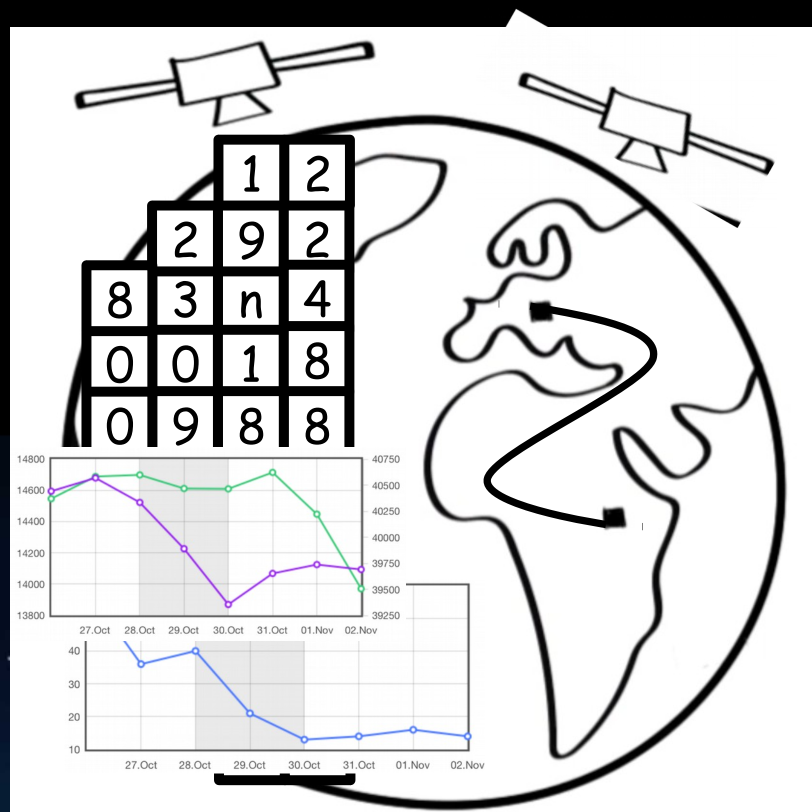
Integrating geography and statistics, but what about earth observation?



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Bridging communities – heterogeneity

Statistical Community

NSS Socio-Economic Datasets

Core Statistical
Census, Demographics, Agriculture, Building, Labour Force, etc.

Tax
Income and Business Tax

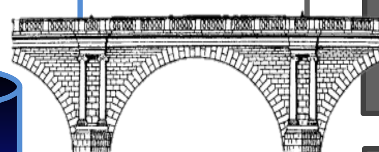
Immigration

Health
Medicare, Pharmaceuticals, Workforce

Land
Valuation and Use

Social Welfare
Unemployment, Disability, Family Support

Others …



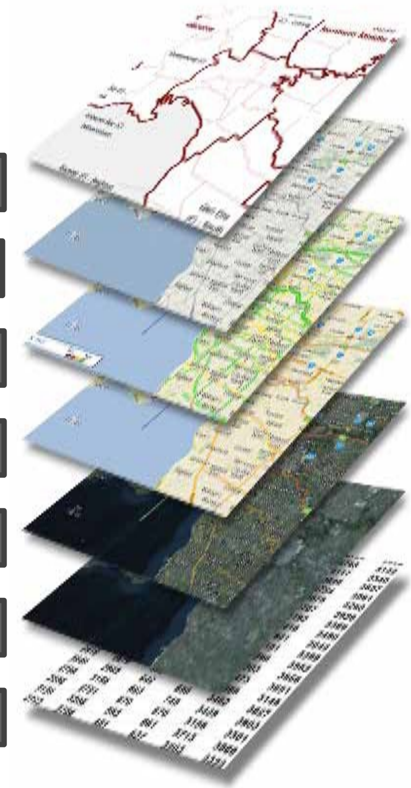
SSF bridge

Spatial Community

Foundation Spatial Data Frameworks – Fundamental Elements

Data layers:

- Admin. & statistical boundaries
- Addressing, Place Names
- Transport, Water
- Land and Property
- Elevation and Depth
- Imagery
- Positioning



Source: UN-GGIM, 2015

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Spatial community – internal differences

National Mapping Authorities

Method:

- “Definite mapping”

Data:

i. Moderate data volumes
ii. Object-based
iii. Resolution: Geographical
iv. Diverse specifications and quality
v. Discontinuous data/borders included
vi. Variable usage rights / licensing
vii. Updating: Periodic/Continuous (low frequency)

Earth Observation (EO) community

Method:

- “Probability mapping”

Data:

i. Considerable data volumes
ii. Image-based
iii. Resolution: Geographical, Spectral and Temporal
iv. Consistent specification and quality
v. Seamless/borderless
vi. Uniform usage rights / licensing
vii. Updating: Continuous (high frequency)

