

# Measuring port berth utilisation with Automatic Identification System (AIS) data

## Studying the berth utilisation of Oslo Fjord container ports

Karina Hjelmervik, University College of Southeast Norway

Halvor Schøyen, University College of Southeast Norway

Hao Wang, Norwegian University of Science and Technology

Ottar L. Osen, Norwegian University of Science and Technology

# AGENDA

- Background
- Research questions
- Method and data collection
- Findings
- Conclusion

# Background: Container port performance

- The time each individual berth is utilised by a ship is essential for both economic and environmental reasons
- Unit of analysis: Berths at container terminals
- Challenge: Cost-efficient way to collect ship and port data

# Research question

- Can ships' berth utilization be measured based on AIS?
- What are the berth utilization of the container ports in the Oslo Fjord?

# Method and data collection



- Static AIS information  
IMO number, ship name, etc.
- Dynamic AIS information:  
GPS position



|                            |           |
|----------------------------|-----------|
| Year:                      | 2015      |
| Total number of ships:     | 2 347     |
| Total number of AIS data:  | 2 428 608 |
| Number of container ports: | 7         |
| Number of Lo-Lo ships:     | 97        |

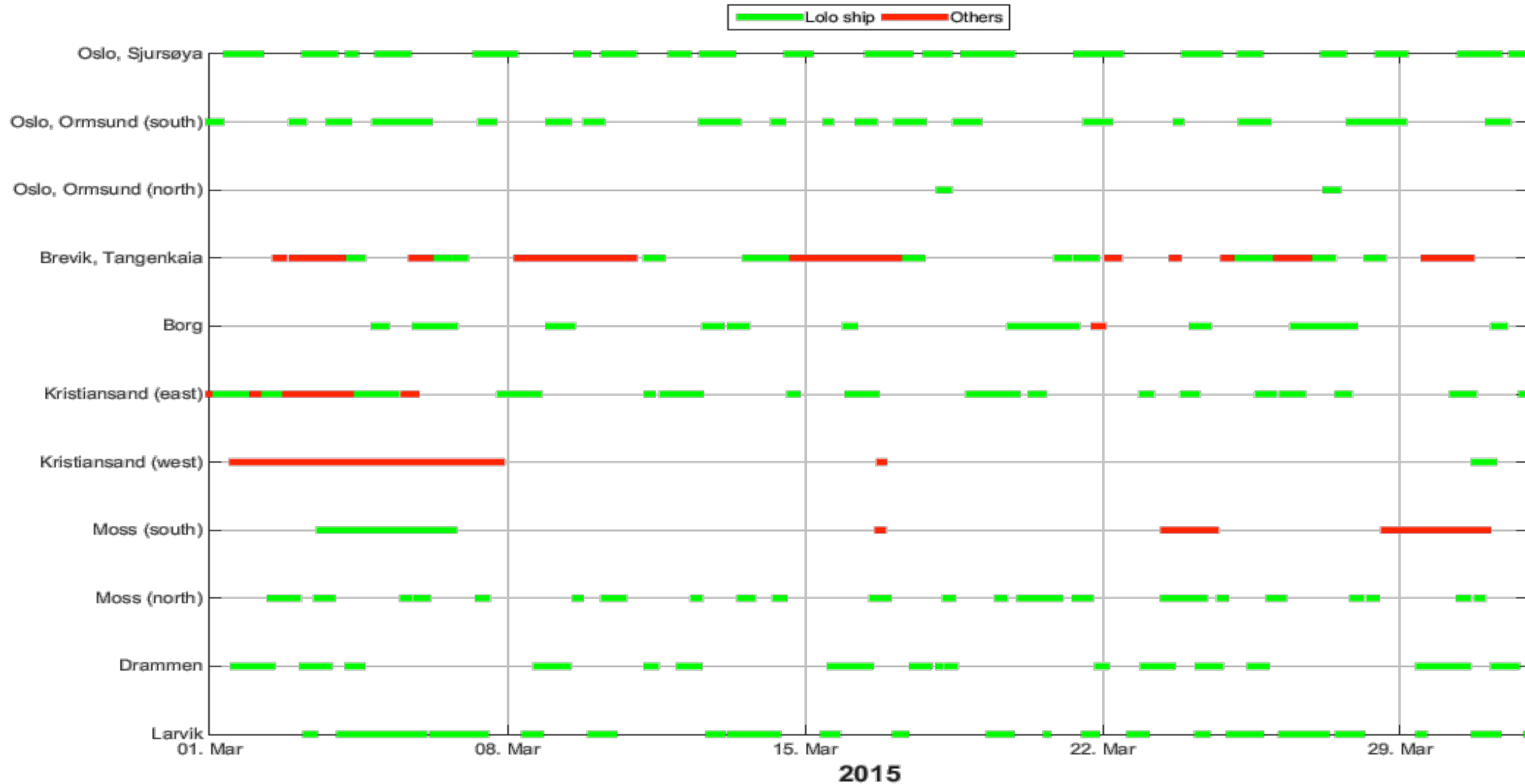
# Finding: Container ship calls

|                     | Calls to container quays |                | Ratio of Lo-Lo<br>container ships to all<br>ships | Container flow<br>per year | Average container flow<br>per Lo-Lo container ship |
|---------------------|--------------------------|----------------|---|----------------------------|--|
|                     | Lo-Lo container<br>ships | Other<br>ships |   |                            |  |
|                     | [No.]                    | [No.]          | [%]   | [TEU/year]                 | [TEU/Lo-Lo ship call]                              |
| <b>Oslo</b>         | 485                      | 9              | 98  | 195 466                    | 403  |
| <b>Drammen</b>      | 206                      | 11             | 95  | 59 464                     | 289  |
| <b>Moss</b>         | 301                      | 30             | 91  | 63 107                     | 210  |
| <b>Borg</b>         | 189                      | 91             | 68  | 45 879                     | 243  |
| <b>Larvik</b>       | 262                      | 20             | 93  | 61 807                     | 236  |
| <b>Brevik</b>       | 154                      | 241            | 39  | 34 557                     | 224  |
| <b>Kristiansand</b> | 327                      | 111            | 75  | 51 460                     | 157  |
|                     |                          |                | Total   | 511 740                    |  |

