

**April 13, 2026**

## News and notes

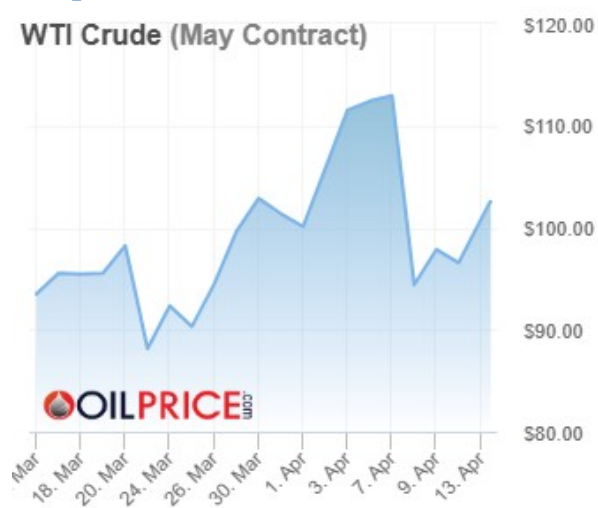
This week, before going on to discuss the geology and mineral resources of Pakistan, we will first look at some news items I thought were interesting.

If you enjoy my blogs, bookmark the site and check on Mondays rather than relying on social media postings which can get lost in the shuffle. For my news items, I try to stick to open access papers.

## Comments

If anyone has comments on any of my postings, please leave a comment on the LinkedIn page for the posting or email me at [raymondreichelt@gmail.com](mailto:raymondreichelt@gmail.com).

## Geopolitics



Oil prices up to April 13, 2026  
Credit: [Oilprice.com](http://Oilprice.com)

## Iran War

- [CNN latest Iran news and videos.](#)
- [Oil tops \\$100, safe-haven dollar gains as US moves to blockade Iran.](#)
- [Pakistani Warplanes Land In Saudi Arabia For Start Of Mutual Defense Pact.](#)
- [The Era of Free Seas Is Unraveling—and Now Everyone’s Going to Pay.](#)
- [Europe’s Jet Fuel Shortage Arriving in Weeks.](#)
- [Gulf’s ‘worst-case scenario’?](#)
- [Hapag-Lloyd: resuming normal shipping to take 6-8 weeks if Middle East stabilises.](#)
- Ray Dalio: [The Big Thing: We Are In A World War That Isn’t Going To End Anytime Soon.](#)

## **Other Geopolitics**

- [Energy Protests in Ireland](#); Ezra Levant's take on the protests [here](#).
- [Venezuela's Gold Rush Could Pull US Companies Into Illicit, Gang-Run Networks](#).
- Video: [Philippines declares state of emergency as crude oil shortage intensifies](#).
- Ukraine war: [Novorossiysk Restarts Oil Loadings at Reduced Capacity After Drone Strike](#).
- [USA and China Rare Earth Diplomacy: The Summit and the Magnets No One Sees](#).

## **Research and News**

- Question: [Is AI Replacing Petroleum Engineers or Empowering Them?](#)
- [Depositional and grain-scale controls on sandstone heterogeneity in arid continental settings: The Dutch Upper Rotliegend Group](#).
- [Earth system instability explains redox paradox during late Cambrian SPICE event](#).
- [Reconstructing the deposition of a 5.5 Ma lithified tephra by multi-scale and -analytical characterisations: the Messinian Maccarone section \(Italy\)](#).
- [Microstructural Controls on Geothermal Reservoir Host Rock Responses to Elevated Pressures and Temperatures](#).
- [On the oxidation state of arc magmas](#).
- [Sediment supply controls on channel morphological adjustments to tectonics and lithology](#).
- Image of the Day for April 10, 2026: [Earthset From the Lunar Far Side](#).
- [Abiotic CO<sub>2</sub> reduction promoted by carbonate and phyllosilicate minerals on the primitive seafloor](#).
- [A tale of two microbialites: Stromatolites and microbially induced sedimentary structures](#).
- [Linking modern-paleo lake systems: climate-driven Li-B differentiation and paleolake evolution validation in Tibetan Plateau salt lakes](#).
- [Geophysical architecture and geochronology of the Neoproterozoic Mentor anorthosite intrusive complex, northwestern Minnesota: largest anorthosite complex of the Superior Province?](#)
- [Shielding of periclase by bridgmanite during compression of a polycrystalline mantle assemblage](#).
- [Instability of Fluid-Mineral Equilibrium Under Non-Hydrostatic Stress Investigated With Molecular Dynamics](#).
- [In situ <sup>40</sup>Ar/<sup>39</sup>Ar dating of authigenic potassium feldspar in midcontinent Laurentia](#).
- [Hartkoppeite, a new mineral with a novel polyoxometalate sandwich cluster](#).