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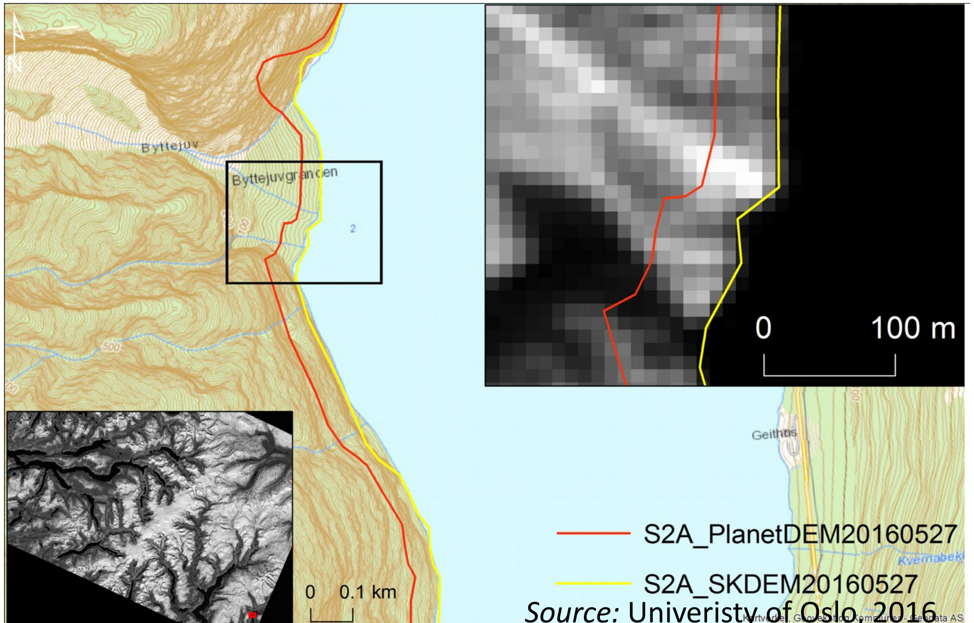
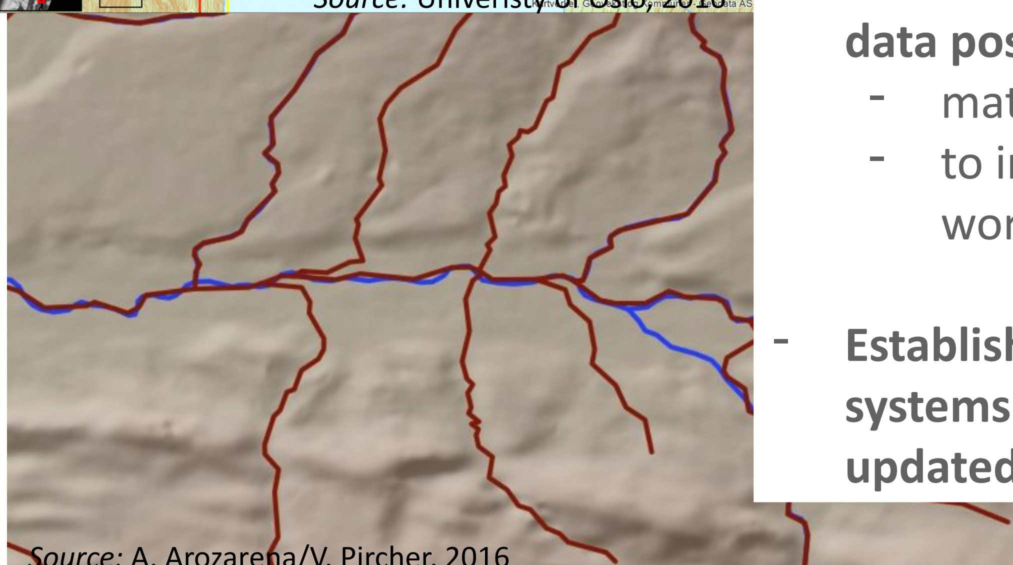
Collaboration is crucial



Source: Univeristy of Oslo, 2016



Source: A. Arozarena/V. Pircher, 2016

High quality reference data consistent with the national reference data is important in order to:

- **Make satellite data analyse-ready**
  - Digital Elevation Model for orthorectification of satellite imagery
- **Make derived products from satellite data possible to:**
  - match to national data and
  - to integrate into national users workflows
- **Establish common maintenance systems to ensure consistent and updated data**

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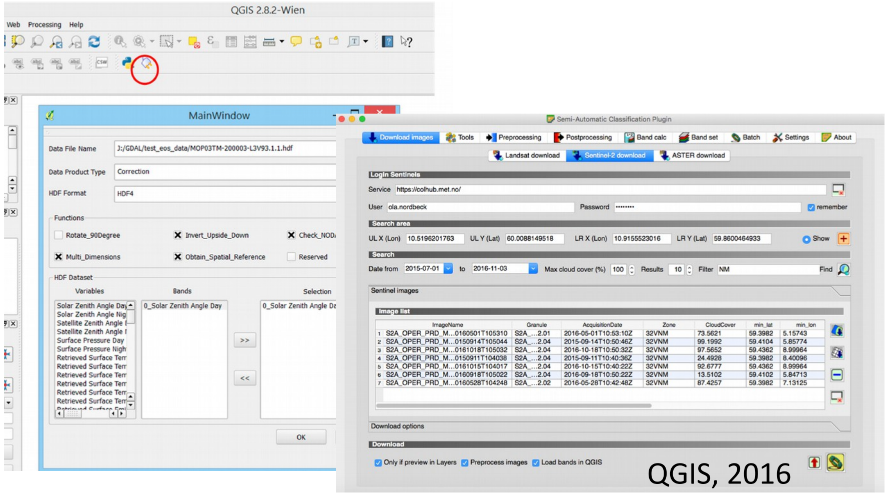
Collaboration is possible



