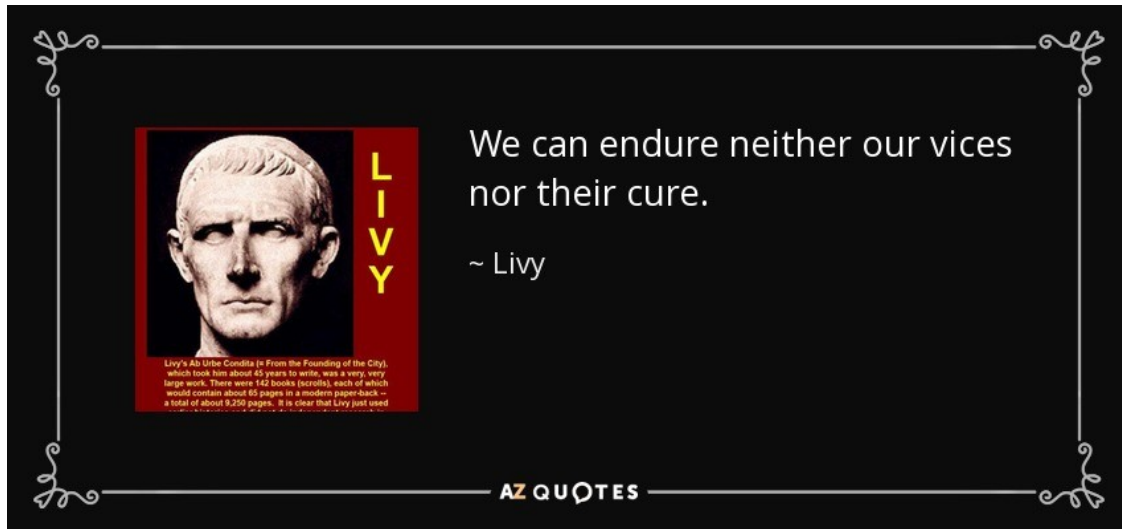


July 29, 2024

## News and notes

Before going on to discuss the geology and geopolitics of Eritrea, here are some news items I thought were interesting.

## Geopolitics



Titus Livius

- [While the West watches a game show, the rest build a new world order.](#)
- There was an [election in Venezuela](#) this past weekend and the [US may 'calibrate' Venezuela sanctions policy post-election, officials say.](#)
- Video on geopolitical analyst, [Alexander Dugin.](#)
- [As the state "withers away", multinationals go on a rampage.](#)
- [Sale of B.C. coal mines to Glencore was bad deal for Canada: report.](#)
- U.S. politics can be harsh: [Jack Posobiec: The Trump Shooting and the Coup Against Biden.](#)
- Supply chain issues: [The development of China's monopoly over cobalt battery materials.](#)

## Research and News

- Petrology: [Two stages of late Paleoproterozoic A-type granites at the southern North China Craton: Geochemical constraints and implications for supercontinent breakup.](#)
- Sedimentology: [Provenance of the late Jurassic to Cenomanian sedimentary succession of the Araripe Basin \(NE Brazil\) and implication for the geodynamic evolution of Western Gondwana.](#)
- Lacustrine geology: [Lacustrine Environmental Perturbations during the Early Jurassic in the Qiangtang Basin, Northern Tibet.](#)

- [Finding and identifying platinum group elements in the Eastman layered mafic intrusion.](#)
- A new issue of *Lite Geology* from the New Mexico Bureau of Geology & Mineral Resources is available for free download [here](#).
- [Deep, hot, ancient melting recorded by ultralow oxygen fugacity in peridotites](#); Phys.org summary [here](#).
- From *The Conversation*: [Seafloor sediment reveals previously unknown volcanic eruption 520,000 years ago in south Aegean Sea.](#)
- Crooked science, I stopped following Geoscience Frontiers a few months ago, something didn't seem right: [Elsevier investigating geology journal after allegations of pal review.](#)
- Plate tectonics video: [Assembling Asia: Ring of Fire – tectonic journeys in East Asia](#); see more of Rob Butler's videos in his YouTube channel, [The Shear Zone](#).
- [Geodynamic and Climatic Forcing on Late-Cenozoic Exhumation of the Southern Patagonian Andes \(Fitz Roy and Torres del Paine massifs\).](#)
- Monitoring seafloor spreading: [Acoustic ambiguity reduction \(AAR\) method: an acoustic signal identification method for GNSS-A observation considering instrumental signal distortion.](#)

