

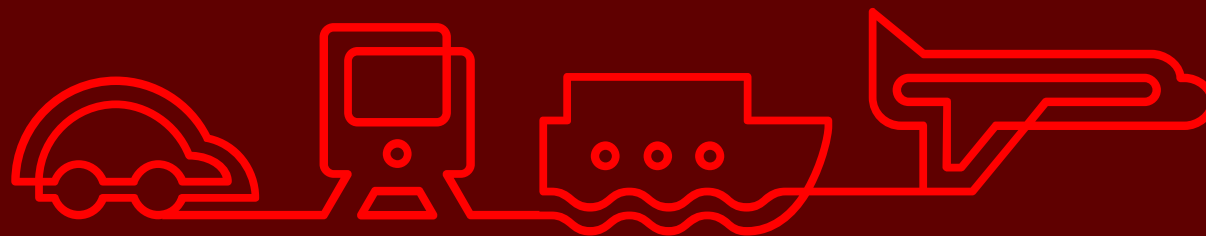


TRAFIKVERKET

Swedish Transport Administration

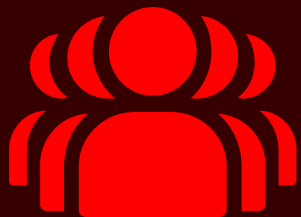


Bringing Sweden closer together



A functioning transport system

- Transport system planning for roads, railways, shipping and aviation
- Construction, operation and maintenance of State roads and railways
- Procuring inter-regional public transport
- Shipping aid
- Civil defence transportation sector