- Uranium mineralogy: [Optical Vibrational Spectroscopic Investigation of Natural and Synthetic Analogs of Uranyl Oxyhydroxyhydrate Minerals.](#)
- 04/07 [Metasomatic monazite growth as a result of apatite-fluid interactions: U-Pb dating of monazite in the Siilinjärvi glimmerite-carbonatite complex, Finland.](#)
- [Paleoenvironment and redox condition of the Mesoproterozoic Chitrakoot Formation, central India: Reconstruction from sedimentological and geochemical proxies.](#)
- [Updated geological assessment of the Southern North Sea set to underpin future offshore infrastructure development.](#)

## Plate Tectonics

- [Three-Dimensional Crustal Deformation Analysis Using Physics-Informed Deep Learning.](#)
- [Rotation in the Southeastern Caribbean Arc \(Grenadines\) Accommodated by Back-Arc Basin Inversion.](#)
- [From Extension to Strike-Slip Faulting Along the Western Continuation of the North Anatolian Fault in the Northern Aegean Sea: Structural, Geochronological and Geochemical Constraints.](#)
- [Kinematics of Burial Remagnetizations in Fold-and-Thrust Belts: A Case Study From the South Pyrenean Foreland Basin \(NE Spain\).](#)
- [Climax of Late Paleoproterozoic Rift-Related Magmatism in the Columbia Supercontinent: Insights From a 1.77–1.76 Ga Large Igneous Province of the Dunhuang Block, Northwest China.](#)
- [Inboard advance of arc magmatism regulates mountain building in the Andes.](#)
- [Active Plume, Abandoned Ridge, or Ancient Slab? olivine-Hosted Melt Inclusions Record the Mantle Melting Conditions Below the East Pacific Revillagigedo Archipelago, Mexico.](#)
- [The Cascadia Subduction zone isn't shutting down – but it's more complicated than we thought.](#)
- [Tectonic setting and mantle source evolution reconstructed from deep time analysis of basalt geochemistry.](#)
- [Cracked on-axis and pristine off-axis crust formed during forearc evolution at a nascent subduction zone.](#)
- [Raman elastic geobarometry from garnet amphibolites in the eastern margin of the Santa Quitéria continental magmatic arc, NE Brazil: New insights into the evolution of Western Gondwana.](#)
- [New Constraints on the Activity and Evolution of the Young Aigion-Erineos Fault System, Gulf of Corinth, Greece.](#)
- [A revised carbon isotope composition of the convecting upper mantle.](#)

## Paleontology

- [The first non-mammalian synapsid embryo from the Triassic of South Africa](#); Phys.org summary [here](#).
- [Obligate faunivorous megatheropod size class patterns across the Jurassic-Cretaceous Periods](#).
- [Cranial anatomy, palaeoneurology, palaeobiology and stratigraphic age of the large-bodied ornithomimid, \*Muttaburrasaurus langdoni\* Bartholomai and Molnar, 1981, from the mid-Cretaceous of Australia](#).
- [Moulting and development in a freshwater prawn from the Cretaceous of Morocco](#).
- What could go wrong? [The \\$10B Company Behind The Dire Wolf Is Now Bringing Back Mammoths](#).
- Not an octopus but a nautiloid instead: [Synchrotron data reveal nautiloid characters in \*Pohlsepia mazonensis\*, refuting a Palaeozoic origin for octobranchians](#); Science Alert summary [here](#).
- [Mummified early Permian reptile reveals ancient amniote breathing apparatus](#); Phys.org summary [here](#).
- [Reassessment of Ostracoda from the Lower Devonian Lilydale Limestone of southeastern Australia](#).
- [Redescription of the \*Panoplosaurus mirus\* \(Ankylosauria: Nodosauridae\) holotype skull using computed tomography, and a new comparative scheme for panoplosaurin cranial ornamentation](#).
- [Extinct lineages in a rift landscape: Middle Jurassic Bennettitales from the Otlaltepec Formation](#).
- [Morphology and phylogeny of \*Bothriolepis yunnanensis\* \(Placodermi, Antiarcha\) from the Middle Devonian of China](#).
- Tusk shells: [The lower Miocene Scaphopoda of Chile](#).
- [The dawn of the Phanerozoic: A transitional fauna from the late Ediacaran of Southwest China](#).

## Ore Deposit Geology

- [Chenjiashuang uraninite: mineralogy, genesis, and potential as a U-Pb dating reference material](#).
- [Linking carbonatites, rare earth ores, and subduction-fertilized mantle lithosphere](#); Phys.org summary [here](#).
- [Aggregation of REE-bearing nanoparticles leads to REE enrichment in Late Permian Claystones from SW China](#).
- [Magma Formed in Deep "Gold Kitchens" Delivers Traces of Gold to Volcanic Islands](#).

## Mining and Energy

- [Saudi Arabia restores full capacity on East-West oil pipeline to 7 million bpd after attacks](#).

- [Deep-sea mining heats up as new player challenges early mover advantage.](#)
- Brazil: [Vale to build iron ore processing plant focused on tailings.](#)
- [Mining executives accused of hijacking Brazil lithium claims.](#)
- [Miner found alive in flooded Mexico mine after being trapped for two weeks.](#)
- [Inside a company making nuclear reactors the size of a shipping container.](#)
- From the USEIA: [Annual Energy Outlook 2026.](#)
- [Drilling Engineer Captures Record Savings For Operator.](#)
- [NexGen and Denison Mines uranium mine projects both going ahead.](#)
- [China achieves zero thermal runaway sodium battery, survives 300°C test.](#)
- [Vancouver-based mining company confirms the deaths of 9 of 10 workers kidnapped in Mexico.](#)
- [Africa's largest uranium producer, Namibia, unveils new high-grade critical mineral site.](#)
- [Metals of the future': copper and silver flow beneath Poland's surface.](#)