QGIS, 2016

>Collaboration is on-going technically

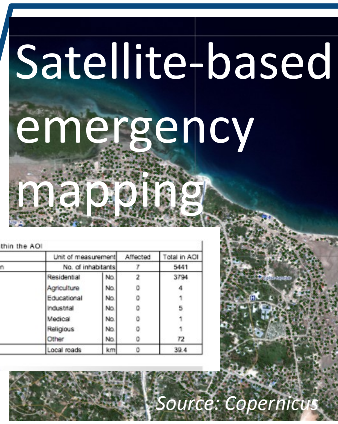
- Rapid development of software and dataformats adapted to handle big satellite data

>Better understanding of mutual needs for collaboration

- Earth Observation data can be an asset in the workflow of Mapping Agencies
- Reference data consistent with national data is important for the user uptake

Example of collaboration in between communities as of today: Emergencies

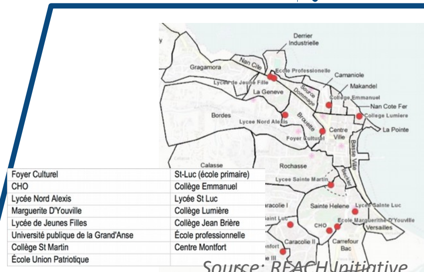
Event



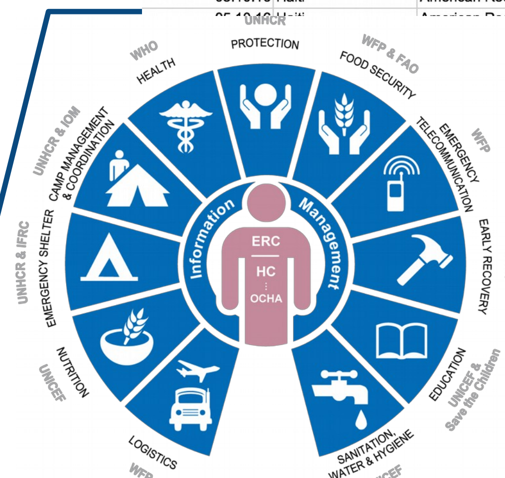
Consequences within the AOI				
	Unit of measurement		Affected	Total in AOI
Estimated population	No. of inhabitants		7	5441
Settlements	Residential	No.	2	3794
	Agriculture	No.	0	4
	Educational	No.	0	1
	Industrial	No.	0	5
	Medical	No.	0	1
	Religious	No.	0	1
	Other	No.	0	72
Transportation	Local roads	km	0	39.4

Making use of:
- Satellite data
- Map data
- Tabular data

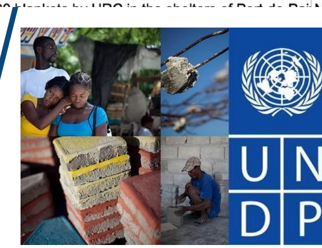
#When	#Country_3W	#Who	3What	#Where_
09.10.16	Haiti	Action Secours Ambulance	Disaster Response Team	Ouest
07.10.16	Haiti	AECID	Sending 4 water purifiers to care for 25000 people for a month.	
10.10.16	Haiti	AM RC	Deployment of delegation team for planning the setup of a regioı	Sud
05.10.16	Haiti	American Red Cross	Distribution of 200 mattresses, 200 hygiene kits in 3 evacuation	North-Wes