Board of Directors
Director-General Roberto Maiorana

10,000
employees

150
different professions



Business volume 2022
EUR 7,9 billion



National plan 2022-2033

68 EUR billion

Maintenance railways

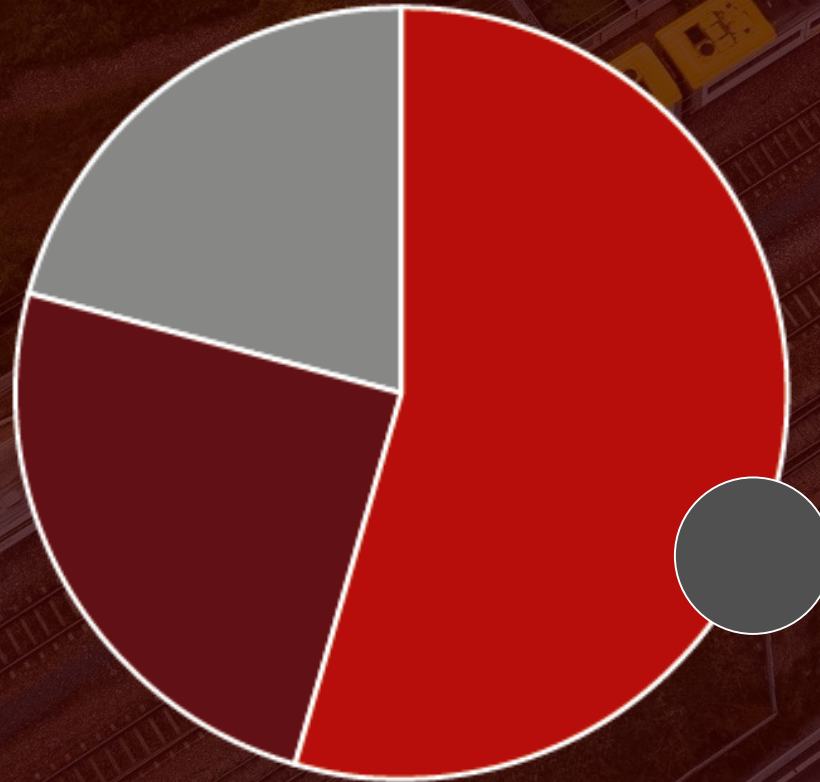
14

EUR billion

Maintenance roads

17

EUR billion

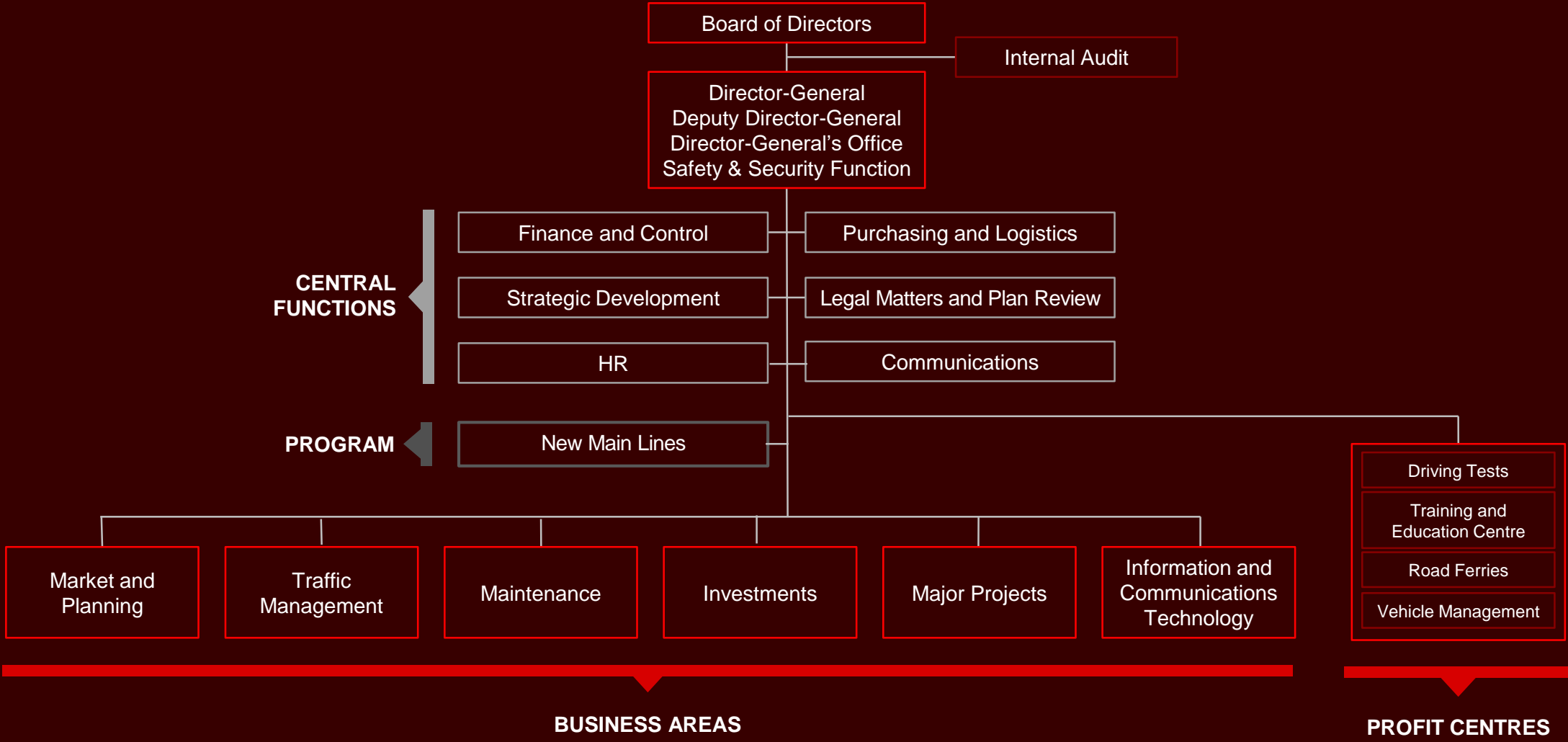


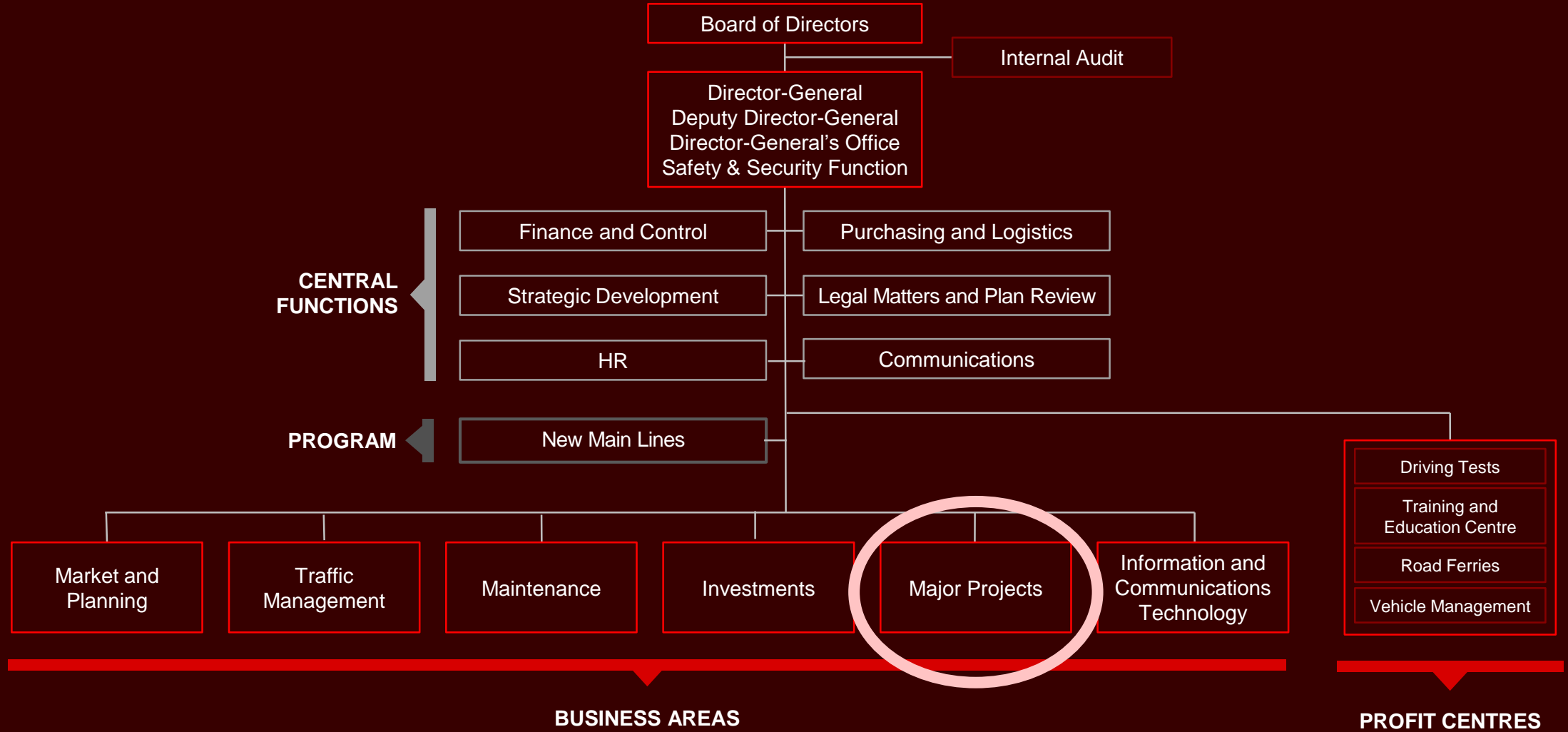
Development

37

EUR billion

+ 7 EUR billion
from congestion charges,
co-funding, loans,
infrastructure and track
fees.





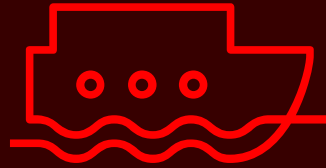
Major Projects



ERTMS (national project)

DAT, Digital Capacity Programme
(national programme)

North Bothnia Line
East Link Project
Mälaren Line Project
Gothenburg–Borås Project
Marieholm Connection Project
West Link Project
Hässleholm–Lund Project



Trollhättan locks
Port of Gothenburg



E4 Stockholm Bypass Project
Södertörn Crosslink Project



Landvetter Connection
Skavsta Connection

Major Projects



ERTMS (national project)

DAT, Digital Capacity Programme
(national programme)