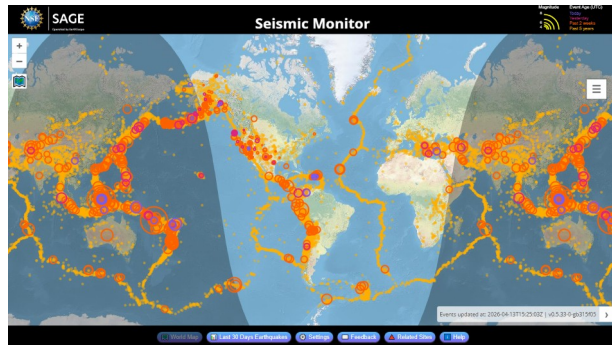
## Environmental Geology and Hydrogeology

- [Application of random forest modeling to evaluate groundwater storage changes in the Breede Water Management Area, South Africa.](#)
- [World's first commercial-ready deep borehole nuclear waste disposal inches closer to reality.](#)
- [Global insights into the lifespan of water boreholes using survival analysis methods.](#)
- [Warming and snow loss increase reliance on old groundwater in a Colorado River headwater.](#)

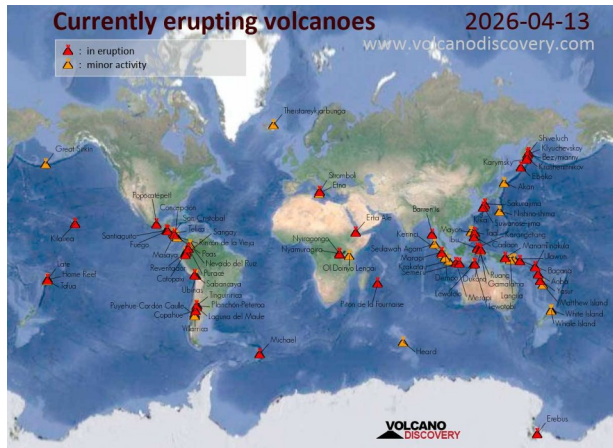
## Glaciers and Climate Change

- Lots of recent papers on glaciers in [The Cryosphere](#) from the EGU.
- [Weathering of the Emeishan Large Igneous Province Enhanced the Nutrient Flux to the Oceans and Led to Late Permian Climate Cooling.](#)
- AMOC: [Atlantic exceptionalism in the twentieth century.](#)
- [Global glacier mass change in 2025.](#)
- [Explaining Glacial-Interglacial CO<sub>2</sub> Changes Requires Multiple Ocean Processes.](#)
- [Configuration of circum-Antarctic circulation at the last green- to icehouse climate transition.](#)
- [Wind-triggered Antarctic sea-ice decline preconditioned by thinning Winter Water](#); SciTechDaily summary [here](#).

## Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

### Volcanoes

- [Smithsonian / USGS Weekly Volcanic Activity Report](#).
- United States Geological Survey (USGS) Volcano Observatories:
  - Yellowstone Caldera Chronicles: [The 2024 YVO annual report has just exploded from the presses!](#)
  - [Cascades Volcano Observatory Weekly Update](#).
  - Volcano Watch – [Caldera clues: tephra deposits from Kīlauea’s past](#).
- [Repeated fracturing-healing behavior of lava plugs drives intermittent explosions during Vulcanian eruptions](#).
- [Lava bursts forth as Hawaii’s Kīlauea volcano erupts](#).

### Earthquakes

- [Euro-Mediterranean Seismological Centre \(EMSC\)](#).
- [Earthquakes Monitoring Live Worldwide](#).
- [The 10 September 2025 Mw 4.1 Earthquake in Northeastern Utah, United States: An Archetypal Continental Mantle Event](#).
- [Felt Reports from the MyShake Smartphone App as an Earthquake Shaking Intensity Metric](#).

### Geohazards

- Earthquakes, volcanic eruptions, and landslides: [Probing rock rupture with naturally occurring nuclide signals](#).
- [A satellite just captured images of a tsunami being born. Here's why that's a big deal](#).

## Free Geology Books and Other Stuff

Free geology books can be downloaded from these sites:

- [OreZone Readers and Experts Telegram Channel](#); the Ore Zone channel also shows employment opportunities for geologists.
- [The Groundwater Project](#) has many groundwater geology books for free download together with free online courses, listed [here](#).
- Free [Groundwater Modeling Courses](#) from the HydroGeoCenter.
- From Western Australia: [Carbonatite, lamprophyre and host rocks in the northern Aileron Province](#).
- The Geology of Indonesia: [Volume 1](#) and [Volume 2](#).
- Brett Davis' book on veins in a deforming rock mass: "[The Veining Bible](#)"; also at [this site](#).
- From the Mineralogical Society of America: [Handbook of Mineralogy](#).
- [Systematic geochemical classification of felsic igneous rocks of the Yilgarn Craton](#).
- From the Arizona Geological Survey: [Geochemistry Diagram Generator v 1.0](#).
- Online app: [Australia's full national topographic library at your fingertips](#).