Early assessment



Humanitarian Cluster activities



Recovery activities

EO data supporting the digitalisation of public sector in Norway

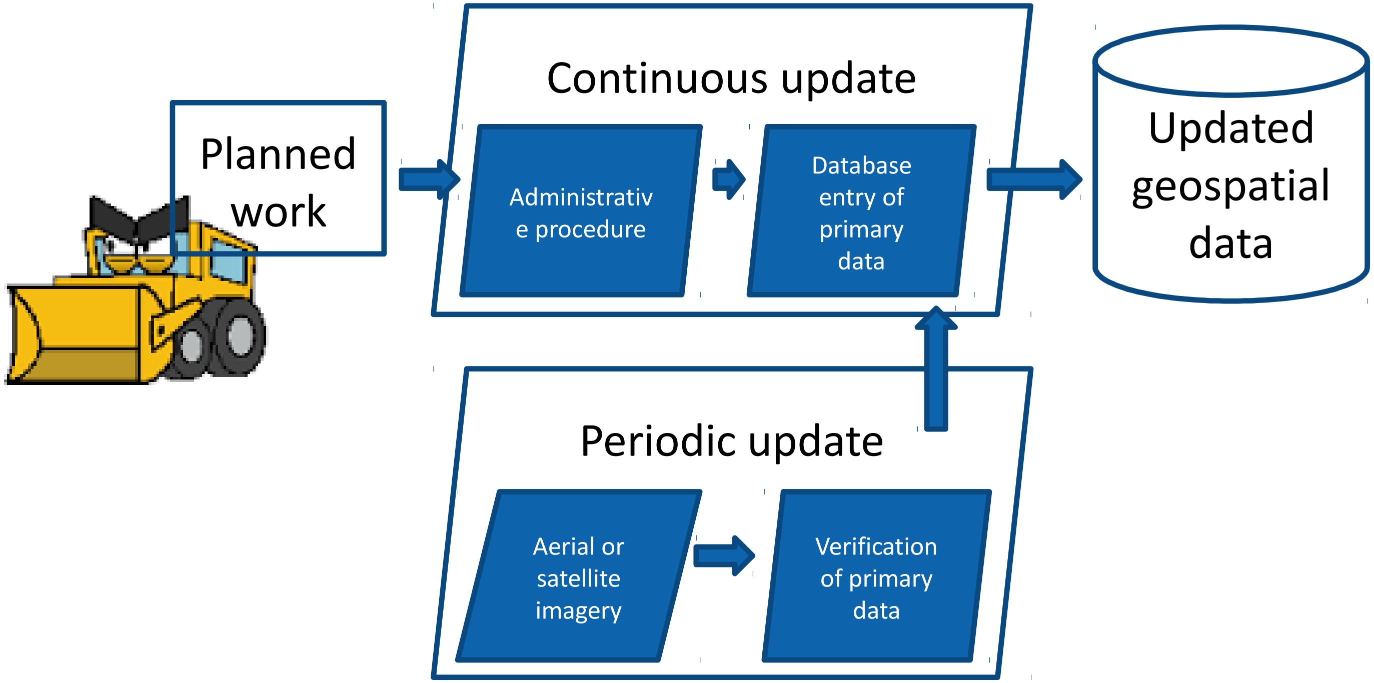
- Mapping is going real-time – following same development as Meteorological and Marine Services
- The modernisation and digitalisation of public sector is on-going
- Norwegian Space Centre promotes integration of satellite data in existing national data management systems
- Some public authorities have the skills to carry out this work themselves others need assistance -> opening up for public - private partnership

Examples:

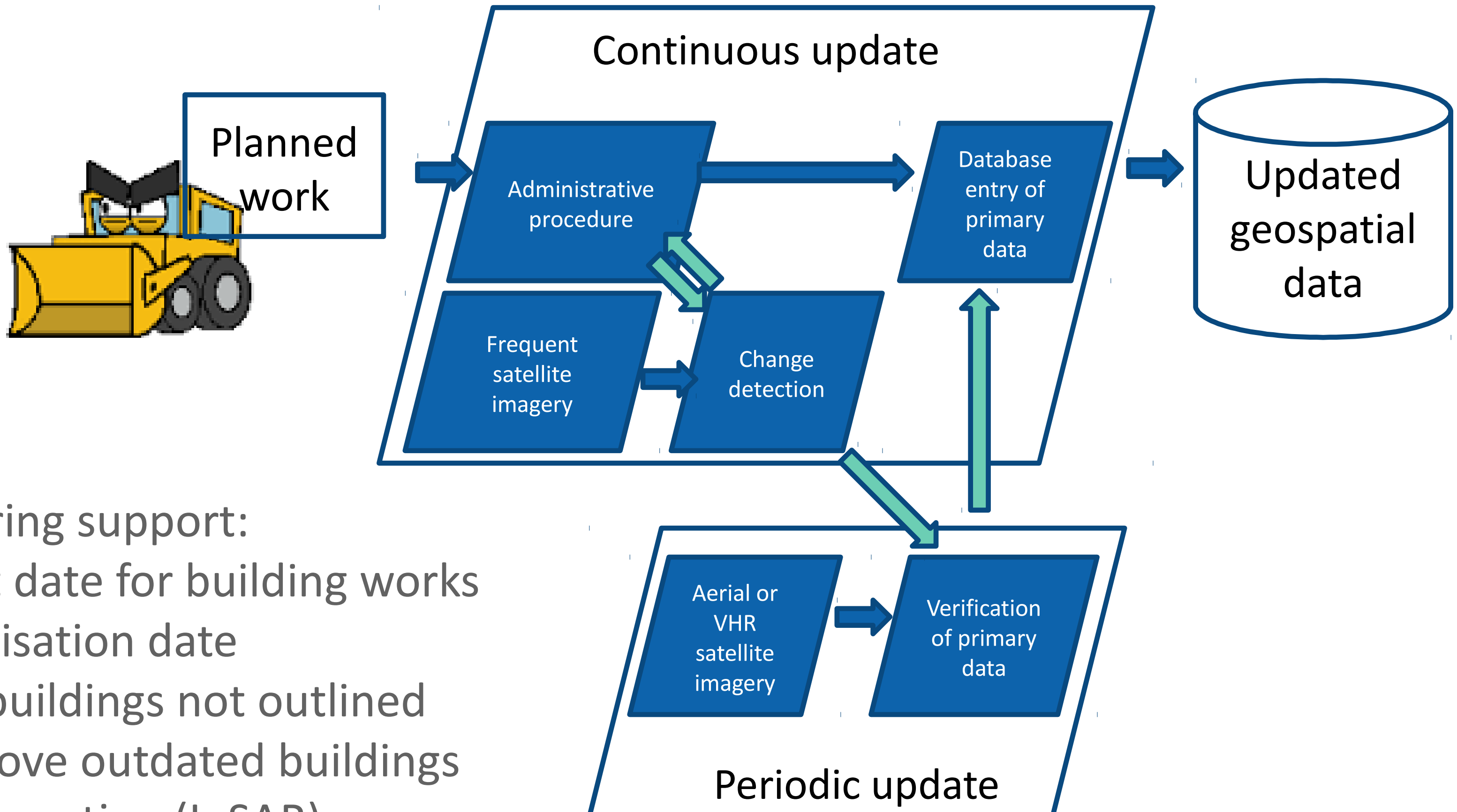
1. National Mapping and Cadastre Authorities (NMCA)
2. National Road Authorities (NRA)