~~North Botnia Line~~

East Link Project

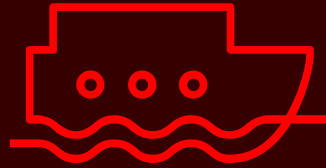
~~Mälaren Line Project~~

~~Gothenburg–Borås Project~~

~~Mariefeld Connection Project~~

West Link Project

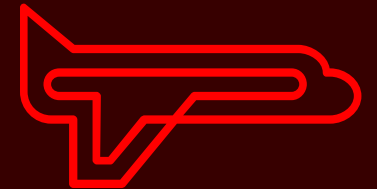
Four Lines Uppsala



Trollhättan locks
Port of Gothenburg



E4 Stockholm Bypass Project
Södertörn Crosslink Project

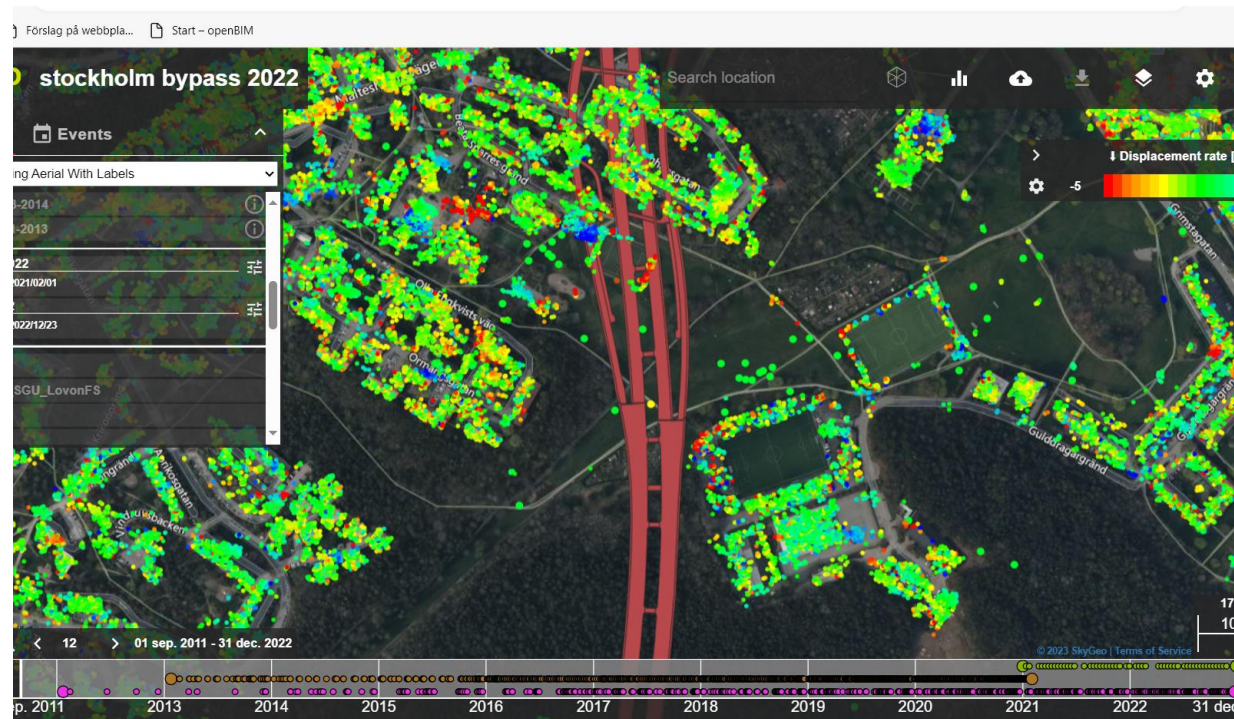
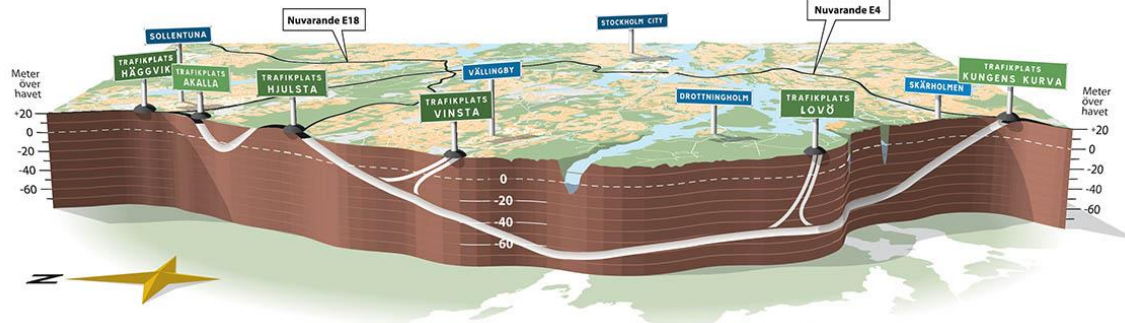


