



Artesian Well in Rajasthan and Tethys Sea

For Prelims: [Artesian Well](#), [Saraswati River](#), [Aquifer](#), [Permeable Rock](#), [Sandstone](#), [Tethys Sea](#), [Mesozoic Era](#), [Gondwana](#), [Laurasia](#), [Tectonic Plates](#), [Himalayan Mountain Range](#), [Tibetan Plateau](#), [Hot Springs](#), [Hydrothermal Vents](#), [Geysers](#), [Mudpots](#), [Fumaroles](#), [Barren Island](#), [Gulf of Kachchh](#), [Indus River](#), [Ganges River](#), [Thar Desert](#).

For Mains: Features of artesian well and their features, their presence in India.

Source: [IE](#)

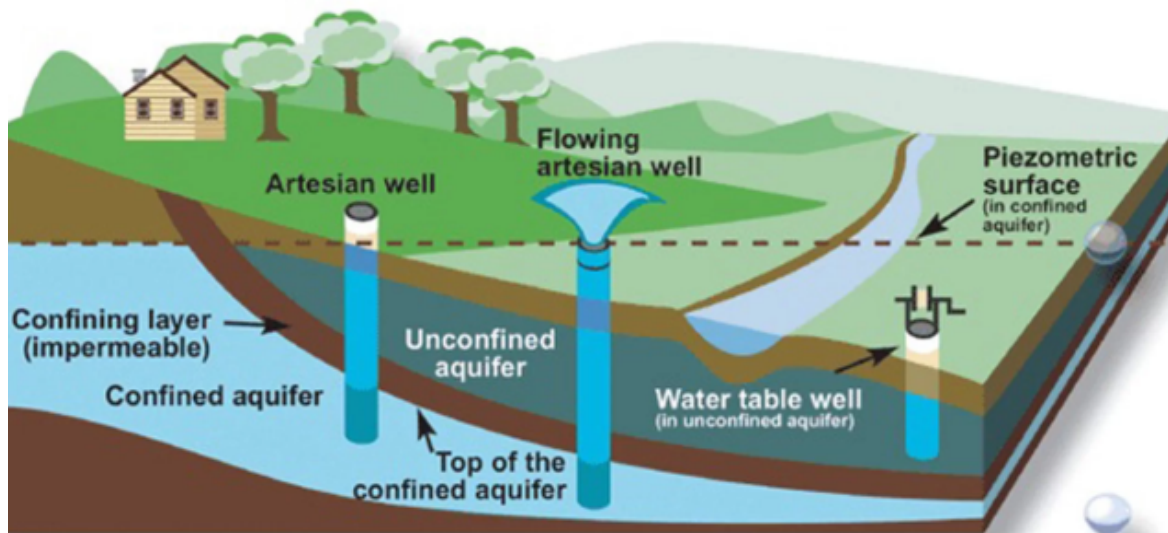
Why in News?

Recently, large amounts of **water** began **gushing out** from underground in **Jaisalmer, Rajasthan** that is attributed to the [Artesian Well](#) in India.

- Experts **rejected** the idea of the water being **linked** to the ancient [Saraswati river](#), suggesting water may be **millions of years old**, with origins from **Tethys sea** (pre-Vedic times).

What is an Artesian Well?

- **About:** An artesian well is a type of well in which **water rises naturally to the surface** under pressure without the need for pumping. This occurs when **water is trapped** in a **confined aquifer** and is under significant pressure.
 - It is also described as “confined” water because of **hardy materials above and below it**.
- **Formation:** Artesian wells are formed when a **well penetrates a confined aquifer**, which is a layer of [permeable rock](#) or **sediment** sandwiched between impermeable layers like clay or rock.
- **Pressure Mechanism:** The water in the confined aquifer is **under pressure** due to the **weight of the water above** it, and when the well is drilled, the pressure forces the water to rise through the **borehole**.
- **Water Flow:** In an artesian well, the water may **flow freely to the surface** if the pressure is sufficient, which is known as “**flowing artesian wells**.”
 - If the **pressure is not enough** to force the water to the surface, it can be **extracted using a pump**.
- **Locations:** Famous artesian wells are found in regions such as the **Great Artesian Basin in Australia**, **Dakota aquifer** in the United States, and **Africa**.
- **Difference with Tube Wells:** Artesian water can **naturally rise to the surface** on its own and is **found deeper** beneath the earth's surface whereas **tube wells require external power** to pump water.



Note: The name **Artesian** comes from the town of **Artois in France**, the old Roman city of **Artesium**, where the best known flowing **artesian wells** were drilled in the **Middle Ages**.

What are the features of Artesian Well Found in Rajasthan?

