

# Regulation of RTK Services in Denmark

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# Outline

- Background
- Norm for RTK-services
- Recommendations on Good GNSS survey practise
- The process

# RTK – Real Time Kinematic

- High accuracy GNSS positioning in real time
  - RTK data is often transmitted to users from an RTK service provider
- Areas of application:
  - Land surveying
  - High precision navigation
  - Agriculture
  - Offshore surveying
  - etc.

# National Survey and Cadastre - Denmark

- Is a government organisation under the Ministry of the Environment
- National authority for maps, charts, and geo-data, and for the spatial infrastructure for eGovernment in Denmark
- Approximately 300 employees

# Denmark

- Area is about 1/3 the size of Georgia
- 5 million people
- Lots of RTK-users



# Coordination and regulation

- The National Survey and Cadastre is responsible for coordination of activities related to mapping and surveying in Denmark
- Also responsible for development and operation of the Danish Cadastre, and for laws and regulation of cadastral land surveying
  - Including requirements to procedures and documentation for GNSS based cadastral surveying

# RTK in Denmark

- In Denmark, RTK-GNSS positioning is used as a very important 'tool' for most mapping and land surveying
- The development is driven by two competing companies, both providing nationwide RTK-services in Denmark
  - Based on Trimble and Leica solutions respectively
- Denmark was (probably) the first country with a nationwide RTK service
  - First nationwide service in 2001

# Regulations of GNSS services

- Regulation of GNSS services is carried out:
  - at sea, by IALA and national authorities
  - in the air, by ICAO and national authorities
- No previous Danish regulation of positioning and navigation on land
  - neither for high accuracy applications (surveying)
  - nor for low accuracy applications (vehicle navigation)



# Norm for RTK services, purpose

- Purpose:  
To ensure quality of performance for *public* land survey activities
- Because the quality of surveying is of vital importance for the society (infrastructure, mapping, construction works etc.)
- The law of the National Survey and Cadastre provides the opportunity to introduce norms and standards for public surveying and mapping

# Norm for RTK services, content

- The norm for RTK services focuses on:
  - Accuracy
  - Integrity
  - Continuity
  - Availability
- With RTK services for land surveying, there are no safety of life issues
  - => weaker requirements than for air applications

# Norm for RTK services, content

- Requirements to the RTK service provider with respect to:
  - Documentation of coverage area
  - Quality of coordinates for reference stations
  - Obtainable user accuracy, horizontal and vertical
  - Monitoring of accuracy and integrity
  - Distribution of warnings and error messages
  - Availability on weekdays at 98%
  - etc.

# Use of Norm for RTK services

- Registration of property boundaries in the cadastre
  - If land surveying is carried out using RTK GNSS, coordinates will be accepted only if an RTK service provider complying with the norm has been used
- It is further envisioned that land survey activities funded by public authorities will require RTK services complying with the norm

# Good GNSS survey practise

- Quality of positions determined by RTK is also dependent on qualifications of the user
  - But no education is necessary to use the equipment
- Therefore a set of recommendations to be followed by RTK-users have been developed
- Purpose is to reduce the risk of poor quality caused by 'human errors'

# Good GNSS survey practise

- Examples of good GNSS survey practise:
  - Always perform control surveys
  - Be aware if surroundings provide much multipath or signal blockage (urban and forest areas)
  - Be aware during poor DOP conditions
  - Be aware if only 5 satellites are visible
  - Be aware if initialisation is slower than 'usual'
  - Only use positions based on fixed solutions (no float or DGPS solutions)

# The process

- Norm for RTK services will be effective this fall
- The two year long process included:
  - Dialog with existing RTK service providers in Denmark
  - Dialog with the National Land Survey of Sweden
  - Dialog with RTK users in Denmark
  - Dialog with layers
  - Hearing with a large number of organisations including universities, government organisations, and professional associations

# Discussion

- The “Norm for RTK Services” and “Recommendations for Good Survey Practise” are new initiatives in Denmark
  - Lessons have been learned during the process
- A professional relationship between RTK service provider and user / customer is still required
  - for instance with respect to liability and pricing