Landvetter Connection
Skavsta Connection

**Using or about to use
InSAR measurements**

E4 Stockholm Bypass Project

- 56 km of tunnels (highway)
- Control of ground water related behaviour due to tunnelling activities
- Strict regulated reporting to the Region of Stockholm County, stated by The Swedish Land and Environmental Court of Appeal



West Link Project

- 8 km of tunnels (railway)
- Control of ground water related behaviour due to tunnelling activities
- Strict regulated reporting to the Region of Gothenburg County, stated by The Swedish Land and Environmental Court of Appeal

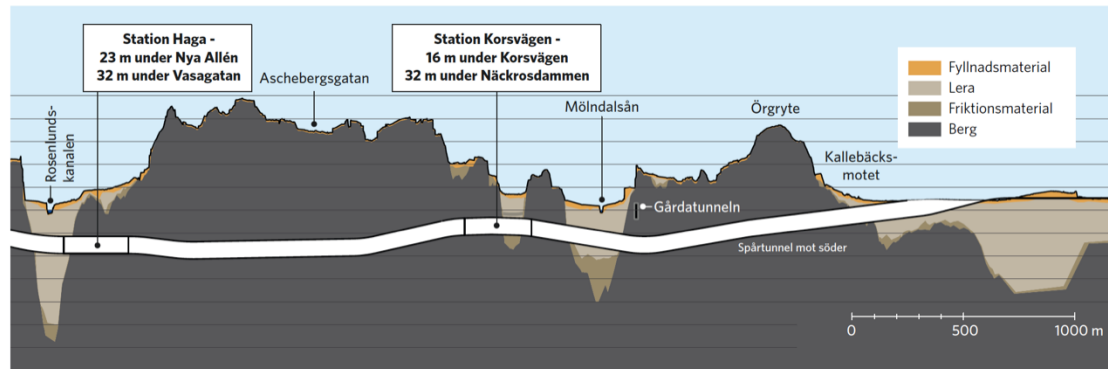
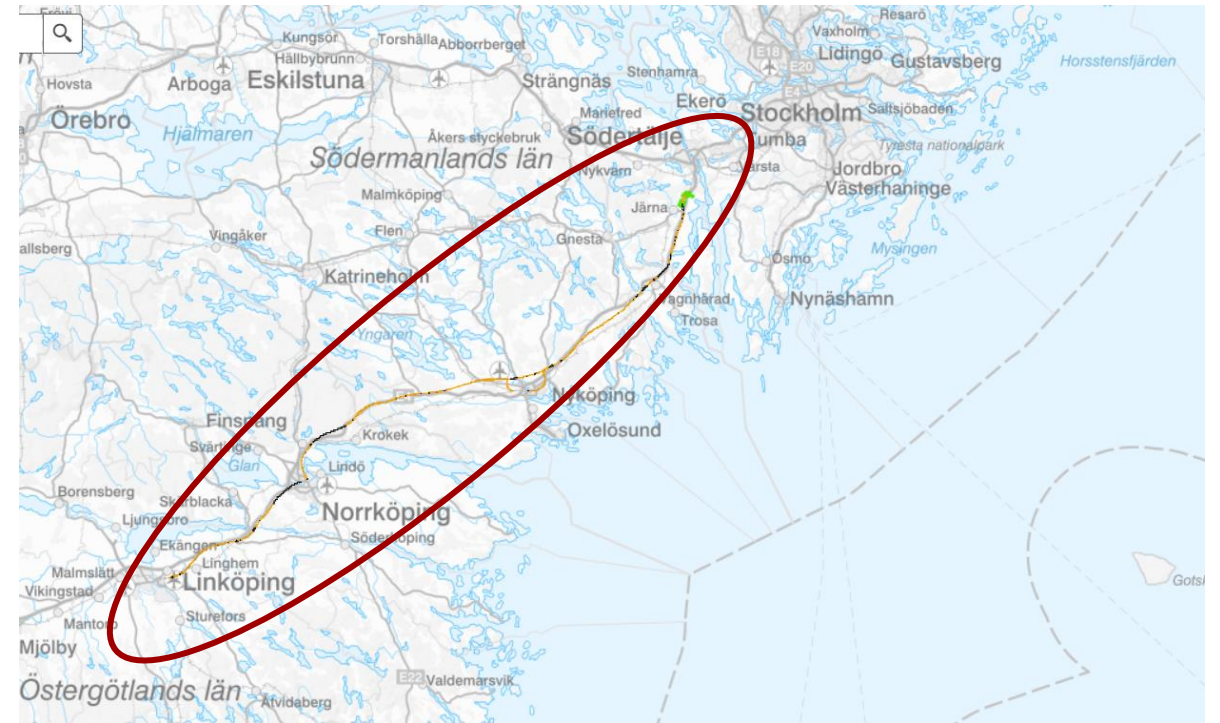


