

Submarine Groundwater Discharge: A Unique Phenomenon of Freshwater Springs in the Salty Coastal Seas

Exploring the phenomenon of freshwater springs beneath coastal seas, challenging conventional perceptions of marine hydrogeology.

Sridhar D Iyer



Image credit: Pxhere

HAVE you ever wondered if under the coastal seas (i.e., the sea adjacent to the coast) there could be fresh water? Can there be a co-existence of fresh water that flows into the sea from the rivers and salty sea water? Do you know that there are areas offshore where there are freshwater springs? These aspects may be surprising to many people, including non-hydrogeologists and oceanographers. But the enigma of fresh water in salty seas is known to those staying in coastal areas and mentioned by Strabo (63/64 BC–c.24 AD), a Greek geographer, philosopher and historian. Pliny the Elder (AD 23/24–AD 79), a Roman author, naturalist, philosopher and naval and army commander, had opined that the Romans depended on the fresh Submarine Groundwater Discharge (SGD) for their daily use.

SGD is the flow of water from land to sea and it includes fresh groundwater and recirculated seawater and groundwater, irrespective of their chemical composition and the influencing

factors. SGD is the opposite of Seawater Intrusion (SWI) and is common where there are permeable coastal aquifers that have a higher water level than the mean sea level and are connected to the sea. The aquifers may extend offshore to significant distances and discharge water into the continental shelf. Worldwide, coastal aquifers are contaminated by SWI that occurs at a depth below sea level and about 40 times the height of freshwater above sea level.

Earlier investigators assumed SGD to be hydrogeologic “curiosities” and were keen to locate and tap these for freshwater. The study of SGD is about 3 decades old although the term was coined by Zektzer *et al.* in 1973. The other terms used are “coastal seepage” or “groundwater seepage.” The scientists who study karst topography i.e., areas predominantly of calcium carbonate rocks (limestone, marble), magnesium carbonate rocks (dolomite), and evaporates (rock salt having sodium chloride) and gypsum (calcium sulphate) prefer the