Complement definite mapping with change detection

Conventional workflow of construction mapping
Here based on Norwegian Planning and Building Act



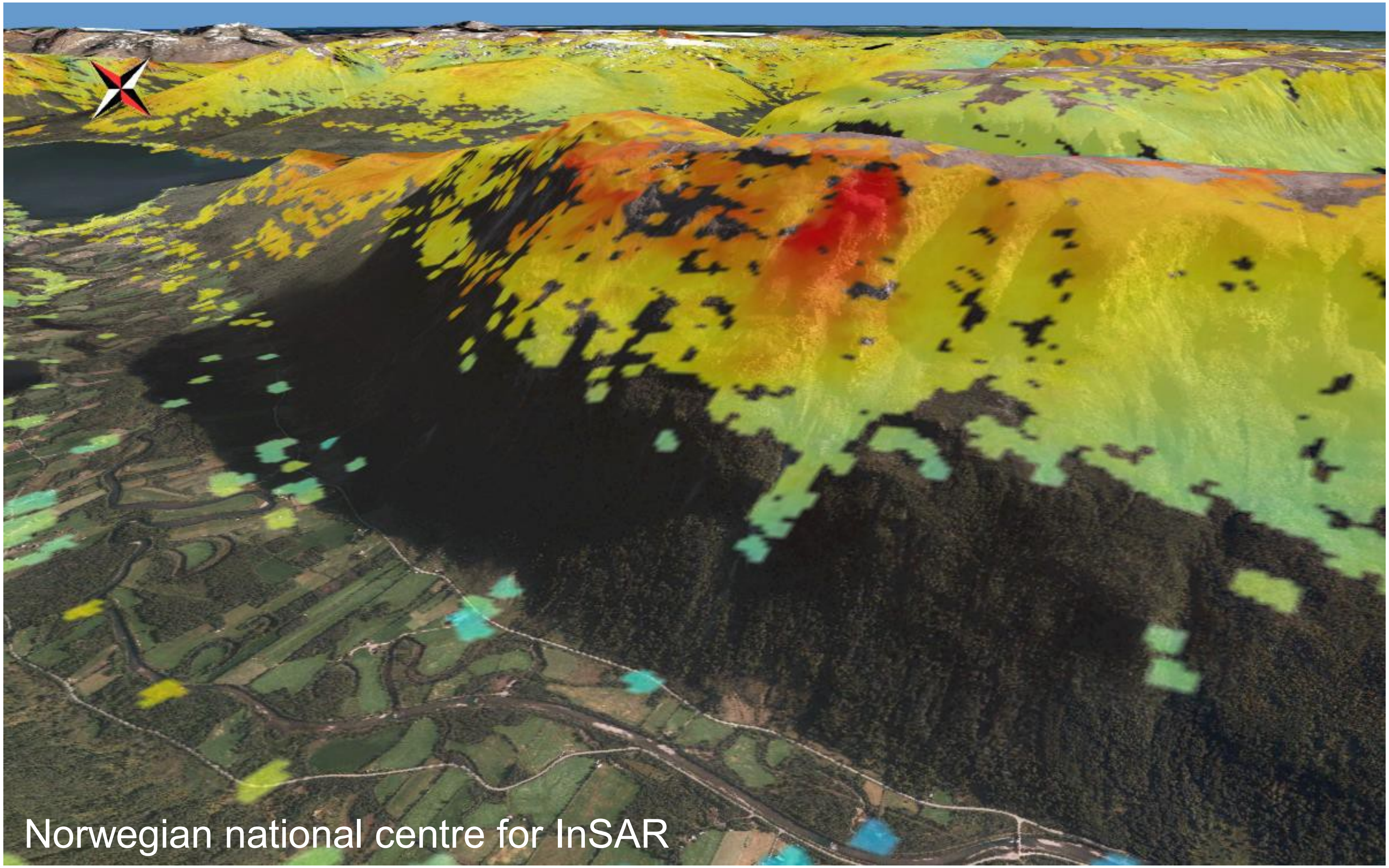
Change detection to support administrative proceedings



