assume fleet composition in 2021.

Verkeerscategorie	Voertuigtype	Speed	Doorstromingstype	Component	Waarde	Eenheid
licht wegverkeer	cat1	<10	file	NOx	0.3481	g/km
middelzwaar wegverkeer	cat2	<10	file	NOx	5.48	g/km
zwaar wegverkeer	cat3	<10	file	NOx	7.14	g/km
licht wegverkeer	cat1	10-80	vrije doorstroming	NOx	0.2174	g/km
middelzwaar wegverkeer	cat2	10-80	vrije doorstroming	NOx	2.00	g/km
zwaar wegverkeer	cat3	10-80	vrije doorstroming	NOx	2.08	g/km
licht wegverkeer	cat1	80-100	vrije doorstroming	NOx	0.234	g/km
middelzwaar wegverkeer	cat2	80-100	vrije doorstroming	NOx	2.00	g/km
zwaar wegverkeer	cat3	80-100	vrije doorstroming	NOx	2.09	g/km
licht wegverkeer	cat1	100-120	vrije doorstroming	NOx	0.286	g/km
middelzwaar wegverkeer	cat2	100-120	vrije doorstroming	NOx	2.00	g/km
zwaar wegverkeer	cat3	100-120	vrije doorstroming	NOx	2.09	g/km
licht wegverkeer	cat1	>120	vrije doorstroming	NOx	0.3151	g/km
middelzwaar wegverkeer	cat2	>120	vrije doorstroming	NOx	2.00	g/km
zwaar wegverkeer	cat3	>120	vrije doorstroming	NOx	2.09	g/km

