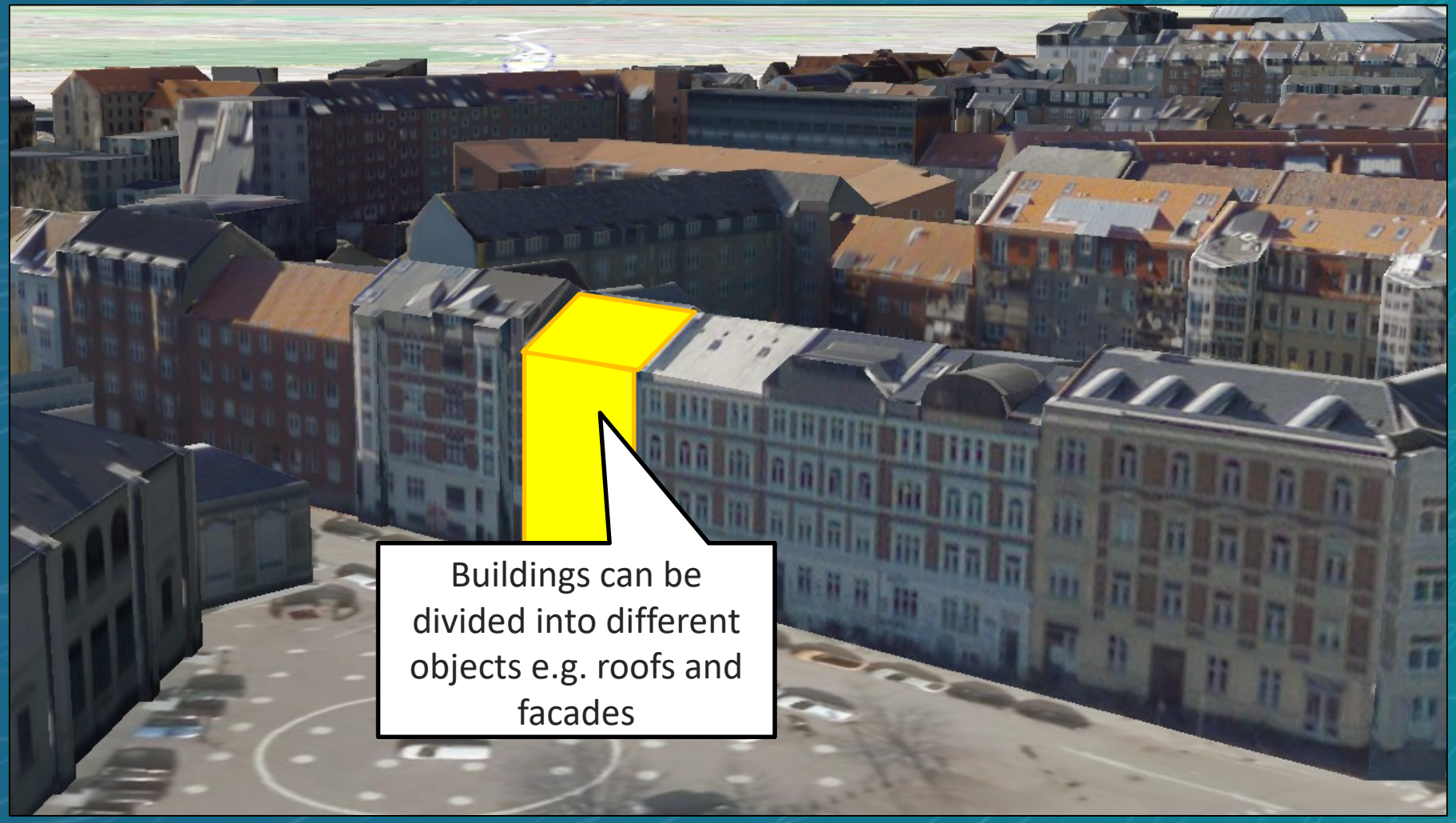
Denmark’s National Digital Twin

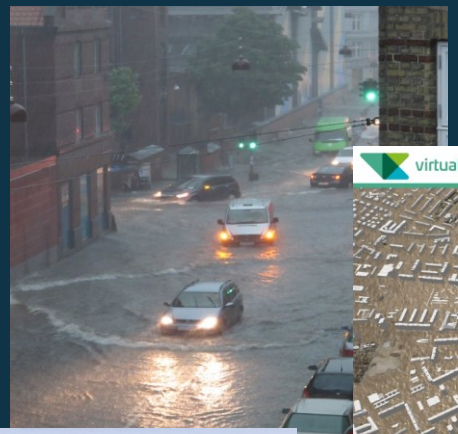
Agency for Climate Data

Digital Twin as common referenceframe

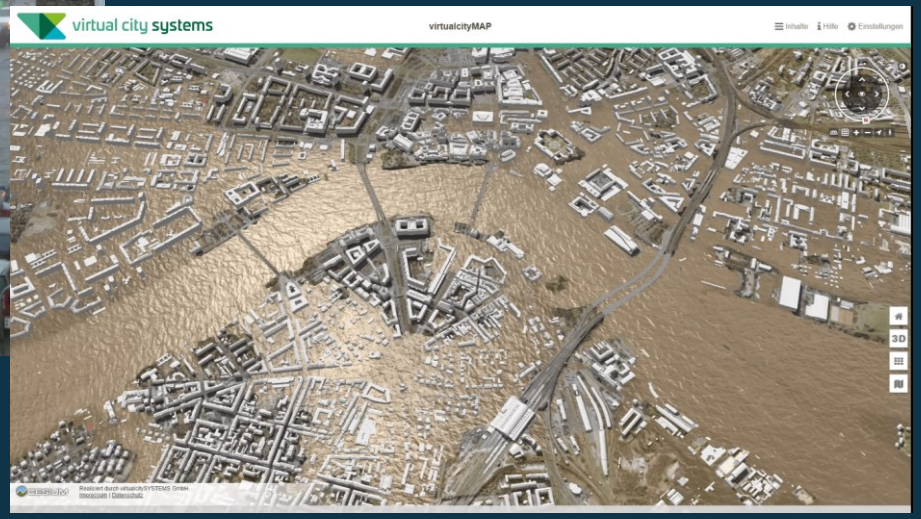
- 3D-data management system (vision: future basic public data)
- Standardized and updated
- Object-based model with unique ID’s. Possible to connect to other registers
- Function as a platform for IoT and Smart City.