## Paleontology

- [Gliding toward an understanding of the origin of flight in bats.](#)
- Vertebrate evolution and lampreys: [Shared features of blastula and neural crest stem cells evolved at the base of vertebrates](#); Phys.org summary [here](#).
- [The first deep-snouted tyrannosaur from Upper Cretaceous Ganzhou City of southeastern China.](#)
- [Jurassic fossil juvenile reveals prolonged life history in early mammals](#); summary from the BBC [here](#).
- The Cambrian *Odaraiia alata* and the colonization of nektonic suspension-feeding niches by early [mandibulates](#); Phys.org summary [here](#).
- [The Central Paratethys Sea – rise and demise of a Miocene European marine biodiversity hotspot](#); Phys.org summary [here](#).
- Evolution and viruses: [DNA methylation enables recurrent endogenization of giant viruses in an animal relative](#); Phys.org summary [here](#).
- [Euthycarcinoid ecology and evolution](#); SciNews summary [here](#); other pre-publication papers from *Neues Jahrbuch für Geologie und Paläontologie – Abhandlungen* [here](#).
- Fossils in amber: [Contributions to the Palaeobiodiversity of Psocodea \('Psocoptera'\) from Lebanese Amber: A Review.](#)

## Mining and Energy

- Ore body geology: [A billion-year shift in the formation of Earth's largest ore deposits](#).
- Ore processing research: [Tellurium Enrichment in Copper Tailings: A Mineralogical and Processing Study](#).
- [Australian gold sector firing at just the right time](#).
- [Australia rejects Rio Tinto unit's uranium mine lease renewal](#).
- Mining is dangerous: [New Gold reports fatality at Rainy River mine in Canada](#).
- [Global coal demand to remain largely stable through 2025 — IEA](#).
- Thoughts on energy and the financial system from Dr. Tim Morgan: [Energy and the credit ratchet](#).
- [Oil Prices Sink in Run-Up to OPEC Meet](#).
- [Mexico seeks more 2025 fuel import deals after refinery delays](#).
- [China unveils meltdown-proof nuclear power plant in clean energy breakthrough](#).
- Geothermal energy research: [Seismic Node Arrays for Enhanced Understanding and Monitoring of Geothermal Systems](#).

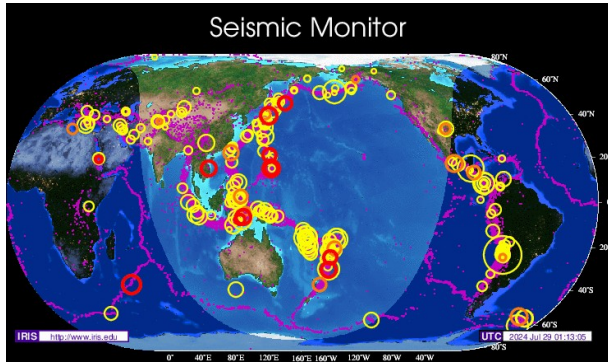
## Environmental Geology and Hydrogeology

- Remediation research: [Remediation of Heavy Metal Pollution from Coal Mine Effluent Using Metal-Organic Frameworks \(MOF\): Impact of Water Media, Operational Factors and Metal Characteristics](#).
- Remediation news: [Province rejects company's appeal on cleanup of Touquoy gold mine](#).

