

*April 17, 2023*

## News and notes

Before going on to discuss how geology has affected the fate of Afghanistan, here are some news items I thought were interesting

## Research

- [The origin of platinum group minerals in oceanic crust.](#)
- Granite formation: [Geochemical significance of lithium and boron isotopic heterogeneity evolving during the crystallization of granitic melts.](#)
- Lightning and mineralization: [Routes to reduction of phosphate by high-energy events](#); Phys.org summary [here](#).
- Stable isotope geology: [A strontium isoscape of northern Australia.](#)
- Aeolian sedimentology: [Spatiotemporal analysis of dune stabilization in the Kyzylkum and Karakum sandy deserts.](#)
- More wind blown sedimentation: [Astronomical Forcing on Loess Deposition in the Junggar Basin Since the Late Pliocene.](#)
- From out of this world: [How the world's oldest known meteorite impact structure changed the chemistry of Earth's crust.](#)

## Plate Tectonics

- The Andes: [Rapid absolute plate motion changes inferred from high-resolution relative spreading reconstructions: A case study focusing on the South America plate and its Atlantic/Pacific neighbors](#); Phys.org summary [here](#).
- Alaska: [Roadblocks and speed limits: Mantle-to-surface volatile flux through the lithospheric-scale Denali fault, Alaska.](#)
- Italy: [Scattering Attenuation Images of the Control of Thrusts and Fluid Overpressure on the 2016–2017 Central Italy Seismic Sequence.](#)

## Coastal Geology

- East coast America: [Hidden vulnerability of US Atlantic coast to sea-level rise due to vertical land motion](#); Phys.org summary [here](#).
- Northern Canada: [Nunataryuk field campaigns: understanding the origin and fate of terrestrial organic matter in the coastal waters of the Mackenzie Delta region.](#)
- More on the Mackenzie Delta: [Biogeochemical River Runoff Drives Intense Coastal Arctic Ocean CO<sub>2</sub> Outgassing.](#)

## Paleontology

- [Wooded grasslands flourished in Africa 21 million years ago – new research forces a rethink of ape evolution.](#)
- Little dinosaurs: [Machine learning confirms new records of maniraptoran theropods in Middle Jurassic UK microvertebrate faunas](#); Phys.org summary [here](#).
- Whales: [New specimens and species of the Oligocene toothed baleen whale Coronodon from South Carolina and the origin of Neoceti](#); Eureka Alert summary [here](#).
- [Plant Megafossils, Palynomorphs, and Paleoenvironment from the Late Middle to Late Eocene Burnaby Mountain Flora, Huntingdon Formation, British Columbia, Canada](#); Eureka Alert summary [here](#).
- Bats: [The oldest known bat skeletons and their implications for Eocene chiropteran diversification](#); Eureka Alert summary [here](#).
- Early vertebrates: [Lasanius, an exceptionally preserved Silurian jawless fish from Scotland](#).

## Environmental Geology and Mining

- [Mapped: Air Pollution Levels Around the World in 2022 – Visual Capitalist.](#)
- Cleanup effects: [Exploring the association of Brownfield remediation status with socioeconomic conditions in Wayne County, MI.](#)

## Energy and Mining

- Exploration activity: [U.S. Oil & Gas Rig Count Falls for Third Week in a Row – Baker Hughes.](#)
- More exploration activity: [BP Launches First Gulf Of Mexico Platform Since Deepwater Horizon.](#)
- [OPEC+ Cuts Partly Due to Reshaping of Global Oil Flows, IEA Says](#); meanwhile [Oil Posts Fourth Weekly Gain as IEA Sees Higher Price Threat.](#)
- How did those sanctions work out, eh? [Russia's Oil Revenues Rebound As Exports Surge To Three-Year High](#); related [Russia's Gasoline Exports Jump As African Buyers Replace Europe.](#)
- [Oil Tanker Goes Missing After Pirate Attack.](#)
- Southwest United States: [Permian Oil Production Hasn't Peaked Yet.](#)
- From the United States Energy Information Administration: [U.S. electric capacity mix shifts from fossil fuels to renewables in AEO2023.](#)
- Finland: [Europe's biggest reactor caps 14-year delay to begin commercial output](#); meanwhile [Germany retires nuclear plants in hopes of greener pastures.](#)
- [Learn More: Components of An Electric Vehicle Battery – ENERGYminute.](#)



