WORKING WEEK 2025
AND Locate25
THE NATIONAL GEOSPATIAL CONFERENCE
FIG Geospatial Council of Australia
Collaboration, Innovation and Resilience: Championing a Digital Generation
Brisbane, Australia 6–10 April

Oslo

The Fornebu Metro Line

7. April 2025

Leif Ingholm, Oslo Municipality

ORGANISED BY FIG Geospatial Council of Australia
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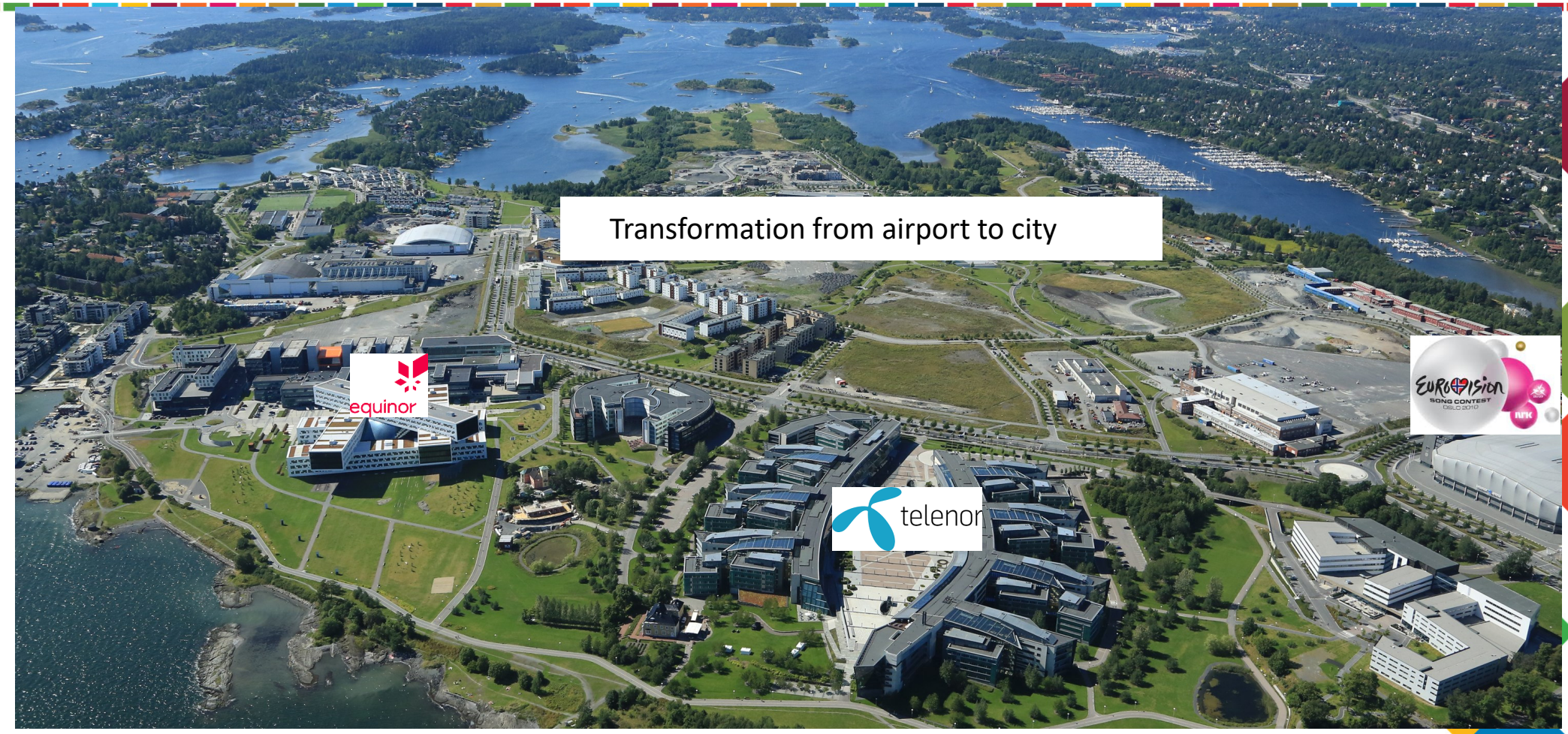
Outline

