Mobil phone position data and official statistics

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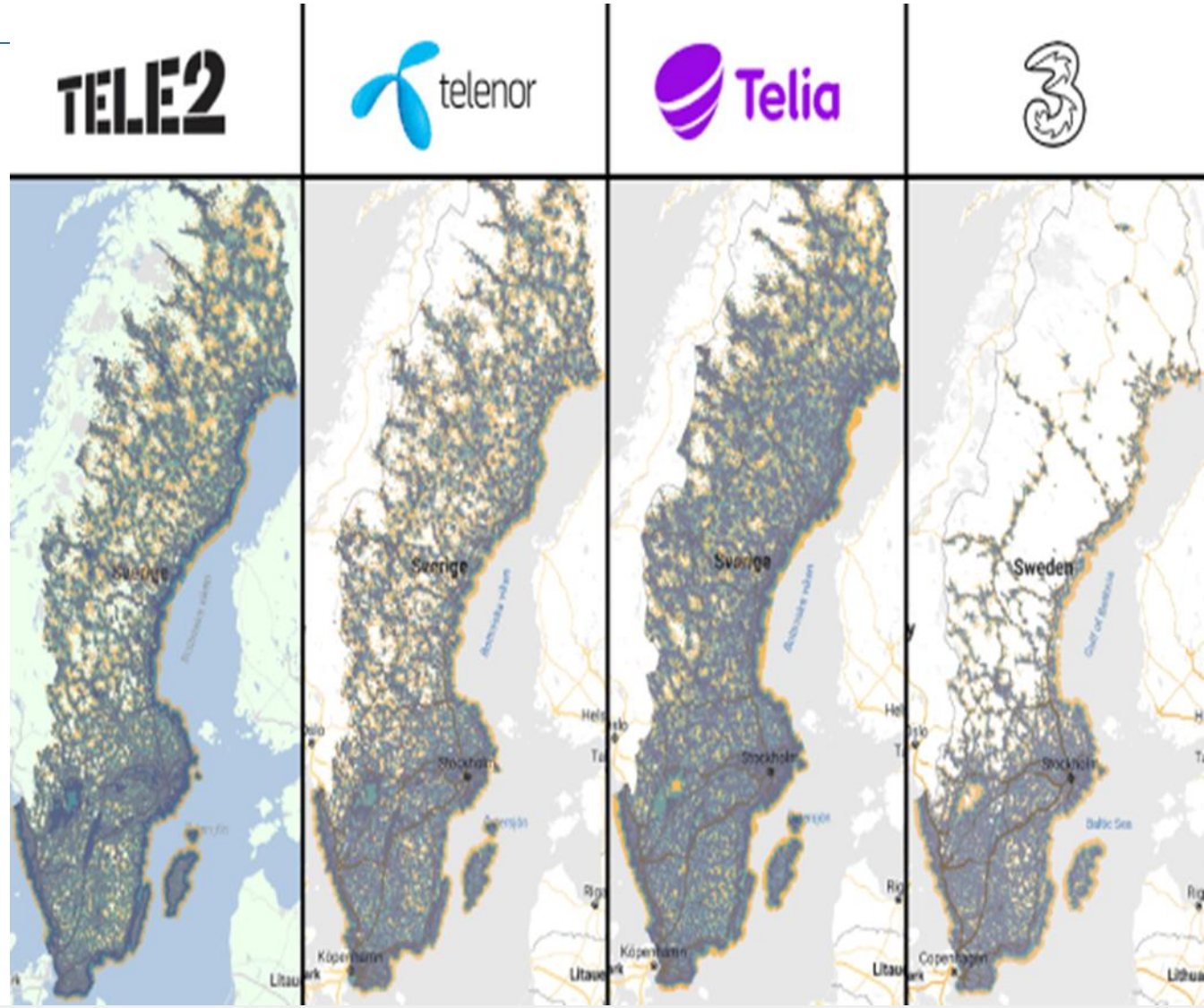
Introduction

- 4 MNOs in Sweden
- All contacted, contracts with
  - Telia (40 % client share)
  - Tre (10 % client share)

Anonymised and aggregated data

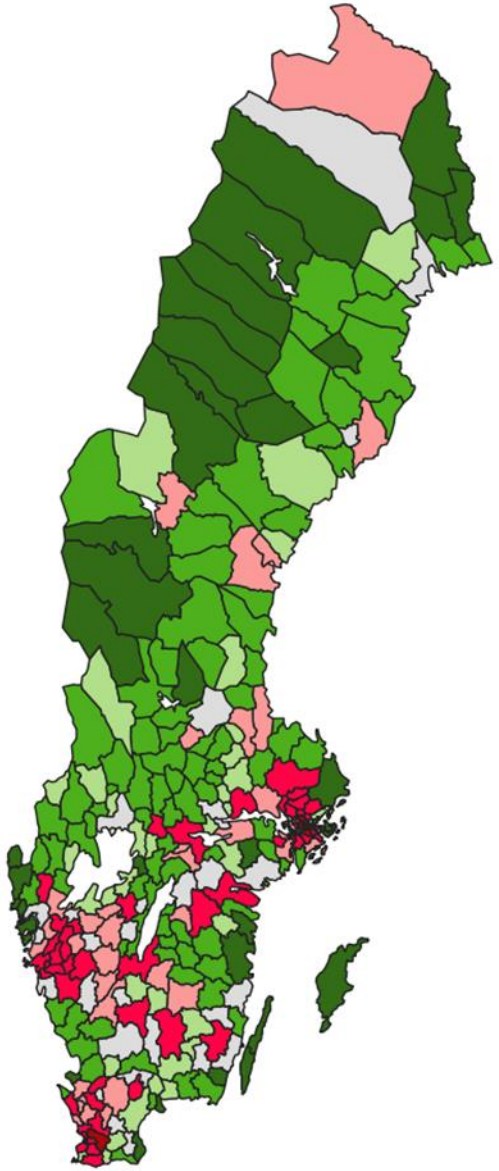
1. **First explorative**
2. **Efter start pandemic: quality**
3. **2022: government assignment**



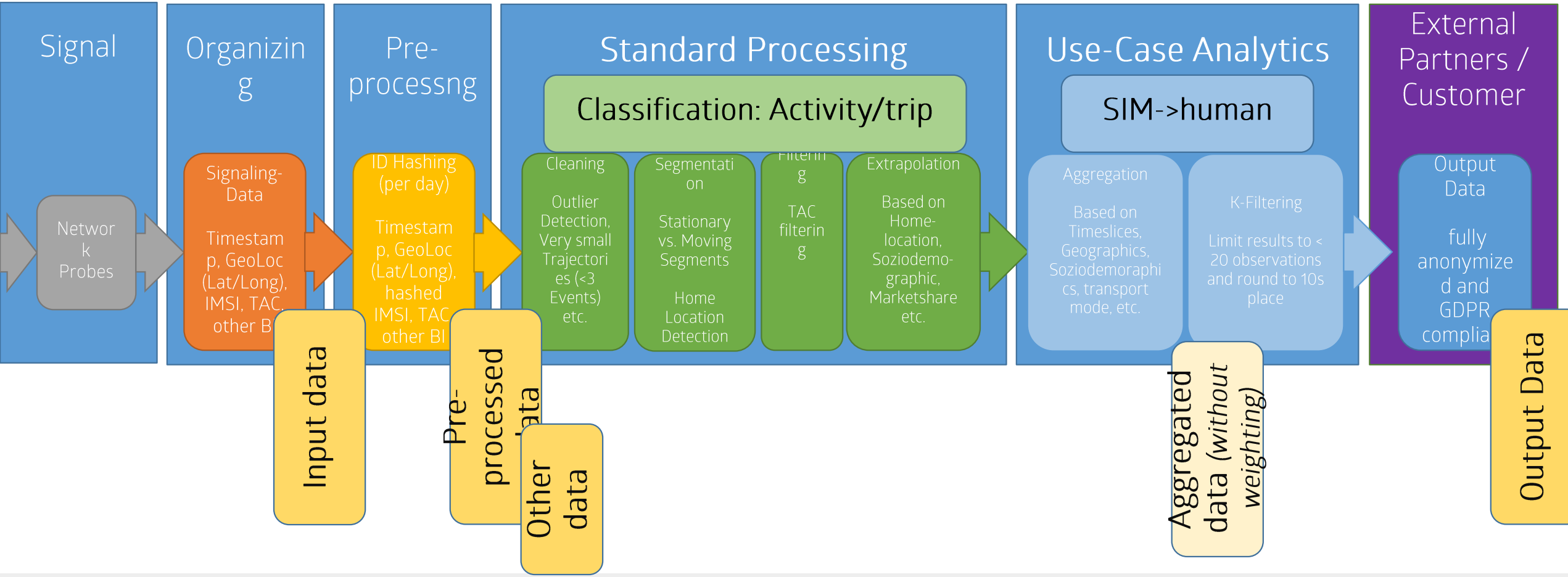
Government assigment

- Conditions for use of official statistics
- Possibilities to replace current surveys
- **DEVELOPMENT OF**

  NEW SMART STATISTICS



MNO data processing



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Crucial steps

- *anonymisation, min.counts, no client data, aggregation*

  ***hashing:** limited time following ind. SIM-cards (24 h),*

  Process driven by strong data-privacy roles

- Signal, organising, pre-processing and standard processing steps:

  SCBs role was passive; facilitating documentation

- Relating SIM-cards to human populations

  SCBs role was active; quality improvement

  NOTE: this issues remains if data from all MNOs are available

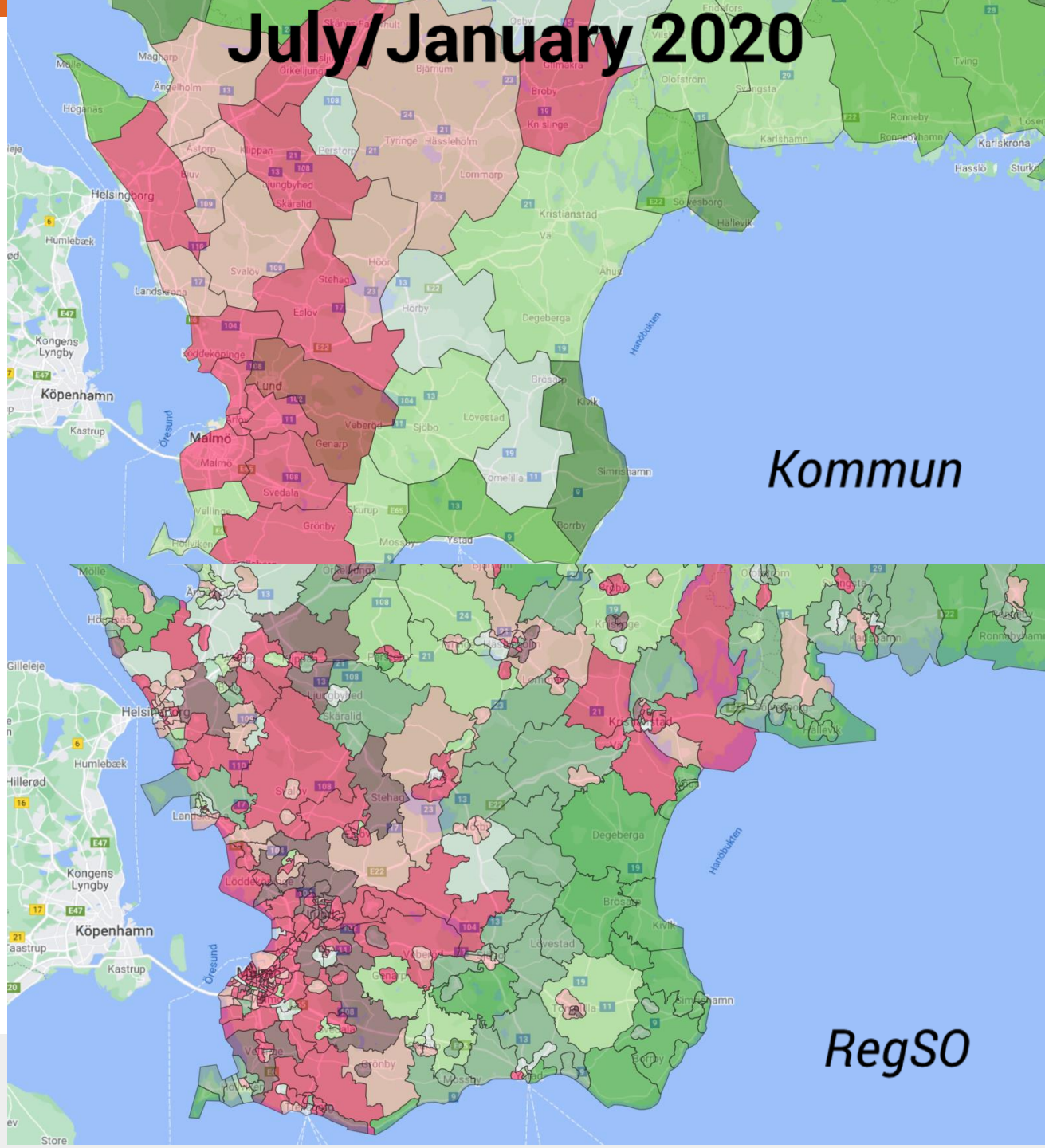
Aggregation level and quality

Factual

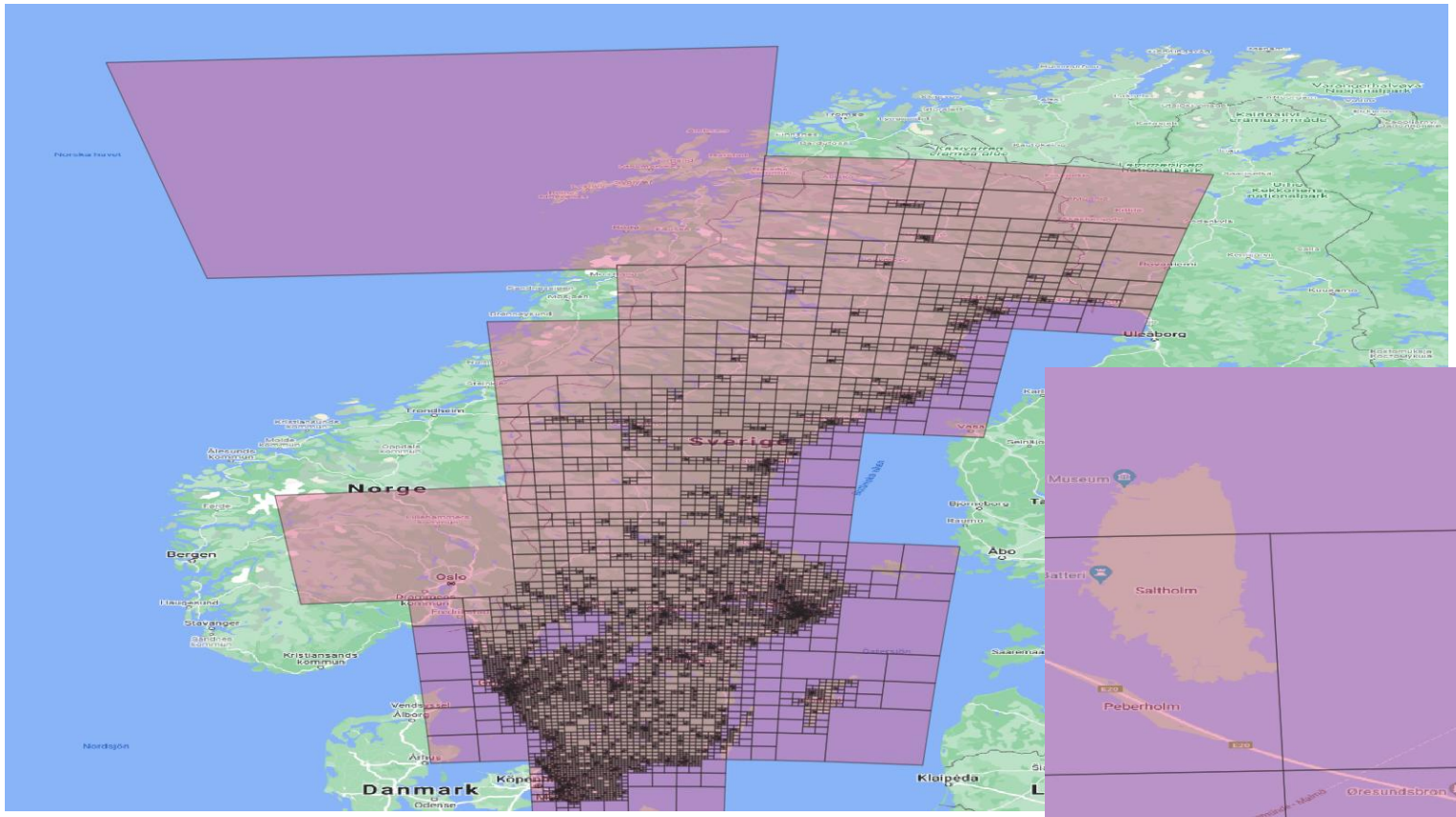
- Aggregated data only
- Dependant of MNOs processes

Therefore…. requirements

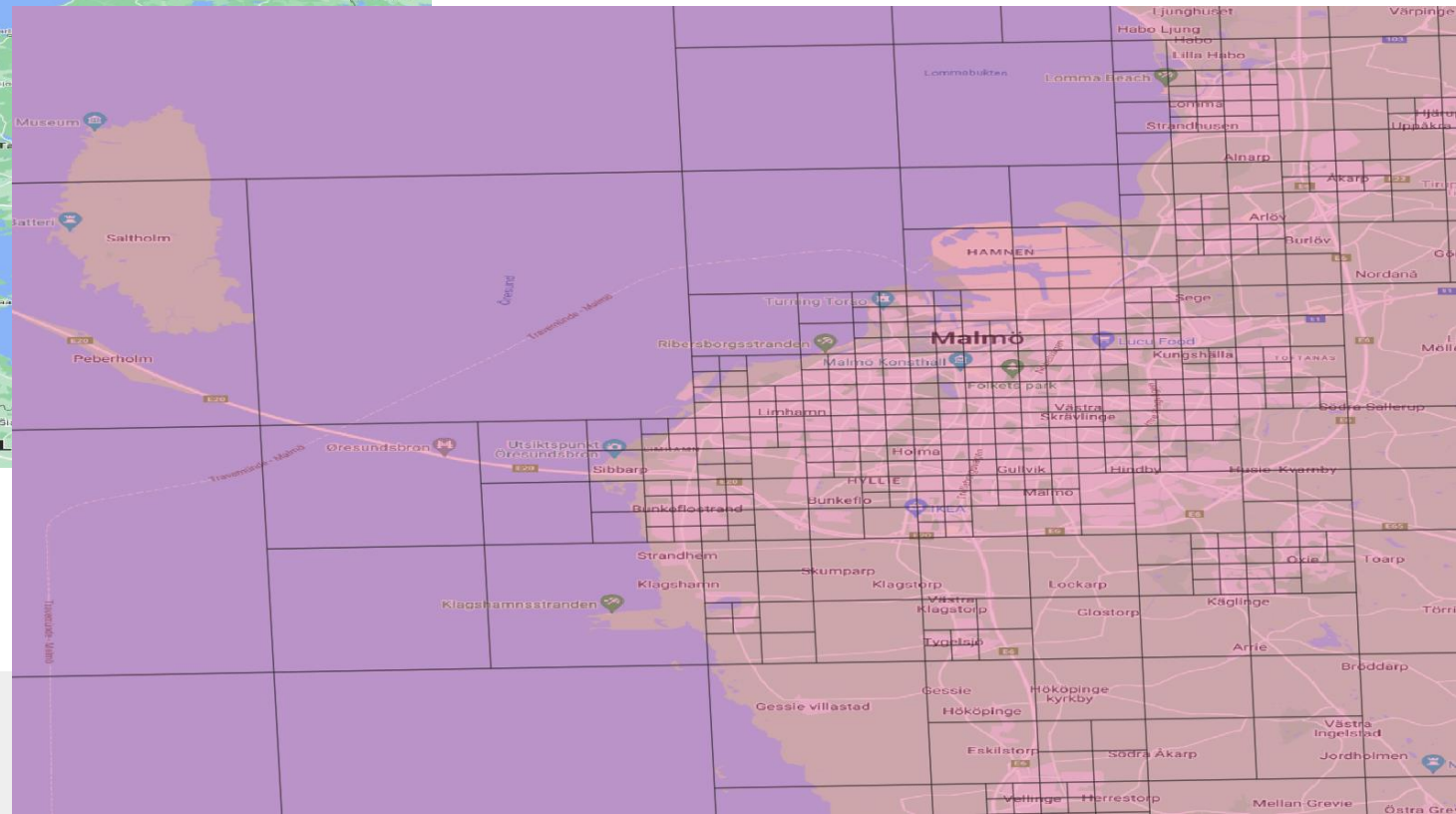
- Collaboration, descriptions, QA etc.
- Data-deliveries at low aggregation levels and with high timely resolution to
  - check plausibility
  - representativity
  - benchmark with related statistics



Data-deliveries: 5 levels: *grid-cell, DeSO, kommun, län, sveriga*



Time-series from 2019
Activity and trips (ODM) every hour
Levels: Grid-cell, district, municipality, region and nation