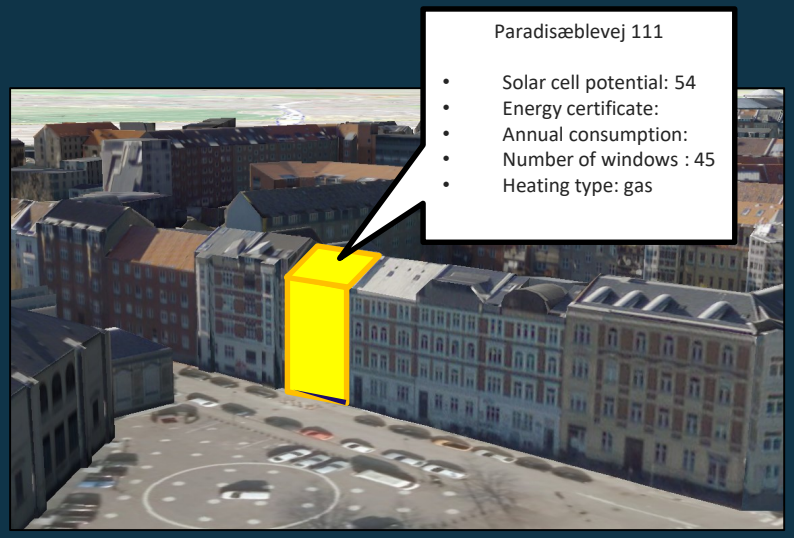


Examples of use cases :

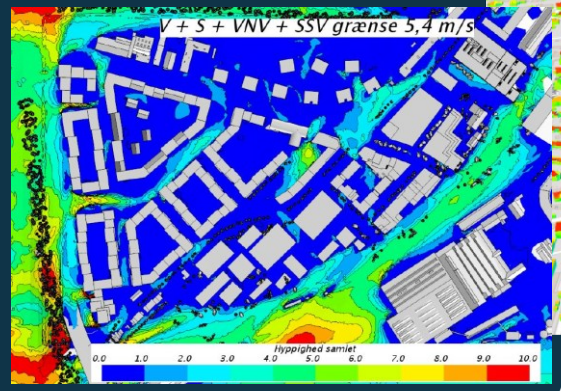


Climate adaption





Energy optimization

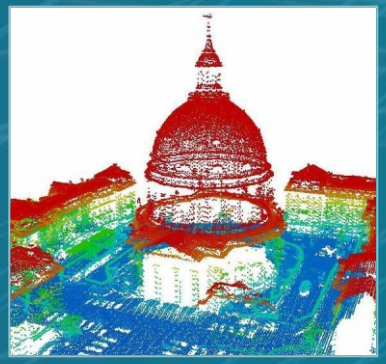


Physical planning

Analyzes: view, wind, noise, light/shadow, solar potential

DATA FOUNDATION:

- The Danish elevation model
- Building polygon from GeoDanmark (footprint)
- GeoDanmark orthophotos