April 17, 2023

## Geology and the Fate of Societies – Afghanistan

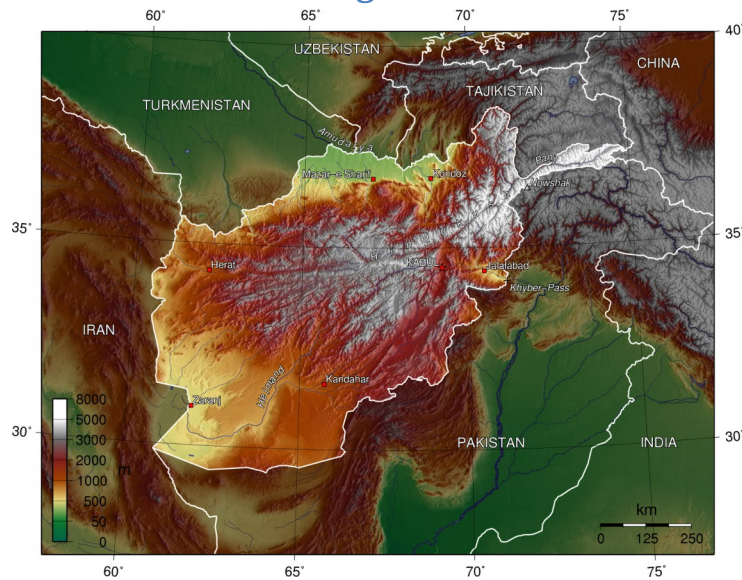


Figure 1 – Topography of Afghanistan

Credit: [Generic Mapping Tools](#), [Creative Commons Attribution-Share Alike 3.0 Unported license](#)

We'll begin our review of geology and the fate of societies with [Afghanistan](#). The Islamic Emirate of Afghanistan is located north of the [Indian Subcontinent](#) and south of [Central Asia](#). About 42 million people live in Afghanistan, according to [current estimates](#). Its geology and geopolitics is interesting, to say the least, and its history is often a tragic example of living near ambitious neighbours.

## Geology

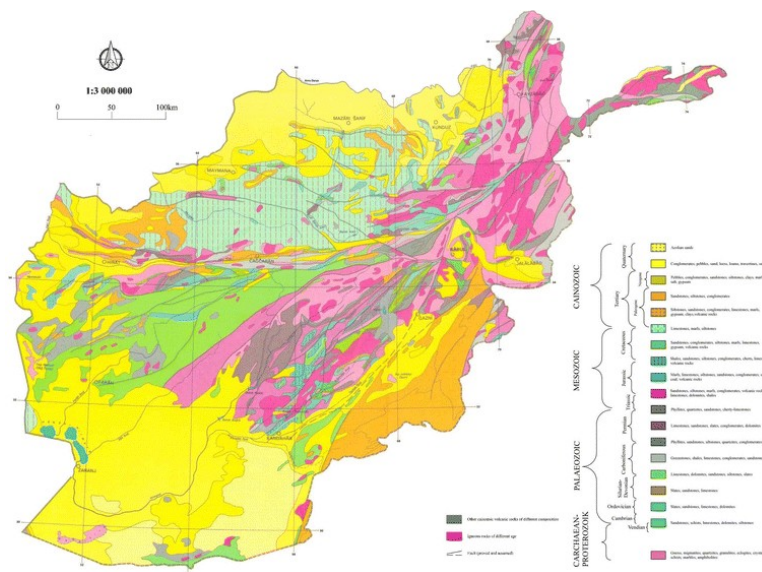


Figure 2 – Geological Map of Afghanistan

Credit: [USGS, 2007](#), [public domain](#)

The [bedrock geology of Afghanistan](#) ranges in age from [Archean](#) to the [Cenozoic](#). Many of the deposits originated in the ancient supercontinent of [Gondwana](#) and the ancient [Paleotethys](#) and [Neotethys](#) seas. The most important feature of the geology of Afghanistan has been the mountain building that has formed it. Three main episodes of orogeny are found in the geology of the country:

- The [Variscan or Hercynian](#) orogeny that happened during the late [Paleozoic](#) and brought together [Euramerica](#) and Gondwana to form the supercontinent of [Pangaea](#);
- The Cimmerian Orogeny that formed many of the mountains in Central Asia and occurred during the [Late Triassic](#); and
- The [Himalayan Orogeny](#) during the Cenozoic where the Indian Subcontinent moved into the [Eurasian Plate](#) thus creating the present Himalayan Mountains.

