



[Print](#) | [Close this window](#)

FEATURE-Shanghai highrises could worsen rising seas threat

Mon Oct 6, 2008 8:04am EDT

(Repeats story that moved at 0000 GMT. For other news from the Reuters Global Environment Summit, click [here](#))

The following feature is part of a global series looking at megacities and water as part the environment summit from Oct 6-8

By Rujun Shen

SHANGHAI, Oct 6 (Reuters) - Shanghai, China's most populous city and an aspiring global financial centre, is also among the world's most vulnerable urban areas to a rise in sea levels as global warming melts polar ice.

Its location on a low-lying alluvial plain near the mouth of Asia's longest river, the Yangtze, had already left it prone, but researchers warn that forests of skyscrapers sprouting across the ambitious metropolis could compound the threat by causing its marshy ground to sink.

"Shanghai came from the ocean, and has been facing the threat of rising sea levels," said Wang Pingxian, a member of the prestigious China Academy of Sciences and professor of ocean geology at Tongji University in Shanghai.

"The rising sea level is a worldwide problem, caused by global warming, but Shanghai and Tianjin, among China's coastal cities, face the biggest challenge, mainly because of land subsidence," Wang said as part of the Reuters Global Environment Summit.

Sinking ground levels have long been a headache for Shanghai, although the culprit has traditionally been the pumping of ground water to support its rapid growth and industrialisation.

The dyke along Shanghai's riverfront Bund, which protects a mile of historic granite buildings from the waters of the Huangpu River, has been raised three times -- by nearly 2 metres (about 7 feet) -- over the past four decades.

Shanghai drilled its first deep well on the Bund in 1860, and as industrial development and ground water use accelerated, the city sank 1.76 metres between 1921 and 1965, or an average of about 4 centimetres a year.

As early as the 1960s, the Shanghai government began addressing the problem by pumping some of its treated water supply, which is now taken largely from the Huangpu River rather than from ground water, back below the surface.

THAT SINKING FEELING

Land subsidence eased substantially and ground levels even began rising in the 1970s when the government was particularly active in pumping water back, but sinking set in once more in the 1990s as the city set out on a frantic building boom.

The city has further tightened its restrictions on ground water use since 2006 and plans to ban use of ground water entirely for non-drinking purposes by 2010, when it expects to be pumping 50 million cubic metres of water (1.8 billion cubic feet) per year underground.

That compares with the 17.3 million cubic metres of water it pumped underground in 2007, when it pulled out 43.8 million cubic metres of ground

water. At its peak, the city pumped out 200 million cubic metres of ground water a year.

As a result of strict regulation of ground water usage, Shanghai sank only 6.8 millimetres in 2007, or 0.5 millimetre less than a year earlier, a government report said.

But while the city moves to stop the ground from being pulled down as ground water is sucked out, researchers now worry that the ground is being pushed down as masses of skyscrapers are plopped down across the urban landscape.

"(Land subsidence) is more serious in areas where groundwater is heavily used, or highrise density is high," said Xu Shiyuan, a professor of geology at East China Normal University.

There are about 10,000 buildings with more than 10 floors in Shanghai, of which 80 percent have been built in the past 10 years, according to Emporis, one of the world's leading providers of building information.

"Land subsidence caused by construction of highrises and underground projects will be a key issue in the future," said a professor at a research institute affiliated to the government in Shanghai, who declined to be named because his institute does not allow researchers to talk to the media.

He said that, although a single highrise building could only cause ground in adjacent areas to subside marginally, dense blocks of highrises could press the soil in sand layers underneath, and contribute to ground sinking over a large area.

"It's a very difficult problem, and we haven't found any effective solutions", he said.

PILING ON THE PRESSURE?

Some researchers said, however, that highrise construction would cause only minor land subsidence and could be limited by technical innovations, although worries would remain that uneven subsidence could damage bridges and tunnels.

"One can't generalise the situation and say highrises are going to have a more significant impact on land subsidence. It's rather a case-by-case scenario," said Xu of East China Normal University.

David Scott, chairman of the Council on Tall Buildings and Urban Habitat, and a principal with engineering firm Arup's New York operations, added: "The weight of big buildings is generally not a big problem". Deep basements can help to offset the weight of large buildings, he said.

Arrays of piles can also mitigate pressure from the weight of buildings.

The developer of the 492-metre (1,614-ft) Shanghai World Financial Centre, which at its opening in late August surpassed the neighbouring Jin Mao Tower as China's tallest building, said it was not contributing to the land subsidence problem.

"Our building is not causing land to sink," said Michiho Kishi, a spokesman for Mori Building.

The clay layer -- firmer ground more than 100 metres underneath the building -- has sunk nearly 120 millimetres (five inches) since construction started, far less than the limit of 250 millimetres set by the government's construction code, Kishi said.

The city itself seems unfazed, with plans to build the 632-metre Shanghai Centre, next to the other two towers. (Editing by Edmund Klamann and David Fogarty)