Figure 1 Undersökningsområdet, ca 21 km²

East Link Project (upcoming)

- 160 km of railway,
- Include a variety of different conditions; construction through three cities, 25 km of tunnels etc that has different needs and requirements of monitoring;
 - monitoring of ground water related behaviour due to construction
 - monitoring of movements
 - behavior of pre-load areas
 - mix of rural/ urban areas



Four Tracks Uppsala Project (upcoming)

- 25 km of railway
- Include a variety of different conditions; construction through two cities, large amount of clay etc that has different needs and requirements of monitoring;
 - monitoring of ground water related behavior due to construction
 - monitoring of settlements
 - behavior of pre-load areas
 - mix of rural/ urban areas



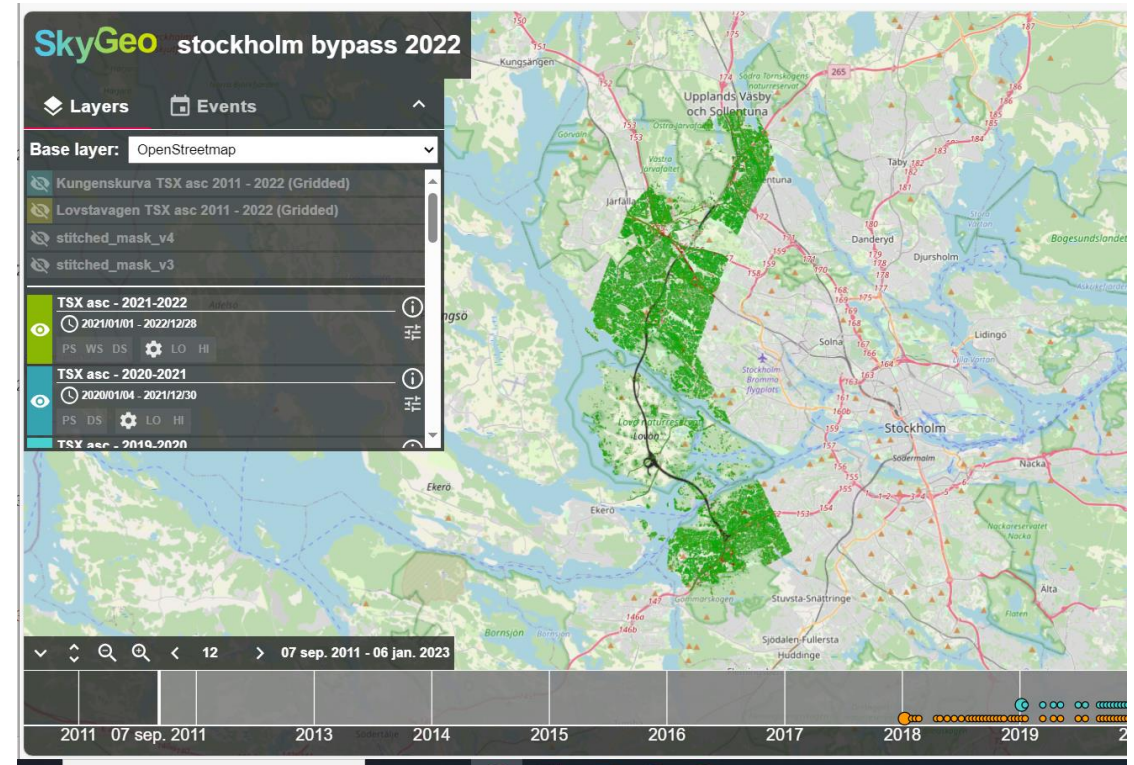
The Crosslink Södertörn Project (upcoming)

- 20 km of highway,
- Include a variety of different conditions; mostly rural area, 8 km of tunnelling, bridges etc that has different needs and requirements of monitoring;
 - monitoring of ground water related behavior due to construction
 - monitoring of movements
 - behavior of pre-load areas
 - mix of rural/ urban areas
 - pin-pointed R & D project