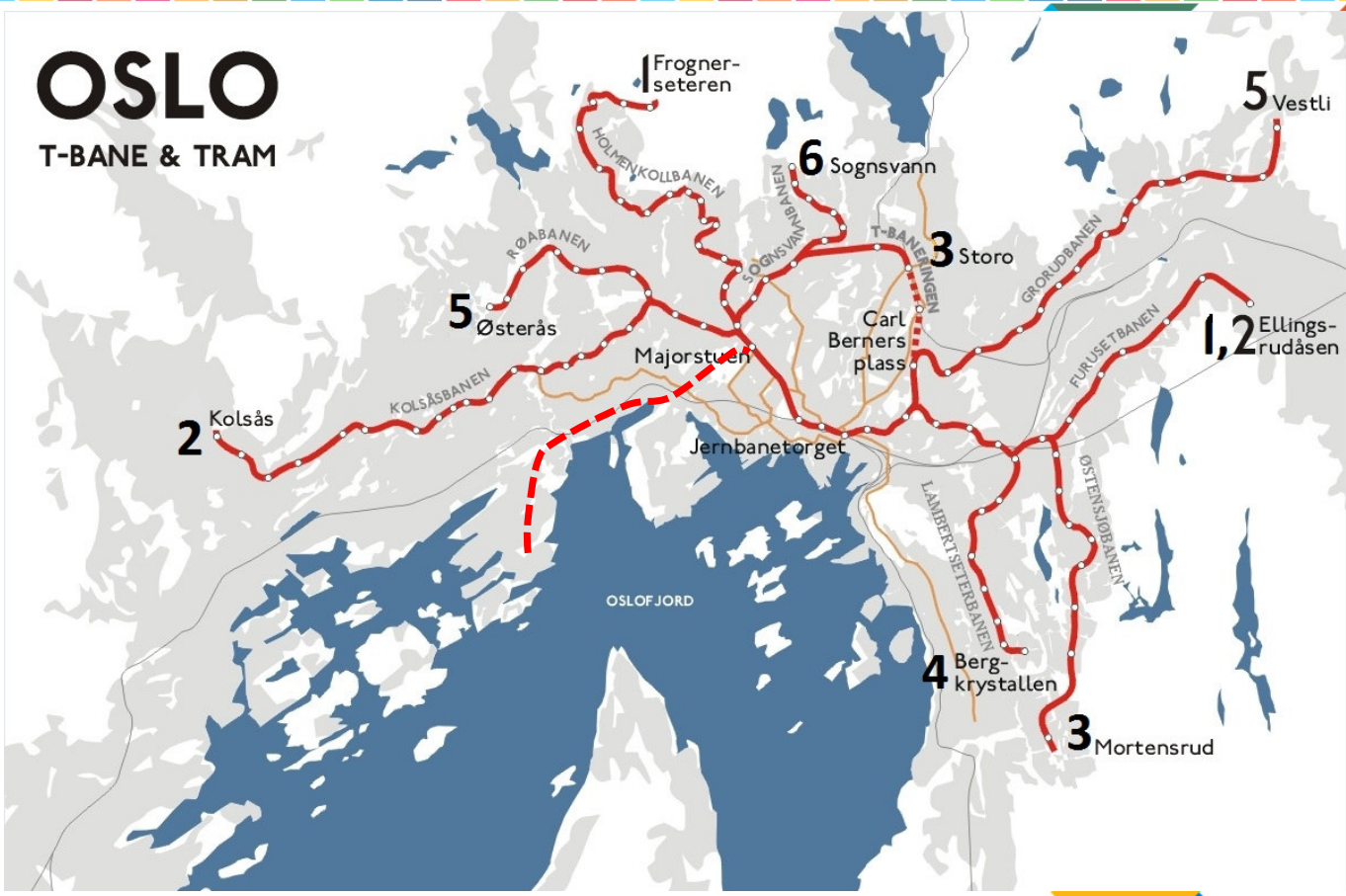
1. The Fornebu line at a glace
2. Digital 3D project – BIM
3. Electric project
4. Zoning plan
5. Who owns the underground?

1 -The Fornebu Line at a glace


Transformation from airport to city
equinor
telenor
EUROVISION SONG CONTEST OSLO 2010
NRK

The Oslo Metro

- First line opened in 1898
- 101 stations (17 are underground)
- 100 million passengers per year JB1
- Total length 85 km
  - Large metro system compared to number of passenger journeys
- Short station spacing 0,85km
  - Global average is 1,28km
- Average speed 31km/h
  - Global average 34 km/h



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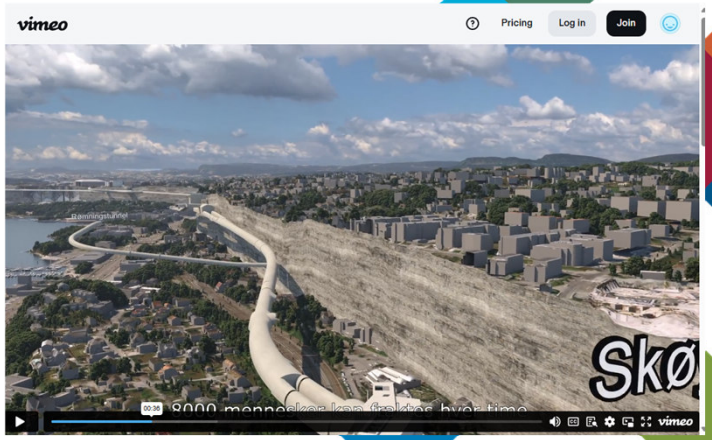
JB1 annually

Jon Magnus Lindløkken Bjørsom; 2025-04-01T12:33:07.212

2 - Fully digital 3D project – BIM

(no “flat paper drawings”)

- BIM is the main information platform for the project
  - Communication with government bodies, landowners, neighbours and stakeholders
- Engineering, management, planning, cost control, contract, systematic completion, GIS

