# How do we handle geodata and services with positions in a global reference frame?

EUREF symposium 2023 – Gothenburg. Gro Grinde, Karoline Skaar, Sveinung Himle - Norwegian Mapping Authority

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# Background and challenges

- The official reference frame in Norway is a realisation of ETRS89, called EUREF89.
- All Norwegian RTK services will give you results in this frame.
- Official geodata in Norway are always referred to EUREF89:
  - Cadastre
  - Maps
  - Roads
  - Agriculture
  - Etc.
- The difference between EUREF89 and ITRFxx current epoch in Norway is ~70 cm.

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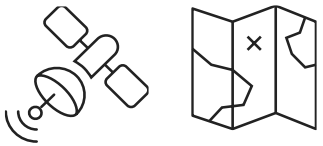
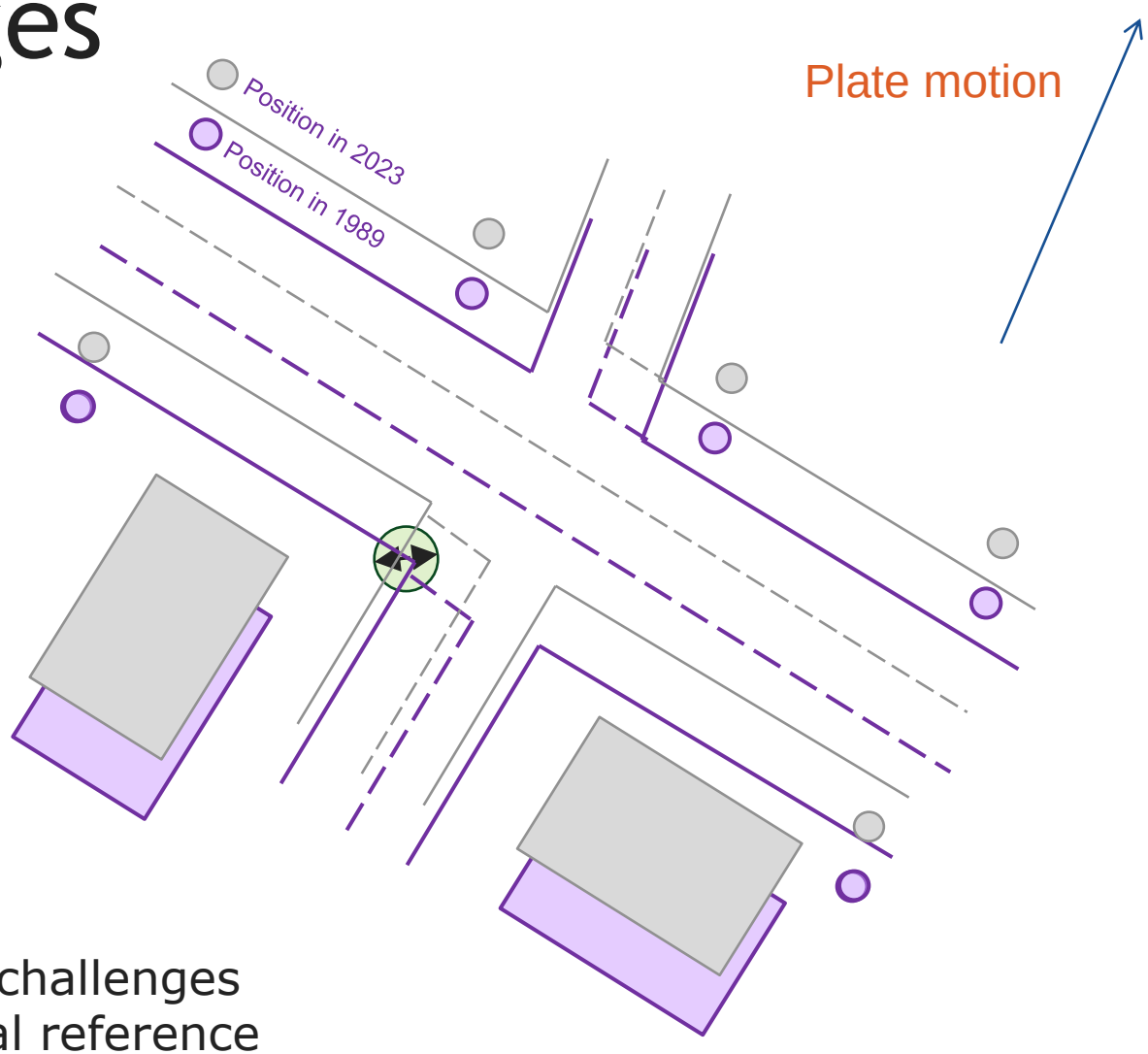