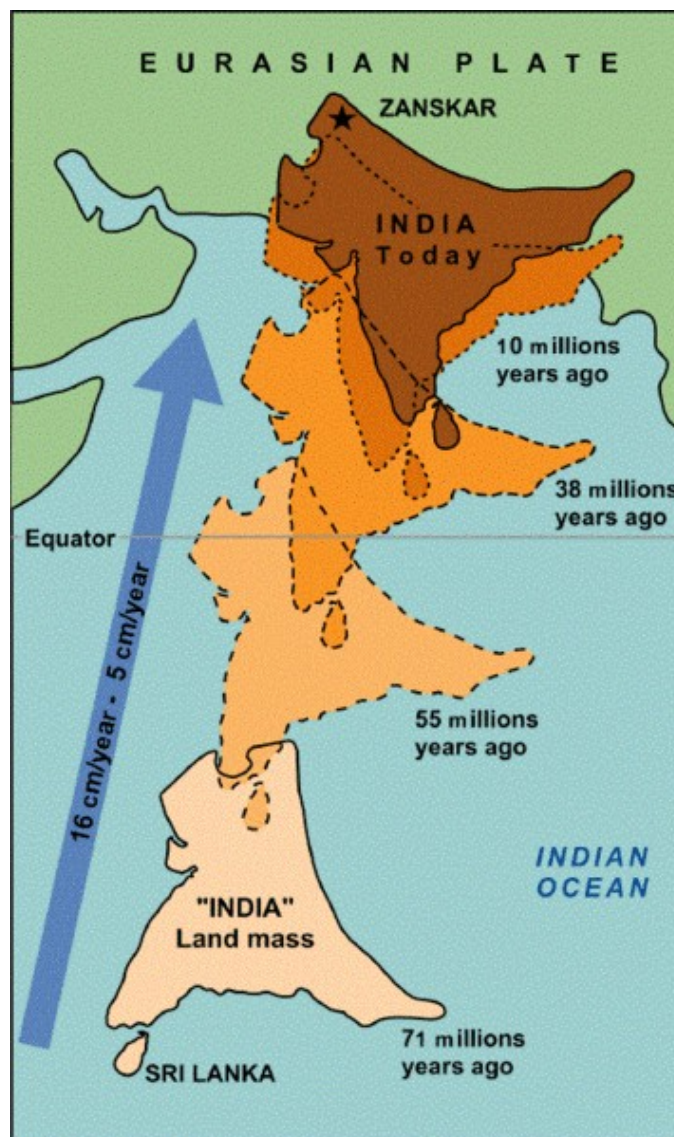


Figure 3 – India-Eurasia Collision 70-0 Million Years Ago  
Credit: Figure 2.1 in [Pierre Dèzes 1999](#)

## Resources

The geology of Afghanistan has left it with an abundance of mineral resources and adequate, though not spectacular, agricultural resources.

### Agricultural Resources

One of the effect of the mountainous topography of Afghanistan is that [only a fraction of the land surface is suitable for any kind of agriculture](#). Only about an eighth of the land is suitable for [arable agriculture](#). Of the rest, some is used for [pasture](#) and much is simply waste land unsuitable for any use. Forests cover only about 3% of the land

Food crops grown in Afghanistan include wheat, as the chief crop, corn (maize), rice, barley, fruits and nuts. Cotton was also an important crop, although the wars of the past few years have destroyed that industry. Opium was once only a minor cash crop but it became a major one during the past 40 years. Recently, the Taliban rulers of the country have attempted to stamp out the drug trade, [with mixed success](#).