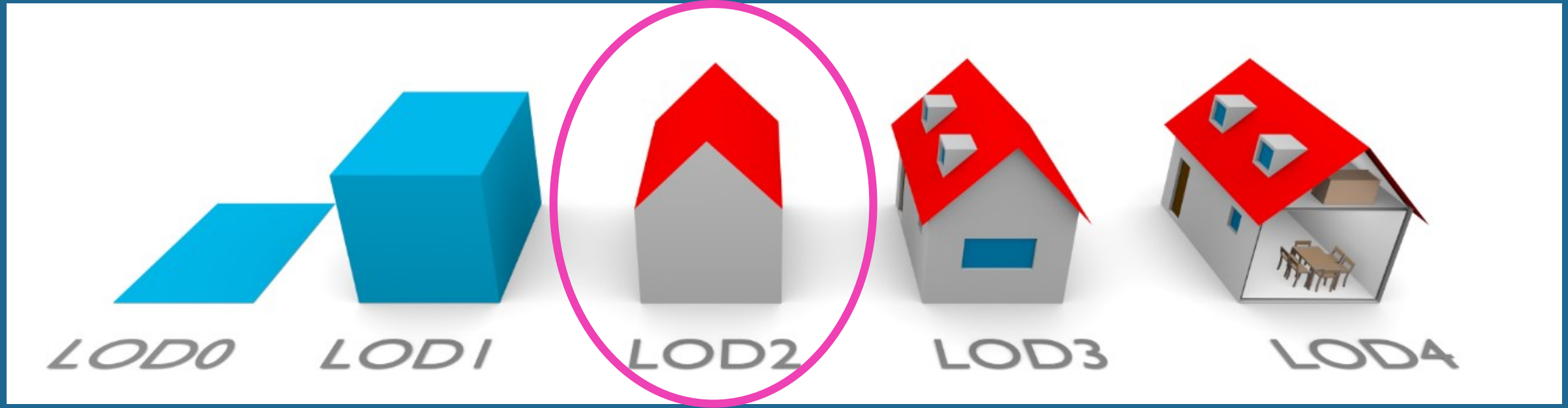
The Danish Elevation Model

GeoDanmark-buildings

Orthophotos

Agency for Climate Data

CityGML: Levels of Detail (LOD)



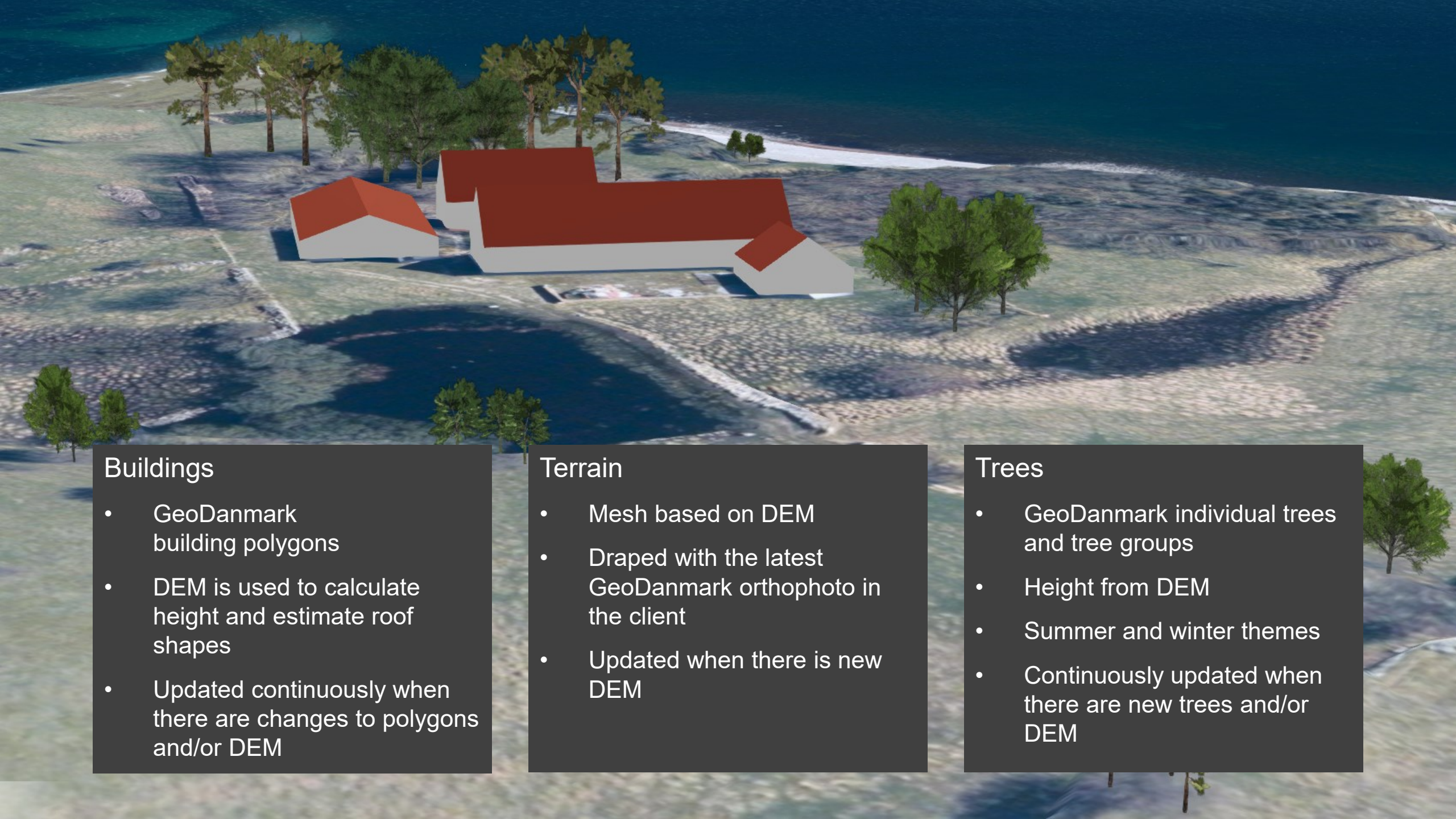
LOD0 is a 2.5D Digital Terrain Model that can be draped with aerial photos or maps.

LOD1 is a "brick model" and the simplest model type. The houses appear with flat roofs.

For a **LOD2** building, the most basic roof surfaces are raised, i.e. a gable roof.