# Background and challenges

- GNSS positioning services with high accuracy, operates in a global reference frame.
- Increased use of data in a global reference frame (WGS84, ITRFxxxx)
- Data collection and contribution from new user groups (non-geodata experts)
  - Crowd sourcing
  - ITS
  - Mobile platforms
  - IoT
  - Drones




How do we meet the challenges when maps in national reference frames should be combined with positions in global reference frames?

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# Project overview

How to facilitate a simple introduction of new reference frames if it becomes relevant?
How to make use of global reference frames?

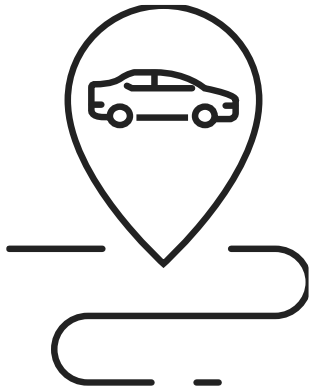
| | |
|---|---|
| Why? | • Multiple factors demands that we handle reference frames different from what we do today. E.g. precise positioning services and increased demand for these services from different user groups (Galileo-HAS) |
| What? | • This project aims to:<br>1. Presentation/report on how to accommodate these challenges.<br>2. Detailed project plan<br>3. Documentation and background information for the plan |
| How? | • The project will draw up hypotheses and principles for future updates of the reference frame. These hypothesis will be tested against a selection of geodata stakeholders and updated accordingly. |
| Who? | • If we are to change/update the national reference frame, multiple stakeholders will be affected of these changes. Any changes and updates in the future should be rooted with geodata stakeholders. |
| When? | • This project will not conclude when a possible change/update will take place, only define the prerequisites for any change/update. |