## Upcoming Events

- [14-15 April 2026: 2026 IAH Ireland Conference – Groundwater 2035, Tullamore, Ireland](#).
- [April 15 Final Stop of the GAC 2025–2026 Howard Street Robinson Lecture Tour Lecture Tour, 'The Origin of Carbonatite Complexes and their Critical Metals', Geology 269, University of Saskatchewan, Saskatoon 3:30 PM to 5:30 PM](#).
- [GAC-MAC 2026 St. John's NL, St. John's Convention Center, May 25-28, 2026](#).
- [PEG2026: 11th International Symposium on Granitic Pegmatites; 16th–19th August 2026, in Perth, Western Australia](#).
- [14-18 September 2026, IAH 2026, 53rd Congress of the International Association of Hydrogeologists; Budapest Congress Center](#).
- [September 30 - October 3, 2026 SEG 2026 Conference Salt Lake City, United States](#).
- [Paleoamerican Odyssey 2026, October 14-17, 2026, Santa Fe Convention Center, Santa Fe, New Mexico](#).
- [November 2-3, 2026 CCMEC 2026 Victoria Inn Hotel & Convention Centre, Winnipeg, Manitoba](#).
- [12-20 August 2028, Geosciences for Humanity, 38th International Geological Congress, in the BMO Centre, Calgary](#).
- [Society of Petroleum Engineers Distinguished Lecturer Schedule](#).
- [American Geophysical Union List of Upcoming Meetings](#).
- The Geological Society: [Events & Courses](#).
- [Upcoming Distinguished Geoscience Australia Lectures \(DGALs\)](#).

April 13, 2026

## Geology and Mineral Resources – Pakistan

### Introduction



Figure 1 – Pakistan

Credit: [Mapland](#), [Creative Commons Attribution-Share Alike 3.0 Licence](#)

The [Islamic Republic of Pakistan](#) is a country of 247,653,551 people in [South Asia](#). The country has an area of 881,913 square kilometres and borders on [India](#), to the east; [China](#), to the northeast; [Afghanistan](#), to the northwest; and [Iran](#), to the west. To the southwest of Pakistan is the [Arabian Sea](#).

Pakistan is a relatively poor country [where](#) 44.7% of the population live below the international poverty line of US\$4.20 a day. The country has a per capita [GDP \(PPP\)](#) of \$6,950 and a low [Human Development Index](#) of 0.544. Pakistan has a semi-industrialized [economy](#) is heavily dependent on agriculture.

In 2024, the top [exports](#) of Pakistan were linen fabrics, rice, men's and women's suits, and knit sweaters. The top destinations were United States, China, Germany, The United Kingdom, and The United Arab Emirates (UAE). In 2024, the top [imports](#) of Pakistan were refined and crude petroleum, petroleum gas, palm oil, and telephones. The top origins were China, UAE, Saudi Arabia, Qatar, and Indonesia. In the latest year, Pakistan was the world's largest importer of tea, used clothing, and metallic yarn.

For more details on the country, check out the [Wikipedia](#) and [Grokopedia](#) articles on the country.

## Geology



Figure 2 – The Collision of India and Eurasia  
Credit: USGS, public domain

The geology of Pakistan has its origin in a collision of a portion of [Gondwana](#), the [Indian Subcontinent](#), into the [Eurasian Plate](#); a [process](#) that began with the [breakup of Gondwana](#) during the [Late Triassic](#) leading to the creation of a [convergent boundary between the Indian and Eurasian plates](#), beginning during the [Eocene Epoch](#) and closing the ancient [Tethys Ocean](#). Moving at a rate of [approximately 9 m a century](#), the movement of the Indian Plate into the Eurasian plate has caused the [rise of the Himalaya Mountains](#), currently rising about [1 cm/year](#), and the [creation of the Tibetan Plateau](#).

The [geology of Pakistan](#) includes deposits ranging in age from the [Archean](#) to the [Cenozoic](#). The major tectonic divisions are:

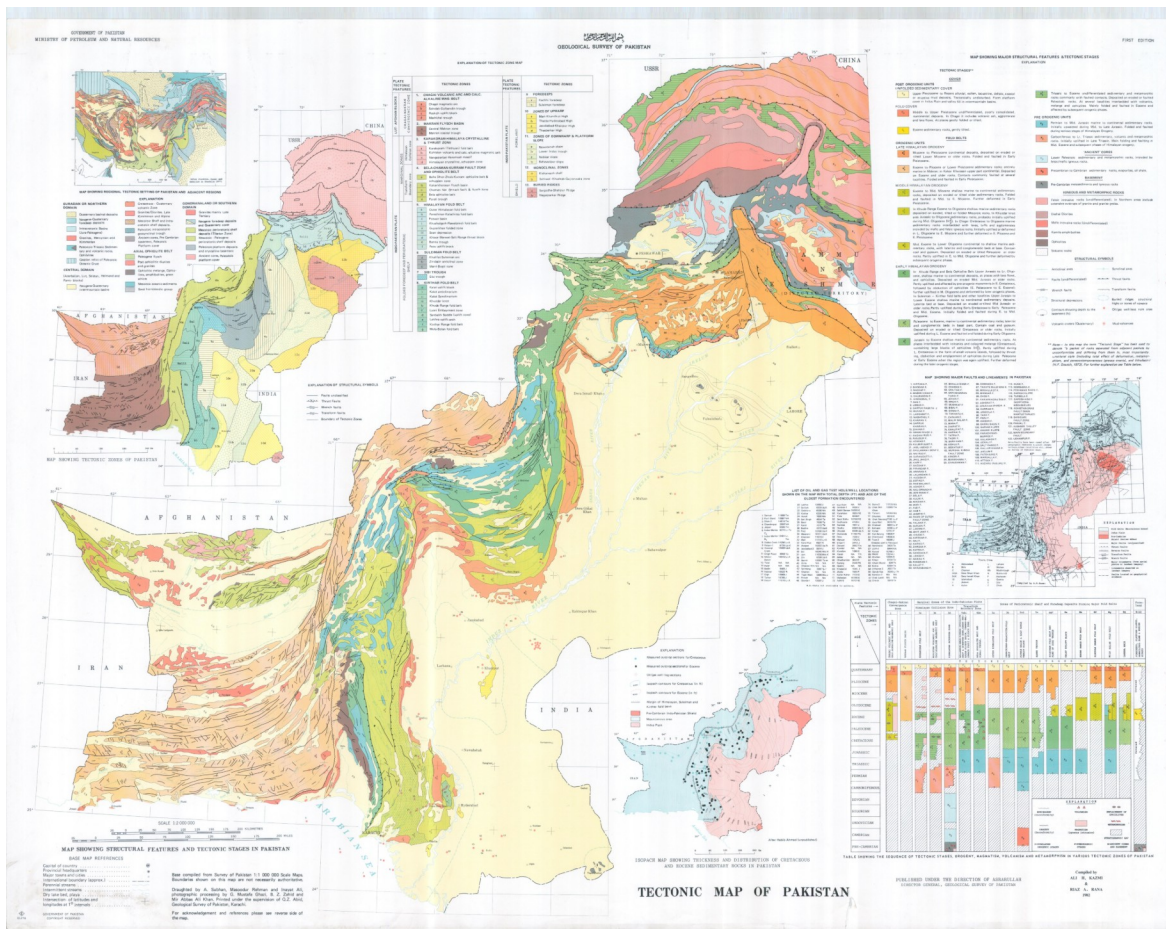
- The [Indus Platform and Foredeep Zone](#);

