Special Issue Iran's Land Sinks as Earthquakes Rise Iran Daily - Monday, March 17, 2025

## Why Iran experiencing severe land subsidence? Implications, solutions

#### ANALYSIS

Land subsidence, a phenomenon with multiple causes, has accelerated at an extremely alarming rate in Iran in recent years. To what extent is this due to climatic conditions and ecosystem management, and to what extent is it linked to external factors?

Iran's environmental conditions have become far more concerning in recent years. Even before the publication of images and videos showing sediment accumulation in parts of dams like Karaj, Latyan, and Lar, autumn shutdowns due to air pollution signaled the escalation of environmental challenges.

Many experts argue that the entanglement of climate change impacts and mismanagement in environmental conservation has been a key driver of this situation over decades. Some, however, emphasize intermediate variables. Sanctions, in their view, have compounded the problem, restricting the government's ability to address environmental issues. For example, energy shortages — linked to insufficient investment in energy extraction and distribution — are cited as worsening air pollution.

Critics counter that "tying people's access to water to sanctions" solves nothing, stressing that internal causes of environmental crises must be identified and managed. Nevertheless, the impact of sanctions on Iran's ecosystems is undeniable. Ali Salajeqeh, the former vice president and head of Iran's Department of Environment, has repeatedly stated that sanctions hinder effective action against climate change. His successor in the current administration, Shina Ansari, emphasizes, "Without lifting sanctions, adherence to environmental goals is impossible."

Environmental challenges are not limited to air pollution and droughts. In connection with all these crises, land subsidence particularly in central regions — has long sounded the alarm of "the ground collapsing beneath our feet."

#### Subsidence warnings

After five decades of sanctions, their effects are now evident across all sectors, with every Iranian facing some form of sanctions in their daily lives. While industries are directly impacted by sanctions, sectors like the environment face indirect consequences. Subsidence and its expansion have become a serious national concern, with a recent parliamentary report warning that 18 provinces now contain high-risk subsidence zones.

The most significant consequence of subsidence lies in its environmental damage. A key finding of the report is the harm subsidence inflicts on surface and subsurface infrastructure, ultimately leading to cracking in buildings, ruptures in vital pipefrom groundwater wells, which has long been the easiest method of accessing water in Iran. Over-extraction depletes underground water resources, causing the spongy structure and pores of aquifers to compact and collapse. This loss of aquifer porosity, driven by declining groundwater levels, has intensified subsidence nationwide.

#### Iran's global ranking

Global studies indicate that only 3–5% of the world's subsidence zones experience rates of 10–15 cm/year, with most areas below 10 cm. Iran's subsidence rates exceed 15 cm/ year, placing it second globally after India, where some regions exceed 50 cm/year. Iran shares this ranking with parts of the US and China.

Half of Iran's population resides in subsidence zones, with concentrations varying by province. For example, 3 million people in Tehran live in subsidence-prone areas, where rates in the southwestern region reach 20 cm/ year. In Isfahan, 2.7 million people are affected, with entire neighborhoods evacuating due to widespread cracks. In Marvdasht, Fars Province, subsidence rates hit 17 cm/year, threatening ancient sites like Persepolis and Naqsh-e Rostam. Even Mazandaran, once unaffected,



#### Ali Beitollahi

intensified subsidence, increased its rate, and expanded affected areas? At first glance, subsidence seems unrelated to sanctions, as its causes are not directly tied to external restrictions.

Ali Beitollahi, Head of the Engineering Seismology and Risk Assessment Department at the Road, Housing, and Urban Development Research Center, explains in an interview with IRAN, "From a control-measures perspective, there is no direct link between subsidence and sanctions. However, a critical factor exacerbating subsidence in Iran is indirectly influenced by sanctions."

The issue lies in Iran's reliance on water-intensive methods to produce fodder and agricultural crops. Virtual water — used for livestock and crop cultivation is consumed at staggering rates. During droughts, deep wells are drilled to meet water demands, accelerating subsidence. "We could import these water-intensive products from water-rich neighboring countries, but sanctions hinder imports," he notes. "If sanctions tighten constraints, we'll have to domestically produce most water-heavy crops. This would inevitably increase water consumption, worsening subsidence," Beitollahi adds.

"Sanctions indirectly intensify subsidence by limiting cross-border farming and imports of essential goods. To meet livestock, agricultural, and food needs, Iran must ramp up water-intensive production — even amid water scarcity placing further strain on aquifers."

Emphasizing the scientific basis of these findings, Beitollahi states, "From this angle, sanctions unquestionably worsen subsidence. Subsidence depends on climate, rainfall, and water resources. The critical issue is water management: sanctions drastically affect water usage, diverting water meant for aquifer recharge to water-heavy agriculture. Even in provinces like Mazandaran and Golestan, well water is funneled into farming, accelerating subsidence."

On whether sanctions hinder access to subsidence-mitigation technology and expertise, he clarifies, "For earthquake and subsidence research over the past three decades, access to scientific papers, conferences, and materials has not been restricted. However, Iranian researchers faced visa denials for international conferences due to sanctions. Equipment for subsidence monitoring is not sophisticated or sanctioned — it's produced domestically. Satellite and radar imagery for subsidence measurement remains publicly accessible and unaffected by sanctions."

# 77

After five decades of sanctions, their effects are now evident across all sectors, with every Iranian facing some form of sanctions in their daily lives. While industries are directly impacted by sanctions, sectors like the environment face indirect consequences.

### lines, and damage to historical<br/>and cultural sites.now sees 9 cm/year subsidence<br/>along the Caspian coast as sea

Studies show that nearly half of Iran's population lives in or adjacent to subsidence zones, with the area of affected land tripling compared to five years ago. The primary cause of subsidence is excessive extraction along the Caspian coast as sea levels recede — a stark contrast to five years ago, when subsidence there was nonexistent.

How are subsidence and sanctions connected? But how exactly have sanctions

The article first appeared in Persian on IRNA.