Advantages/ Disadvantages in the Projects

- + High level of;
 - area-coverage
 - accuracy in specific points
 - access to historical data
= value for the money
- Local coverage - primarily within the project (and connecting projects)
- Vegetation
- Winter (snow)

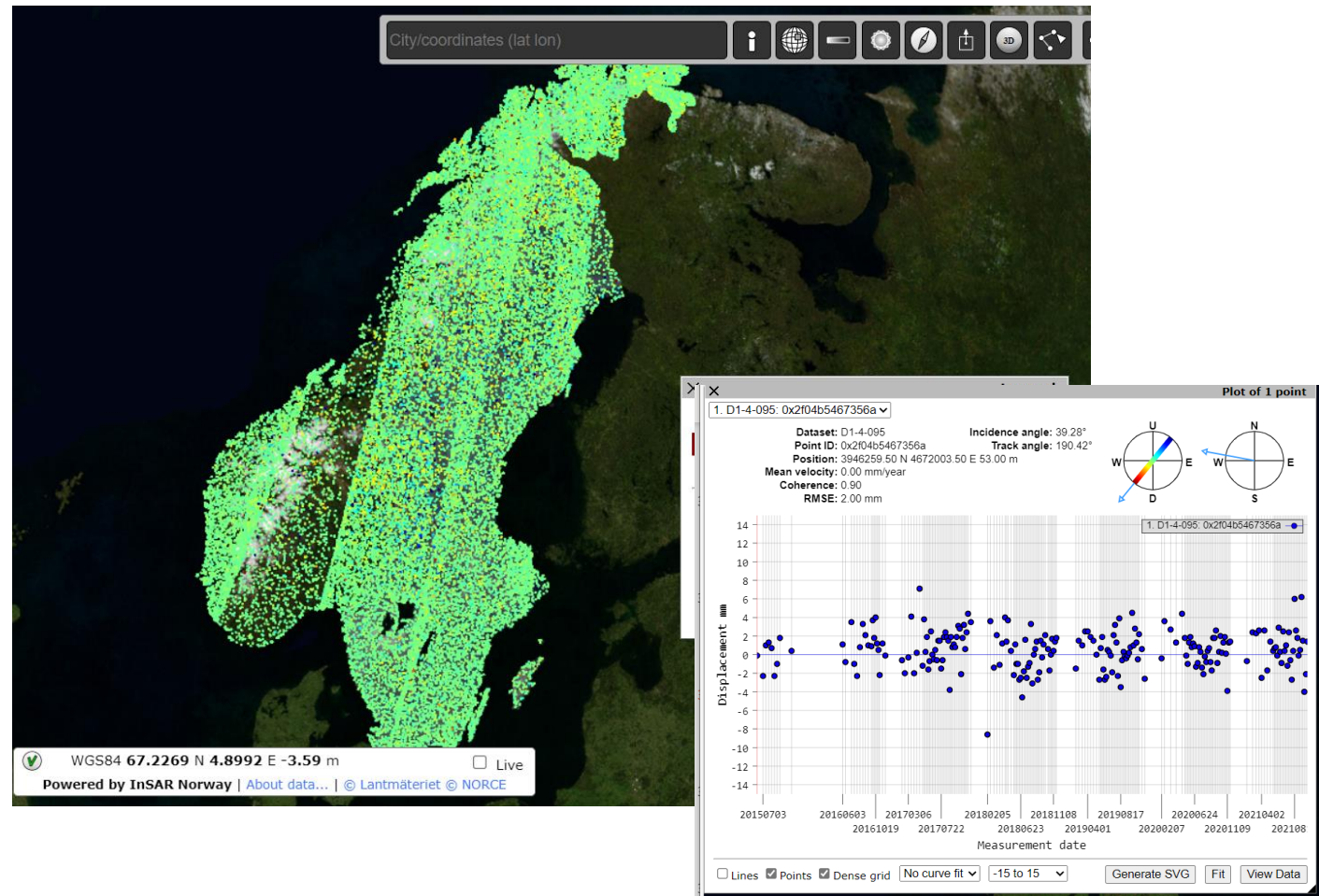


Further nationwide developments InSAR

National coverage useful for

- Pre-planning
- Monitoring of infrastructure
- Climate adaption
- Condition assessment