- The [NW Himalayan Fold-and-Thrust Belt](#);
- The [Kohistan-Ladakh Magmatic Arc](#);
- The [Karakoram Block](#);
- The [Kakar Khorasan Flysch Basin and Makran Accretionary Zone](#); and
- [Pakistan's Offshore Zones](#).

Pakistan's geology is fairly complex, if you want to dig into the details – and there are lots of them – I suggest that you read this reference:

- Ali H. Kazmi, A. H, and I. A. Abbasi, 2008, *Stratigraphy & Historical Geology of Pakistan*, Department and NCE in Geology, University of Peshawar, [https://www.researchgate.net/publication/337166277\\_Stratigraphy\\_Historical\\_Geology\\_of\\_Pakistan](https://www.researchgate.net/publication/337166277_Stratigraphy_Historical_Geology_of_Pakistan)

Figure 3 links to a downloadable geological map of the Pakistan.



**Figure 3 – Tectonic Map of Pakistan**  
**Credit: ©Geological Survey of Pakistan**

## Paleontology

With its complicated geology, [Pakistan has a wide variety of fossils](#). Here are a few examples.

### *Ambulocetus*

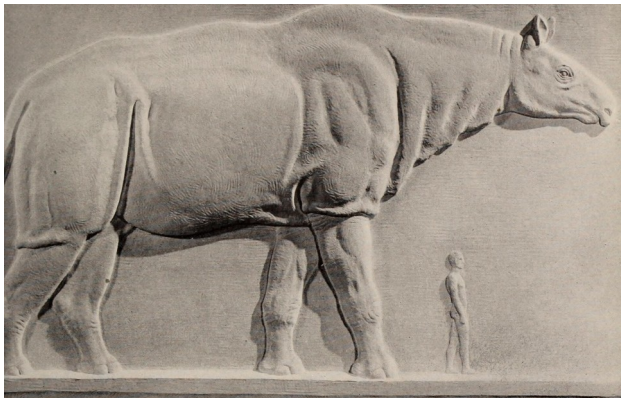


**Figure 4 - *Ambulocetus* Model and Skeletal Restoration**

**Credit: [Ghedoghedo](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license**

*Ambulocetus*, i.e. “The Walking Whale” was an early [cetacean](#) that lived on the Indian subcontinent during the [Early Eocene](#). *Ambulocetus* was [originally found](#) by Pakistani palaeontologist [Mohammad Arifand](#) and American palaeontologist [Hans Thewisse](#) in 1991. The fossil came from the [Kuldana Formation](#) in the [Kala Chitta Hills](#) of [Punjab](#), Pakistan. *Ambulocetus* was approximately 10 feet long and weighed around 550 pounds.

### *Paraceratherium*, a.k.a *Baluchitherium*



**Figure 5 - Reconstruction of *Baluchitherium*, American Museum of Natural History**  
**Credit: [American Museum of Natural History](#), public domain**

*Baluchitherium*, properly called *Paraceratherium*, was an extinct genus of hornless [rhinoceros](#) that lived during the [Oligocene Epoch](#) of the [Paleogene Period](#). It was huge, it stood about 4.8 m tall and weighed 15 to 20 tonnes with a total body length of 7.2 m. Researchers describe it as "[the largest land mammal ever imagined](#)". It lived in Central Asia and the Indian subcontinent and was first found in the [Chitarwata Formation](#) of [Baluchistan](#). In 1911, [Clive Forster-Cooper](#) coined the term *Paraceratherium* to describe it, but also used the term *Baluchitherium*. It gets complicated since many different researchers found