A **LOD3** building is an architectural model and erected with all roof structures, as well as windows and doors.

A **LOD4** building is an architectural model with interior information such as rooms and furniture.



Buildings

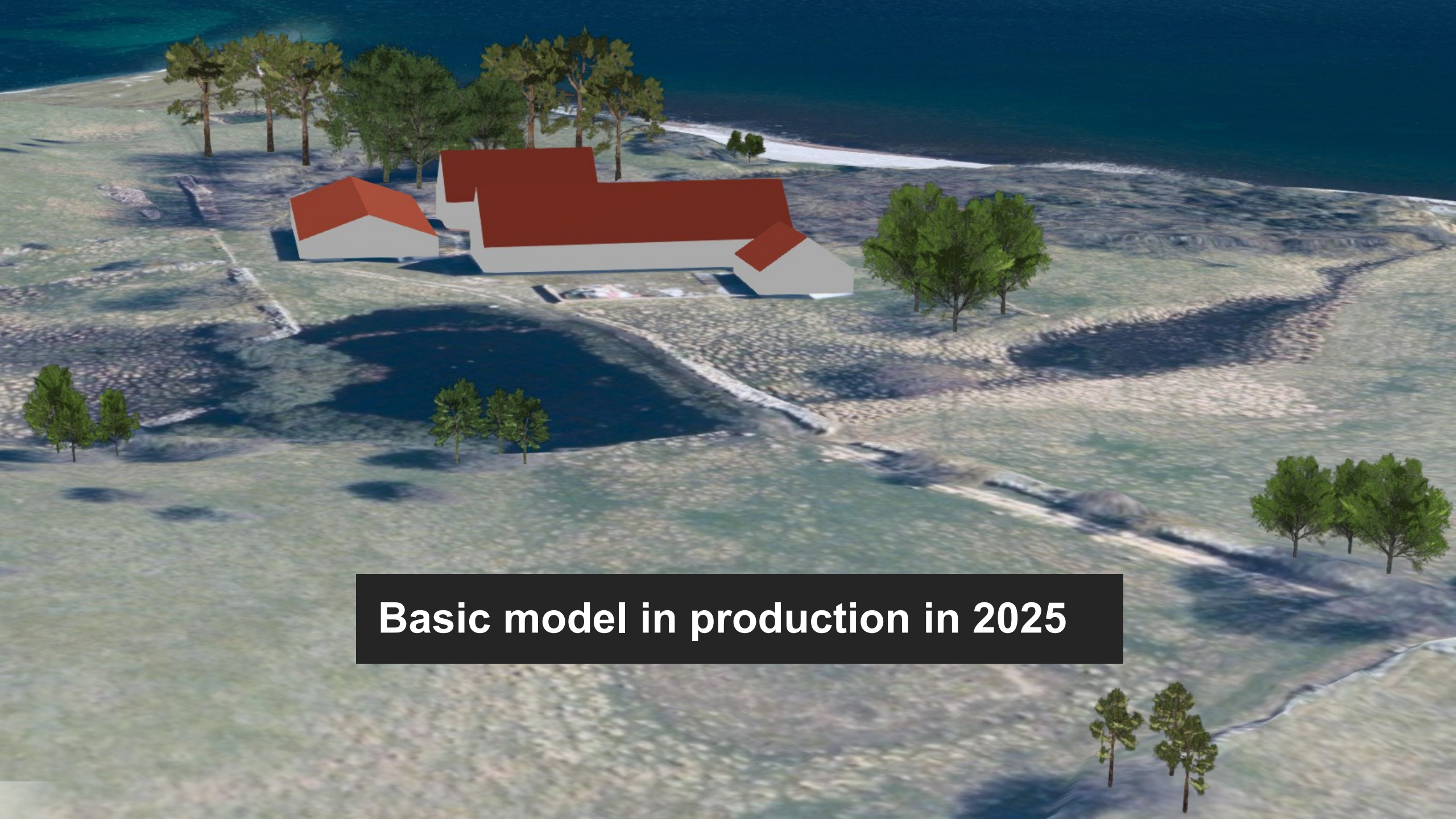
- GeoDanmark building polygons
- DEM is used to calculate height and estimate roof shapes
- Updated continuously when there are changes to polygons and/or DEM

Terrain

- Mesh based on DEM
- Draped with the latest GeoDanmark orthophoto in the client
- Updated when there is new DEM

Trees

- GeoDanmark individual trees and tree groups
- Height from DEM
- Summer and winter themes
- Continuously updated when there are new trees and/or DEM