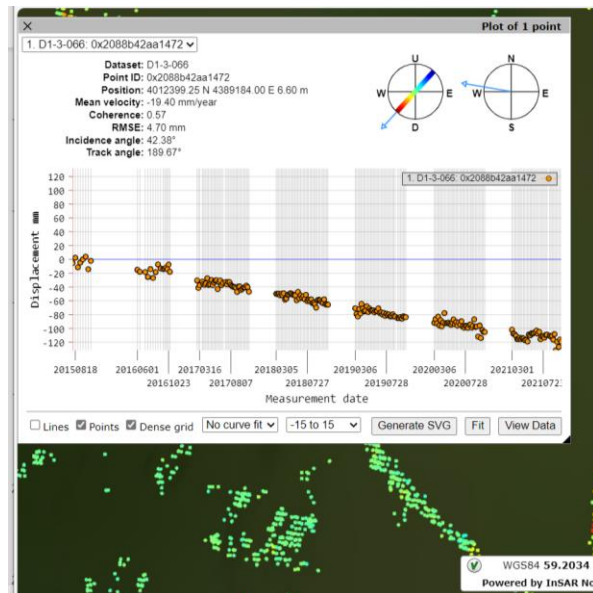
Co-operation between several Swedish authorities and The Swedish National Space Agency



Further nationwide developments InSAR

Area of special interest

- Monitoring of infrastructure
 - Identifying areas of interest
 - Condition assessment
 - Use of AI for detection
 - Year-round monitoring



Further nationwide developments InSAR

Combination InSAR Sweden + SBAS

1. utilize and analyze the SBAS technique to generate a dense displacement map for transport-related infrastructures located on non-urban, slopes and partly vegetated areas
2. assess the feasibility of developing a satellite-based monitoring system to integrate both PSI (used in the InSAR-Sweden project) and SBAS maps to improve the accuracy of displacement estimation

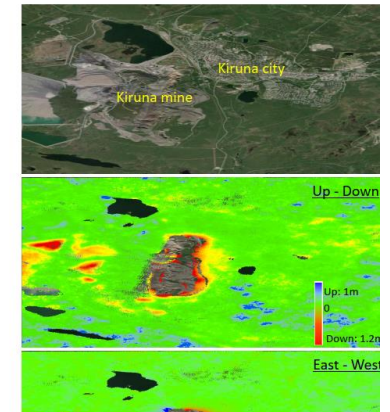
Application of SBAS in mining monitoring

□ Small Baseline Subset (SBAS)

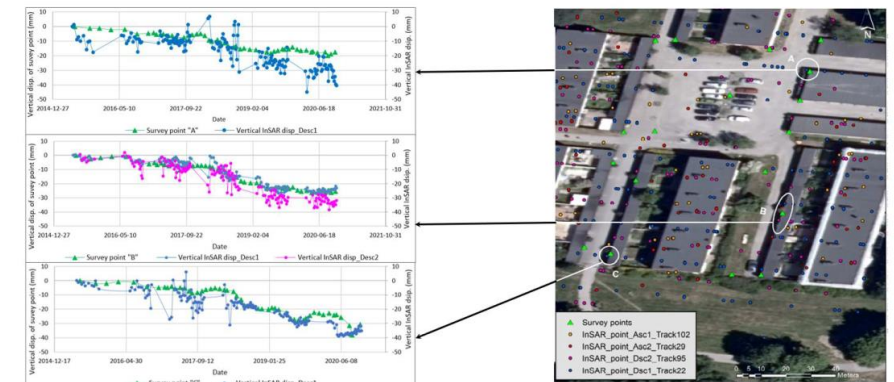
- Suitable for natural terrain
- Dense deformation map

□ 2D displacement map

- Combination of ascending and descending modes



Comparison of InSAR Sweden points and leveling data (Stockholm)



Summary of InSAR in Sweden

For the case of the major projects at Swedish Transport Administration, InSAR is considered to be an established and cost-effective way of monitor several types of conditions and is from now-on to be included in the pre-planning process.

But, since Swedish Transport Admin. consists of much more than our Major Projects, an extended usage of nationwide InSAR will be in place for an overall use within Swedish Transport Administrations areas of operation.



Thanks for your attention!

For further information, please contact

Bo.larsson-gruber@trafikverket.se