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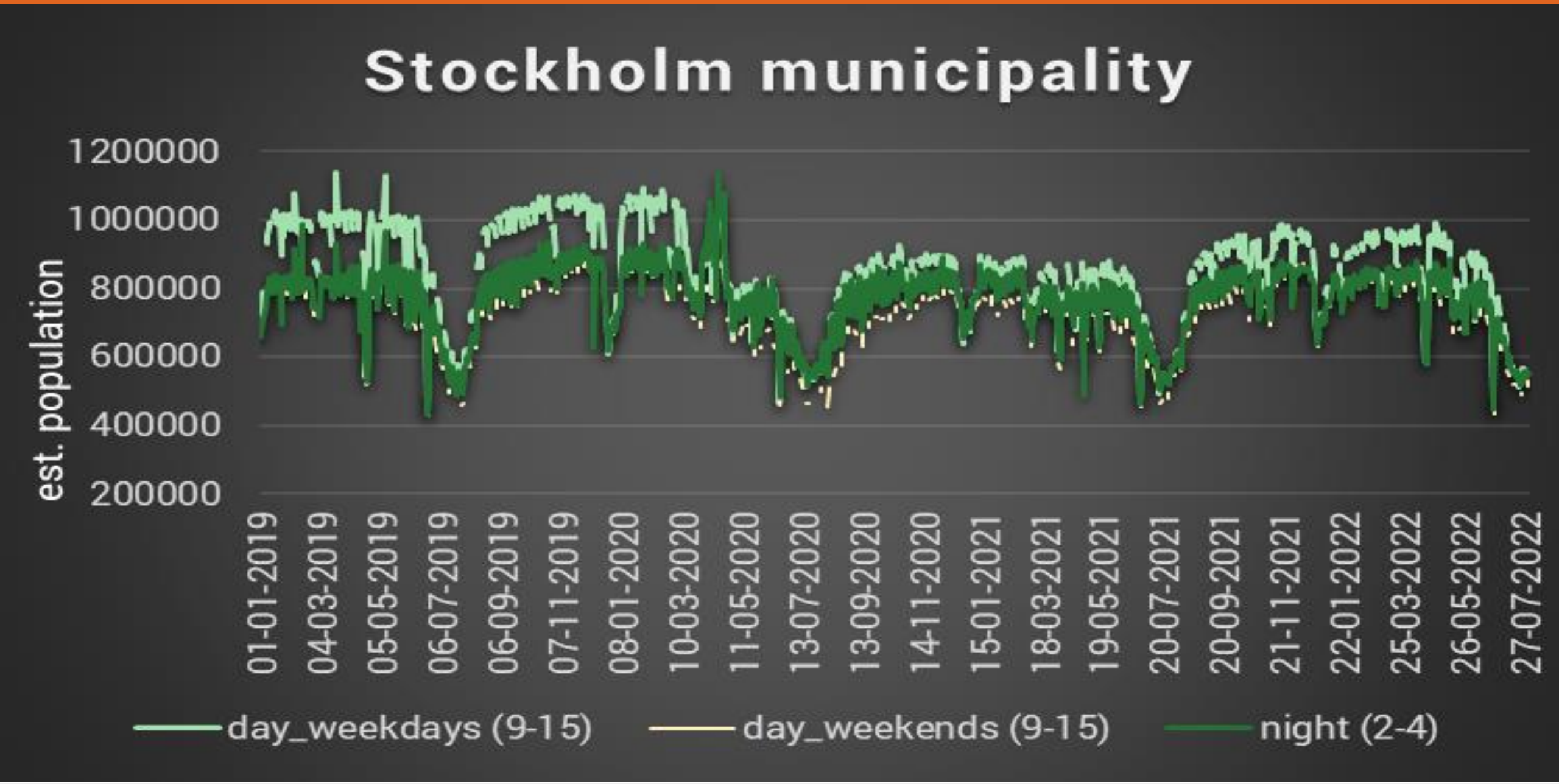
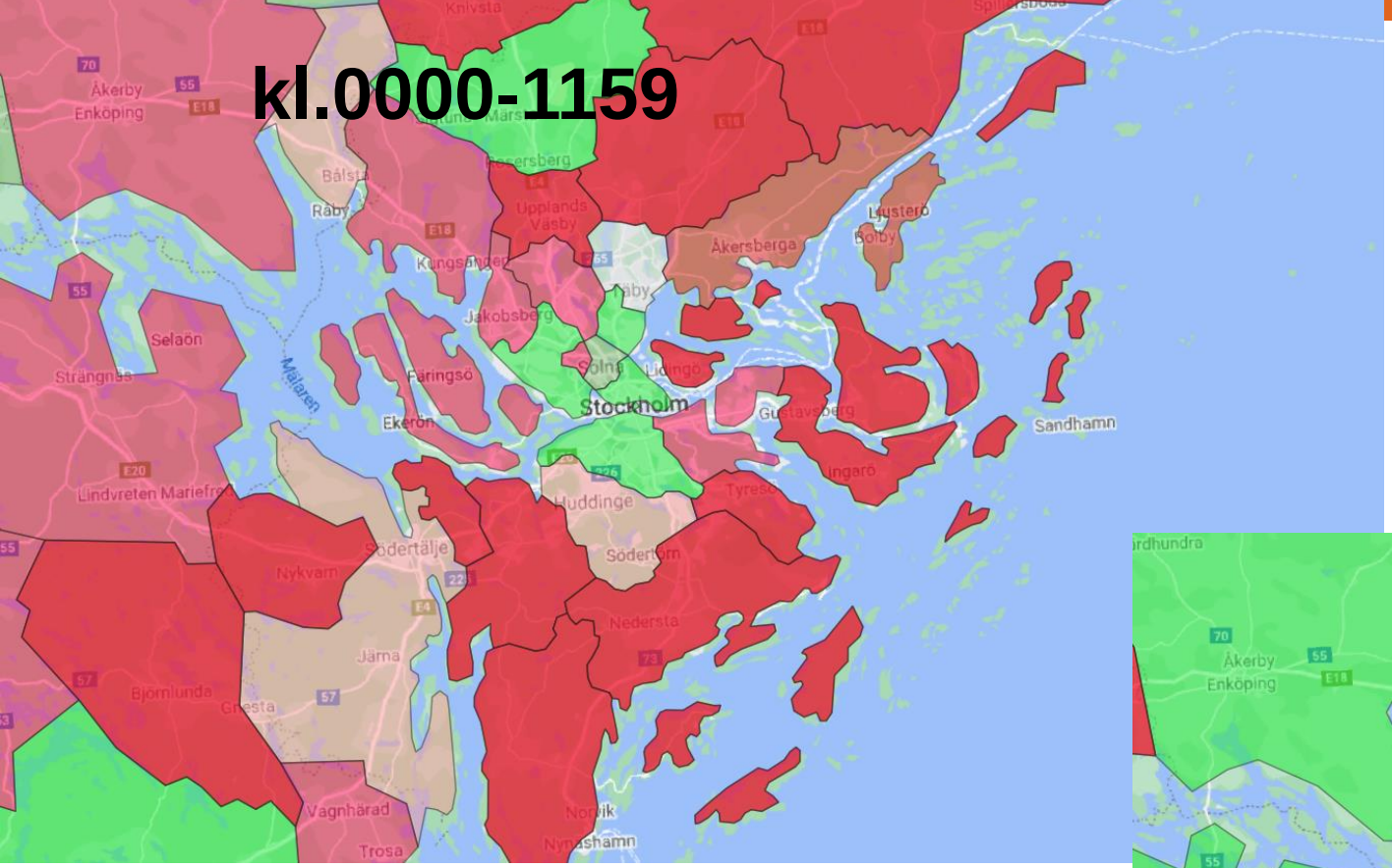
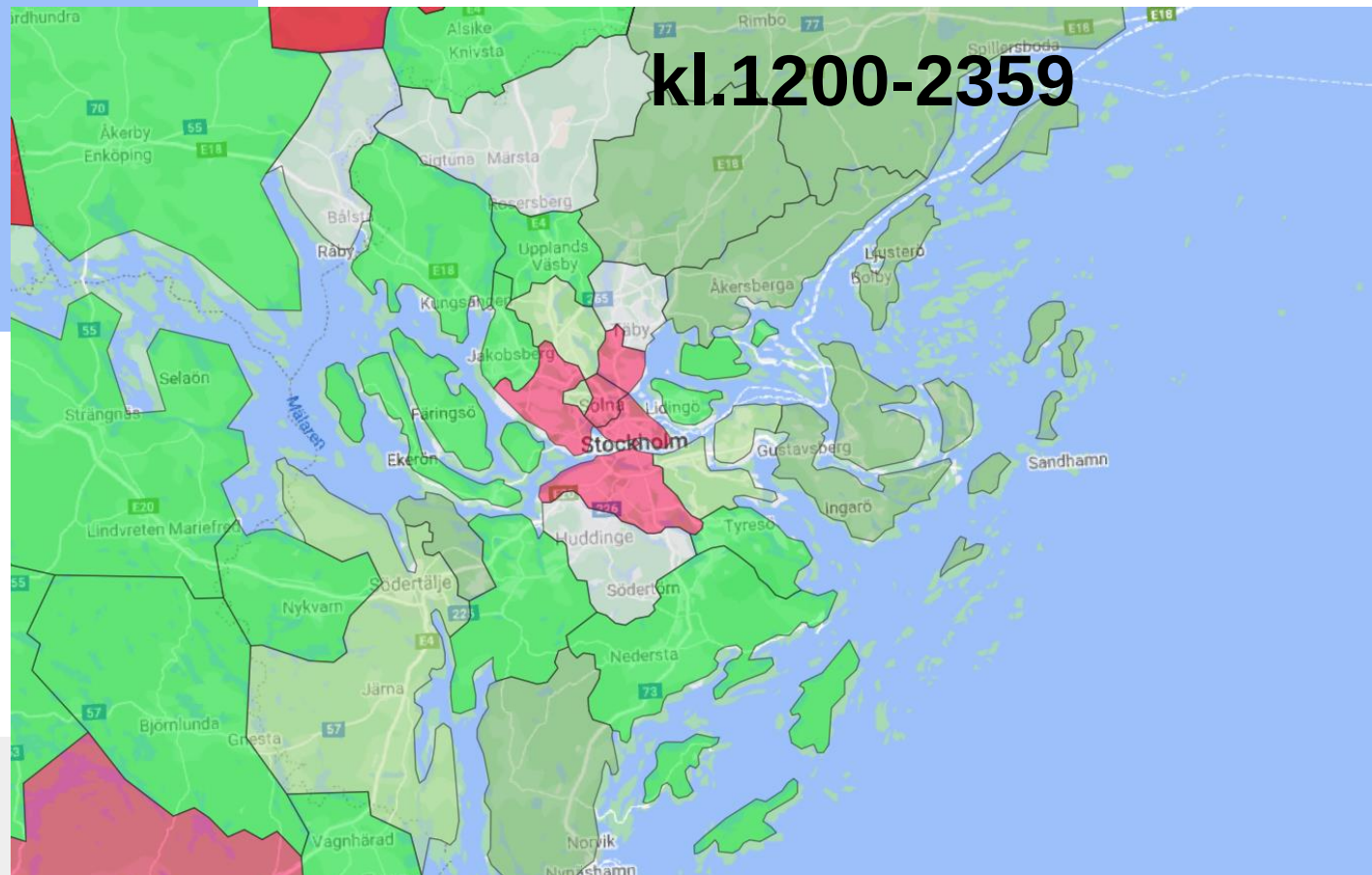

Stockholm municipality
est. population
1200000
1000000
800000
600000
400000
200000
01-01-2019
04-03-2019
05-05-2019
06-07-2019
06-09-2019
07-11-2019
08-01-2020
10-03-2020
11-05-2020
13-07-2020
13-09-2020
14-11-2020
15-01-2021
18-03-2021
19-05-2021
20-07-2021
20-09-2021
21-11-2021
22-01-2022
25-03-2022
26-05-2022
27-07-2022
day_weekdays (9-15)
day_weekends (9-15)
night (2-4)

Trips: Inbound/outbound

2022-02





RÖD: In <, Ut mer ’**ut**pendling’

In/Ut < 0.50

0.50 <= In/Ut < 0.80 0.80 <=
0.95 <= In/Ut <= 1.05

1.05 < In/Ut < 1.20

1.29 <= In/Ut < 1.50

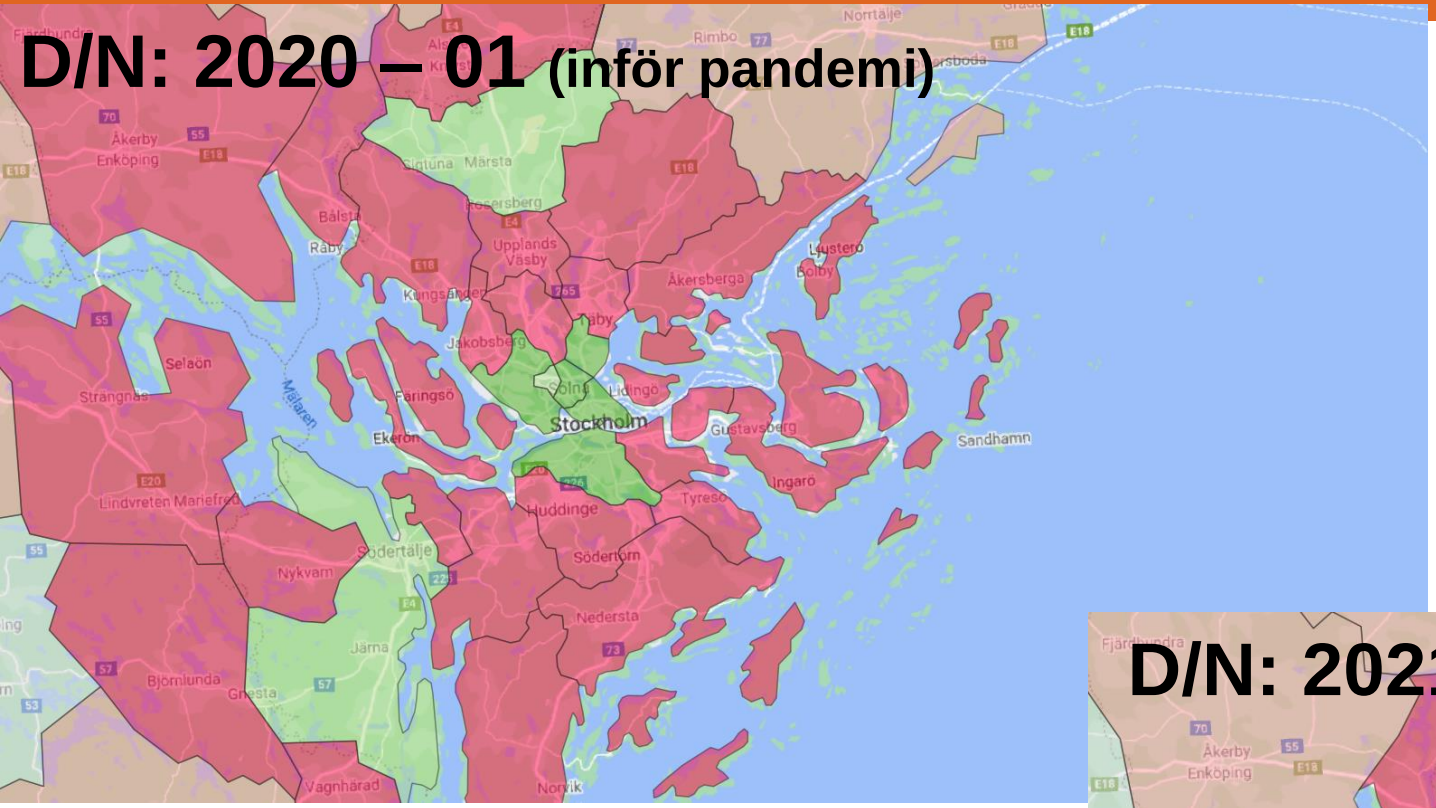
In/Ut >= 1.50

GRÖN: In >, Ut mer ’**in**pendling’

NSM 2022

Effect COVID-19 Stockholm region

D/N: 2020 – 01 (inför pandemi)



RÖD: dagakt <, mer ’**ut**pendling’