An important part of the agricultural potential of Afghanistan is the availability of water resources and [especially groundwater](#). Groundwater use in Afghanistan has increased over the years, often in an uncontrolled fashion leading to [over-subscription of aquifers](#). [Groundwater contamination](#), especially from sewage is also a common problem.

### Mineral Resources

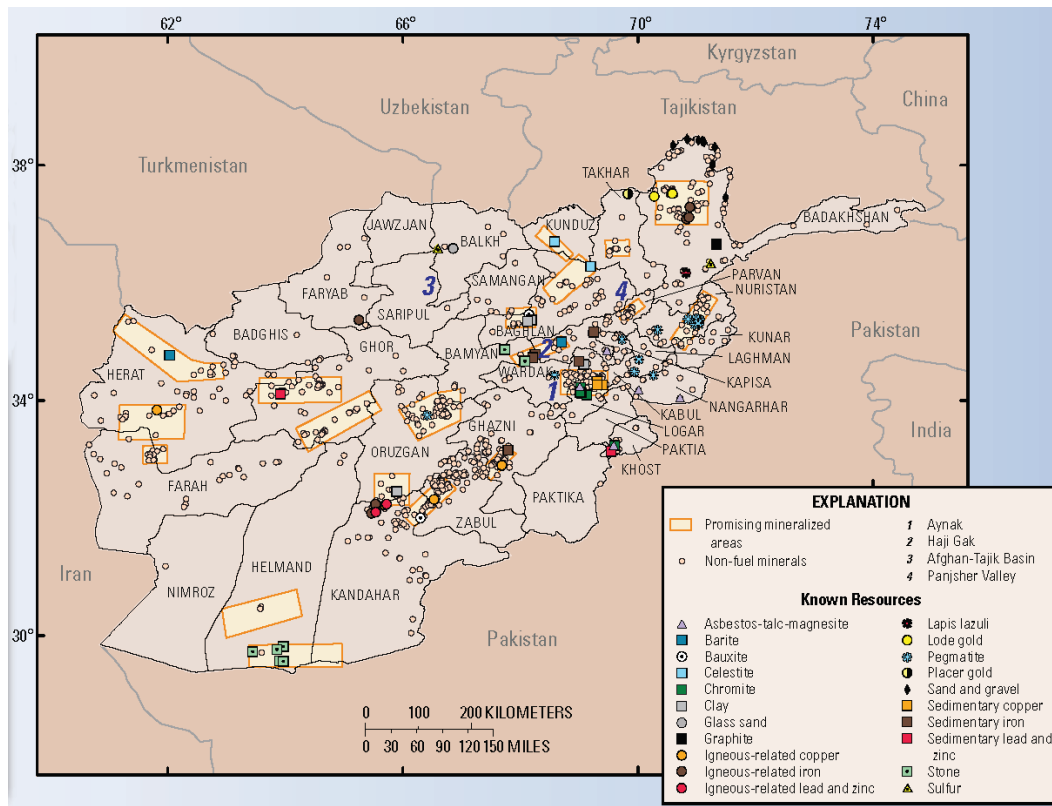
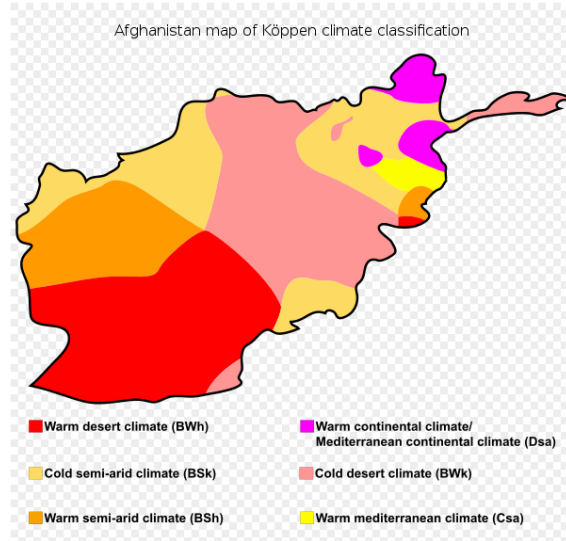


Figure 4 – Map of Afghanistan with Mineralized Areas

Credit: USGS, public domain

As can be seen in Figure 4, Afghanistan has a [wide variety of mineral resources](#) including: coal, copper, iron ore, lithium, uranium, rare earth elements, chromite, gold, zinc, talc, barite, sulfur, lead, marble, precious and semi-precious stones. The country also has deposits of [natural gas and petroleum](#).