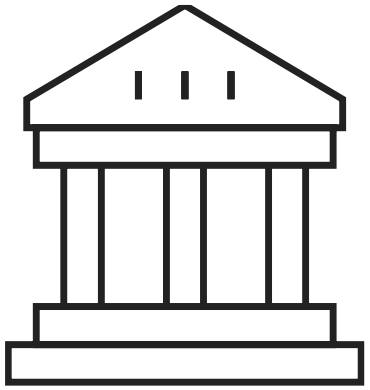
# Report structure – key parts

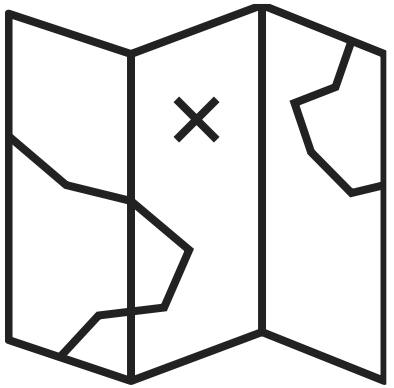
Data collection

Administration

Distribution







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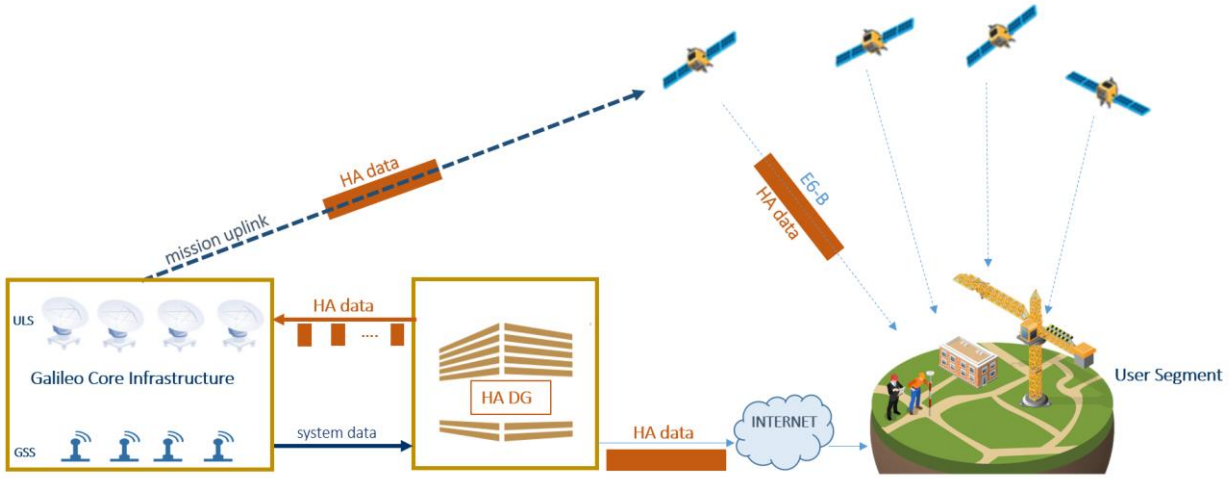
# Technology trends - GNSS

- Absolute positioning (PPP)
  - Hexagon SmartNet Global PPP
  - U-blox PPP
  - Reference frames > ITRFxx, WGS84

- Galileo High Accuracy Service (HAS)
  - Free of charge access
  - Horisontal Accuracy < 20 cm (95 %)
  - Vertical Accuracy < 40 cm (95 %)
  - Reference frame > GTRF (~ITRF)

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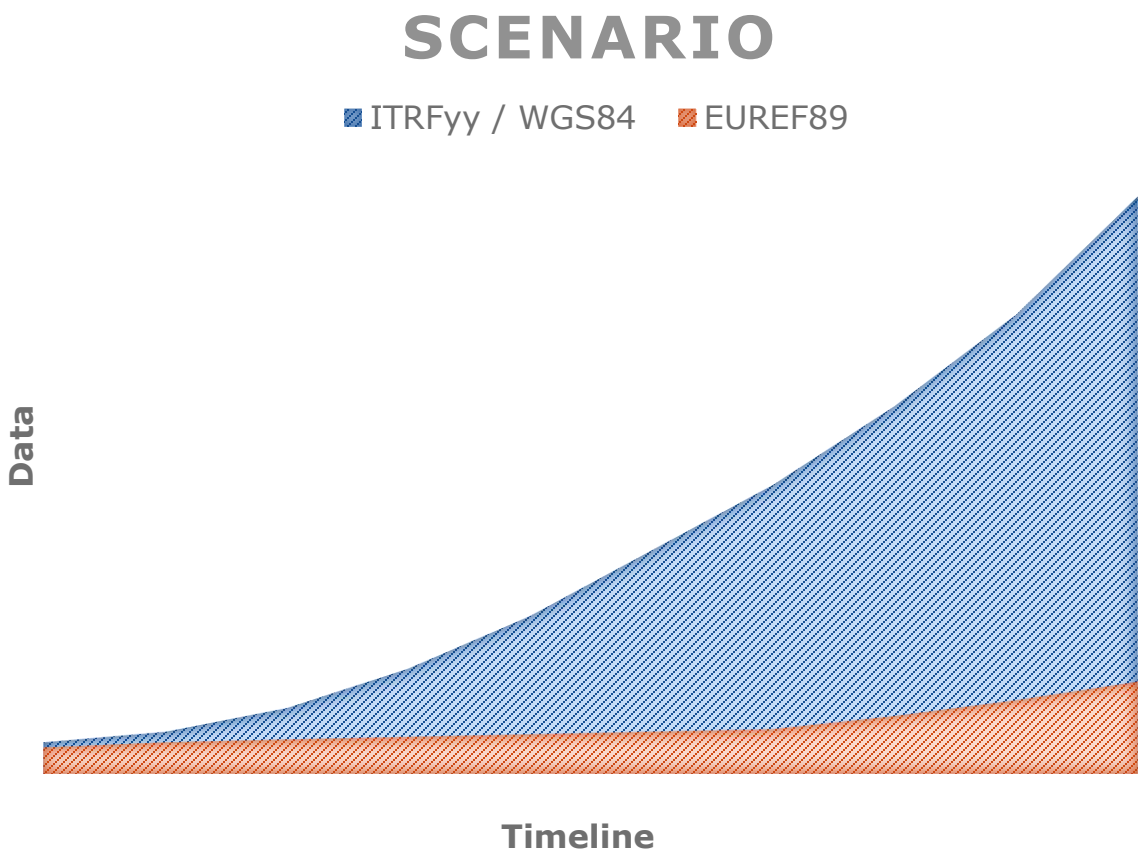
# Future scenario