D/N < 0.90

0.90 <= D/N < 0.98

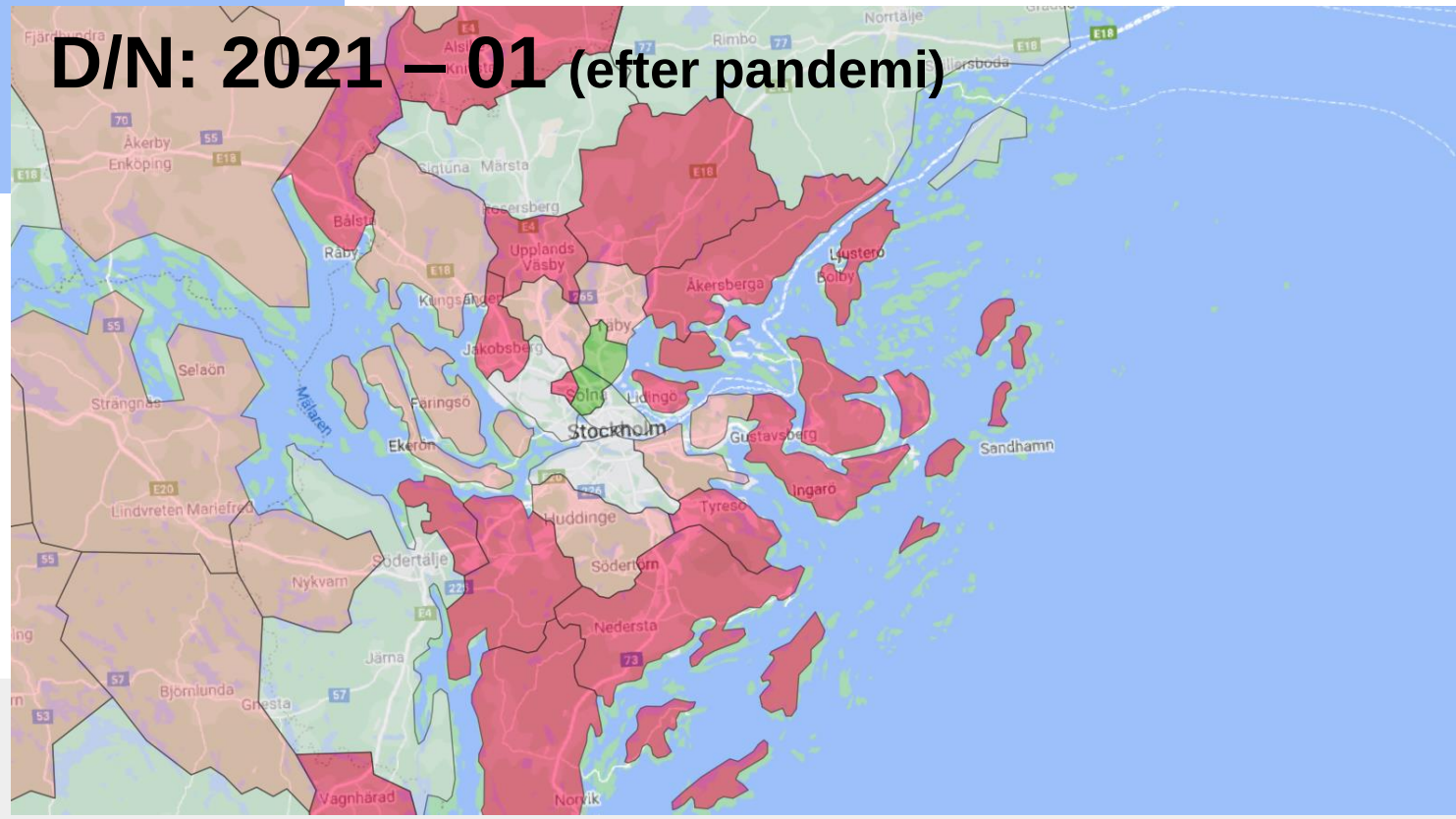
0.98 <= D/N <= 1.02

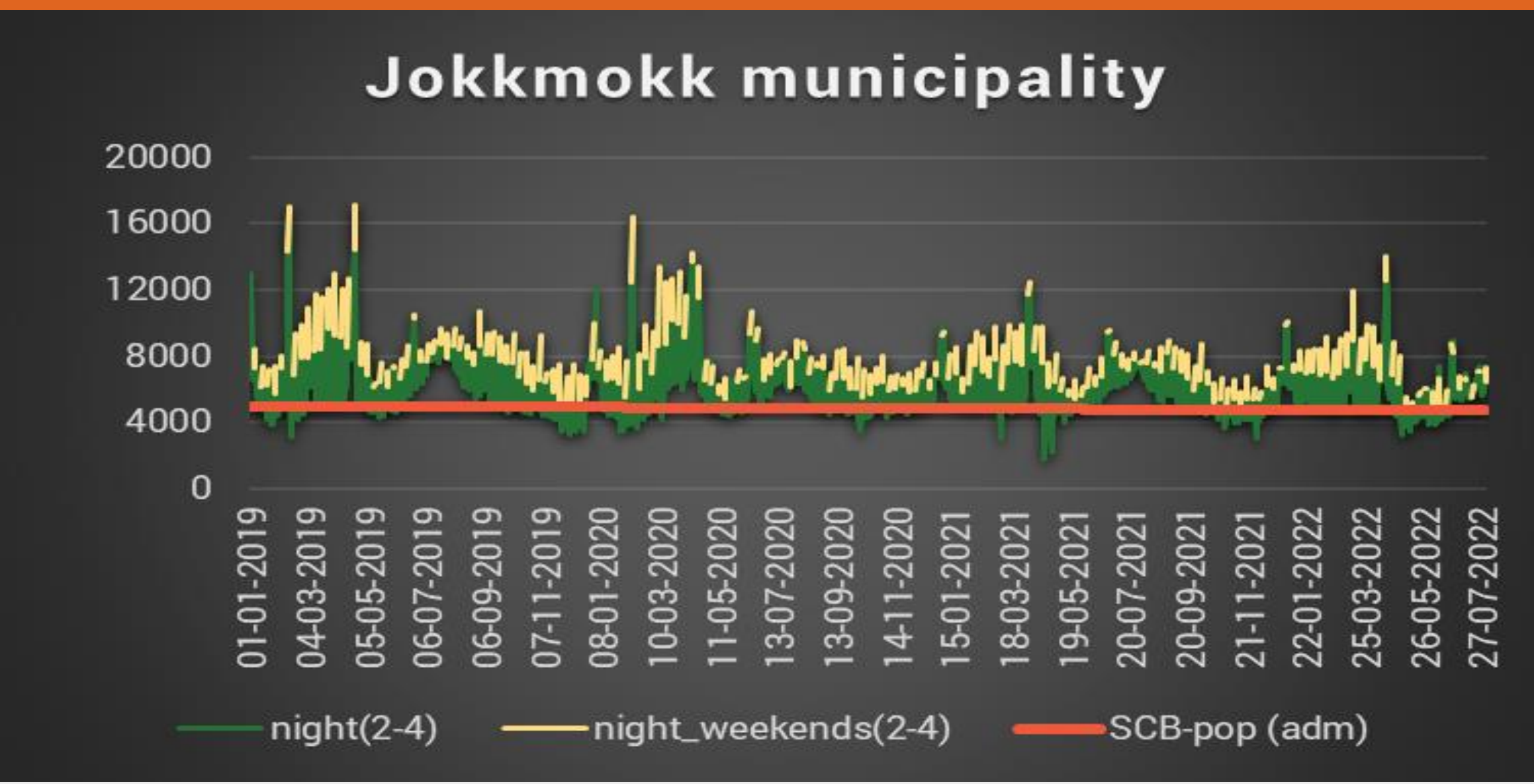
1.02 < D/N < 1.10

D/N >= 1.10

GRÖN: dagakt >, mer ’**in**pendling’

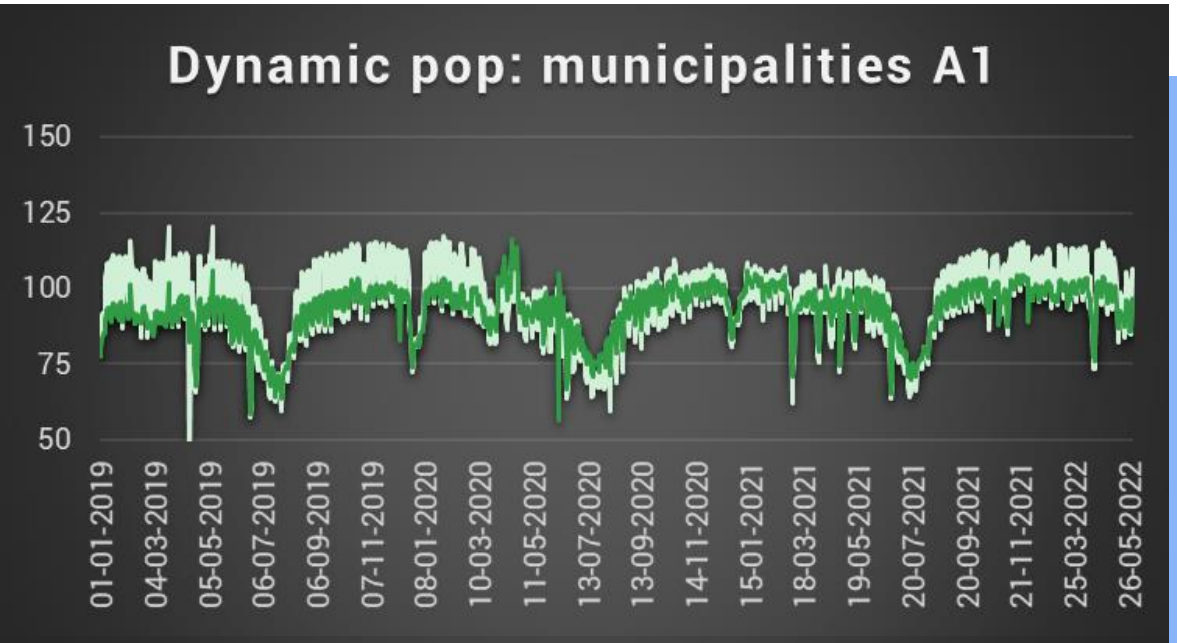
D/N: 2021 – 01 (efter pandemi)