## Climate



**Figure 5 – Afghanistan, Map of Köppen Climate Classification**  
 Credit: [Ali Zifan, Creative Commons Attribution-Share Alike 4.0 International](#) license

[Afghanistan’s climate](#) is best described as generally dry, varying from desert to semi-desert, and in varying degrees of cold and warm conditions. The overall dryness of the climate is the most significant since it limits the agricultural potential of the country.

## Geopolitics



**Figure 6 – Map of Central Asia**  
 Credit: [Cacahuete, Creative Commons Attribution-Share Alike 4.0 International, 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic](#) license

Afghanistan is the home of the original [Great Game](#). However, long before the Russian and British Empires meddled in the affairs of Central Asia, Afghanistan has attracted the covetous attentions of the various great powers in Asia. The geopolitical situation for Afghanistan comes down to the following unchanging conditions:

- By itself, Afghanistan is a great prize, given its mineral wealth;
- Any great power or powers that arise in the vicinity of Afghanistan will want a piece of the action from that mineral wealth;
- Afghanistan is also the cross-roads of many trade routes between Western, Central, south and East Asia; and
- The flow of wealth along trade routes will attract the attention of those seeking security of their trade as well as those who wish to benefit from facilitating the trade.

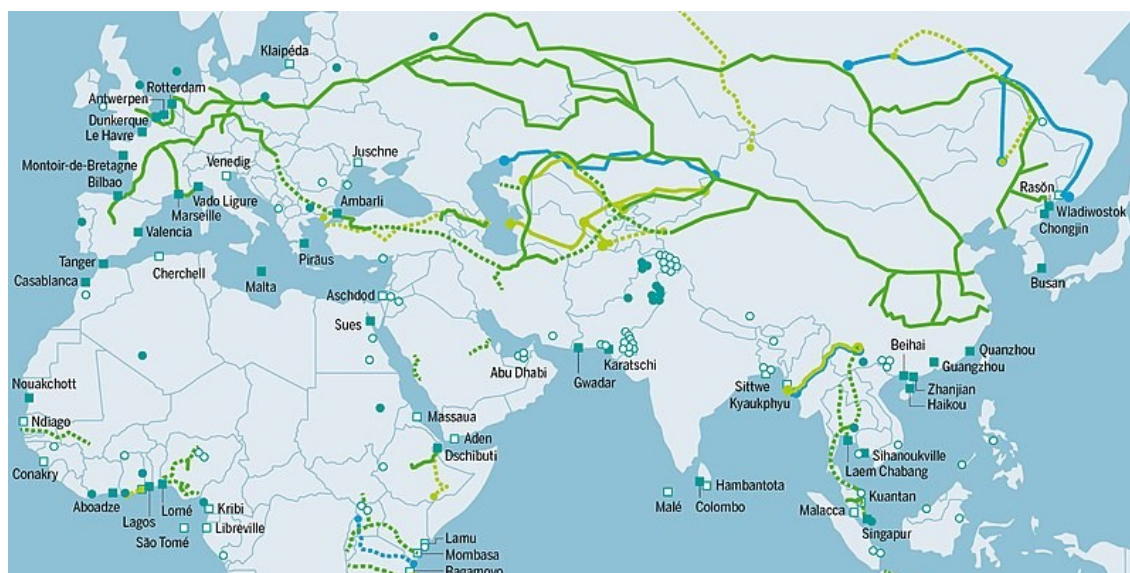


Figure 7 – China’s Belt & Road Initiative

Credit: Appenzeller/Hecher/Sack, [Creative Commons Attribution-Share Alike 4.0 International license](#)

Currently, many powers, both great and small, have an interest in the situation in Afghanistan:

**China** is a rising power and has begun developing their [Belt & Road Initiative](#) to facilitate trade. So far they are looking at doing so in peace. However, the temptation to interfere with the politics of countries along the route will be great, if only to secure the safety of their trade. As shown in Figure 7, above, many of these routes run through Afghanistan. Also, the growing industry of China is bound to increase demand for the minerals produced in Afghanistan.