- Probably, global reference frames will be more used at devices and by users
- The use of EUREF89 is more stable

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# CASE: ITS and reference frames

The ITS community faces two challenges with respect to reference frames

1. The very existence of different reference frames
   - Different GNSS methods → results in different reference frames
   - Any set of coordinates must be accompanied by the reference frame used
   - Different reference frames requires transformations

2. Standards for positioning in ITS requires global reference frames, national maps in national reference frame
   - High-definition maps in national reference frame (for Norway EUREF89)
   - Requires transformation of data
   - Continental drift and intra plate deformations entails difficulties using maps, since coordinates of physical objects in a regional frame will become less accurate over time.

HORIZON-CL5-2022-D6-01-01 - European demonstrators for integrated shared automated mobility solutions for people and goods (CCAM Partnership)

MODI A LEAP TOWARDS SAE L4 AUTOMATED DRIVING FEATURES

**Coordinator:** ITS Norway

**Partners:** 34 (27 participants + 2 affiliated entities + 5 associated partners)

**Timeline:** 1 October 2022 - 31 March 2026

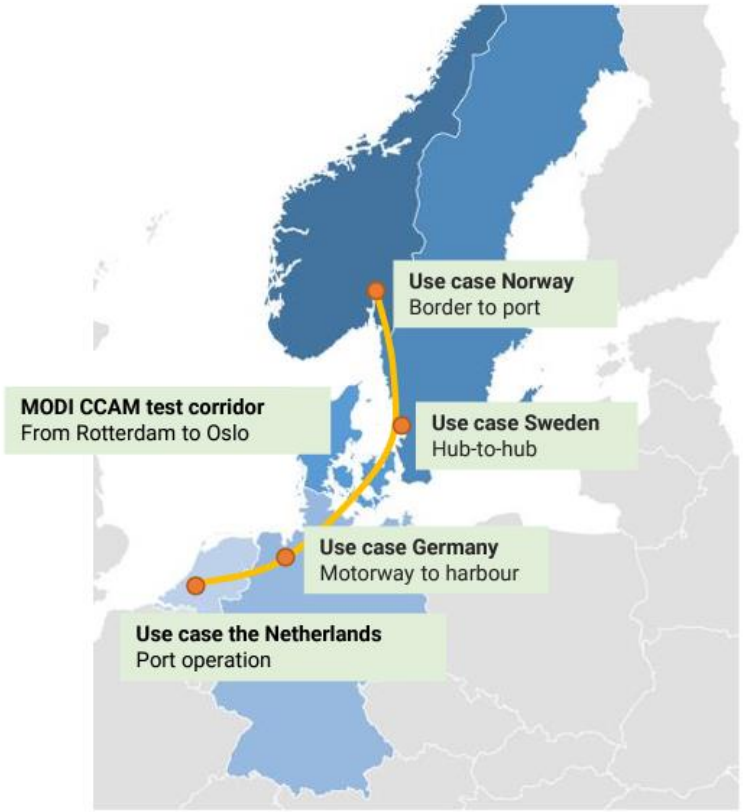
**Total cost:** € 27,992,880 - **EU contribution:** € 23,030,095