- **Water Eruption:** In desert regions of Rajasthan, water is **confined underneath** a geological layer of **sandstone**.
 - As soon as the top layer is **punctured**, water starts flowing upwards due to heavy pressure, often gushing out like a **fountain**.
- **Ancient Sea Evidence:** The water found in the borewell exhibited **high salinity** that is similar to that from **ancient sea or saline groundwater sources**.
 - The water is believed to be linked to the **Tethys Sea**, which existed **around 250 million years ago**.
- **Presence of Marine Clay:** Along with the water, **Oozes (fine white marine clay having skeletal remains)** surfaced, further supporting the idea that the groundwater is remnants of an **ancient sea**.
 - The sand found in the area, believed to be from the **Tertiary period (around 6 million years ago)**, was also brought up with the groundwater.
- **Geological Significance:** The Jaisalmer region once **bordered the Tethys Sea**, with **dinosaurs** inhabiting one side and deep waters on the other.
 - **Giant shark fossils** have been found only in India (Jaisalmer), Japan, and Thailand in Asia.

What are the Key Facts About the Tethys Sea?

- **About:** The Tethys Sea formed during the early stages of the **Mesozoic Era**, particularly during the **Triassic period** (about 250 to 201 million years ago).
 - It was located between the landmasses of **Gondwana** (the southern supercontinent) and **Laurasia** (the northern supercontinent).
 - Gondwanaland incorporated present-day **South America, Africa, Arabia, Madagascar, India, Australia, and Antarctica**.
 - Laurasia included **North America, Europe, and Asia (except peninsular India)**.
- **Geographic Extent:** The Tethys Sea extended across what is now parts of **Europe, Asia, Africa, and the Middle East** and connected the **Pacific Ocean** in the east and the **Atlantic Ocean** in the west.
- **Closure:** By the **Late Cretaceous** (around 66 million years ago), the Tethys Sea began to close

as the **tectonic plates** continued to shift.

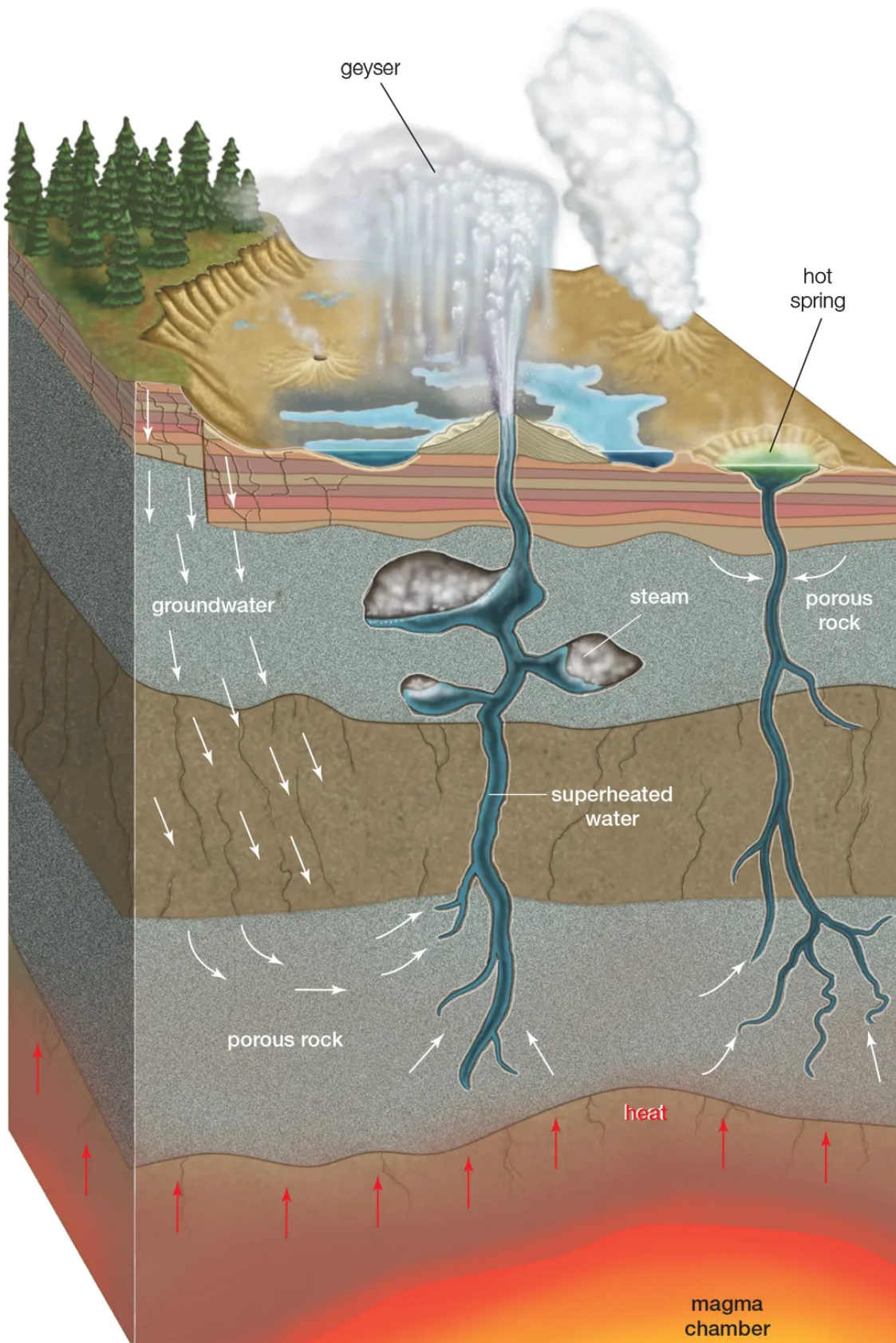
- The remnants of the Tethys Sea can still be seen today in the form of smaller seas, like the **Mediterranean Sea**, **Caspian Sea**, and **Black Sea**.
- **Tectonic Significance:** The gradual closure led to the creation of new landmasses, such as the **Indian subcontinent** moving toward the **Asian plate**, leading to the uplift of the **Himalayan mountain range** and the **Tibetan Plateau**.
- **Fossil Evidence:** The Tethys Sea is known for being home to a rich diversity of marine life, including early forms of **sharks**, **ammonites**, and **marine reptiles** like **ichthyosaurs** and **mosasaurs**.
 - The Tethys Sea's evolution helped form **petroleum basins** in North Africa and the Middle East, aiding **organic material accumulation and hydrocarbon maturation**.