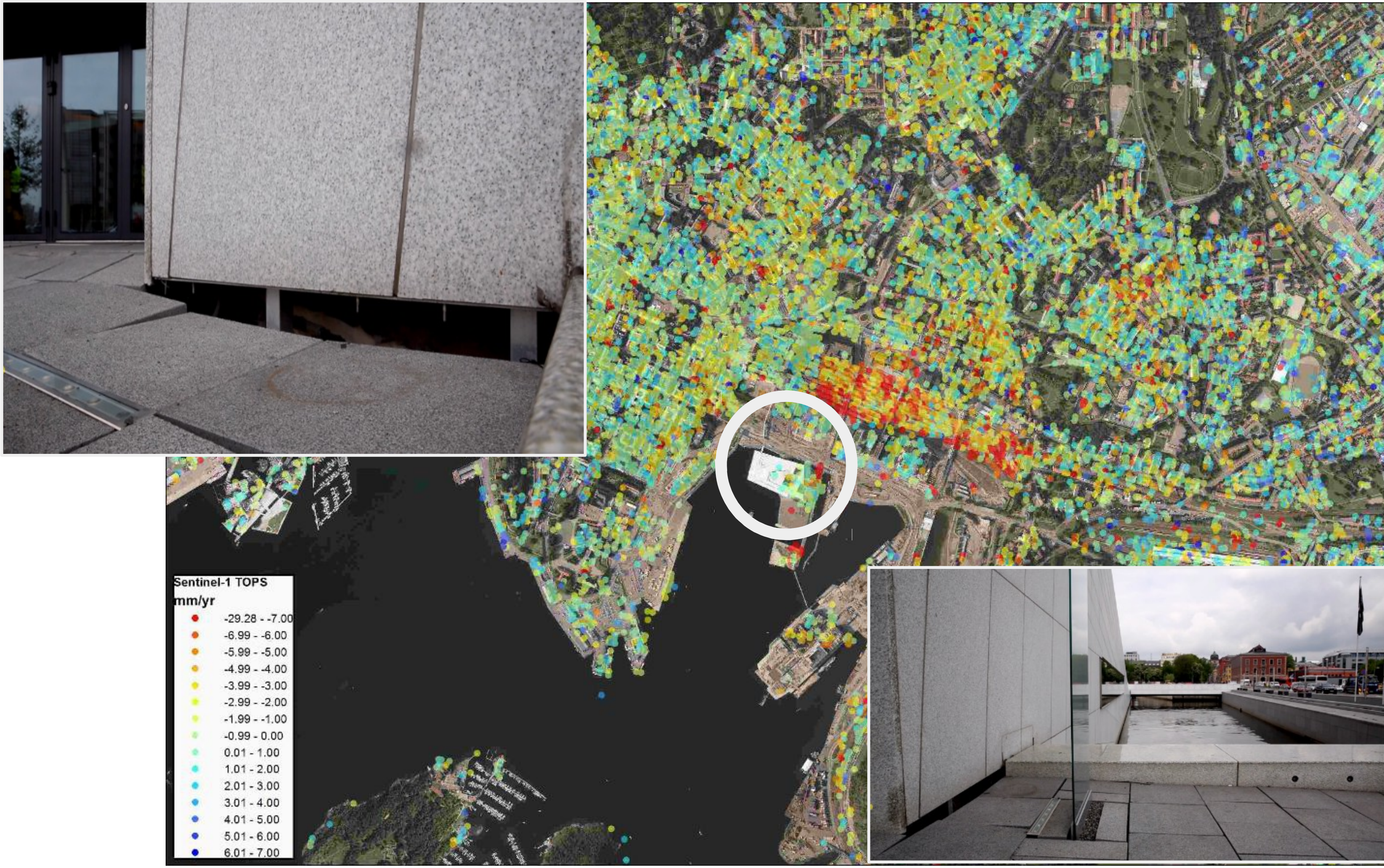
Monitoring support:

- Start date for building works
- Finalisation date
- For buildings not outlined
- Remove outdated buildings
- Deformation (InSAR)

