

InSAR as a Service

Monitoring Land Subsidence

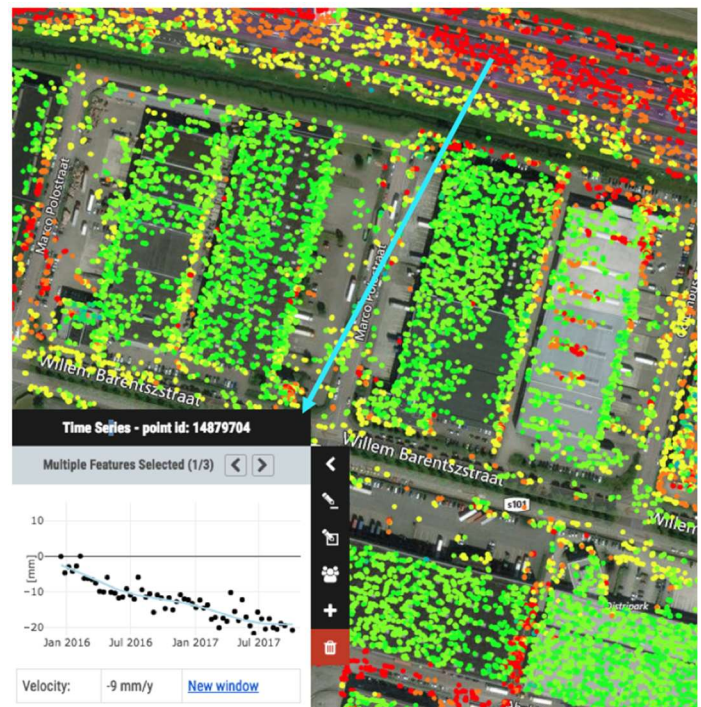


As two low-lying delta countries, the Netherlands and Vietnam are long-standing partners in the field of water cooperation. The cooperation with Ho Chi Minh City has focused on flood mitigation, urban planning and climate adaptation. Based on earlier project results it has become clear that in parts of HCMCity, Land Subsidence (LS) and a suboptimal urban drainage system are important causes for more frequent floods. Land Subsidence also causes damage to urban infrastructure like roads, sewage systems and bridges, in the long term damages hydraulic infrastructure (riverside embankments, sluices) and could even affect the newly constructed metro line. In the Mekong Delta the emphasis is on making the Delta more resilient to the impacts of climate change. Recent studies by Dutch researchers show that high rates of Land Subsidence will increase the vulnerability of the sinking delta to flooding and will affect the livelihoods of the people. With the detrimental effects of Land Subsidence already visible in the streets, and floods becoming more frequent and widespread, authorities and infrastructure operators have to act to monitor and manage the effects of Land Subsidence. It is essential to collect field data and monitor critical infrastructure in order to take effective countermeasures.

Land Subsidence monitoring in HCMCity and Mekong delta

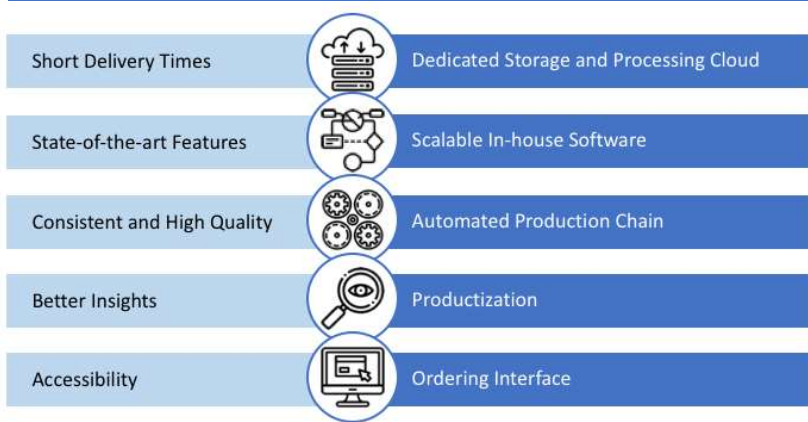
In HCMCity, Geomatics Centre-VNU has developed the expertise to provide land subsidence monitoring information based on InSAR. The Geomatics Centre performs regular InSAR studies based on free and/or scientifically available satellite data sources. However, processing InSAR-data is a difficult procedure because of the complexity of the technique, but also due to the massive data-volumes. Processing InSAR-data for periodical and detailed land subsidence monitoring requires significant human and financial resources, and there is a need to apply the technology efficiently and consistently.