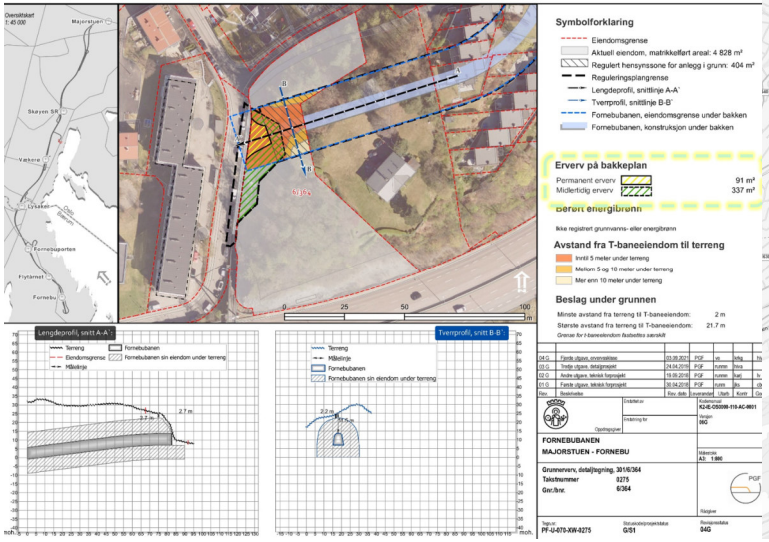


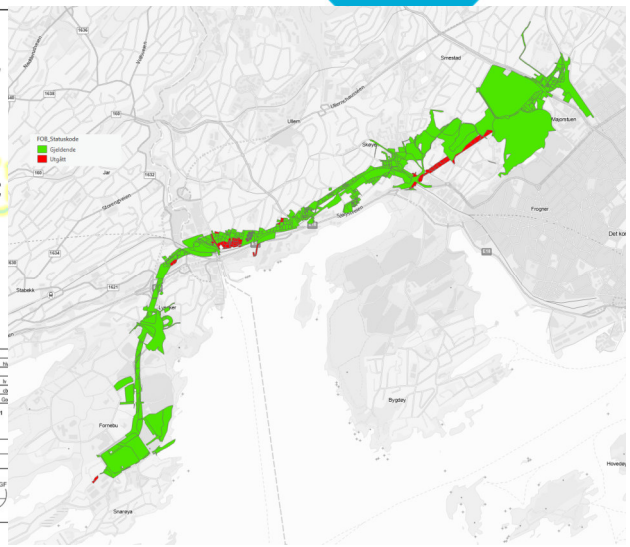
Oslo

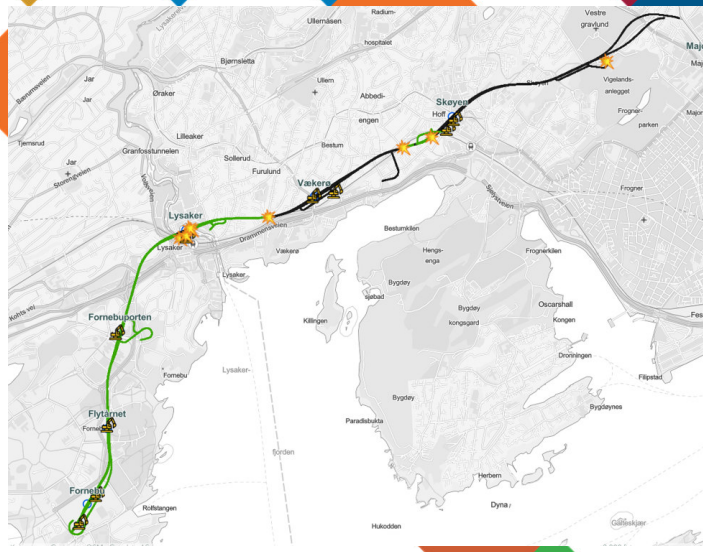
PGF

Presenterer

Several GIS portals

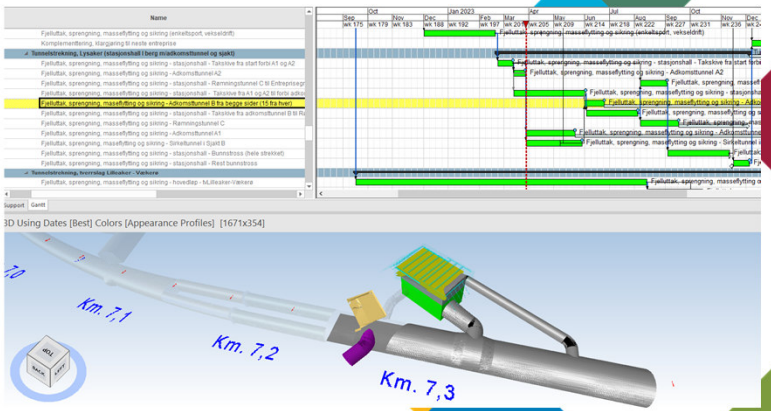


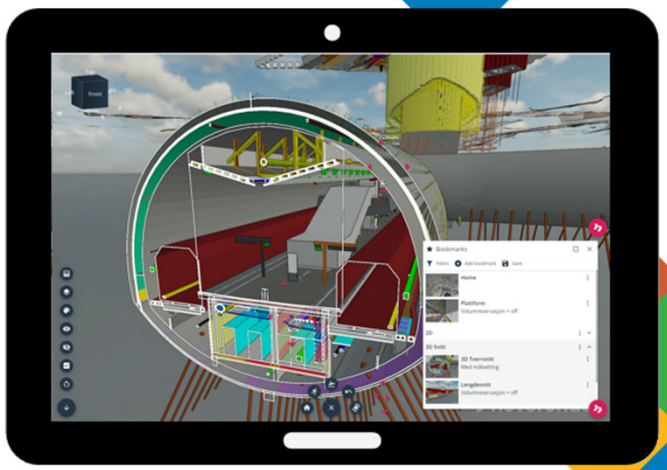




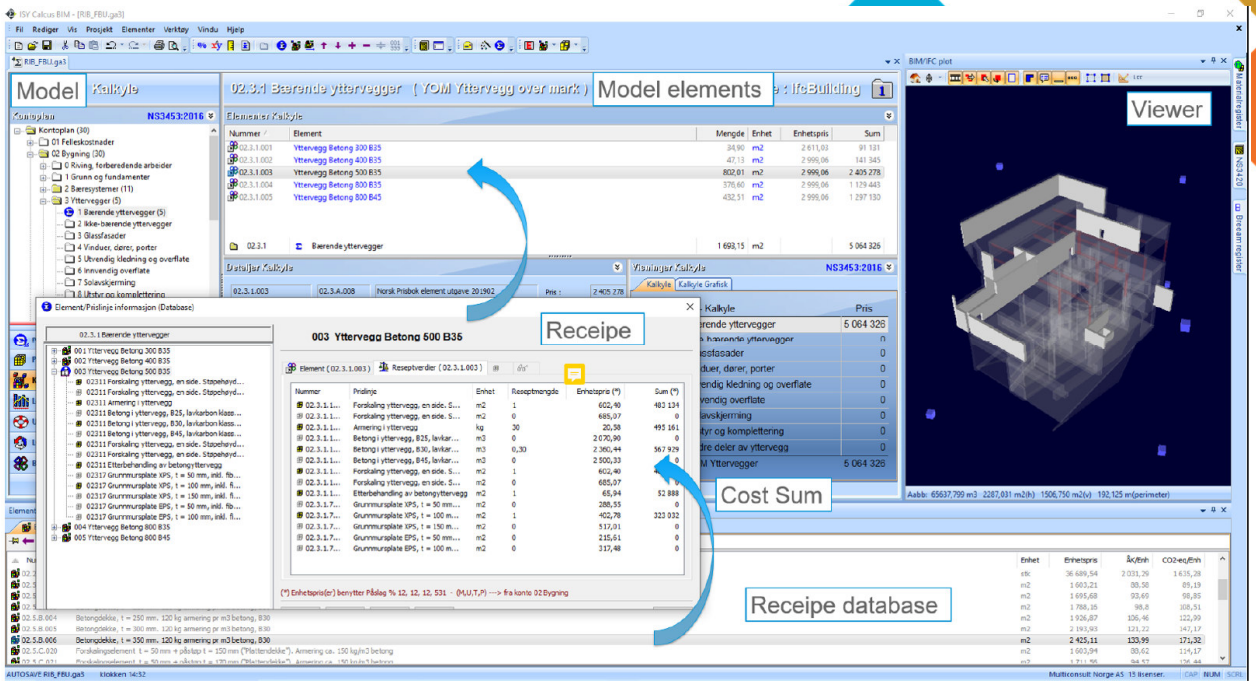
[Fornebubanen](#) – Publikumsmodell

- 3D engineering and coordination between disciplines
- Contractors tacking progress
- Connection to public mapping services, Cadastre data, Energy wells, External environment, Flooding Etc.





The model has entries from the description, providing a direct link between the model object and the entry in the contract.



3 - Fully electric project

Oslo Municipality requires electric or zero emission machines in all its projects

- This has led to increased demand for electric machines

(relatively) New technology

- No different in function than a regular fossil machine (according to the operators)
- Not all machines are available in electric versions
  - Mapped out in advance, so that some operations can be done with non-electric machines
  - Not permitted to use biogas under ground
- The machinery is in a development phase. The dumper trucks load 37 T
  - We have already taken in larger ones (60 T), still not “world class”, but the technology is moving.

SANY - SKT90E
Electric Off-Highway Mining Truck
Load Weight 37 T

Slide nummer 12

IM1 Her kan du vurder å si at vi ikke kan bruke biogass under jord, og derfor når vi ikke målsetttingen om full utslippsfrihet i 2025. Bente har holdt presentasjon for kinesisk gruppe og har sikkert noe om dette i engelsk versjon.