Basic model in production in 2025

3 development projects

Draping of oblique images

- On the fly draping
- Visualization

Hydrology

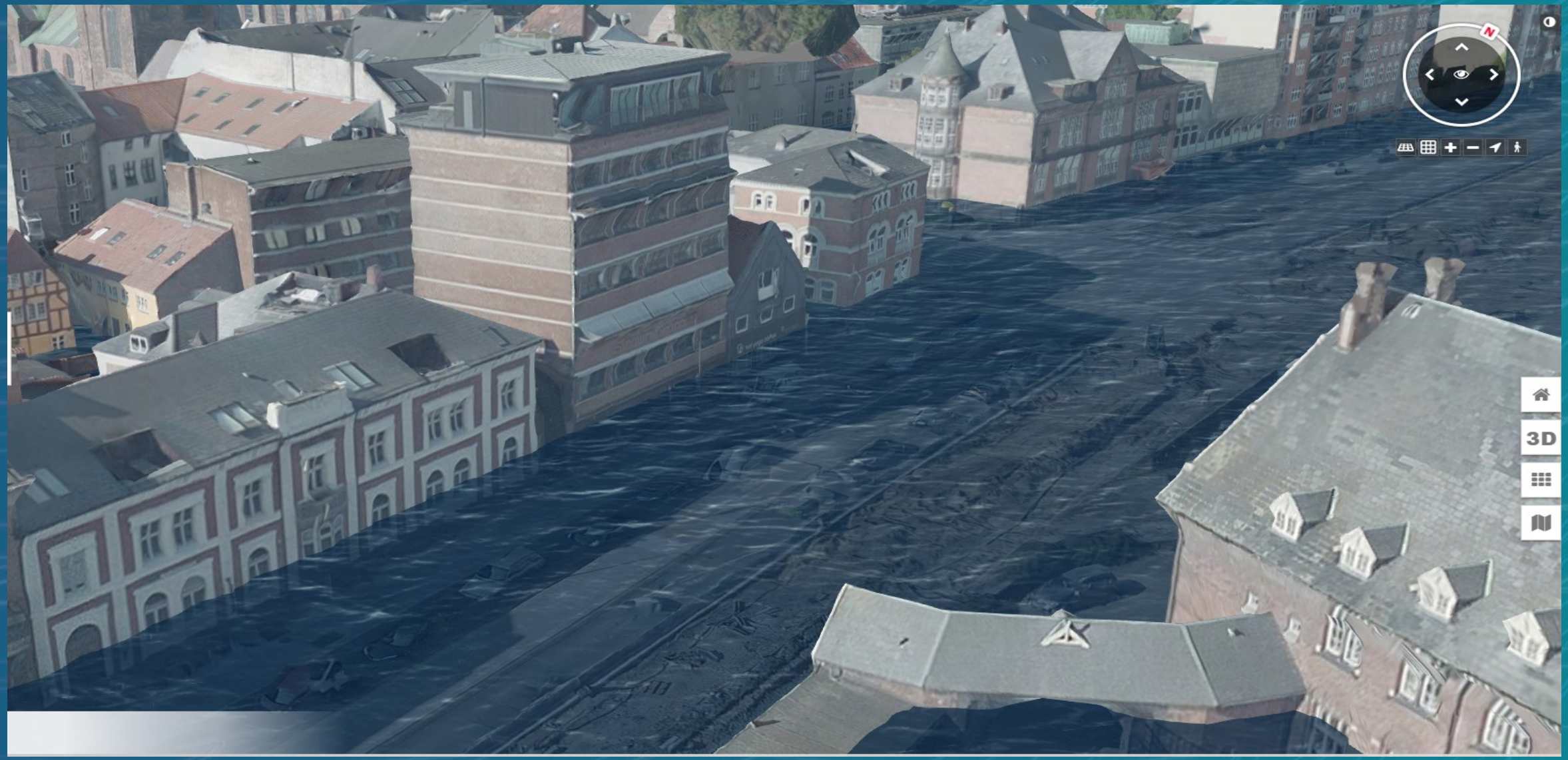
- Converting hydrological data to be used in 3D
- What happens during:
  - extreme rainfall scenarios
  - storm surge
  - floods
- Visualization