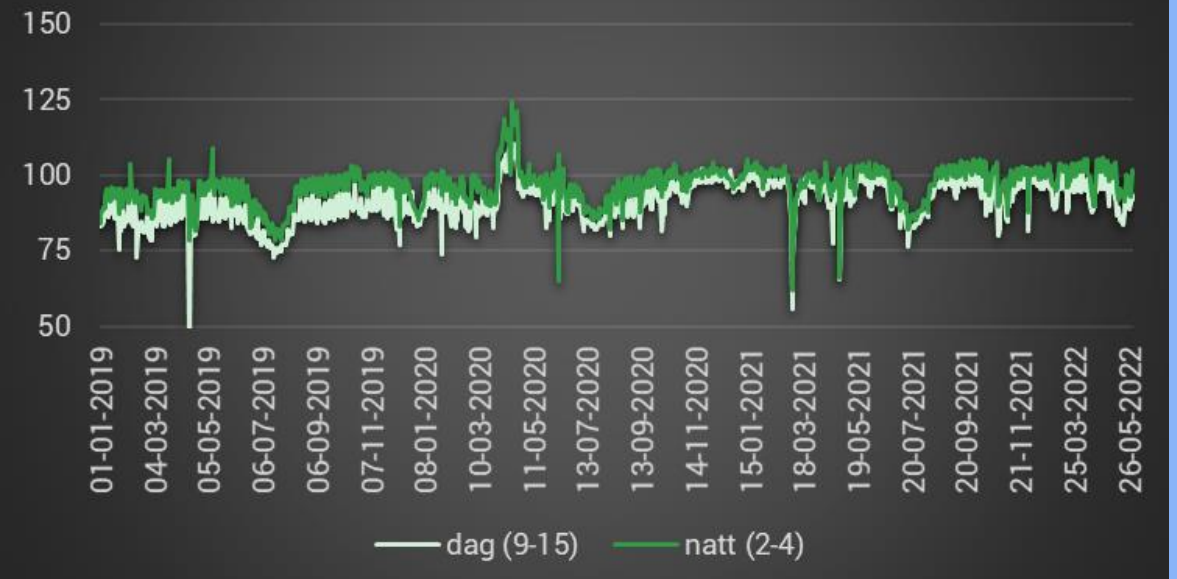


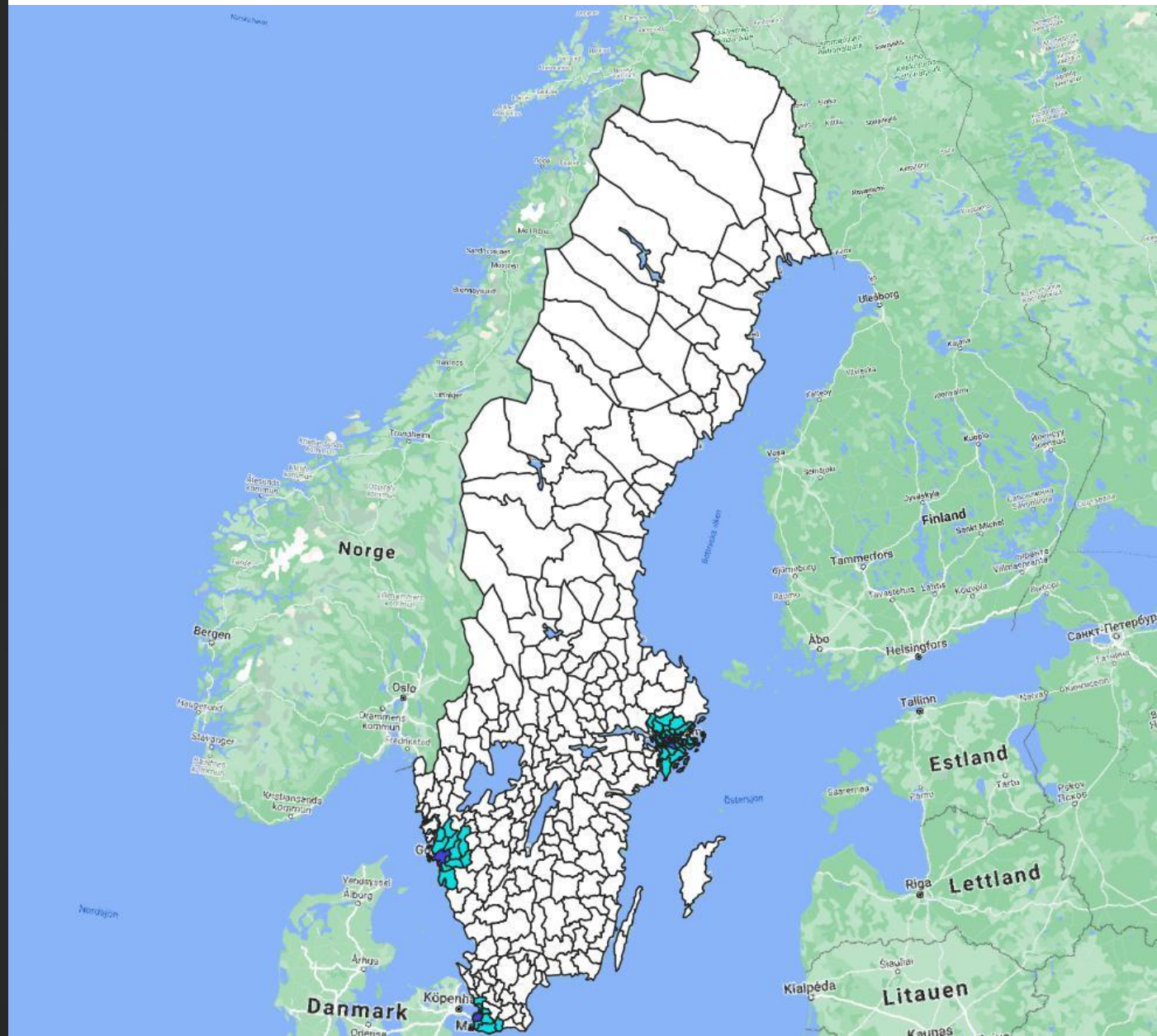

Jokkmokk municipality
20000
16000
12000
8000
4000
0
01-01-2019
04-03-2019
05-05-2019
06-07-2019
06-09-2019
07-11-2019
08-01-2020
10-03-2020
11-05-2020
13-07-2020
13-09-2020
14-11-2020
15-01-2021
18-03-2021
19-05-2021
20-07-2021
20-09-2021
21-11-2021
22-01-2022
25-03-2022
26-05-2022
27-07-2022
night(2-4)
night_weekends(2-4)
SCB-pop (adm)

Main group	Group	description	Number
A. Cities and Suburbs	A1. Cities	population > 200 000	3
	A2. Commuting municipality near city	Commuting rate >= 40 % A1 or municipality near A1	43
B. Towns and municipalities nearby town	B3. Medium-sized town	population >= 40 000 and < 200 000	21
	B4. Commuting municipality near town	Commuting rate >= 40 % to B3	52
	B5. Muncipality near town	Commuting rate < 40 % to nearby town	35
C. Small towns, rural, densely populated and desely populated tourism municipalities	C6. Small town	population >= 15 000 and < 40 000 i biggest pop. Area	29
	C7. Commuting municipality near small town	Commuting rate >= 30 % to C6	52
	C8. Densely populated	population < 15 000 i pop. area and commuting rate < 30 %	40
	C9. densely populated with tourism	population < 15 000 i pop. area and tourism faciilities	15

A1 and A2: Cities and surburbs

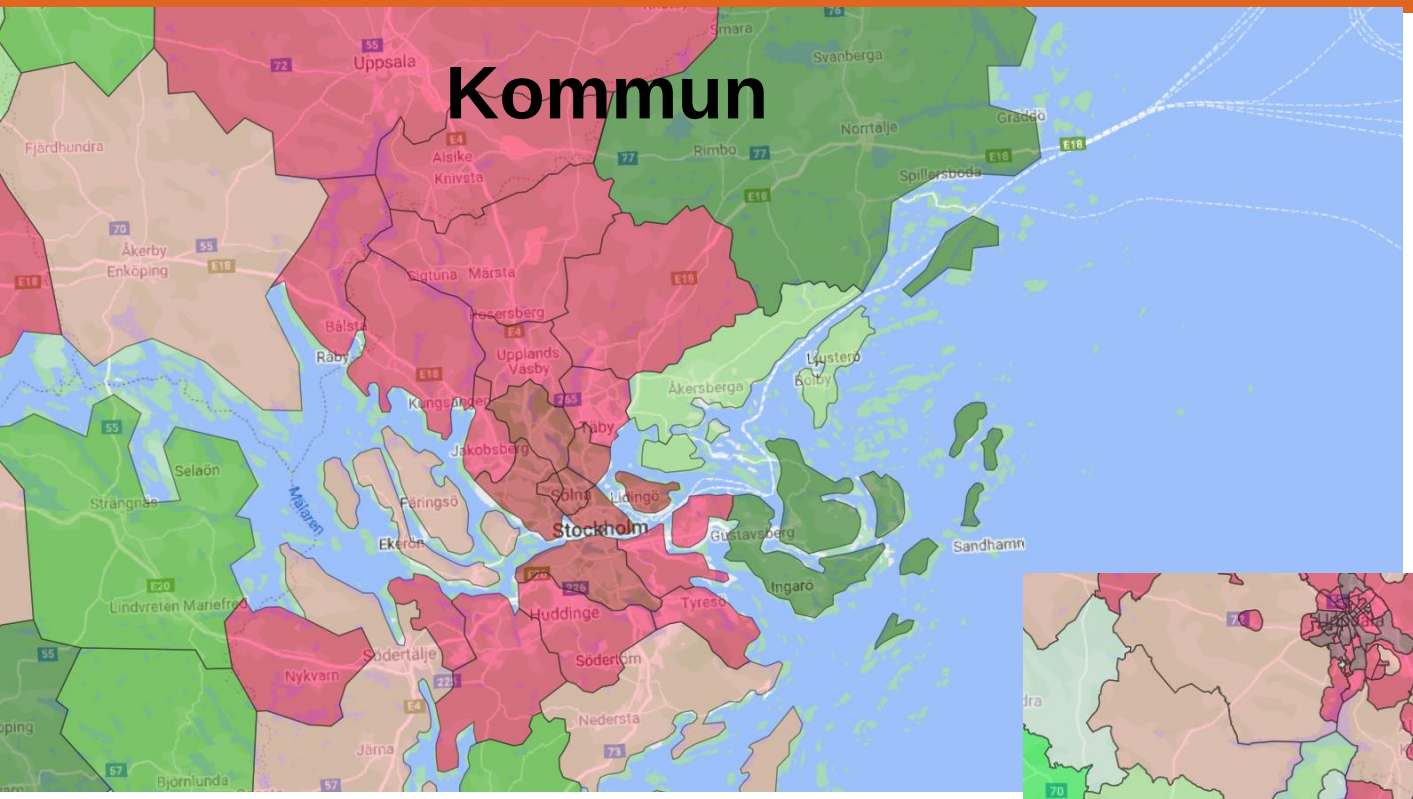




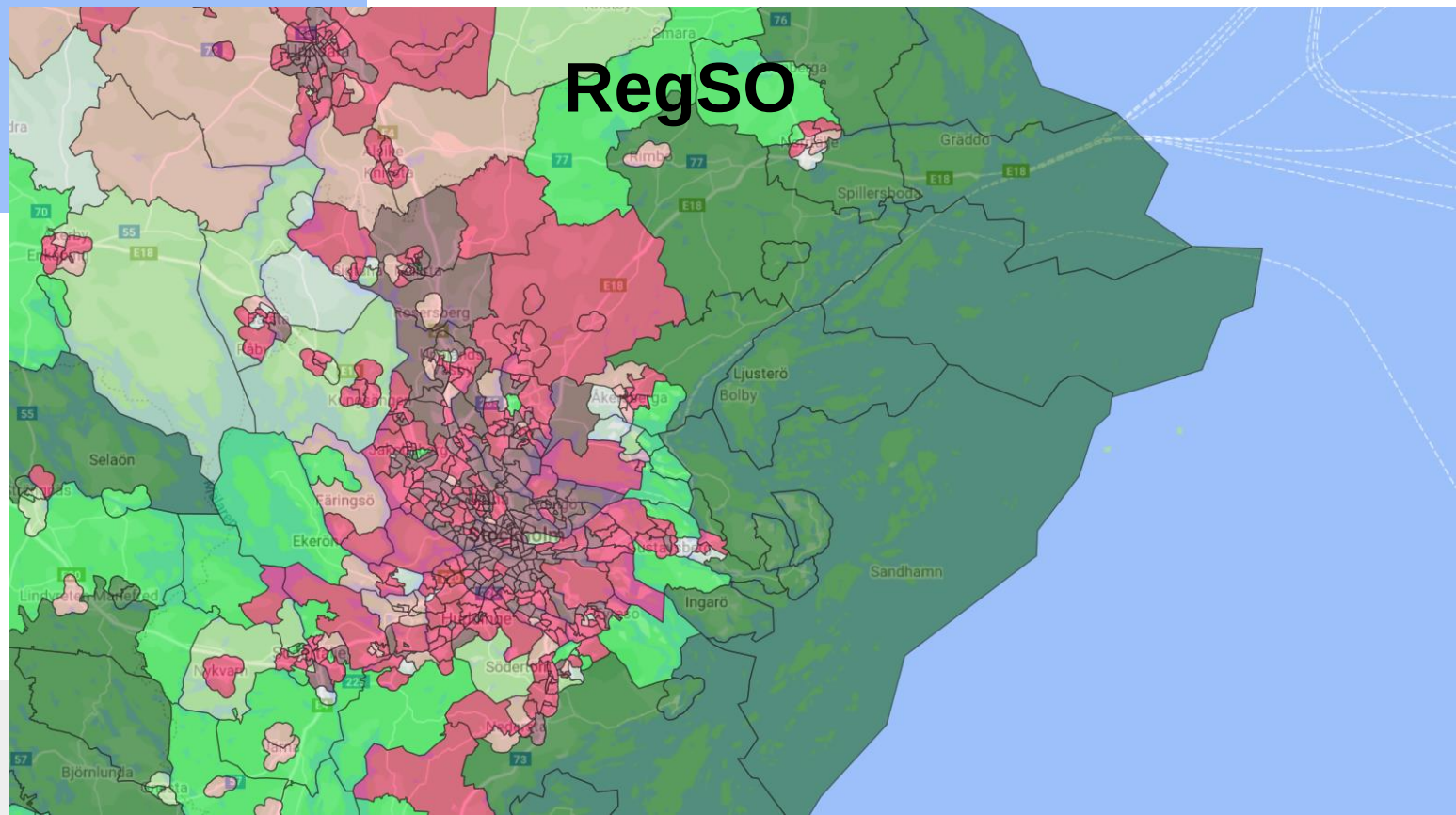


Stockholm Region:

seasonal effects: populations



July/January 2020



Dark Red *('less people in July')*

m7/m1 < 0.70

0.70 <= m7/m1 < 0.90

0.90 <= m7/m1 < 0.98

0.98 <= m7/m1 <= 1.02

1.02 < m7/m1 <= 1.10

1.10 < m7/m1 <= 1.50

m7/m1 > 1.50

Dark Green *('more people in July')*

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Trips from Stockholm (ODM) – 202111(a)

NUMBER (daily average)

Svart’