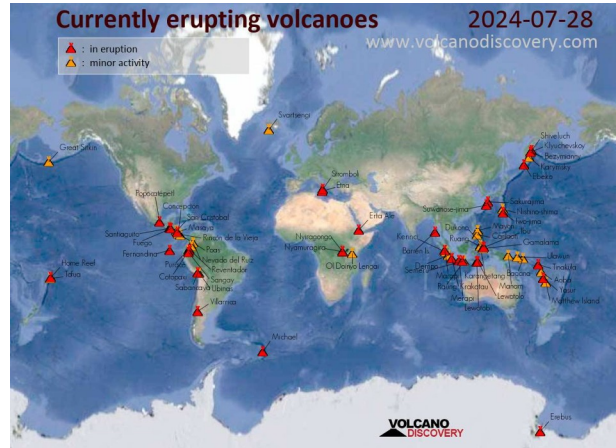
## Glaciers and Climate Change

- [Heterogeneous changes in global glacial lakes under coupled climate warming and glacier thinning](#).
- Ocean and glacier interaction: [Footprint of sustained poleward warm water flow within East Antarctic submarine canyons](#); Phys.org summary [here](#).
- Ocean currents and climate change: [How Soon Might the Atlantic Ocean Break? Two Sibling Scientists Found an Answer – and Shook the World](#).
- More on ocean currents and climate change: [Isotopic evidence against North Pacific Deep Water formation during late Pliocene warmth](#).
- Volcanoes and climate change: [Evolution of the Climate Forcing During the Two Years After the Hunga Tonga-Hunga Ha'apai Eruption](#); Phys.org summary [here](#).

## Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

- United States Geological Survey (USGS) Volcano Watch: [What's been a movin' and a shakin' in Kīlauea's upper East Rift Zone?](#)
- USGS Yellowstone Volcano Observatory: [A small hydrothermal explosion at Norris Geyser Basin](#); related video: [Yellowstone's Hydrothermal Explosion Sends Visitors Running, Damages Boardwalk: Geologist Analysis](#).
- [Smithsonian / USGS Weekly Volcanic Activity Report](#).
- [Euro-Mediterranean Seismological Centre](#)
- [Earthquakes Monitoring Live Worldwide](#).
- From Kyle Bradley and Judith A Hubbard: [Precursory slip before large earthquakes – signal or noise?](#)
- [M4.9 west Texas earthquake presumed anthropogenic](#); USGS report [here](#); related story [here](#).
- [M5.1 earthquake in Vietnam is largest in country since 2007](#); USGS summary [here](#).
- Floods: [National-Scale Flood Hazard Data Unfit for Urban Risk Management](#); Phys.org summary [here](#).
- Wildfires: [Jasper, Alberta](#) and [California](#).

### Upcoming Events

- [Goldschmidt 2024, August 18-24, Chicago IL](#), organized by the Geochemical Society and the European Association of Geochemistry.
- [Lloydminster Heavy Oil Show September 11-12](#); Pipeline Online summary [here](#).
- [Groundwater Week 2024](#), December 10-12 in Las Vegas, Nevada.
- [Copper to the World Conference, Tuesday 26 – Wednesday 27 August 2025](#), in Adelaide, Australia; report on 2024 conference [here](#).

July 29, 2024

## Geology and the Fate of Societies – Eritrea



**Figure 1a – Eritrea**

**Credit: [CIA World Factbook](#), public domain**

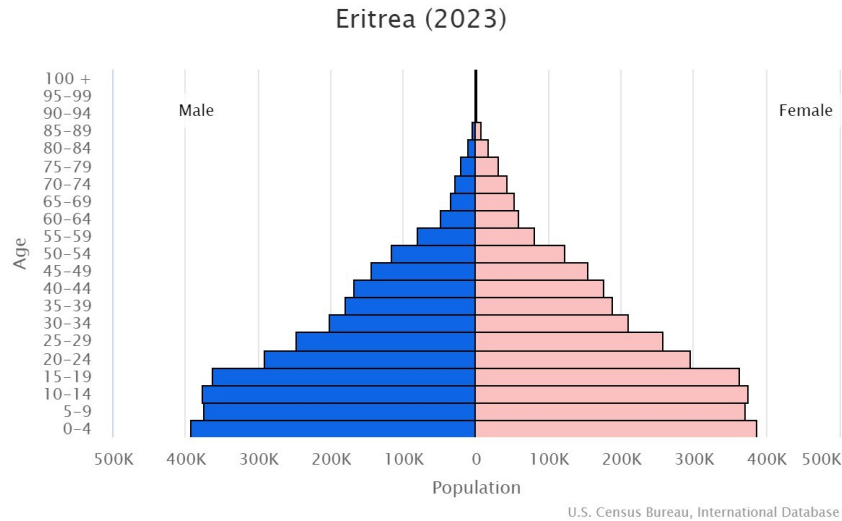


**Figure 1b – Location of Eritrea**

**Credit: [CIA World Factbook](#), public domain**

This week we look at another small country in [Africa](#), the [State of Eritrea](#). Located on the southwest shore of the [Red Sea](#) in the [Horn of Africa](#). Eritrea shares land borders with [Sudan](#) to the north and west, [Ethiopia](#) to the south and [Djibouti](#) to the southeast. Eritrea's territory includes offshore islands in the [Dahlak Archipelago](#) and several of the [Hanish Islands](#). Across the Red Sea are [Saudi Arabia](#) and [Yemen](#). The country is a unitary one-party [presidential republic](#) under the [dictatorship](#) of [President Isaias Afwerki](#). The capital and largest city in Eritrea is [Asmara](#) (pop. 1,258,000 in the metropolitan area).