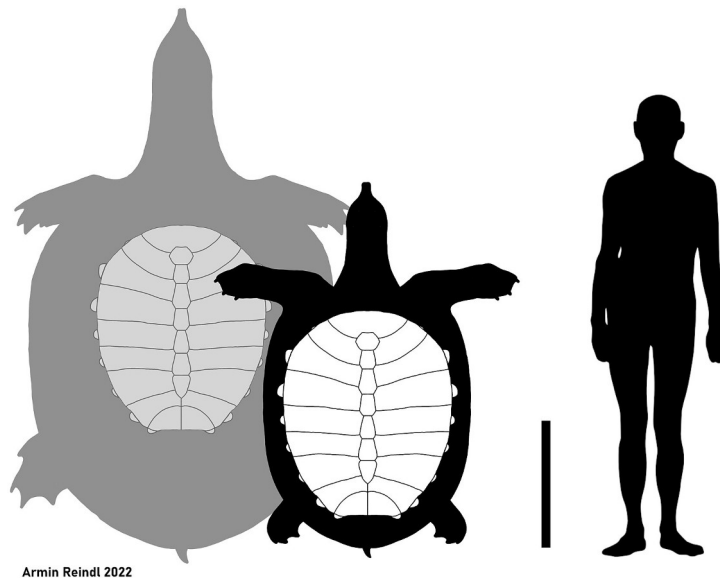
specimens of *Paraceratherium* in Asia and published their findings in various English, Russian, and Chinese language journals. The current agreed designation is *Paraceratherium* although geologists [in Pakistan](#) favour the term *Baluchitherium*.



**Figure 6 - *Baluchitherium* Skull at the American Museum of Natural History**  
**Credit: [Ryan Somma](#), [Creative Commons Attribution 2.0 Generic](#) license**

*Baluchitherium* also shows up in the social commentary of the American author [James Howard Kunstler](#). In his writings, Kunstler compared his fellow Americans to the giant Oligocene mammal (for example: [here](#), [here](#), [here](#), and [here](#)). Kunstler is an entertaining and insightful writer, much better than me. I heartily recommend his work and you can follow him at his website [here](#).

### *Drazinderetes tethyensis*



**Figure 7 – *Drazinderetes tethyensis***  
**Credit: [Armin Reindl](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license**

[\*Drazinderetes tethyensis\*](#) was a species of soft-shelled turtle that lived in the Tethys Ocean during the [Middle Eocene](#). Fossils of *D. tethyensis* were [first found in 1996](#) in the [Drazinda Formation](#) of the Indus Basin. *D. tethyensis* fossils showed a creature 1.5 to 2.1 metres long that lived all or most of its life in the ocean.

## *Pakicetus*



Figure 8 – *Pakicetus* Skeleton

Credit: [Kevin Guertin](#), [Creative Commons Attribution 2.0 Generic](#) license

Another ancient cetacean, *Pakicetus* was endemic to South Asia during the [Ypresian](#) age of the Eocene Period. A wolf-like mammal, it was about 1 to 2 metres long, and lived in and around water where it ate fish and other animals. *Pakicetus* was [first found](#) in 1981 in the Kuldana Formation by [Philip D. Gingerich](#) and [Donald E. Russell](#). *Pakicetus* was important in that it was one of the first fossils [positively identified](#) as an ancient cetacean by the characteristic features of the inner ear that are found only in cetaceans.

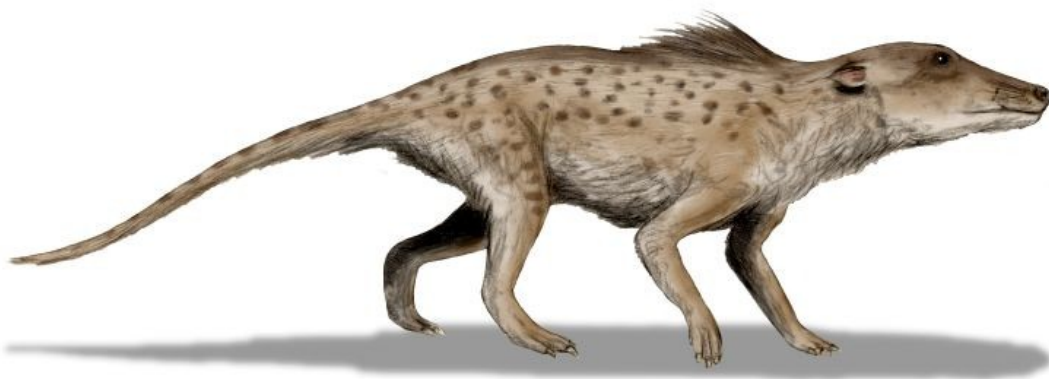


Figure 9 – Reconstruction of *Pakicetus*

Credit: [Nobu Tamura](#), [Creative Commons Attribution 3.0 Unported](#) license

## Mineral Resources



**Figure 10 – Himalayan Salt from Pakistan**

**Credit:** [Ivar Leidus](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

With its [complex geology](#), Pakistan has a [wide variety of mineral resources](#). According to the most recent [USGS Minerals Yearbook for Pakistan](#), the country's mineral industry includes metallic minerals, industrial minerals, and fuel minerals. The latest statistics on Pakistani mineral production from the USGS are [here](#). Let's look at this industry.