**India** is another rising power with an interest in Afghanistan. Like China, their growing industry will look greedily at the riches of Afghanistan. Also, just as under the [British Raj](#), India has a [genuine security interest](#) in what happens in Afghanistan. An Afghanistan dominated by China or Russia may not be in India’s best interest. [Chaos in Afghanistan](#) is also not in India’s interest and may lead to some sort of intervention.

While not a major power, **Pakistan** has a strong and growing interest in Afghanistan. The [Pashtun](#) tribe lives in both Pakistan and Afghanistan, so there are many personal ties between the two countries. Also, the Pakistani government has close ties to the [Taliban](#) and [continues to develop them](#). Some see the hand of Pakistan's security services behind the Taliban victory in Afghanistan although some think it a [Pyrrhic victory](#).

**Iran** is another country with [a stake in Afghanistan](#) and has sent some of its own forces into the country in the past. Iran currently has [friendly relations with the Taliban government](#) in Afghanistan, [but that may not last](#). Iran's must be concerned with instability in Afghanistan and will act to protect its own interests.

**Russia** and its allies in Central Asia (Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan, and Tajikistan) also have an interest in Afghanistan. Like China, trade is a big consideration. Also, like Iran and India, Russia, and especially its Central Asian allies, have much to fear from disorder in Afghanistan. Finally, some fear that [Russia will return to the machinations](#) of the 19<sup>th</sup> Century Great Game.

**The United States** and its NATO allies suffered a significant defeat in Afghanistan, made worse by America's [chaotic withdrawal in 2022](#). For now, the USA is unlikely to want to get back into Afghanistan. However, don't underestimate the [hubris](#) of the [neoconservatives](#) (who run the American foreign policy establishment). Also, the United States continues to cultivate good relations with both Pakistan and India and could get drawn into any conflict that those powers have in Afghanistan.

## History and Current Condition

The [history of Afghanistan](#) shows many invasions and settlements of the territory from the [Neolithic](#) until the present. Throughout its history, Afghanistan shows the close connections to the rest of Asia. It has also been a [history of almost continuous warfare](#)

In more recent times, at least three great powers have come to grief trying to control the place:

- In the 19<sup>th</sup> Century, the British Empire in India (The Raj) attempted three armed incursions into Afghanistan: the [First](#), [Second](#) and [Third](#) Afghan Wars; in each case the British were decisively beaten by the Afghans.
- In the 20<sup>th</sup> Century, the [Soviet Union invaded Afghanistan](#); same [result](#) as the British in the 19<sup>th</sup> Century.
- Finally, in the 21<sup>st</sup> Century, the [United States and its NATO allies invaded Afghanistan](#), also with the same result as the British and Soviets.

Each of the foreign interventions in Afghanistan in the last 200 years followed a similar pattern. The invading power usually had success in taking major cities, like Kabul. However, the initial success was followed by a long guerrilla war that wore down the invaders. In the end, the resistance by the Afghans forced a humiliating and chaotic withdrawal upon the invading power.

The current rulers of Afghanistan follow [a strict interpretation of Islam](#). The Taliban are veterans of a long war against the godless communists of the Soviet Union followed by a civil war and then a long war with the godless forces of Western corporate power. The Taliban are not very forgiving of anyone who

behaves in a manner forbidden by [Sharia Law](#) or imitates the ways of the godless forces that wrecked their country.

The Taliban are using their current power to [impose their views](#) on the peoples of Afghanistan. I expect opposition to the Taliban to grow since Afghans don't like being pushed around, by anyone. Sadly, another civil war may be in the cards.

Afghanistan is not an easy place to govern and the Taliban may not succeed in the long run. We can only hope that they sort out their problems and enjoy a long period of peace. They don't want any outside help in that respect. However, if the situation in Afghanistan becomes chaotic, one of the neighbouring powers may ["blow the bugle, draw the sword"](#) by intervening in Afghanistan.

### **Standard Caveat**

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.