



The sinking of Venice in Italy

Already a unique and beautiful city, Venice has achieved extra fame from its frequent flooding, because the entire city is slowly sinking. Total subsidence has been small compared with that at some other sites, but its impact is critical because Venice lies almost at sea-level. Total decline of land level relative to sea level has been about 250 mm during the last hundred years. The ground subsidence relates to the thick layers of poorly-consolidated clay that underlie the city, and compressing in response to declining pore-water pressure within them. Starting in the late 1940s, that decline was greatly accelerated by major industrial abstraction of water from adjacent sand aquifers, but this was halted just before 1970 when its harmful effects were recognized. Ground compression and tectonic subsidence continue, but very slowly. The key factor now is the rising sea-level. When most of Venice was built, prior to about 1400, sea levels were falling due to the onset of the Little Ice Age, but they have been rising again since about 1650. They continue to rise, hence increasing the frequency of flooding episodes, and each winter has seen more frequent *Acqua Alta* events when much of the city is flooded at high tide. The short-term response has been to accept the flooding as part of Venetian life, with raised walkways in place through the winters, but removed each summer. During an *Acqua Alta*, the boardwalks provide access to all key locations, and away from the boardwalks, residents and visitors alike rely on wellington boots to stay dry when reaching shops, offices and hotels. This photograph should now be a historical document because the system of movable tidal barriers, known as Mose, became operational late in 2020 when it was able to close the three entrances from the Adriatic Sea into the Venetian lagoon for the duration of a high tide. Tidal levels are predictable, and the barriers can be raised within 30 minutes when required, even when sirocco winds not forecast can push the Adriatic to higher levels at its northern end. The barriers will protect Venice for many years into the future, but just how many depends largely on sea-level rise in response to global climate change.

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