Irene Synnøve Måsøval; 2025-04-01T11:52:13.125

Charging

- Charging infrastructure is important for success!
- Large construction sites =

  movement between charging and attack, drains power

- Plan a sufficiently developed power grid for charging
- Requires a sufficient capacity in the local power grid


ColorLine Cruises
ColorLine Cruises
ColorLine Cruises
ColorLine Cruises


ABC
500m
90 m


ABC
500m
Gabrielle Queen
Gabrielle Queen
Gabrielle Queen

Have a back up

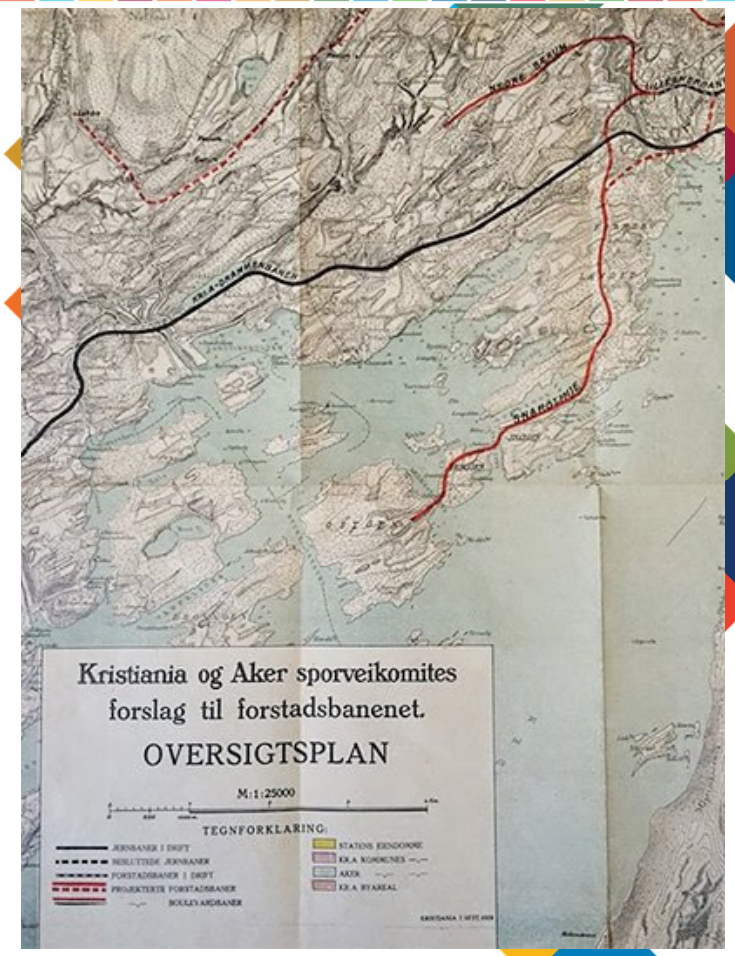
- The machines have some childhood illness
- Frequent breakdowns, subsequent troubleshooting, repair and lack of spare parts, are more common for some new types of electric machinery
  - In order not to jeopardize project progress, we made predefined procedures to use non-electric machines

4 - The zoning plans

- Oslo and Bærum are two separate municipalities and therefore, two planning processes
- Greater project maturity = constantly challenged the zoning boundaries
- Always invest your energy in the early phase!
  - Early land acquisition is highly critical for progress

Quick historic revju

- 1919: First Suburban rail proposal
- 1939: Airport opend
- 1990s: Plans for conventioal railroad.
- 2003 and 2005: Zoning plan for automatic Monorail/Sky-rail
- 2007: Plans for Sky-rail droped – Tram proposed instedad
- 2012: Akershus County decides to built a conventional metro, connected to the existing metro system.
- 2016 and 2018: Zoning plan for metro approved
- 2020: We decide to change the layout of the metro.
- 2020-2023: Zoning and building in parallell. The plan was split in to several smaller plans.



