## A data-driven basis for decisions at Lemvig Vand – establishment and maintenance of utility supply pipes

# The benefits of a data-driven basis for making decisions

- Predict future drain and water supply pipe capacity requirements
- Awareness of renovation requirements over future years
- > Plan maintenance work to minimise costs

## The challenge

Lemvig Vand's assets in Thyborøn are threatened by ground subsidence. The current data from Thyborøn shows subsidence of up to 1.5 cm a year, which puts Lemvig Vand's assets under considerable pressure. The assets in Thyborøn constitute a significant total value of approx. DKK 110 million, so it is a matter of very high priority for Lemvig Vand to be able to ensure a long service life for their assets.

This will be achieved by following a holistic approach that sheds light on both the present and, not least, the future.

Lemvig Vand faces specific challenges as both ground motion and groundwater dynamics challenge the service life and functionality of their pipelines.



Figure 1: Image from a TV inspection in Thyborøn.

Ground motion and groundwater dynamics are very important when using concrete pipes. Concrete pipes deteriorate/wear out faster due to hydrogen sulphide corrosion when they are oxygenated as a result of subsidence and lowered ground water.

This applies to rainwater and waste water pipes and to drainage pipes in the Thyborøn area. Recent studies show that the same problem affects drinking water pipelines, although these usually use iron pipes instead of concrete. (New drinking water pipelines use thick plastic pipes).

### Method

Lemvig Vand now wants to implement a new concept for monitoring of vertical ground motion. This is done by using advanced radar measurements from satellites, which are collected using radar reflectors from Geopartner Inspections set up in the Thyborøn supply area.



Figure 2: Radar reflectors to measure ground motion.

Radar reflectors are used to produce accurate ground motion measurements. The reflector is measured with precision levelling and is used as a local reference point for the satellite calculation.

The measurements are linked to what is known about geological data using GeoAtlas Live (from Geo) and Map GM (from Geopartner Inspections).

This method of linking geological knowledge and satellite measurements gives Lemvig Vand an overall picture of the Thyborøn supply area, thus ensuring that decisions about both maintenance and new installations are made on a basis that is both objective and driven by data.



Figure 3: Map of ground motion in Thyborøn, based on satellite calculations The satellite data is provided by ESA's Sentinel-1 satellites.

To be continued...

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The diagram below shows a geological cross section through the town down to a depth of 40 metres. It also shows the thickness of fill layers (in grey). The fill layer that is present in large areas of Thyborøn is one of the most significant causes of subsidence in the area.



Figure 4: Cross section profile of geological model. Shown with a blue stripe in fig. 3.

#### Value to Lemvig Vand

Together with existing knowledge about the area's geology, satellite surveillance is able to contribute towards an efficient data-based basis for making decisions, which means that Lemvig Vand expects to increase pipeline service life by up to 20%. This corresponds to savings on reinvestment worth approx. DKK 8-9 million.

In relation to new installations, this improved decision-making basis gives Lemvig Vand in practise a stronger overview of where to position the physical pipes in the ground for the best possible conditions in relation to service life. This knowledge as a whole is also of indirect value to Lemvig Vand in several other contexts and in connection with other related tasks.

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The use of satellite data means that we can expect a significant increase in the service life of our pipelines and thus potential savings of up to DKK 3 million each year.

- Lars Nørgaard Holmegaard, Director of Lemvig Vand

#### Perspective

There is considerable potential in the implementation of data-driven decision-making by utilities suppliers all over Denmark as about one third of Denmark's supply networks are underground. Non-Danish utilities suppliers also have a perspective for the use of satellite data as a data-driven basis for making decisions.