Ut > 5000

Ut > 1000

Ut > 500

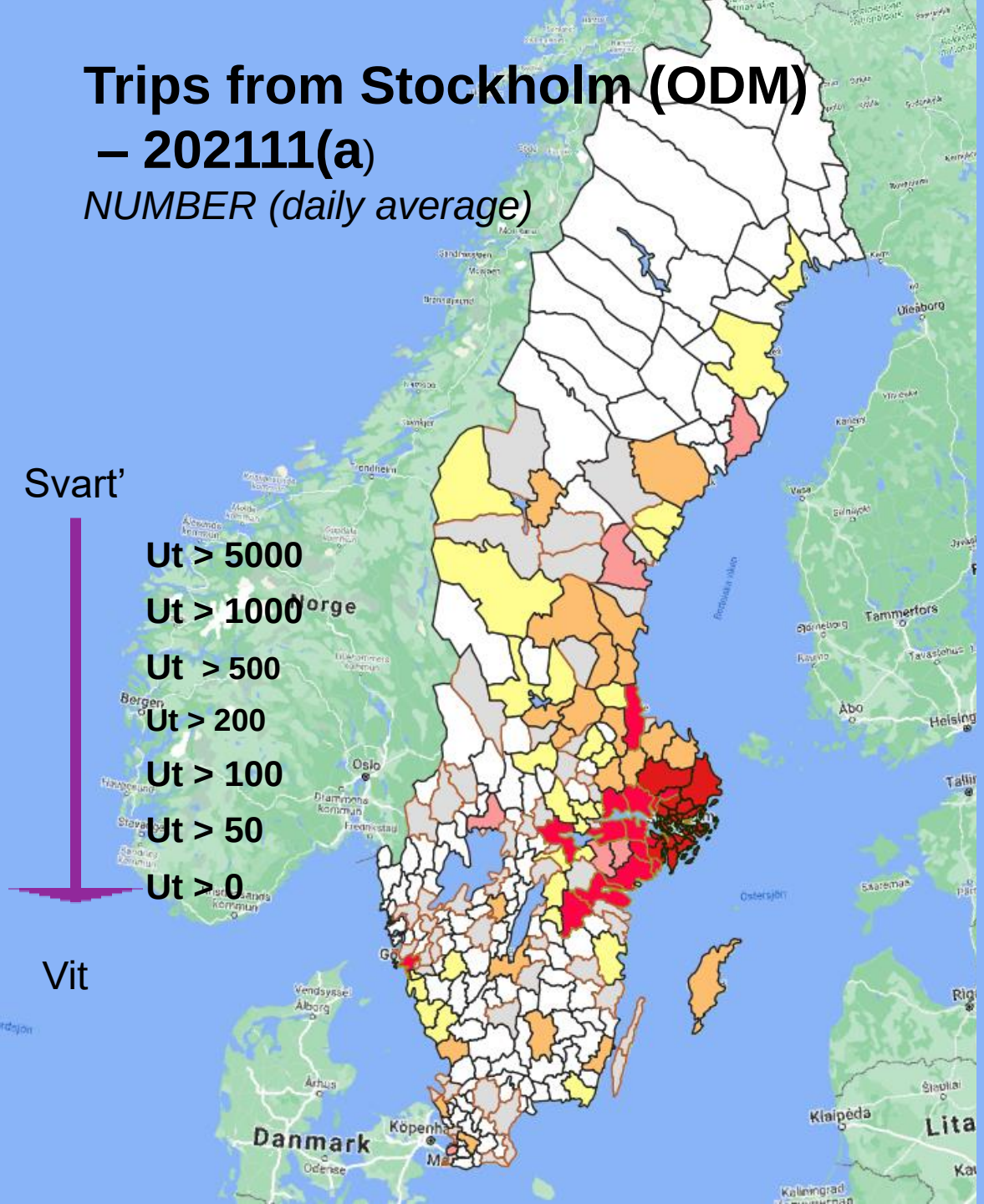
Ut > 200

Ut > 100

Ut > 50

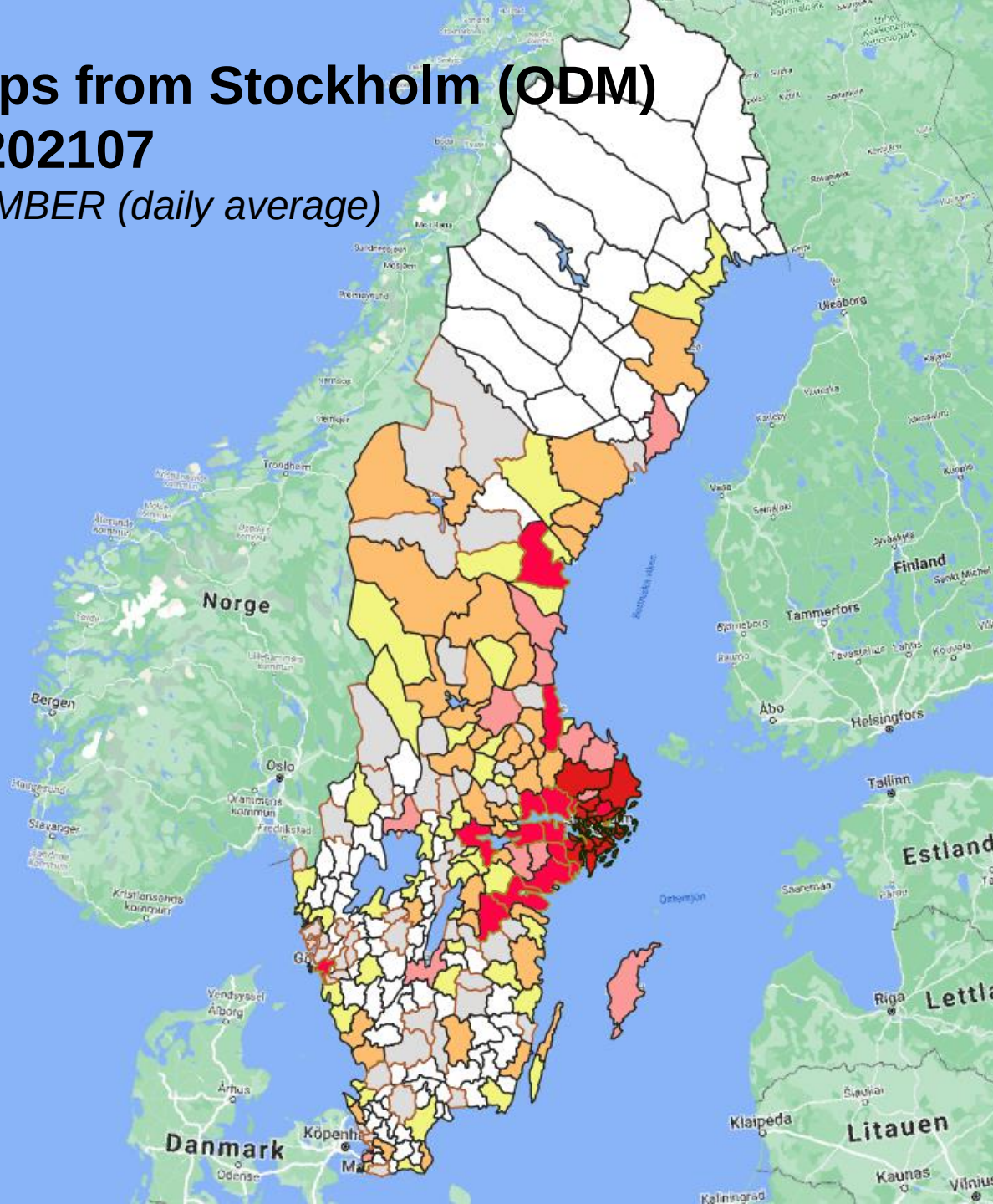
Ut > 0

Vit

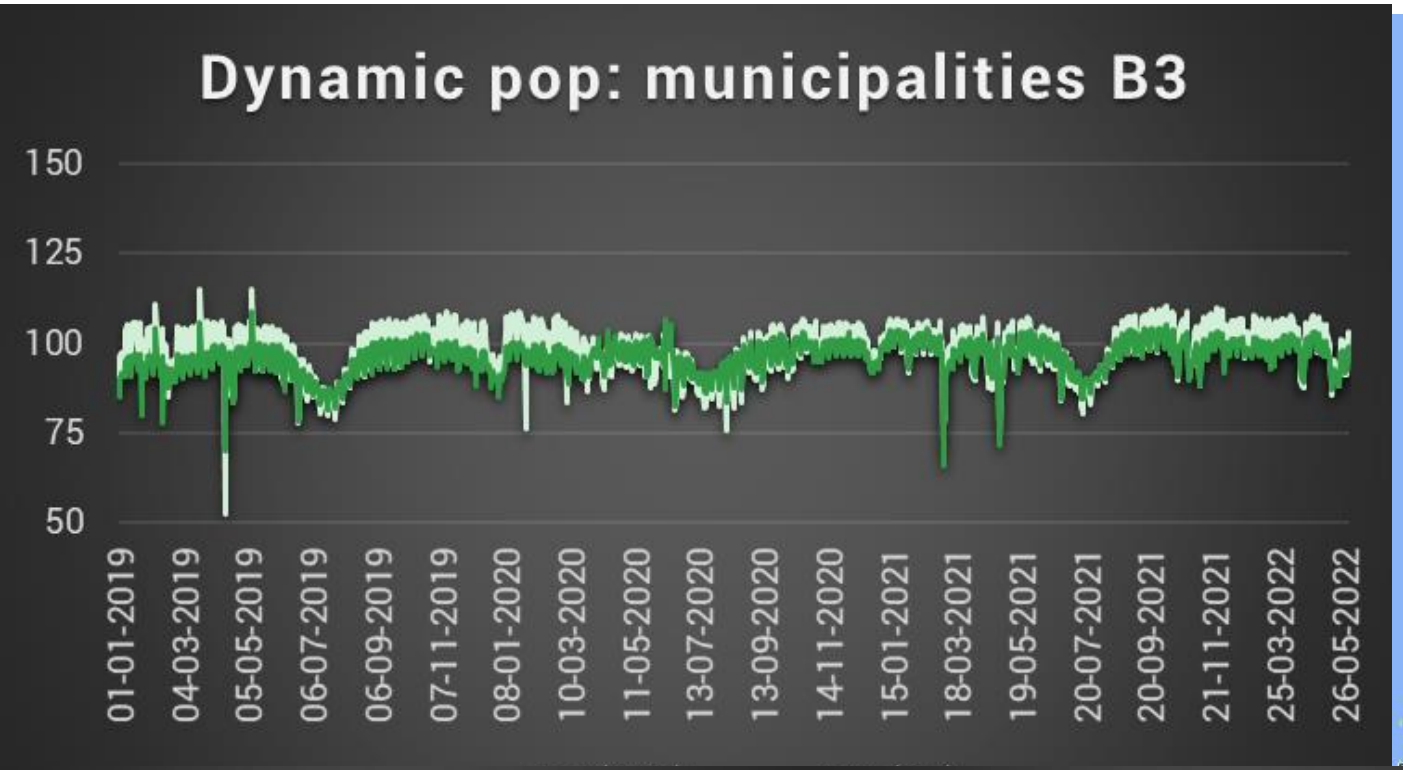


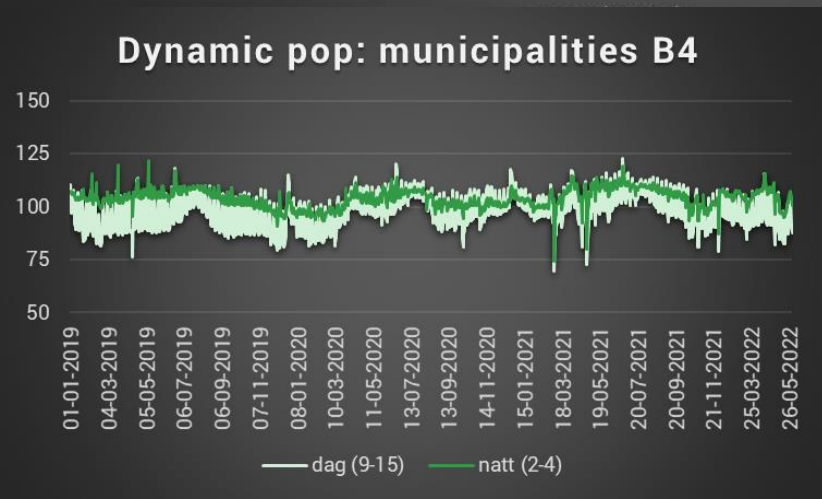
Trips from Stockholm (ODM) – 202107

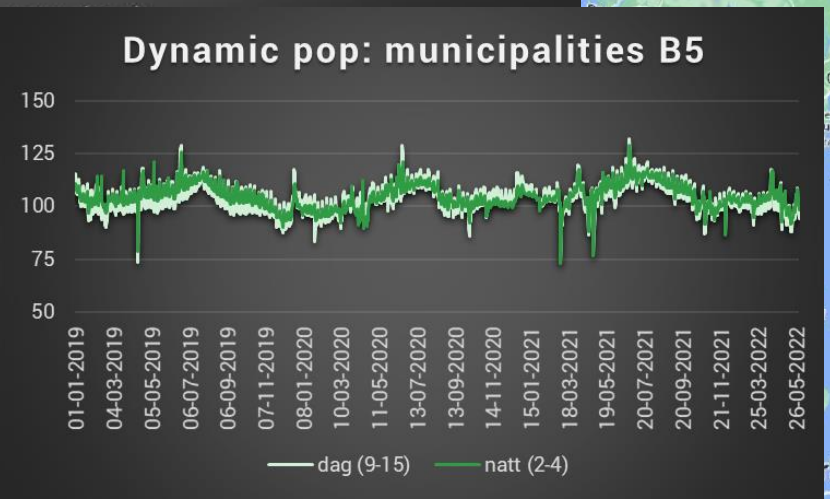
NUMBER (daily average)