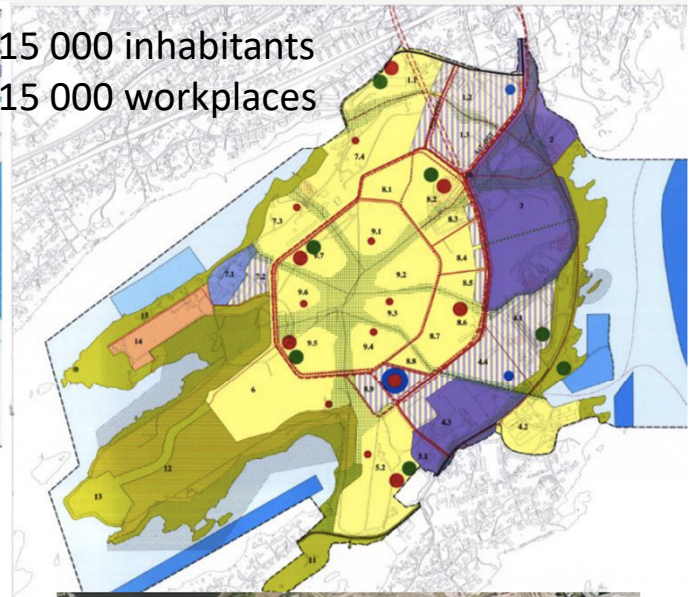
Munisipal masterplan 1, 2 and 3

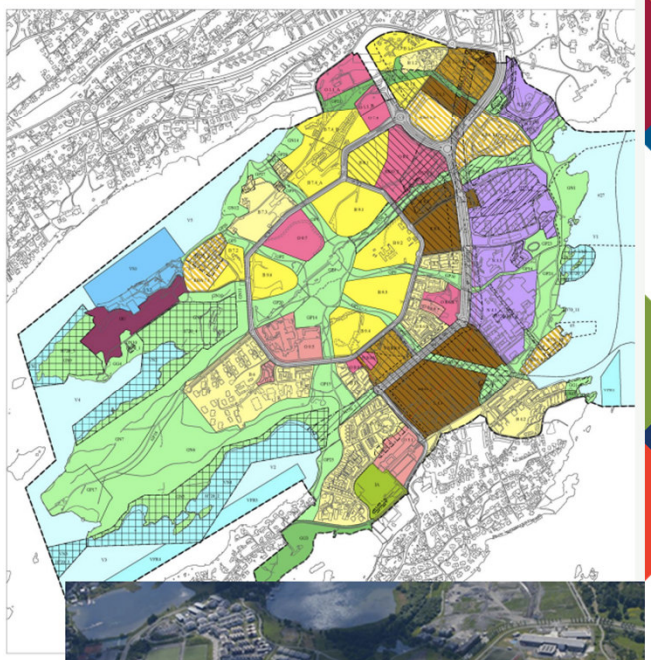
KDP 1 1996

KDP 2 1999

KDP 3 2019

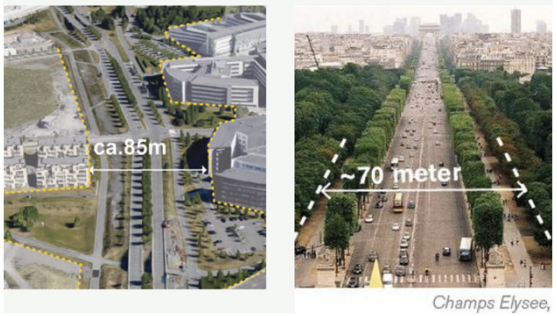
15 000 inhabitants
15 000 workplaces



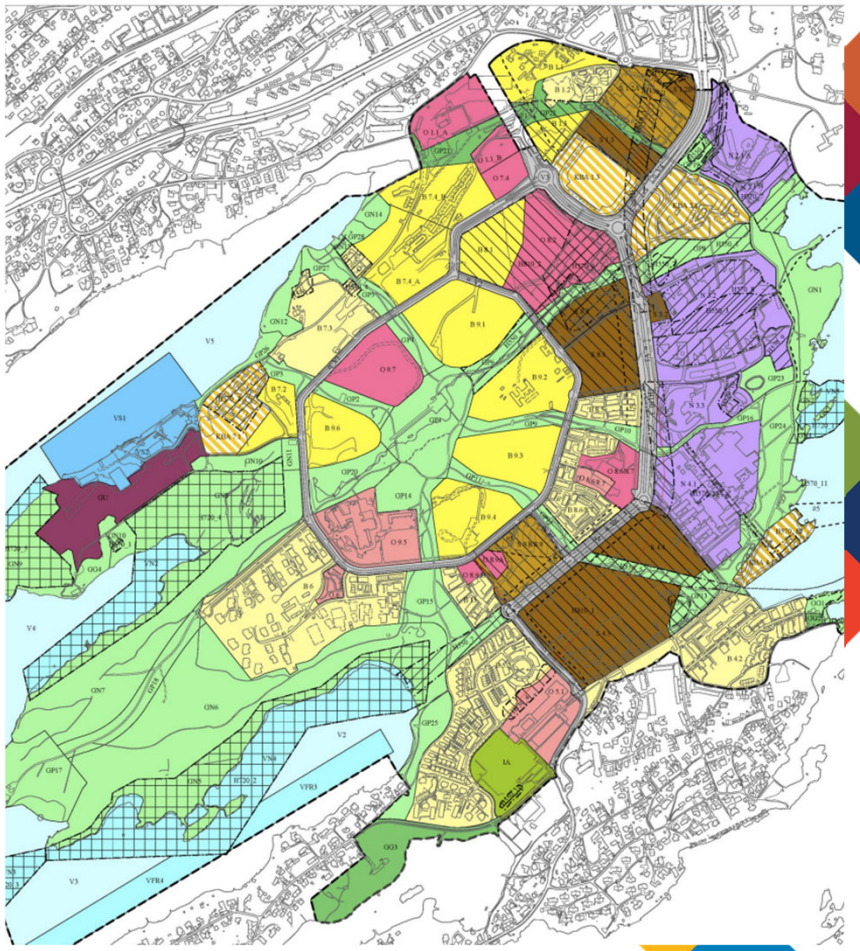


Municipal masterplan 3

- Masterplan nr 1. and 2. from 1996 and 1999 had 15.000 inhabitants 15.000 workplaces
- In 2019 the peninsula had 7 500 inhabitants and 25 000 workplaces
- Goals for the new masterplan is to:
  - Make the metro feasible
  - Make Fornebu into a town the size of Lillehammer with 25.000 inhabitants
- Nature
- Mixed spaces
- Avenue?

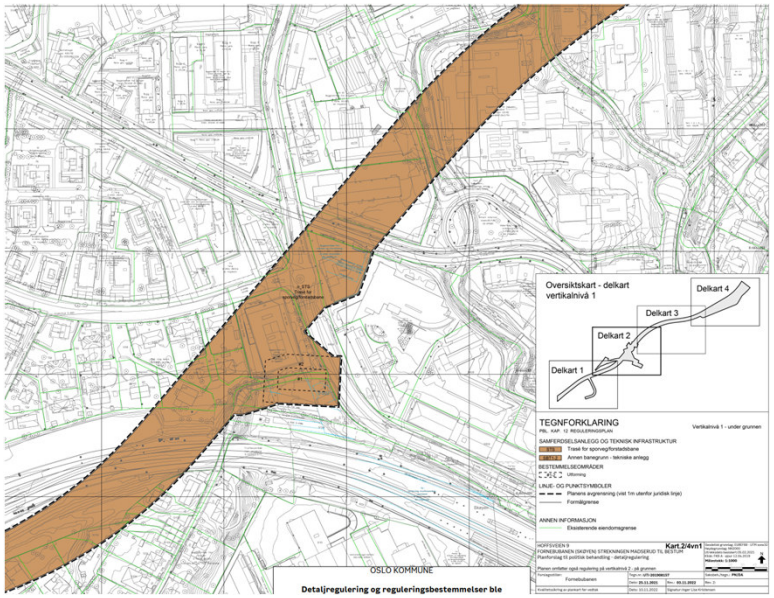


Champs Elysee,

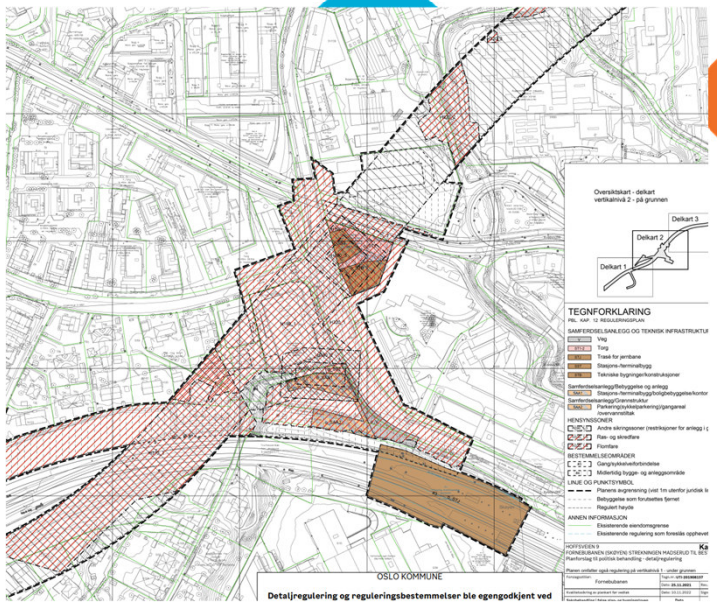


- It was a major focus on **quick clay** in Norway in 2020
- All physical planning had to have special focus on it

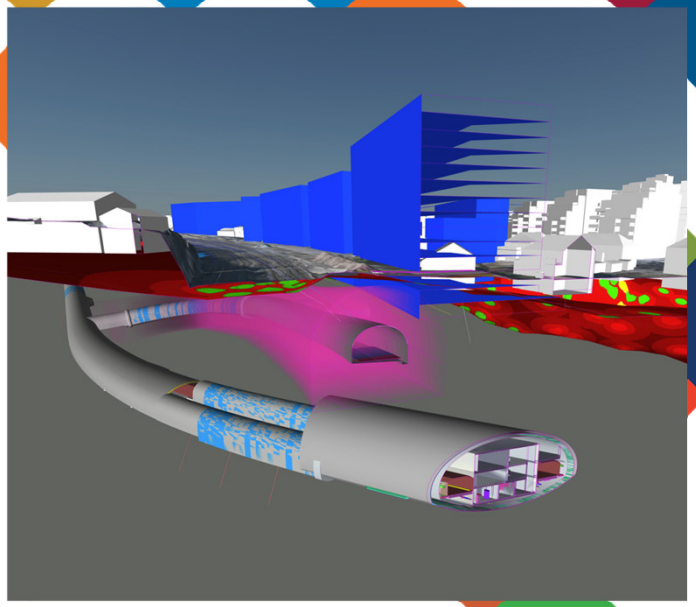
- Lack of 3D zoning plan
  Property is 3D – zoning plans are 2D (levels)



