Geophysical Research Abstracts
Vol. 19, EGU2017-19573, 2017
EGU General Assembly 2017

How to deal with subsidence in the Dutch delta?

Esther Stouthamer (1) and Gilles Erkens (2)

(1) Dept. of Physical Geography, Utrecht University, Utrecht, The Netherlands, (2) Deltares Research Institute, Utrecht, The Netherlands

In many deltas worldwide subsidence still is an underestimated problem, while the threat posed by land subsidence to low-lying urbanizing and urbanized deltas exceeds the threat of sea-level rise induced by climate change. Human-induced subsidence is driven by the extraction of hydrocarbons and groundwater, drainage of phreatic groundwater, and loading by buildings and infrastructure. The consequences of subsidence are increased flood risk and flood water depth, rising groundwater levels relative to the land surface, land loss, damage to buildings and infrastructure, and salinization of ground and surface water..
The Netherlands has a long history of subsidence. Large-scale drainage of the extensive peatlands in the western and northern parts of the Netherlands started approximately 1000 years ago as a result of rapid population growth. Subsidence is still ongoing due to (1) continuous drainage of the former peatland, which is now mainly in use as agricultural land and built-up area, (2) expansion of the built-up area and the infrastructural network, (3) salt mining and the extraction of gas in the northern Netherlands.

Mitigating subsidence and its negative impacts requires understanding of the relative contribution of the drivers contributing to total subsidence, accurate predictions of land subsidence under different management scenarios, and its impacts. Such understanding enables the development of effective and sustainable management strategies. In the Netherlands, a lot of effort is put into water management aiming at amongst others the protection against floods and the ensuring agricultural activities, but a specific policy focusing on subsidence is lacking. The development of strategies to cope with subsidence is very challenging, because (1) the exact contribution of different drivers of subsidence to total subsidence is spatially different within the Netherlands, (2) there is no single problem owner, which makes it difficult to recognize this a common societal issue that should be tackled, and (3) it requires an integrated approach involving technical knowledge on contributors to subsidence, water management, governance arrangements, the legislative framework, socio-economic developments and spatial planning.

To develop a sustainable solution to subsidence, we propose an approach including: (1) monitoring of surface elevation and drivers of subsidence, (2) scenario studies using coupled state-of-the-art 3D geological, hydrological and subsidence numerical models , and (3) a national database and model infrastructure. The next step is to carry out (4) a societal cost-benefit analysis and (5) to optimize governance arrangements and the legislative framework enabling the (6) implementation of measures.
The realization of these requirements and the implementation of the resulting management strategies requires a joint effort of the national research institutes, including universities, and the involved local, and regional governmental organizations controlled by the national government. The research institutes should be responsible for developing monitoring strategies, generating the data and databases and developing the numerical models, governance arrangements and the legislative framework. The governmental organizations have the important responsibility for putting subsidence on their agendas, facilitating the research institutes and the implementation of governance arrangements and legislative framework enabling the implementation of effective measures.