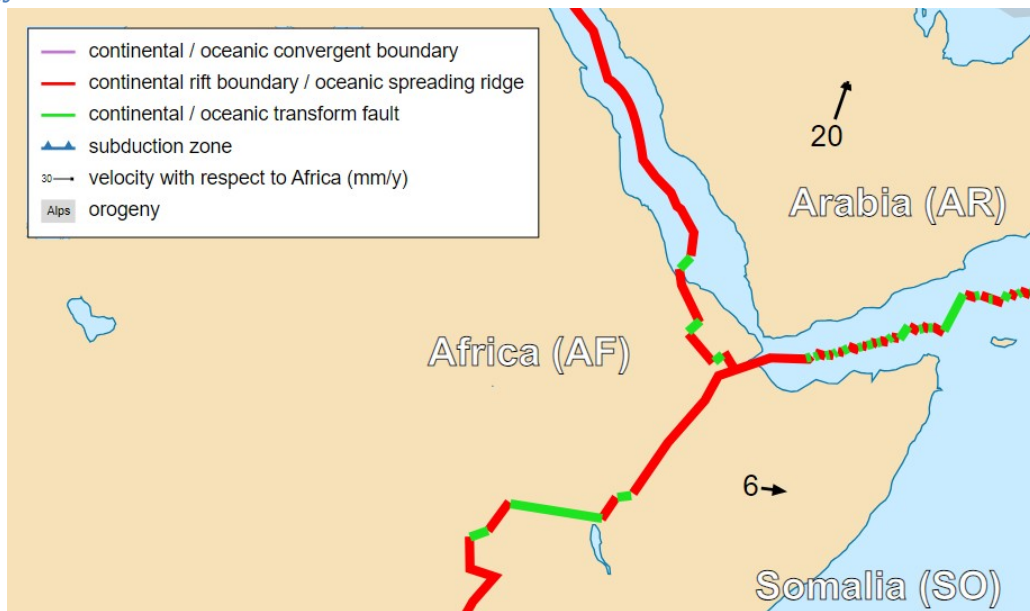
According to the [Central Intelligence Agency](#) (CIA) [World Factbook on Eritrea](#), it has a total area of 117,600 square kilometres (km<sup>2</sup>) of which 101,000 km<sup>2</sup> is land and 16,600 km<sup>2</sup> is water. Also according to the CIA, 6,343,956 people live in Eritrea, 43.3% of whom live in urban areas. The approximately 6.34 million people are a diverse mix of ethnicities. The largest group, 50%, are [Tigrinya](#). Of the rest, 30% are [Tigre](#); 4% are [Saho](#); 4% are [Afar](#); 4% are [Kunama](#); 3% are [Bilen](#); 2% are [Hedareb/Beja](#); 2% are [Nara](#); and 1% are [Rashaida](#). Official languages are: [Tigrinya](#), [Arabic](#), and [English](#). Other languages spoken include: [Tigre](#), [Kunama](#), [Afar](#), together with a variety of [Cushitic languages](#). In terms of education, 76.6% of the total population 15 and over can read and write (male: 84.4% and female: 68.9%). People generally attend school for 8 years. Most Eritrean are either [Christian](#) or [Muslim](#). Christians are further divided among [Eritrean Orthodox](#), [Roman Catholic](#), and [Evangelical Lutheran](#). Almost all Muslims in Eritrea are [Sunni](#).