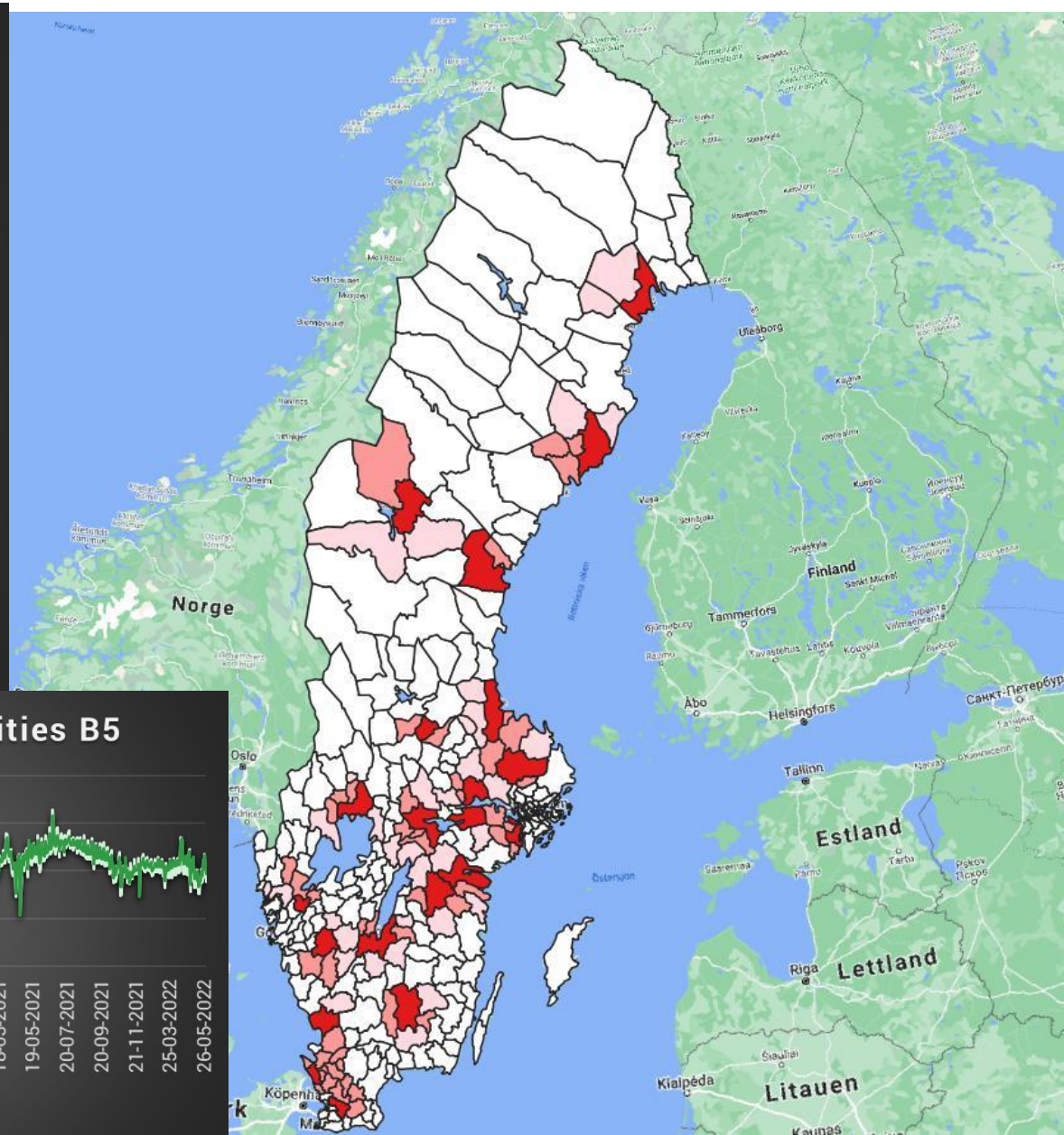


B3, B4, B5: towns and municipalities nearby towns

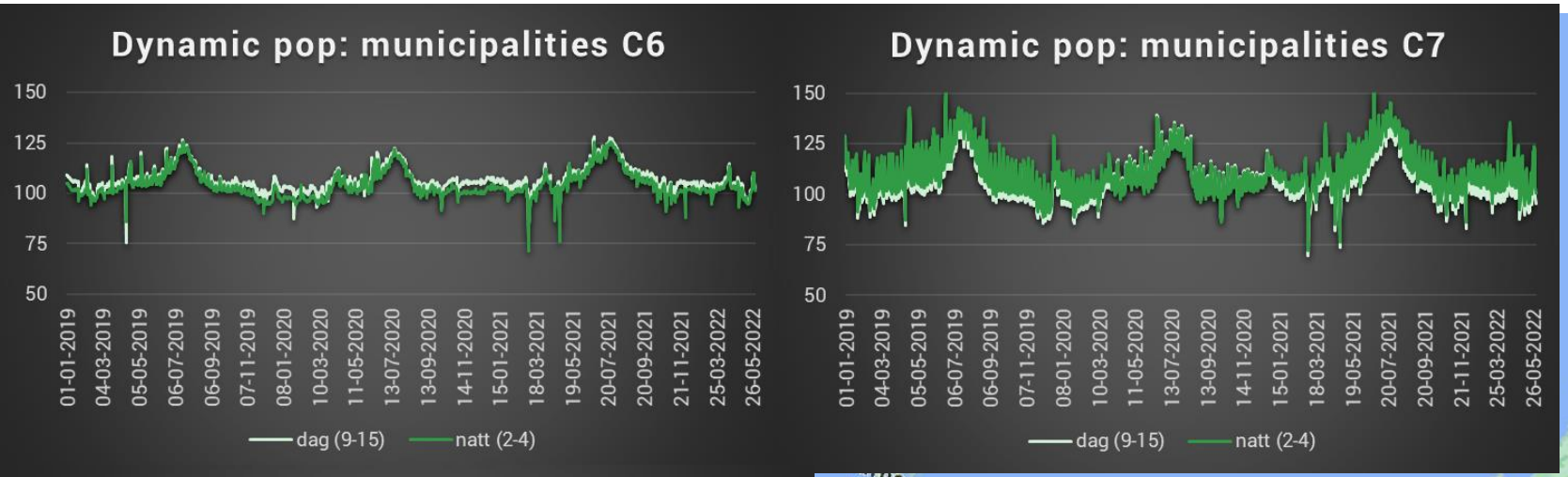


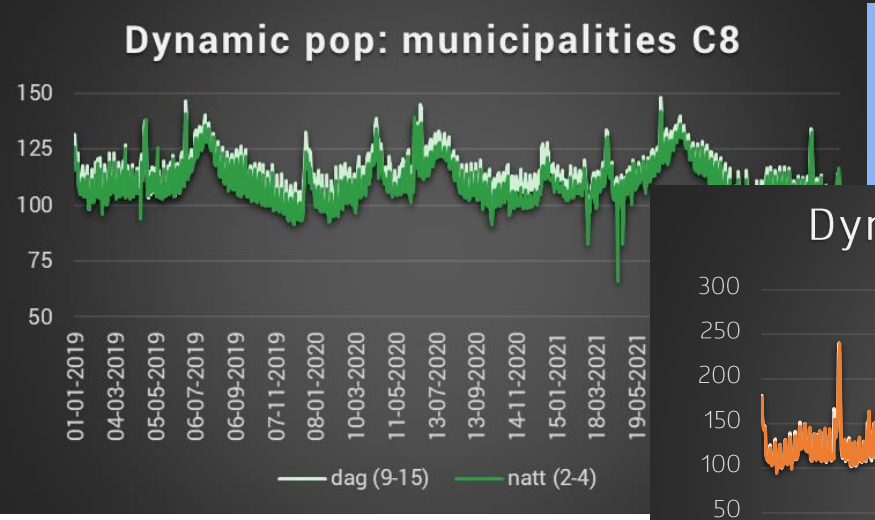


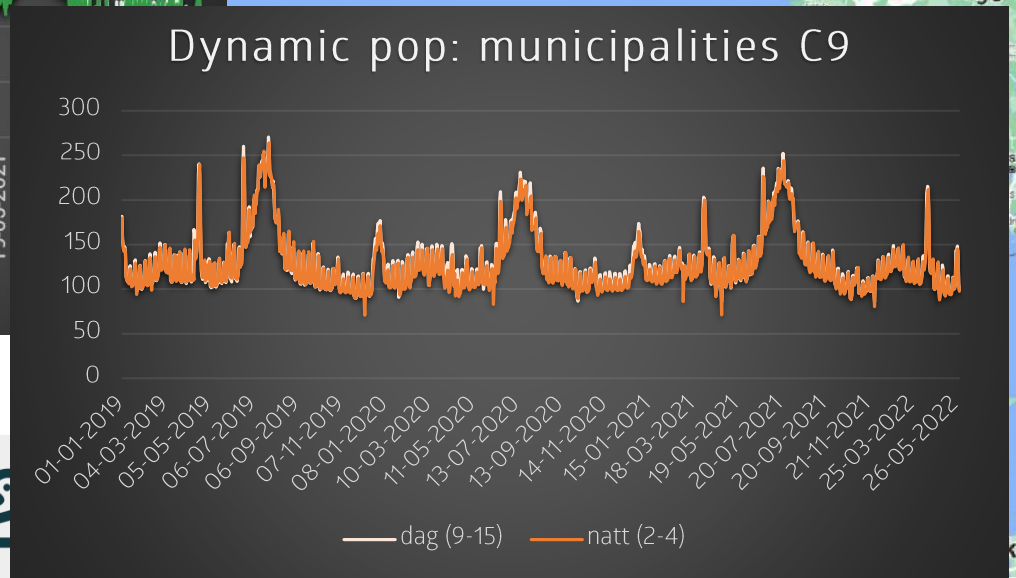


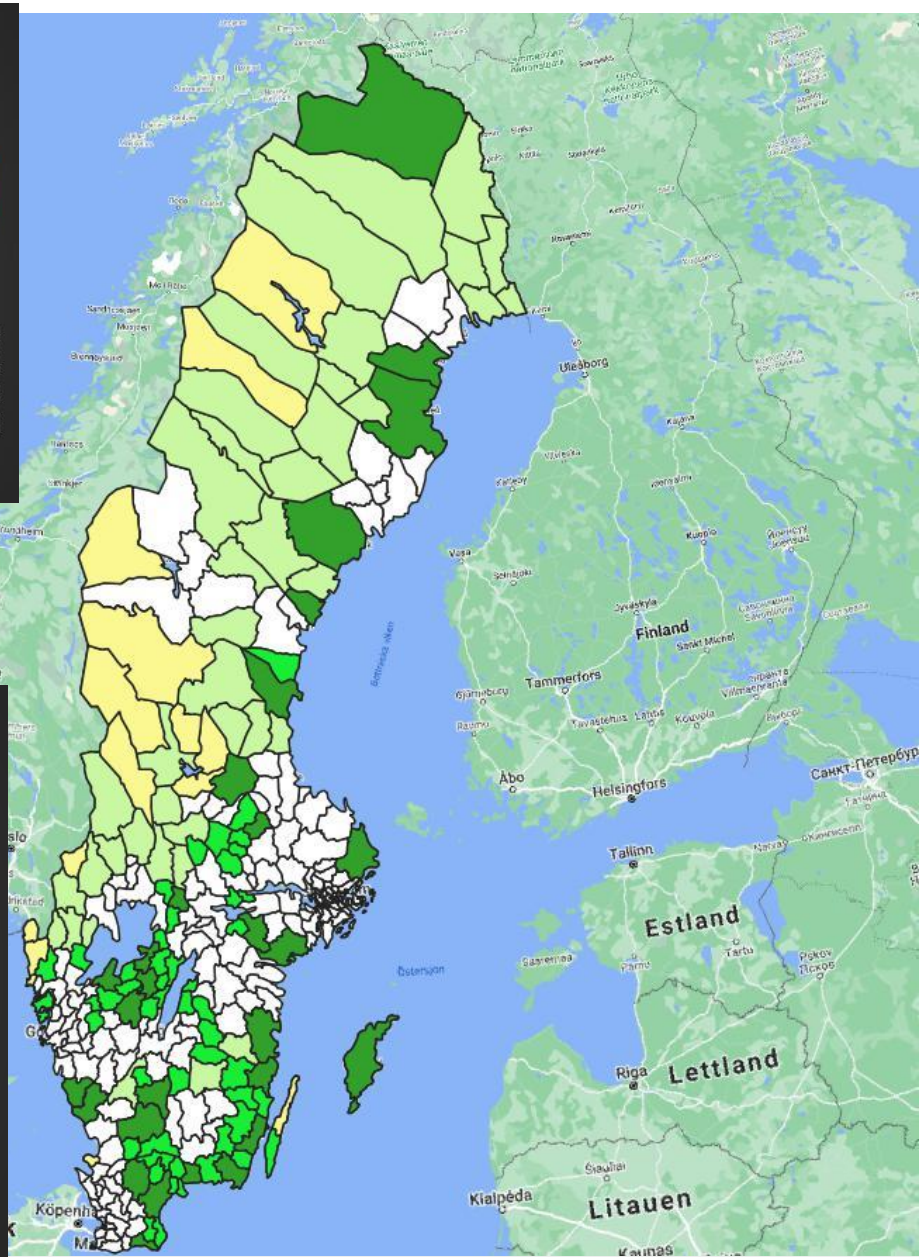


C6, C7, C8, C9: *small towns, densely populated and tourism municipalities*









'Smart' statistics I

Dynamic population statistics

Seasonal variations in 'night' population

Plus related travel

(example monthly: July vs. January)