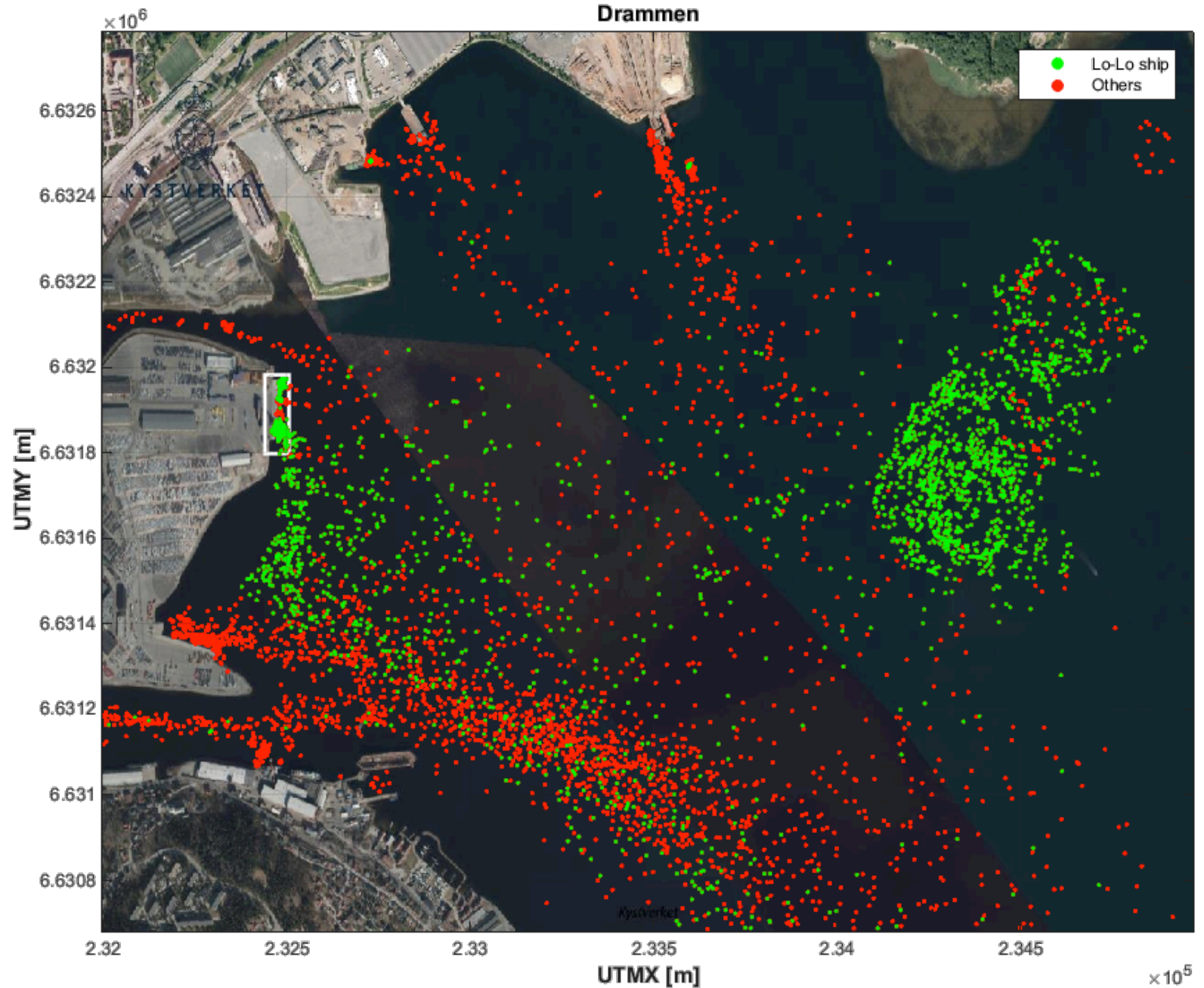
From Statistics  
Norway



# Finding: Ship traffic mix



# Example: Port of Drammen





# Findings: Berth utilisations

| No. of ships berthed simultaneously | 0    | 1    | 2   | 3   | No. of berths |
|-------------------------------------|------|------|-----|-----|---------------|
| Oslo, Sjursøya                      | 66.2 | 30.9 | 2.8 | 0.1 | 3             |
| Oslo, Ormsund (north)               | 99.1 | 0.9  | -   | -   | 1             |
| Oslo, Ormsund (south)               | 79.9 | 20.1 | -   | -   | 1             |
| Drammen                             | 75.7 | 24.3 | -   | -   | 1             |
| Moss (north)                        | 82.8 | 17.2 | -   | -   | 1             |
| Moss (south)                        | 98.5 | 1.5  | -   | -   | 1             |
| Borg                                | 82.0 | 19.0 | -   | -   | 1             |
| Larvik                              | 73.5 | 26.5 | -   | -   | 2             |
| Brevik                              | 86.6 | 13.4 | -   | -   | 1             |
| Kristiansand (west)                 | 98.9 | 1.1  | -   | -   | 1             |
| Kristiansand (east)                 | 75.3 | 22.3 | 2.4 | -   | 2             |
| <b>Total no. of berths</b>          |      |      |     |     | <b>15</b>     |

# Conclusion

- A method to measure container ship berthing with AIS is developed
- Oslo Fjord: 7 container ports with 15 berths are identified
- Oslo Fjord container ports' berth utilisations are measured, providing evidence on which ports may have under- or overinvested in quay infrastructure for container business
- The method and empirical findings can –among others- be applied to study berth availability, duration of ship's stay in port and liner operator's route choice, impacting on energy efficiency and air pollution