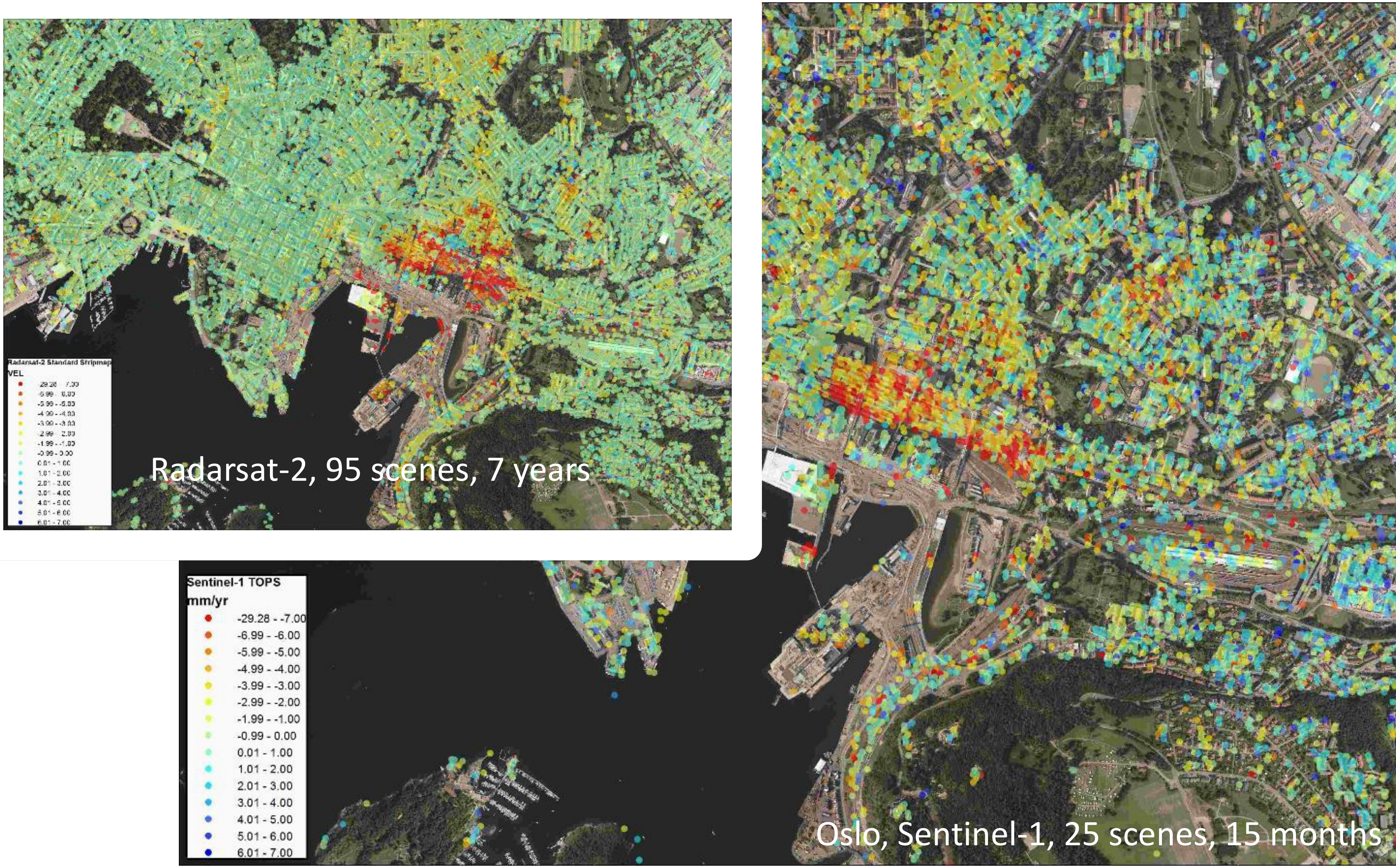
Interferometric synthetic aperture radar (InSAR)
Landslide monitoring



Subsidence around Oslo Central Station



From commercial satellite data to free and open imagery



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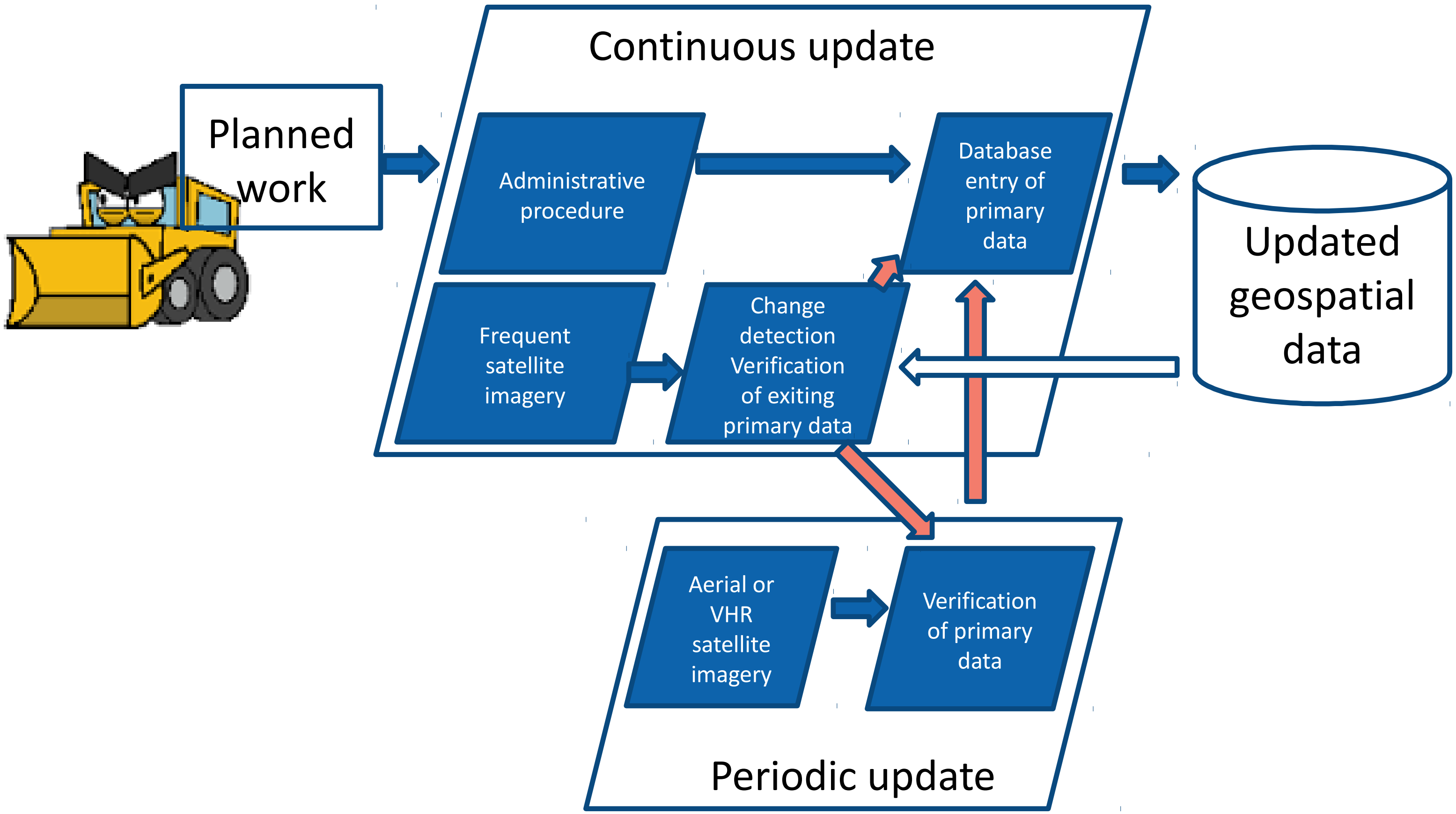
Change detection to identify changes to existing geospatial data