Forests

- Tree detection in Danish forests
- Classification of species
- Visualization

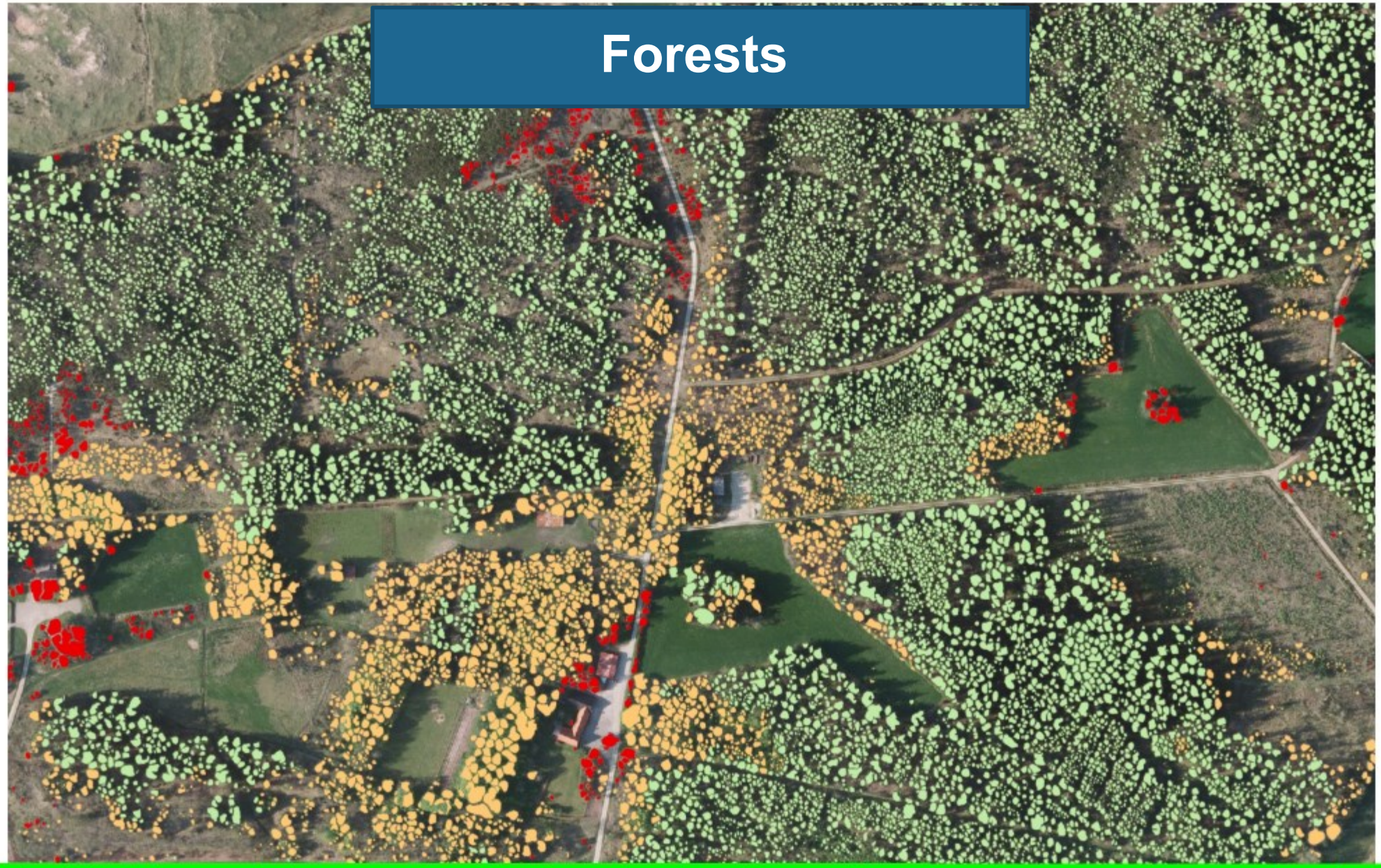
Hydrology

Visualization of storm surge scenario of 6 m in Aarhus in Denmark's Digital Twin with 3D orthophotos