### *Metallic Minerals*

- [Antimony is mined](#) in [Balochistan](#) by [Mteq Pakistan \(Pvt\) Ltd](#). [Recent discoveries](#) have lead to a [lot of interest in Pakistan antimony](#).
- [Bauxite \(aluminum ore\) is mined](#) in the [Lahore District](#) of [Punjab Province](#).
- [Pakistan Chrome Mines Ltd](#), mines chromite in Balochistan.
- Copper and gold are mined at the [Saindak Copper-Gold Mine](#), [Barrick is developing the Reko Diq](#) copper-gold deposit; both of these deposits are in Balochistan.
- Iron ore is mined by various small scale producers and by [AR Mineral](#) from mines in Balochistan.
- Lead and zinc are mined at the [Duddar Mine in southeastern Balochistan](#).
- Magnesium is mined at the [Kumhar mine](#) in the [North-West Frontier Province](#).

### *Industrial Minerals*

- Barite, lead, and zinc are mined by [Bolan Mining Enterprises](#) in Balochistan.
- There are over 30 [cement plants in Pakistan](#).
- Dimension stone production includes marble and [travertine](#) from various locations.

- [Gulzar Ahmed Mines \(SMC\) Pvt Ltd.](#) mines feldspar from their quarries in [Mansehra District](#)
- The [Shah Industrial Mining Company](#) mines fluorspar and barite in the [Khyber District](#) of the North-West Frontier Province.
- Various gemstones are mined by [artisanal miners](#) in [Chumar Bakhoor](#).
- Gypsum mines include the [Dadukhel mine](#), the [Dera Ismail Khan mine](#), the [Khewra mine](#), the [Kohat mine](#), [Mawand mine](#), and the [Rakhi-Munh mine](#).
- Phosphate rock is mined by the [New Swat Mining Corporation](#) in [Abbottabad District](#).
- [Salt mines](#) include the [Khewra Salt Mines](#), the [Bahadurkhel mine](#), the [Ghani Salt Mine](#), the [Khewra mine](#), the [Warcha salt mine](#), and by [artisanal miners](#) in the [Kalabagh mines](#).
- The [National Mining Corporation](#) mines silica sand at various locations in Punjab, [Sindh](#), Balochistan, and the North-West Frontier Province.
- Talc is mined from [various producers](#) in the North-West Frontier Province.

### ***Fuel Minerals***

Coal mining in Pakistan includes the:

- [Chamalang Coal Mines](#),
- [Indus East Coal Mine](#),
- [Jherruck Coal Mine](#),
- [Jhimpir Coal Mine](#),
- [Lakhra Coal Mine](#),
- [Ongar Coal Mine](#),
- [Saleh Jo Tar Coal Mine](#),
- [Salt Range Coal Mine](#),
- [Singharo Bhitro Coal Mine](#),
- [Sinhar Vikian Varvai Coal Mine](#),
- [Sonalba Coal Mine](#), and the
- [Sonda-Thatta Coal Mine](#).

Figure 11, below, shows the locations of the energy infrastructure in Pakistan.