In order to achieve higher levels of impact and contribute to addressing the negative effects of land subsidence in Vietnam, Geomatics Centre-VNU has entered into a cooperation with WaterLand Experts and Sensor bv of The Netherlands. The cooperation will support further developing the technology and its application in support of flood management and long-term infrastructure operation and maintenance. The cooperation is supported by the Government of The Netherlands. The project will conduct pilot studies in HCMCity and in the Mekong Delta and share the results with local authorities, stakeholders and related projects.



Vietnam and the Netherlands Cooperation in Water Management and Climate Adaption for HCMCity and Mekong Delta.

The recently completed Rise and Fall project (<https://www.uu.nl/en/futuredeltas/project-rise-and-fall>) generated important new insights in the groundwater system of the delta, and the patterns for land subsidence caused by natural compaction and the extraction of large volumes of groundwater. These data show that the delta is very vulnerable to further sea level rise, and confirm the need for detailed and consistent monitoring of land subsidence. In another cooperation water supply company VEI from The Netherlands and water supply companies in Soc Trang, Can Tho and Hau Giang provinces are looking for ways to make long-term water supply more resilient; good monitoring data and information on the connection between groundwater use and land subsidence is needed (see: <https://en.vietnamplus.vn/netherlands-helps-to-improve-water-supply-capacity-in-mekong-delta/141873.vnp>). The coming years, the Blue Dragon cooperation between Dutch Water Boards and local authorities in Mekong delta provinces aims to improve practical and operational water management in order to be better able to manage imminent flood, land subsidence and salinity intrusion challenges.



Sensar provides high-quality and client-oriented land subsidence analysis through **InSAR-as-a-Service**. Our innovative approach allows for efficient processing of source data without struggles with complex software, data storage and computing power. To obtain a high degree of quality, efficiency and save costs, Sensar has developed its own InSAR processing software, its own private computing cloud and customer-oriented information products. With this service InSAR analytical results become more accessible, processing time is reduced and user-friendliness is improved.

The **InSAR-as-a-Service** approach improves the use and delivery of Land Subsidence monitoring data to stakeholders. This is urgently needed to improve awareness and develop timely and adequate solutions. Geomatics Centre, WaterLand Experts and Sensar bv will demonstrate the method in HCMCity and Mekong delta, and make available important information to develop measures to counter the effects of Land Subsidence.

Developing solutions for Land Subsidence related problems

In Ho Chi Minh City, both Sensar and Geomatics Centre are analysing data to apply and use the advantages of our innovative processing method and software. Based on our new results and supporting information about the vulnerability of (parts of) HCMCity and the effects of land subsidence, the relationship with flooding will be demonstrated, and also the effects of settlement on roads and infrastructure. By using high resolution satellite data, the progressive effects of land subsidence/settlement on large infrastructure (i.e. highways, bridges, sluices, embankments) can be monitored. The current settlement rates observed in HCMCity certainly affect the life-span and performance of infrastructure. The partnership of Geomatics Centre, WaterLand Experts and Sensar bv will share the results of this pilot with the relevant authorities in the city.

In the Mekong Delta the land subsidence analysis will use multi-annual Sentinel-1 images and will provide information for different stakeholders. The selected pilot area will cover a large part of Can Tho, Soc Trang and Tra Vinh provinces. In Can Tho and Soc Trang there is need for information on the relation between land subsidence and flood risks and the effects of groundwater extraction. Collaboration with the provincial water supply companies facilitates the study of the relation between land subsidence and groundwater extraction, contributing to decisions about long-term investments for domestic water supply. In Tra Vinh province major infrastructure, viz. a large power plant and facilities, located close the coast, is vulnerable to land subsidence and flooding. After completion of the InSAR-as-a-Service based land subsidence analysis, Geomatics Centre and WaterLand Experts will interpret the data and report the results to stakeholders in the provinces.

To understand the process and (multiple) causes of Land Subsidence, periodical and consistent monitoring and analysis of data is essential. By using state-of-the-art software and processing techniques, developed and proven in other Industry 4.0 Information Technology applications, Land Subsidence monitoring can be done efficiently, at reduced costs and customer friendly. Our partnership aims to strengthen these capabilities in Vietnam. The application of modern field monitoring (water, land, environment) and analytical technology is obligatory in the Mekong Delta and in the HCMC metropolitan region. It is essential to effectively find solutions for diverse water management challenges. In the coming years these techniques are urgently needed to support economy and livelihoods, and create liveable cities and a resilient Delta.

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