**Figure 2 – Demographic Profile of Eritrea**  
**Credit: U.S. Census Bureau, International Database, public domain**

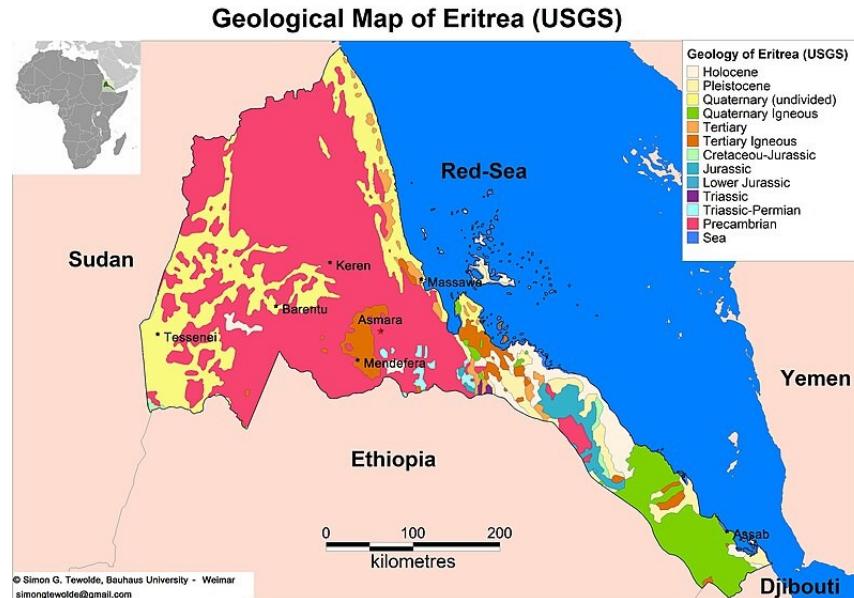
The [demographic profile](#) shows a young country, the median age is 21.3 years. The apparent stabilization in the population is the result of people [leaving the country as refugees](#). The annual growth rate of the population is 1.1%; the total fertility rate is 3.50 births per woman; and the life expectancy at birth for both sexes is 67.2 years.

## Geology



**Figure 3 – Tectonic Framework, Horn of Africa**  
**Credit(extracted): Sting (Eric Gaba), Creative Commons Attribution-Share Alike 2.5 Generic license**

The Horn of Africa sits at the junction of three tectonic plates separated by [continental rift boundaries](#) and [transform faults](#). To the northeast is the [Arabian Plate](#), moving away from the [African Plate](#) at 20 millimetres /year (mm/y) and to the east is the [Somalia Plate](#), moving away from the African Plate at 6 mm/y.



**Figure 4 – Geology of Eritrea**

**Credit: [Simontewolde](#); [Creative Commons Attribution-Share Alike 3.0 Unported](#) license**

We can look at the [geology of Eritrea](#) by going from the oldest to the youngest deposits in the country. One caveat is that the ages of the various formations are not always agreed upon.

The oldest rocks in Eritrea are [Neoproterozoic](#) aged rocks of the African and Arabian plates (sometimes grouped together as the [Arabian-Nubian Shield](#) or ANS that underlie the entire country and outcrop throughout much of the land. The ANS rocks in Eritrea are typically divided into the following [geological terranes](#):

- The rocks of the [Barka Terrane](#) are exposed in the north-western part of the country in the [Barka lowlands](#); typical mineralogy includes [amphibolite](#), [pelitic schist](#) containing [kyanite](#) and [staurolite](#), [quartzite](#), and [marble](#).
- The [Hagar Terrane](#) extends from the Barka River up to the Adobha Abi valley in the east and is made up of [oceanic volcanic rocks](#) and [accretionary wedge materials](#); the deposits includes layered sequences of [chloritic schists](#), [epidotic](#) and chloritic [metabasalts](#), some thin and discontinuous marbles, and [manganiferous](#) and [ferruginous cherts](#).
- The [Nakfa Terrane](#) is bounded by the Adobha Abi valley in the west and by the Red Sea escarpment to the east; typical rocks in the Nakfa Terrane include [calc-alkaline volcanic](#) and [volcaniclastic](#) rocks [conformably overlain](#) by a [metasedimentary](#) sequence of chlorite schists, [coarse grained sandstones](#) (grits), [conglomerates](#), occasional pelitic [sericite schists](#), [carbonates](#), [granites](#) and [gneisses](#); the Nakfa Terrain is considered to represent a relic [island arc](#).
- In the south, the [Danakil Terrane](#) is composed of metamorphic rocks typically grouped into three formations: (1) [migmatitic hornblende biotite](#) gneisses; (2) a phyllitic formation consisting of schists, conglomeratic [phyllites](#), crystalline [limestones](#), and [graphitic](#) schists; and (3) post-tectonic [granitoids](#) intrusions.