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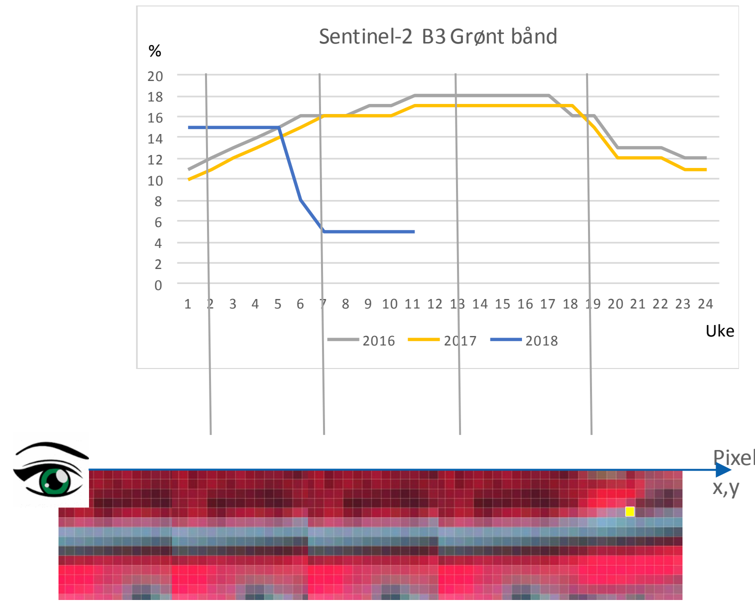
Road management based on change detection

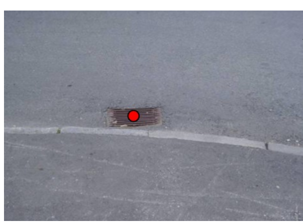
Problem:

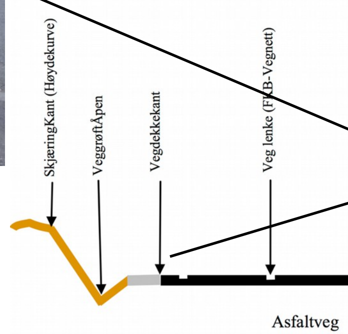
1. Water on road
2. Reduced line of site along road

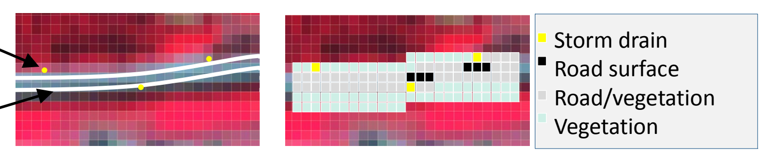
Reason:

1. Storm drain clogged
2. Overgrowing









Continuous monitoring of pixels covering:

1. Registered storm drain
2. 5 m around registered road buffer

Satellite imagery important for monitoring the Sustainable Development Goals

V. Innovations for Cost Reduction

This report has highlighted the need to invest in official statistics for core SDG monitoring, but as highlighted by the Independent Expert Advisory Group on the Data Revolution, new data collection and monitoring technologies are rapidly becoming available. These new innovations will dramatically advance our ability to monitor the impact of development programs, as well as change the way we collectively design and implement them. High-resolution satellite imagery, mobile devices, biometric data, and crowd-sourced citizen reporting will influence both official data collection processes and the operation of programs they monitor. A few innovative applications are discussed below, but there are others that will offer new forms of monitoring in the coming years, many of which are being rapidly developed. For example:

1. Satellite imagery
   - The cost of high-resolution image acquisition is falling while the availability of images and capacity for automated processing are increasing. There are many applications for such data across multiple goals, such as predicting harvests, disaster response, earth observations and food security situations; monitoring geographic patterns and likely transmission corridors of diseases that have geospatial determinants; measuring population density and the spread of new settlements; and mapping and planning transportation infrastructure.

Sentinel-1, Austfonna, Svalbard