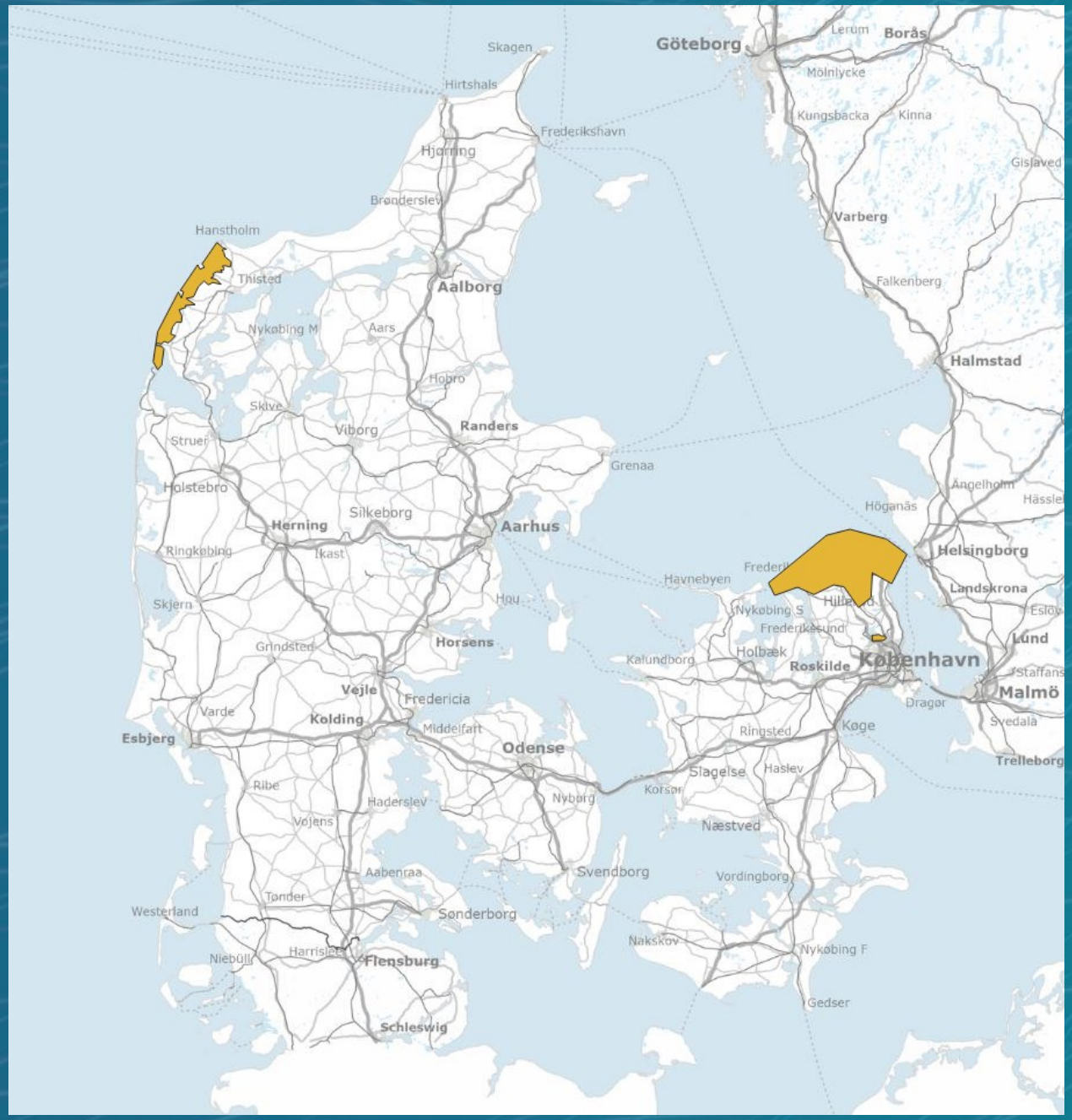


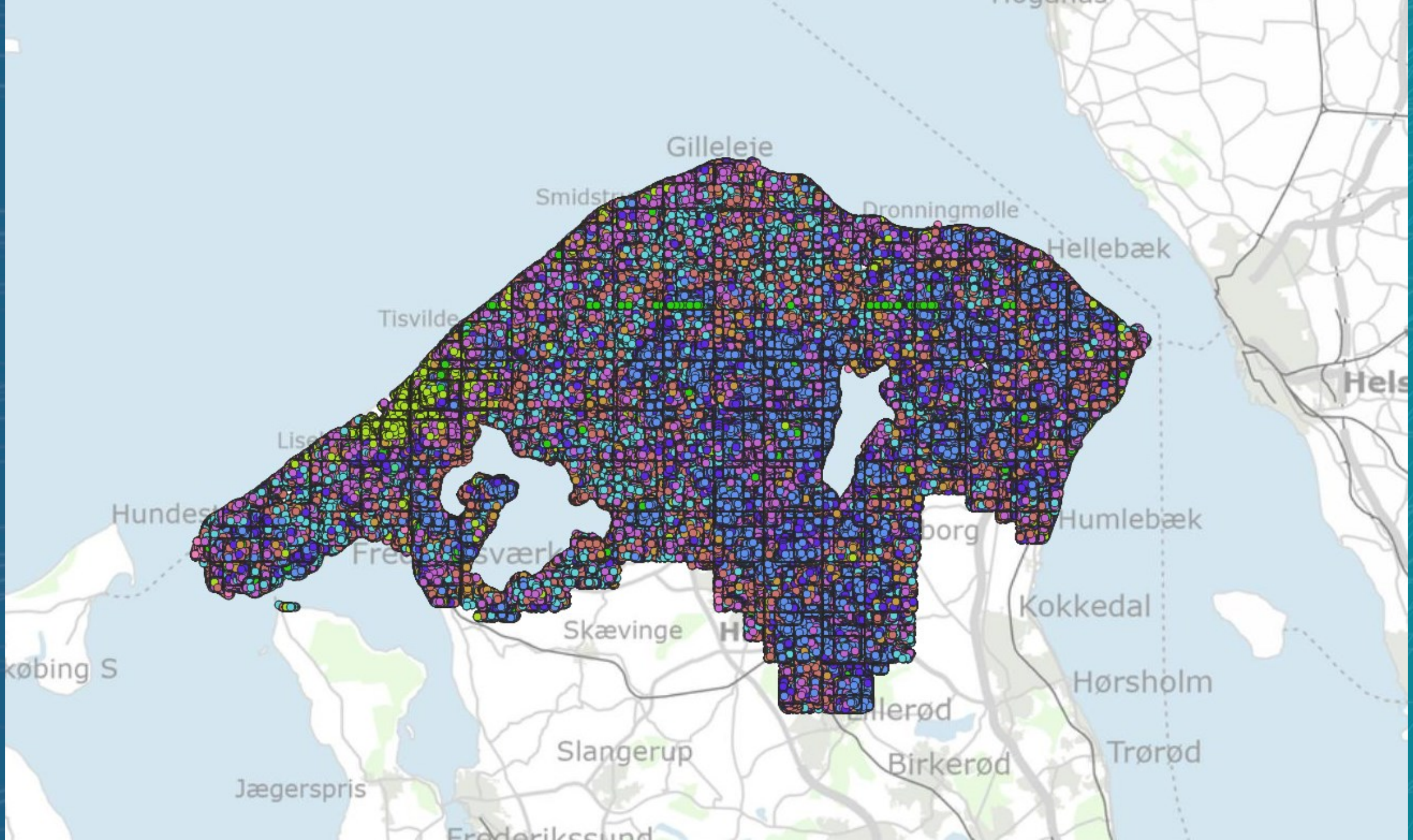
The digital twin is interactive and can be shown on detailed level