CONSIDER FLEET FOR PARTICULAR YEAR

OUTPUTS

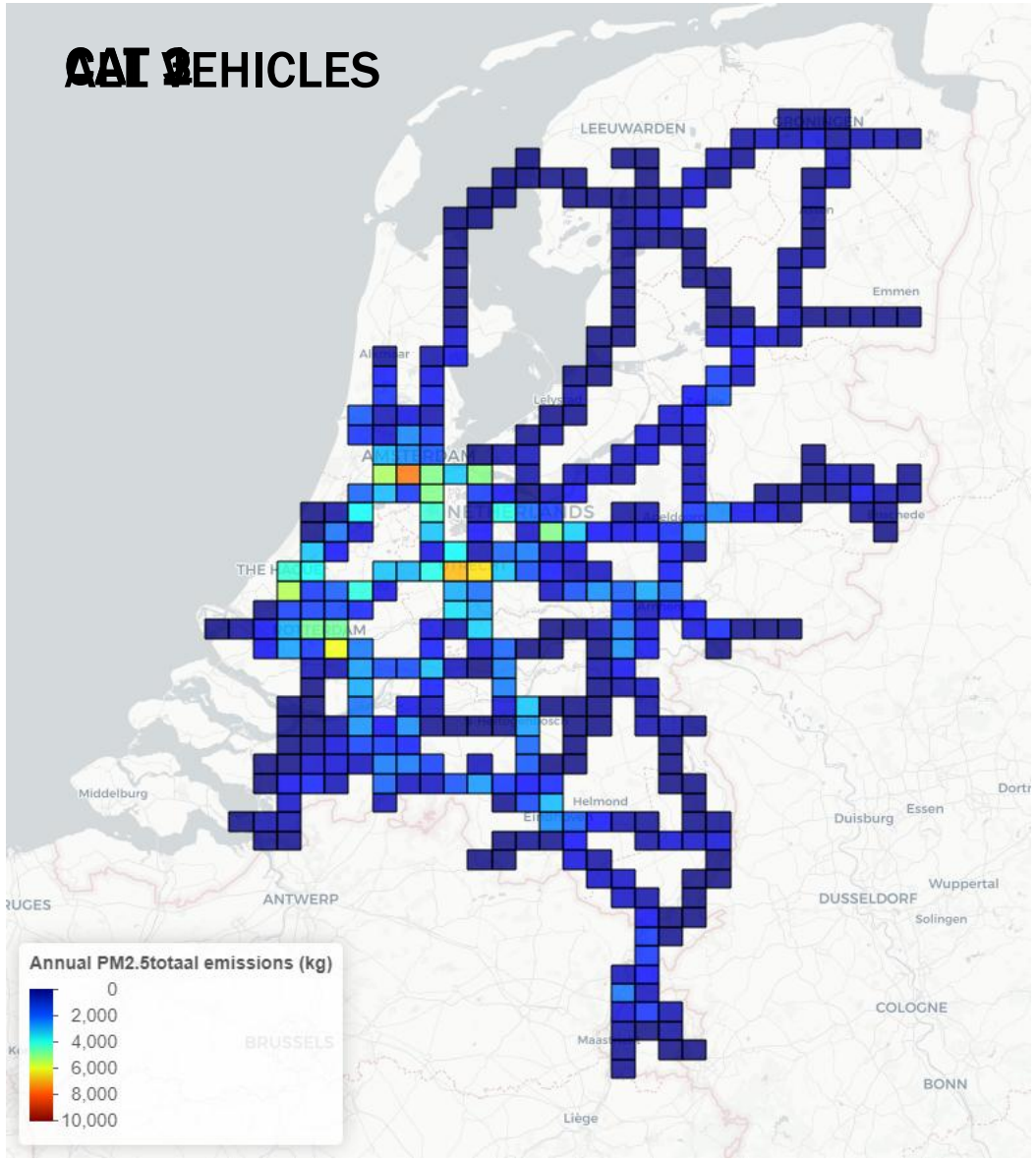

Total daily NO_2 emissions for 38 km2 grid area with centre coordinates lat:52.075 lon:5.05
januari-2014
februari-2014
maart-2014
april-2014
mei-2014
juni-2014
juli-2014
augustus-2014
september-2014
oktober-2014
november-2014
december-2014
z z m d w d v
NO_2 kg/day
300
250
200
150


Yearly average variation in hourly NO_2 emissions for 38 km2 grid area with centre coordinates lat:52.075 lon:5.05
maandag
dinsdag
woensdag
donderdag
vrijdag
zaterdag
zondag
NO_2 kg hour^{-1}
hour
cat1
cat2
cat3
month
j f m a m j j a s o n d
weekday
ma di wo do vr za zo
mean and 95% confidence interval in mean

