

Session DPFR 4.4: Sinking Deltas

Date and Time of Session: Wednesday, 29 September 2010 2010, 14.00 – 15.45.

Short description of the session topic and the objective of the session

Topic: Land subsidence in delta regions is an often-neglected cause for flooding and associated problems, and poses an even more potent threat for the mid- and longer term.

Objective: Exploration of the various processes leading to subsidence (e.g. upstream interventions in river systems, extraction of groundwater from deltas, heavy construction and infrastructure and oxidation of organic (peat) deposits). Discussion of the interrelated causes and effects of subsidence and the impacts of sinking deltas on environmental and socio-economic development.

Session Agenda and Main Speakers

Session chair: dr .Rien Dam, Deltares, the Netherlands.

Main speakers:

- Subsidence: Modelling, measuring, matching, monitoring. Dr. Peter Fokker, TNO, the Netherlands.
- Satellite Monitoring of Water Defence Systems in practice. MSc. Freek van Leijen, Hansje Brinker BV, the Netherlands.
- Surface deformation phenomena in the Rhine-Meuse delta. Miguel Caro Cuenca and Ramon F. Hanssen, Delft University of Technology, the Netherlands.
- Greenhouse gas exchange in peat meadow areas; impact on land subsidence. Dimmie Hendriks, Deltares, the Netherlands
- Subsidence phenomena in deltas; hidden processes but visible impacts. Ger de Lange, Deltares, the Netherlands.
- Subsidence impacts in tropical peatlands in SE Asia: scale of the problem and current knowledge base. Aljosja Hooijer, Deltares, the Netherlands.

Most exciting insight, moment or outcome

In some areas the speed of subsidence is significantly higher than sea level rise. Subsidence and its related damage or costs of measures is therefore an important spatial planning and flood mitigation problem.

Main conclusions, themes, insights or messages

- Subsidence can have large antropogenic causes: changes in watermanagement, groundwater mining, land use, sediment depletion, aggregate and salt mining. In addition, there are natural causes, such as compaction, geologic processes.
- The causes can be complex, a integral approach is therefore needed.
- Satelite monitoring of water defences can help in the monitoring and leads to better insight in causes of subsidence. It can lower costs of maintenance of vital flood defences.
- Satelite monitoring (spaceborne radar) makes it able to make time series analysis of subsidence by so-called Persistent Scatterer Interferometry (PSI). This method avoids the

problem of growing vegetation. The detection of minor changes is possible with these techniques, viz. It has revealed that the land surface level is affected by the seasonal changes in groundwater level.. Results further show that in the Krimpenerwaard (The Netherlands) subsidence is much greater than sea level rise: 7.67 mm/year versus 3 mm/year.

- Climatic change (temperature rise, pronounced seasonal droughts) leads to higher velocities of peat oxidation, thus leading to more subsidence. This process takes place especially in peat meadow areas of The Netherlands. On the whole, oxidation of peat is a large contributor to subsidence and GHG emissions (CO₂, CH₄, NO₂). For example: 100 years of consecutive oxidation in the Netherlands is comparable to the CO₂ emissions of industry of the USA in half a year, or 50 times the recent volcanic eruption in Iceland. Reversing/abating this process is possible but depending on land use and type of Green house gas. Even individual plant species can influence emissions.
- In SE Asia peat burns and peat drainage (leading to oxidation) are very large contributors to peat decomposition and emission of GHG. In the present situation the emissions are even larger than historic emissions of The Netherlands. Costs of subsidence are rising because of flooding of subsided land. New policy is needed. It is advised to take measures e.g. by changing land use, improving water management, adjustments to forestry/economic use of forests, fertilisation. But there's still a large knowledge gap about how to take measures (it's a complex problem).

Key phrases or quotes

- Land subsidence in delta areas is very widespread and an order of magnitude higher than anticipated sea level rise. Consequently, the costs and damages inflicted by subsidence are very high. Therefore, there is a need for reprioritising or a new focus: addressing subsidence is more important than mitigating sea level rise. By changing watermanagement practices subsidence can be slowed down or even reversed.
- Although much insight in subsidence of peat land in The Netherlands is available, there's still need for further research of this complex process, especially in the peat forest areas of SE Asia.

Main recommendations, commitments, proposals, new initiatives or key follow-up actions agreed in the session

- Session convener and participants are preparing a thematic work package on subsidence. This work package will be proposed to Delta Alliance, viz. to be part of the forthcoming Delta Alliance work programme. (or alternatives). By Rien Dam, Deltares in the Next 3-6 months