- General public interest
  (State Road Agency, local Health Authorities etc.)
- Underlying data can be used to replace questions in 'tourism surveys'

2020: July vs. January

Dark Red *('less people in July)*

m7/m1 < 0.70

0.70 <= m7/m1 < 0.90

0.90 <= m7/m1 < 0.98

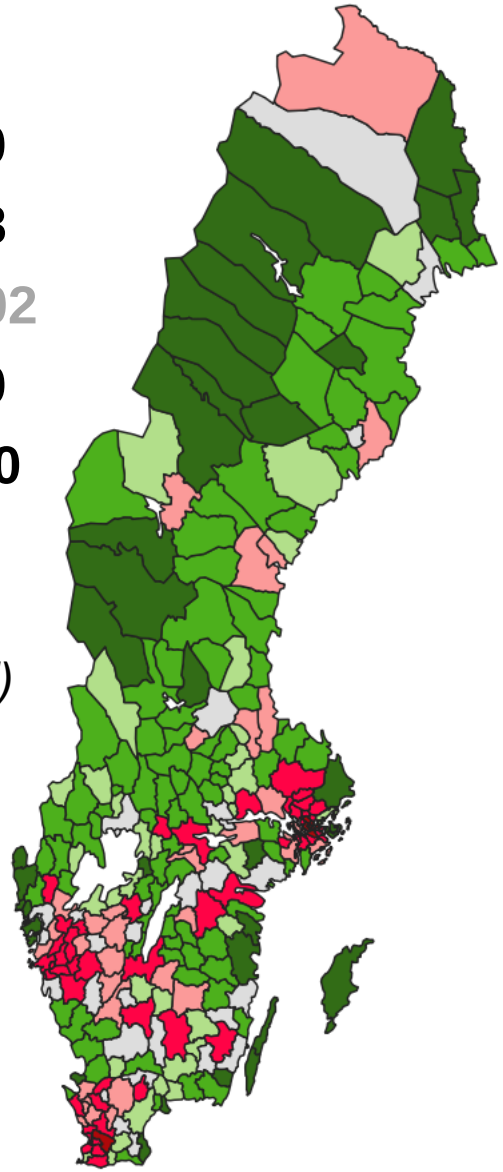
0.98 <= m7/m1 <= 1.02

1.02 < m7/m1 <= 1.10

1.10 < m7/m1 <= 1.50

m7/m1 > 1.50

Dark Green *('more people in July')*



'Smart' statistics II

Dynamic population statistics

Variations in day/night populations

plus related travel

- General public interest
  (daily commuting; regional planning
  - especially with 'working from home')

- Can be used to replace questions in
  'travel mode' questionnaires.

Red

D/N < 0.90

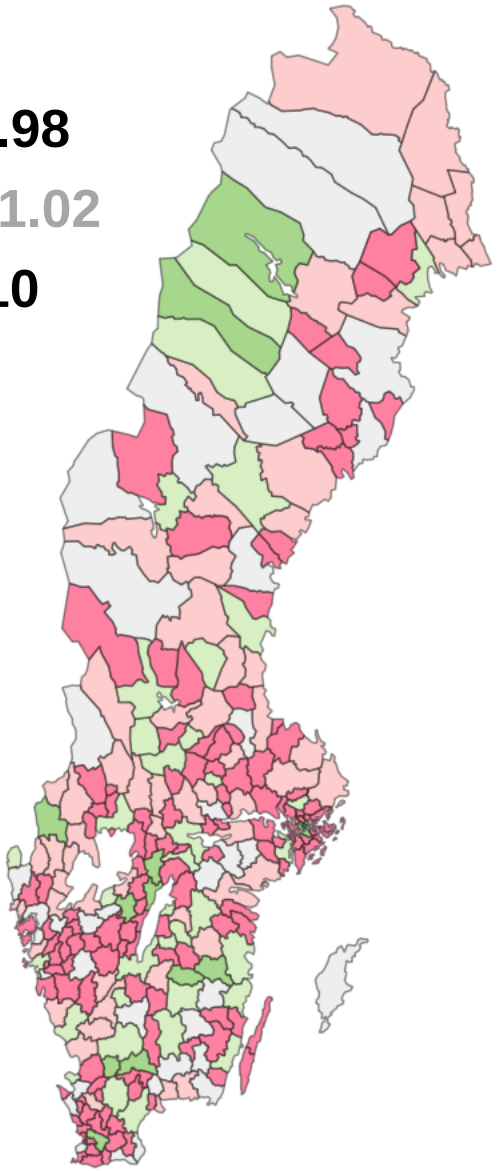
0.90 <= D/N < 0.98

0.98 <= D/N <= 1.02

1.02 < D/N < 1.10

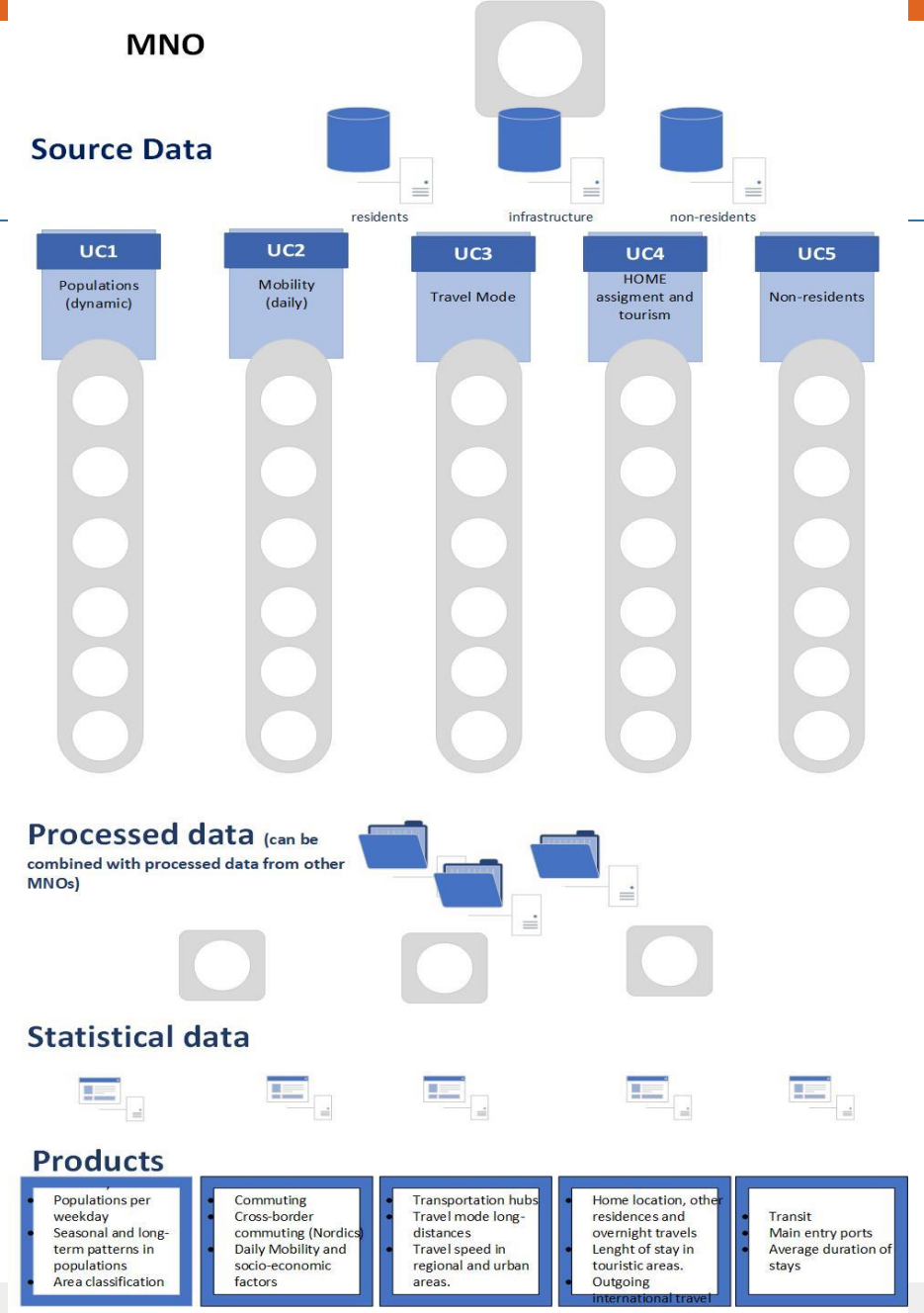
D/N >= 1.10

Green



What can (or should ?) be a 'Nordic' ambition

- Standard terminology
- Standard processing pipeline
- Statistical output for the Nordics positioned vs.commercial activities
- **PARTNERSHIPS NSIs / MNOs**



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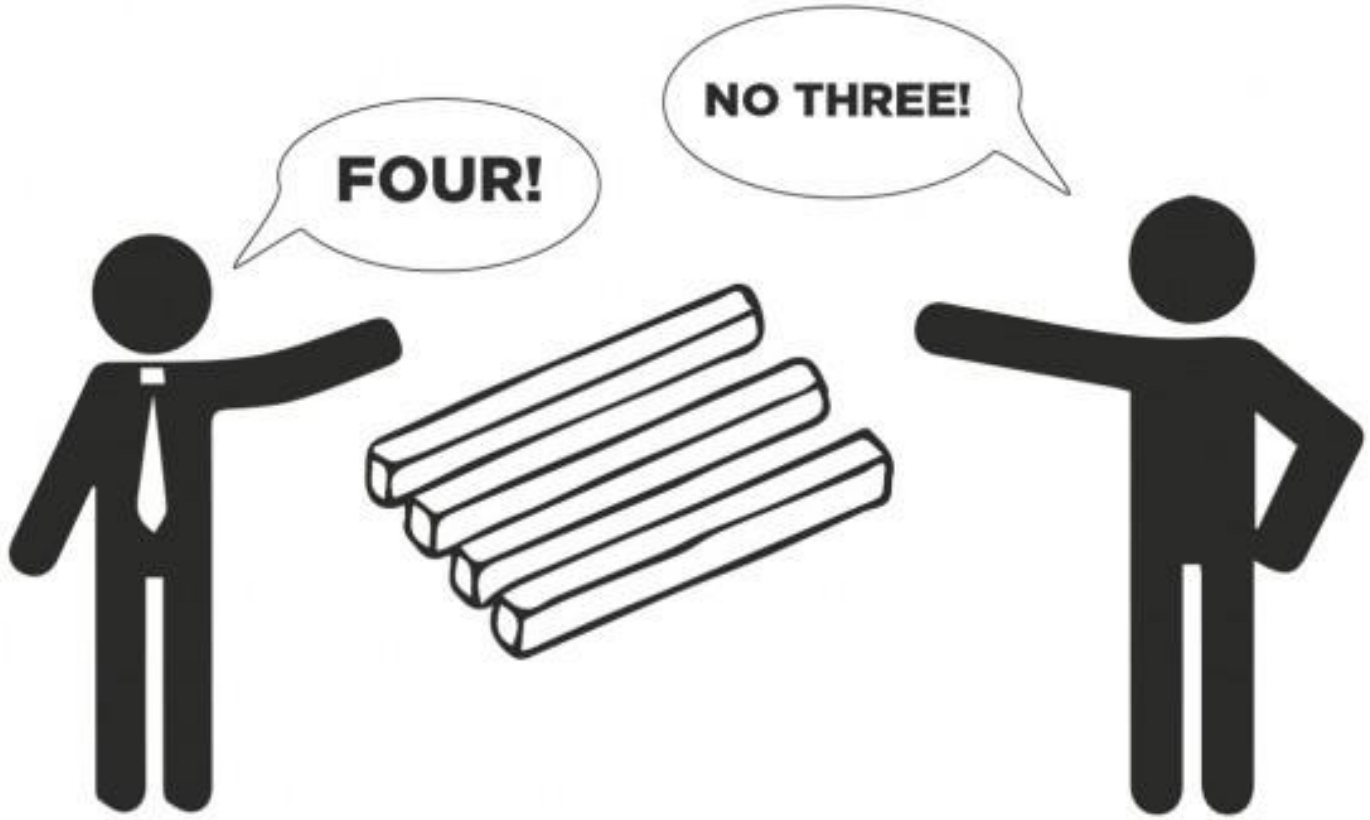
Lessons learned

- Complex
- Standards needed
- New way of thinking



Conclusions and challences

- **Complex data och methodolgy:**
  - Mobile phones -> human beings
- **Quality:**
  - Check data from the lowest aggregation level
  - Trends seems plausible, but….. method need to be more robust to produce statistics
- **Privacy-aspect**
  - Communicate 'clear limits'
- **Needed**
  - Position OS (output) vs. Commercial interest
  - Legal framework for data-access to start partnerships
  - Standard for Industry (MNO-expression), Standard for OS (SCB-expression)