~95 Million years ago



What are Other Examples of Underwater Gushing on the Surface?

- **Hydrothermal Vents:** They are **underwater hot springs** found near the **tectonic plates**, where **hot water and minerals** from beneath the Earth's crust are expelled into the **ocean**.
- **Hot springs:** Hot springs on land are areas where **heated groundwater** (heated by geothermal heat from Earth's interior) emerges at the surface.
 - E.g., **Manikaran** (Himachal Pradesh), **Gaurikund** (Uttarakhand).
- **Geysers:** These are geothermal features that **periodically eject water and steam** due to underground heating.
 - When heated by **nearby magma**, the water flashes into steam, causing an eruption of hot water and steam. E.g., **Yellowstone National Park (US)**.
- **Mudpots:** These are the **bubbling pools of mud** that form in geothermal areas. They are formed when limited **geothermal water mixes with mud and clay**.
- **Fumaroles:** Fumaroles occur when **magma passes through the water table**, heating the water and causing steam to rise, carrying volcanic gases like **hydrogen sulfide (H₂S)** to the surface.
 - It is often found near **"dying volcanoes"** where magma deep underground has solidified and cooled. E.g., **Barren Island** (Andaman and Nicobar Islands)



Saraswati River

- **About:** It is a river mentioned in ancient Indian texts, primarily the **Vedas** in which the Saraswati river is considered the **holiest and mightiest** river of the **Vedic Period** [(8000-5000 years before present (BP))].

- **Origin and Course:** It originated in the **Himalayas** and flowed through the regions of **Punjab, Haryana, Western Rajasthan,** and **Gujarat** between the **Indus river** in the west and the **Ganges river** in the east.
 - The river eventually drains into the **Gulf of Kachchh** in the **Arabian Sea**.
- **Disappearance:** The Saraswati river **disappeared around 5000 BP** due to **climatic** and **tectonic changes**.
 - It is believed that the river still flows underground beneath the **Thar Desert** and retains its **Himalayan connectivity**.
- **Mention in Ancient Literature:** The **Saraswati River** is mentioned frequently in ancient texts like the **Vedas, Manusmriti, Mahabharata,** and **Puranas**.
 - **Vedas:** The Saraswati is called the "**Best of Mothers,**" "**Rivers,**" and "**Goddesses,**" with the Rigveda highlighting its importance and the **Yajurveda** mentioning its **tributaries**.
 - **Manusmriti:** The area between the **Saraswati and Drishadvati river** (seasonal river in Haryana) is regarded as **Brahmavarta**, created by God.
 - **Mahabharata:** Mentions **pilgrimage sites** along the river and its disappearance into desert sand at **Vinasana** (place where the Saraswati river disappeared) due to low water discharge.
 - **Puranas:** The **Markandeya Purana** describes the Saraswati rising from the **Plaksha tree (Pipal tree)** with a sage worshipping its rise.

Conclusion

The recent gushing of water from underground in **Jaisalmer, Rajasthan**, attributed to an artesian well, has sparked debates about its connection to the **ancient Saraswati River**. However, scientific analysis suggests that the water is from **ancient sea remnants**, specifically linked to the **Tethys Sea, rather than the Saraswati River**.

Drishti Mains Question:

Discuss the concept and formation of artesian wells.

Q. Salinization occurs when the irrigation water accumulated in the soil evaporates, leaving behind salts and minerals. What are the effects of salinization on the irrigated land? (2011)

- (a) It greatly increases the crop production
- (b) It makes some soils impermeable
- (c) It raises the water table
- (d) It fills the air spaces in the soil with water

Ans: (b)