### Energy Infrastructure Map - 2020

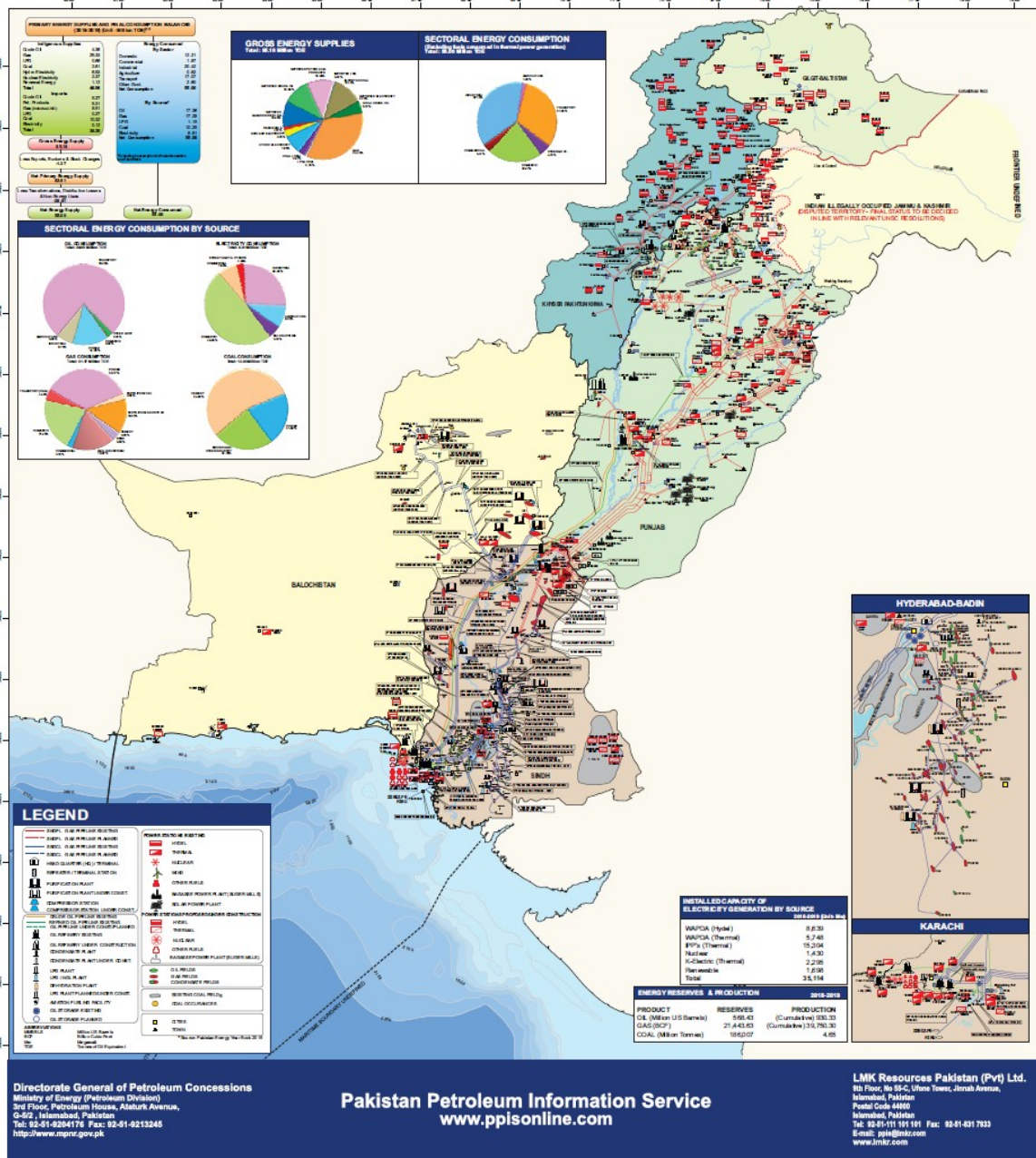
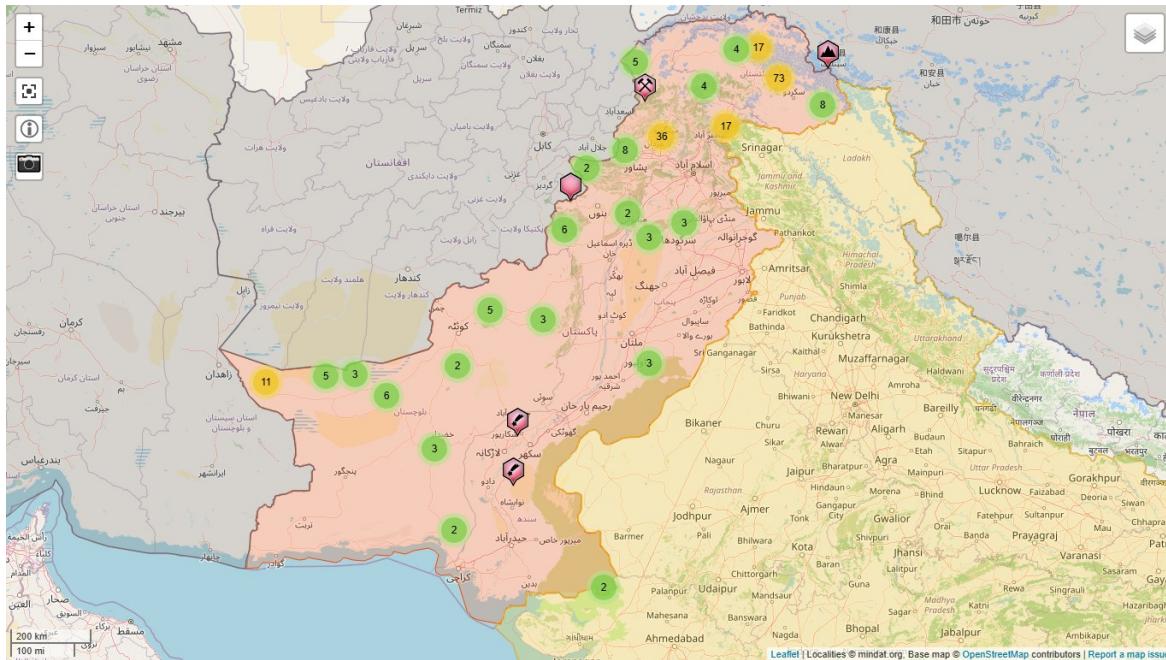


Figure 11 – Pakistan Energy Infrastructure  
Credit: Pakistan Petroleum Information Service

Figure 12, below, links to an interactive mineral occurrence map from [Mindat.org](http://Mindat.org).



**Figure 12 – Mineral Occurrence Map of Pakistan**  
 Credit: [Mindat.org](http://Mindat.org)

## Summary



**Figure 13 – Pakistan Landscape**  
 Credit: [Joham javed](#), [Creative Commons Attribution-Share Alike 4.0 International license](#)

The legacy of the ancient Tethys Ocean and the raising of the Himalayas has given Pakistan a [great potential](#) for mineral exploration and development. However there are risks such as [general political instability](#) and [endemic corruption](#). There are also geopolitical risks including the current [armed dispute with Afghanistan](#) and the ever present potential for [nuclear war with India](#). The Iranian war, next door, is another complication and risk. [Separatist movements in Balochistan](#) and the [general lawlessness of the North-West Frontier Province](#) make projects in those geologically promising regions risky. A hard nosed cost/benefit analysis should be a prerequisite to any mining or petroleum project in Pakistan.

## **Standard Caveat**

### **[J. Robert Oppenheimer on freedom and scientific inquiry](#)**

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.