ANNUAL TOTALS

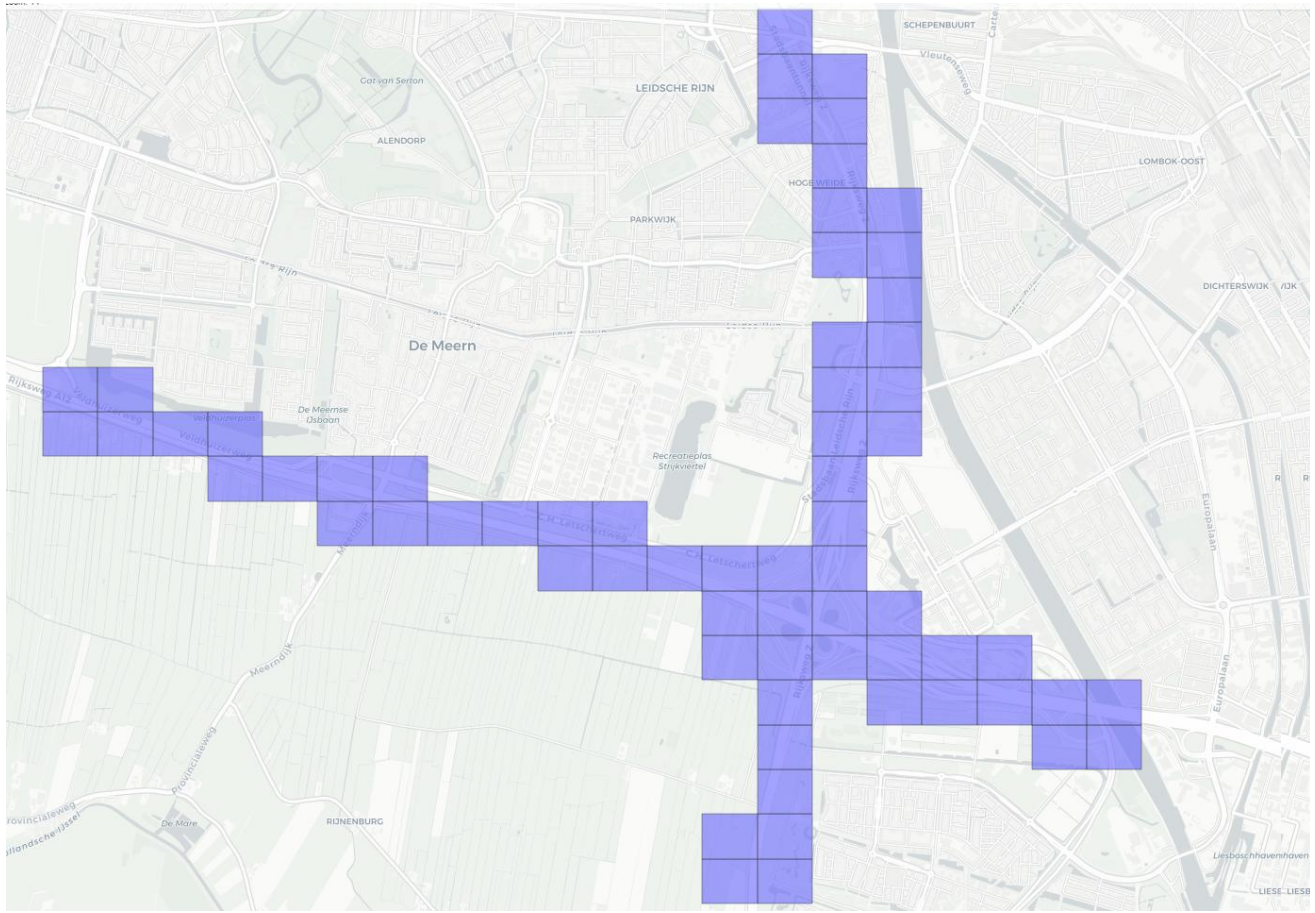
- Sum of all roads in ~5km grid cell (38km^2)
- TOTALS for Netherlands 2014: (kg):

Component	ER	THIS WORK	Difference
CO	79,678,789	47,128,893	59%
EC	701,675	233,666	33%
NH3	2,014,560	2,298,304	114%
NOx	45,335,875	28,735,283	63%
PM2.5	978,556	633,342	64%



USING_OUTPUTS

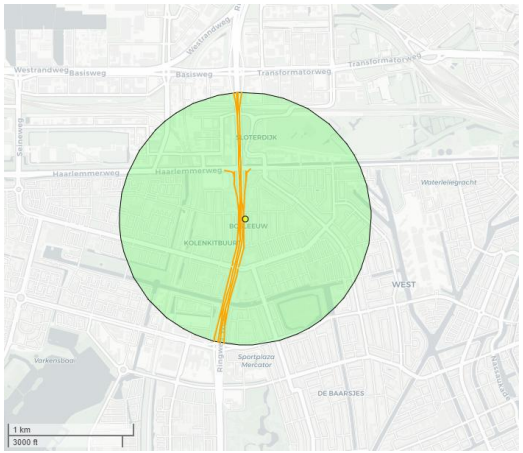
- Calculate with smaller cells to improve resolution



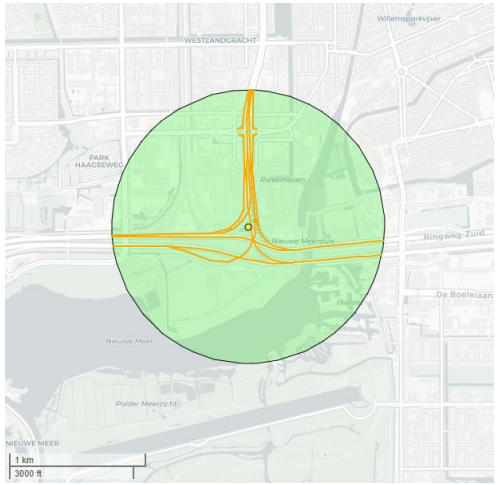
OUTPUTS

VALIDATION SITES

EINSTEINWEG A10



BREUKELEN-SNELWEG A2



AMSTERDAM SUD A10

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