- Zoning plan level 1



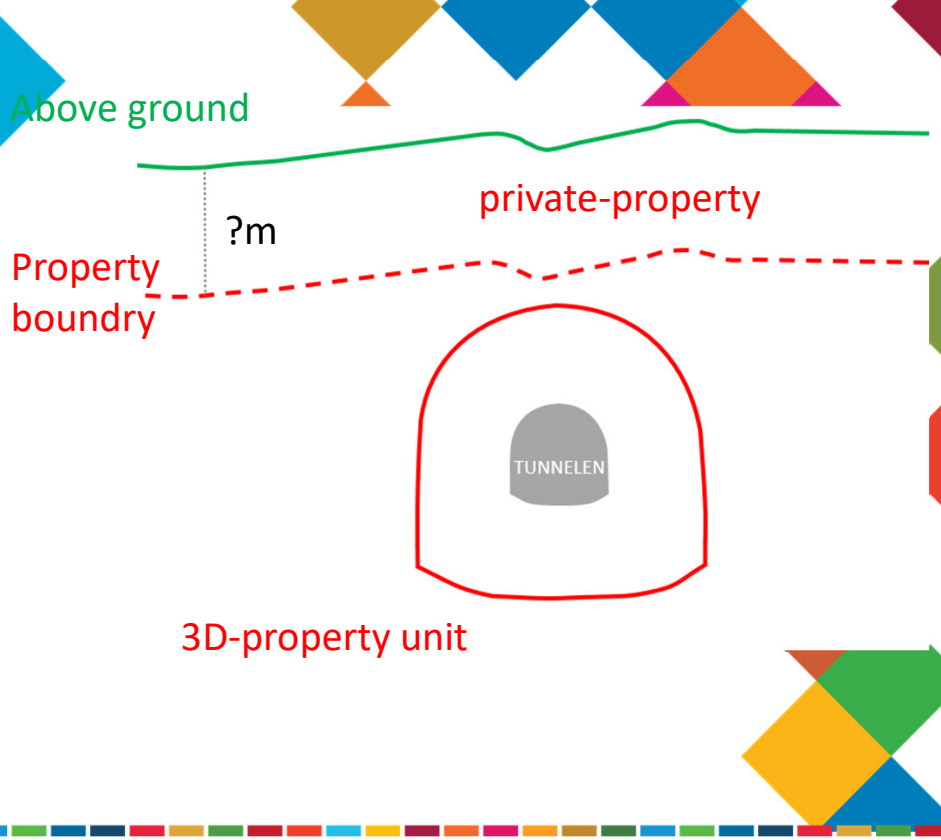
- Zoning plan level 2



- 3D-property-unit

5 - Who owns the underground?

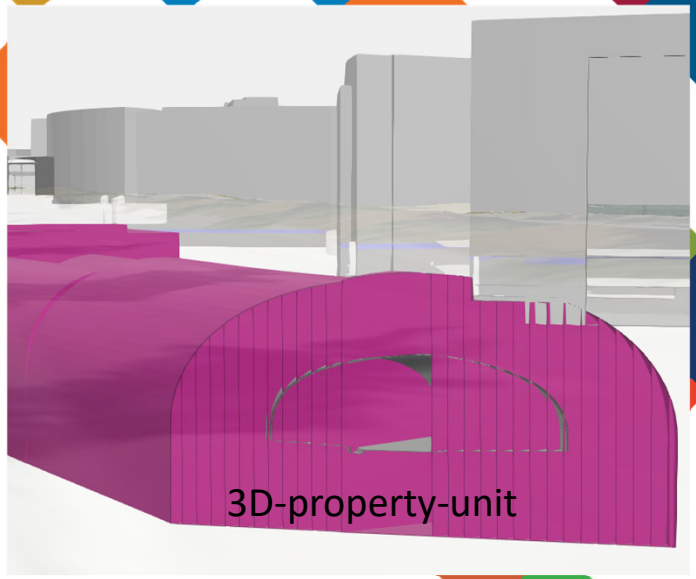
- In Norway you own as far down as you would have economic interests
- We've made assessments that property rights extend less than 10 meters down
- Reasoning:
  - 2018: Only 19 buildings in the capital region had 4 basement floors or more
  - Except the National Archives, all others were parking basements
  - Parking basements have low ceilings - 3 meters high?
  - Conclusion: ownership extends less than 10 meters underground since more than 3 basement floors are rare



95 properties in "owned underground"

Properties where our acquisition "collides" with the landowners' property rights

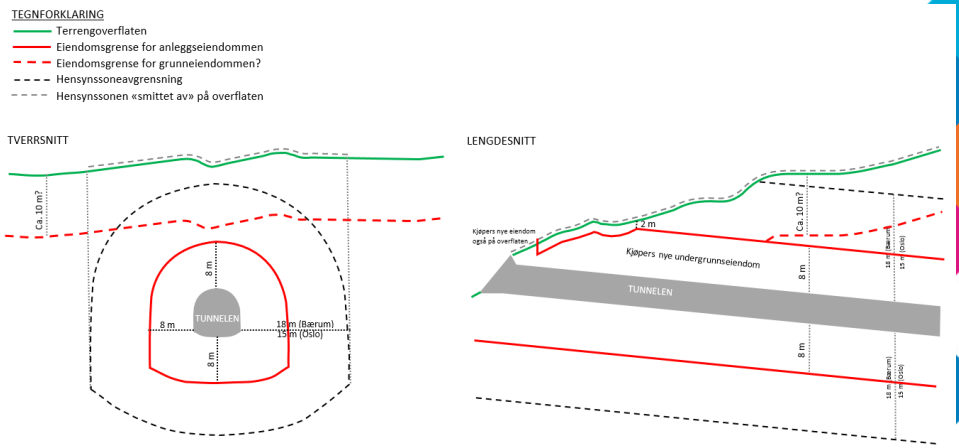
- The properties are classified based on our definitions of property rights (<10 m) , as well as our definition of our own need for property (the volume of the 3D-property-unit).
- Our acceptance that a property is affected does not necessarily mean they have an economic loss and a right to receive compensation.
- We are awaiting arbitration on several properties