**Funding scheme:** Innovation Action (IA)

# The ambition of MODI

## Accelerate the introduction of CCAM solutions to significantly improve logistic chains

- The MODI project aims to **accelerate the adoption of highly automated freight vehicles through demonstrations** and by **overcoming barriers** to the **rollout of automated transport systems and solutions in logistics**.
- MODI will demonstrate automated heavy-haul vehicles use cases on the **logistics corridor from Rotterdam in the Netherlands to Moss in Norway**, crossing four national borders and demonstrating terminal operations at four different harbours and terminals in route.
- **Automated transport** will **significantly contribute** to **improving European transport and logistic chains**. The MODI initiative will contribute to make substantial steps toward identifying and resolving barriers preventing this from coming true.

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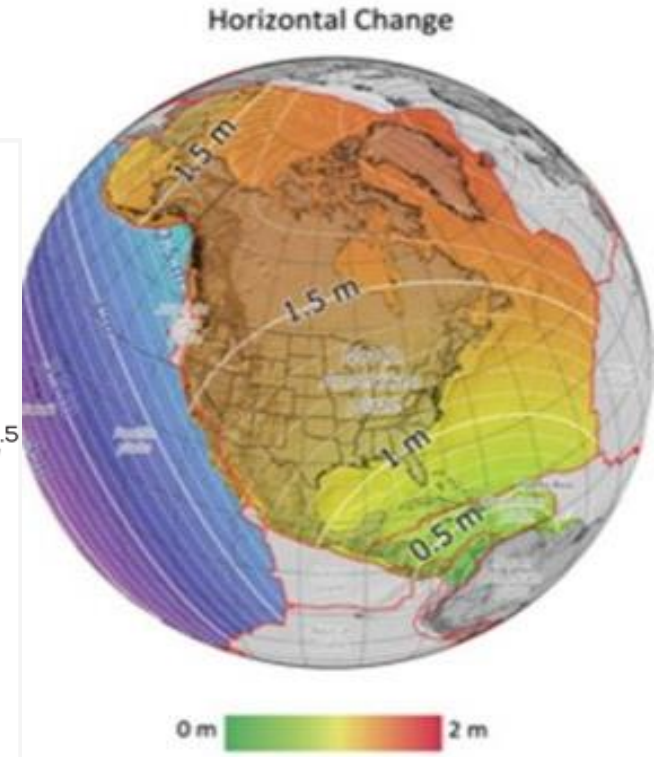
https://modiproject.eu/

# International initiatives


*Approximate shift from GDA94 to GDA2020 locations across Australia. Image sourced from ICSM website.*




Differences NAD83 NATRF2022

**North America (USA/Canada)**

- Modernized NSRS
- 2 reference frames approach
  - NAD83, updates from ITRFyy
  - NATRF2022, PATRF2022, MATRF2022, CATRF2022

**Australia/New Zealand**

- Organized by ICSM and ANZLIC
- "Two-frame" approach
  - GDA2020
  - ATRF2014/ATRF2020
  - MDWG (Metadata Working Group)

**Europe?**

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# Possible activities

Reference frames

- Realization and developing
- Updates

Standardization

- ISO (ISO 19111 / ISO 19115 etc.)
- OGC
- Metadata, reference frames and transformations
- Observed epochs and reference frame epochs

Formats, applications, frame works

- Databases
- Exchange formats
- Improved spatial data deliveries
- IT architecture

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# Questions?

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