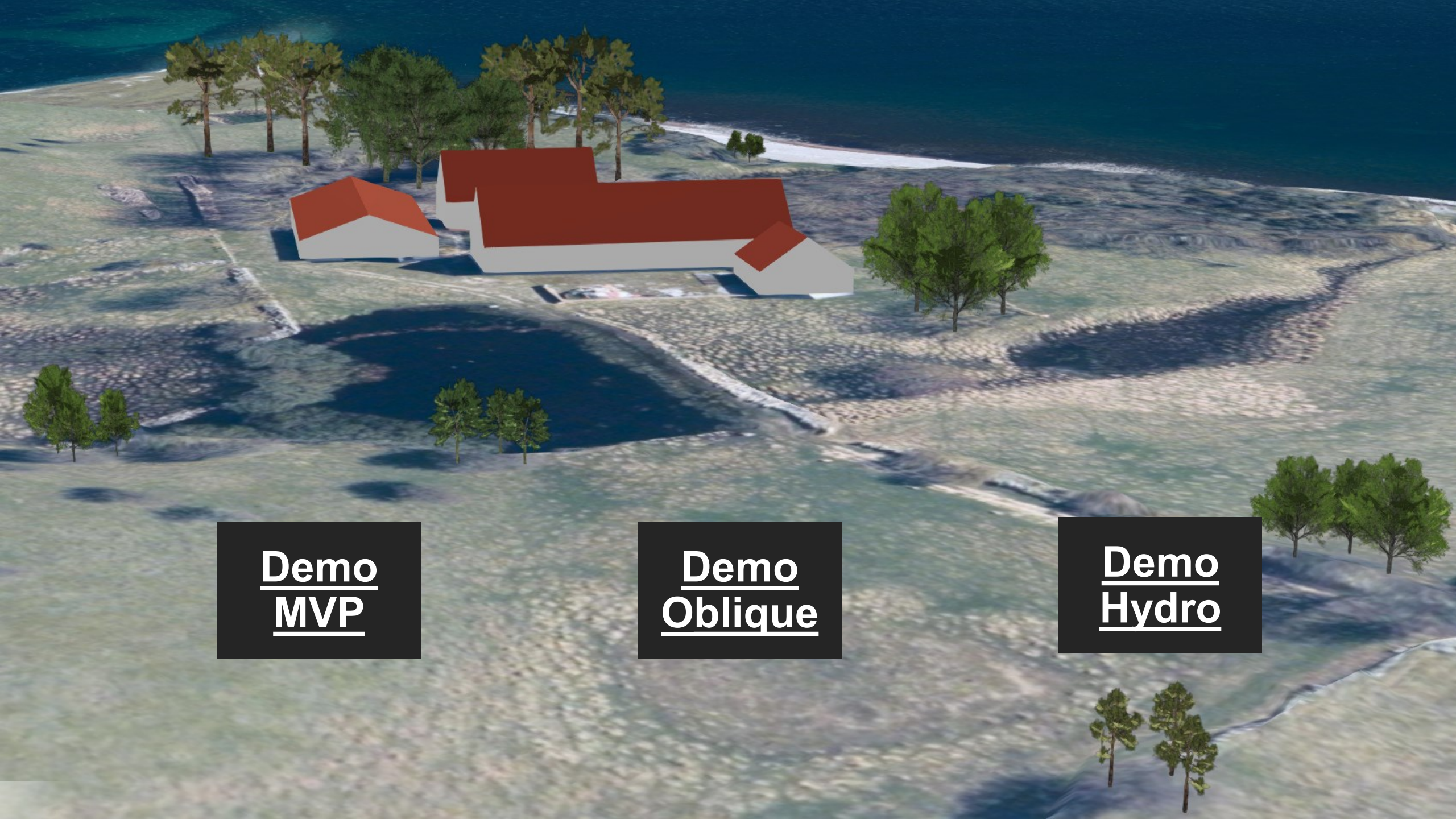
Forests



Polygon dataset (in this example trees are colored by Copernicus forest type, red=non-forest, green=coniferous, yellow=deciduous): each tree is associated with an attribute table containing e.g., crown area/diameter, Copernicus forest type, estimated tree height


Skagen
Göteborg
Lerum
Borås
Mölnlycke
Hirtshals
Kungsbacka
Kinna
Frederikshavn
Hjørring
Gislaved
Brønderslev
Varberg
Hanstholm
Thisted
Aalborg
Falkenberg
Nykøbing M
Aars
Halmstad
Hobro
Skive
Viborg
Randers
Struer
Grenaa
Holstebro
Ängelholm
Höganäs
Silkeborg
Herning
Aarhus
Helsingborg
Ringkøbing
Ikast
Havnebyen
Landskrona
Skjern
Hou
Nykøbing S
Frederikssund
Lund
Horsens
Grindsted
Kalundborg
Holbæk
Roskilde
København
Vejle
Fredericia
Malmö
Dragør
Varde
Kolding
Middelfart
Ringsted
Køge
Svedala
Esbjerg
Odense
Trelleborg
Slagelse
Haslev
Ribe
Korsør
Haderslev
Nyborg
Vojens
Næstved
Aabenraa
Svendborg
Vordingborg
Tønder
Westerland
Sønderborg
Nakskov
Nykøbing F
Niebüll
Harrislee
Flensburg
Gedser
Schleswig


Gilleleje
Dronningmølle
Hellebæk
Tisvilde
Humlebæk
Kokkedal
Skævinge
Hørsholm
Slangerup
Birkerød
Trørød
Jægerspris


Demo
MVP
Demo
Oblique
Demo
Hydro

Denmark’s National Digital Twin:
https://dataforsyningen.dk/labs/2265

Klimadatastyrelsen