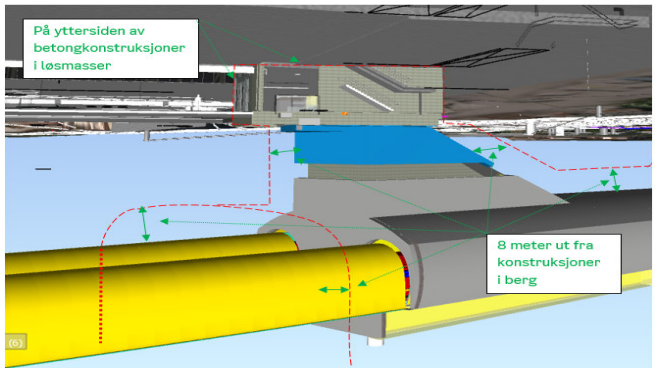


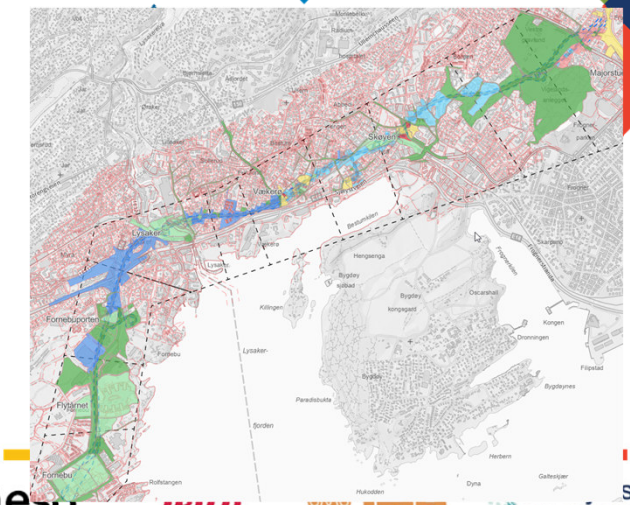
225 properties are in "ownerless underground"

- Who is a part – and who is not a part?
  - In cases of doubt, an "awaiting" part status is offered – let the court of arbitration decide.
- "Non owners" Receive an information letter about the acquisition, and offered no compensation
  - It has not resulted in conflicts

- Land acquisition database with GIS-map
  - Records
  - Communication with landowners
  - Communication with construction managers
- 550 properties
  - 140 affected above ground
  - 95 affected underground
  - 225 classified by us as “not owned”
  - 15 have energy wells
  - 40 are affected by **zones requiring special consideration** (not considered a part)
  - The rest are neighbors/not affected







The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG

2nd relevant SDG

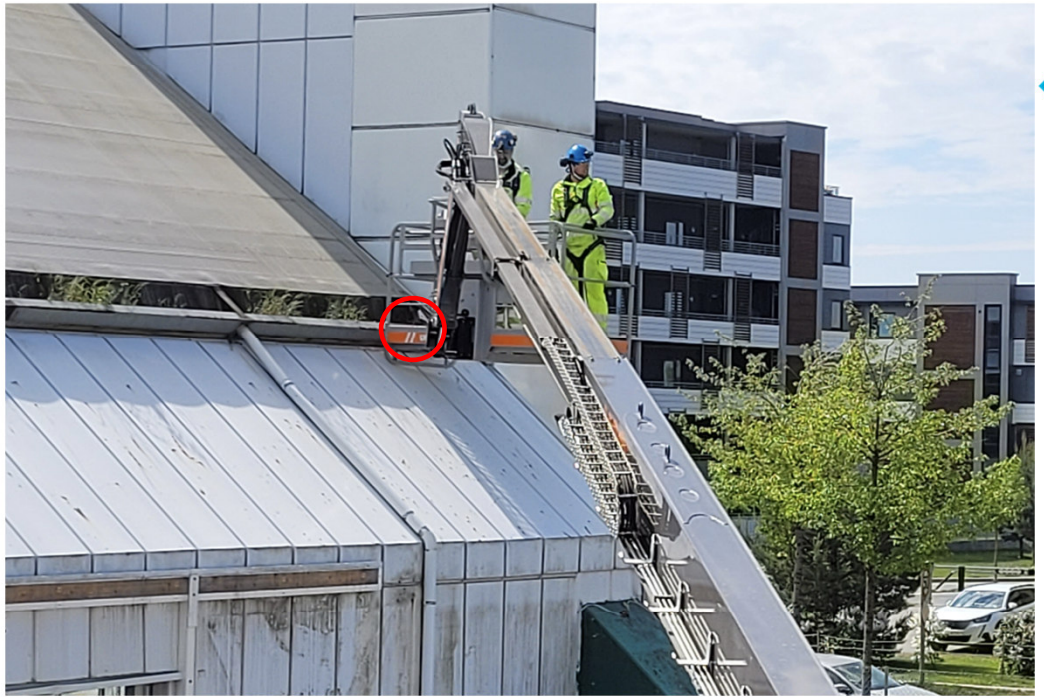
3rd relevant SDG

SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals

14 LIFE BELOW WATER

Freshwater pearl mussel *(Margaritifera margaritifera)*



Yes?

STEP 1: SELECT HERE THE THREE MOST RELEVANT SDGs
STEP 2: COPY THE SDG INTO PREVIOUS SLIDE