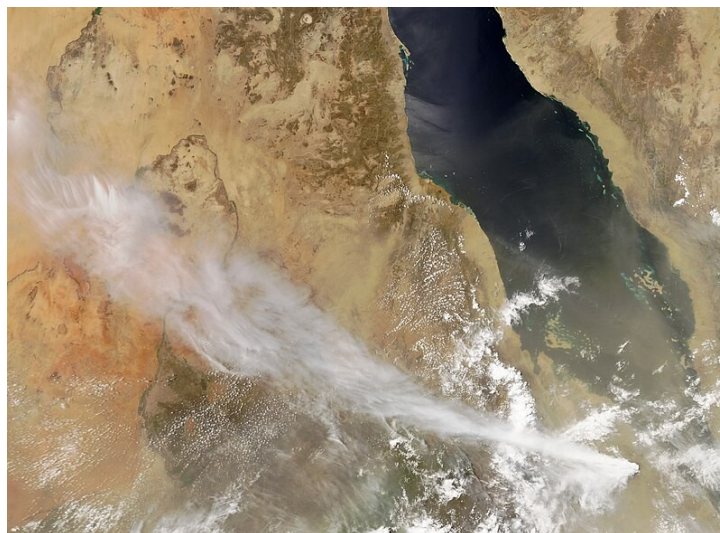
Overlying the Neoproterozoic basement rocks are [Late Paleozoic](#) and [Mesozoic](#) sediments including:

- The [Triassic](#) Merbet ([Adigrat](#)) Sandstone which outcrops in the southern part of the country and in the [Danakil area](#), and is commonly [intercalated](#) with [siltstones](#) and layers of [hematite](#); it [unconformably](#) overlies thin layers of conglomerate and sandstones which may be glacial deposits.
- The [Jurassic](#) Adailo ([Antalo](#)) Limestone; this unit is exposed over a large area in the Danakil and is made up of fossiliferous and layered limestones.

Overlying the Mesozoic deposits are [Tertiary](#) aged ([Paleogene](#) and [Neogene](#)) volcanic and sedimentary deposits. The volcanic deposits include [olivine basalts](#) with intercalations of [intermediate](#) lavas and [tuff](#); stratified [basalts](#) composed of basaltic lava flows and tuffs often intercalated with sediments; and lava flows and volcanic cones, mainly composed of [trachytes](#), [rhyolites](#) and [ignimbrites](#).

The Tertiary sedimentary rocks include three main formations: the [Danakil](#), [Dogali](#) and [Desset](#) Formations. The Danakil and Dogali Formations are of Neogene age and are composed mainly of limestone intercalated with conglomeratic sandstones and siltstones. They are overlain by calcareous sands with coral reefs, partly consisting of pebbles of volcanic origin, and gravels with sand, silt and clay horizons. The Desset Formation comprises sandstones, clays and fine beds of anhydrite and halite unconformably overlying the Dogali formation in the northern part of the coast, while the Red Series containing coarse clastic fresh water sediments occupies the southern part of the coast.

[Quaternary](#) sediments are mostly [evaporites](#) found in the [Danakil Depression](#) (a.k.a. [Hell on Earth](#)). These evaporites include bedded [halite](#), [gypsum](#), [anhydrite](#), as well as [potassium](#) and [magnesium salts](#) together with shell material. Also in the Quaternary deposits are [flood terraces](#), silt, sand (both [fluvial](#) and [aeolian](#)) and gravel. Quaternary volcanic activity in the Danakil region has also deposited basalt lava flows and [volcanic cones](#). Modern volcanism in Eritrea includes [Mt. Dubbi](#) (1,625 m) and [Mt. Nabro](#) (2,218 m) which [last erupted](#) in June 2011.



**Figure 5 – Nabro Volcano Ash Cloud June 13, 2011, Eritrea**  
**Credit: [NASA Earth Observatory](#), public domain**

## Resources

### Agriculture



**Figure 6 – Agricultural Landscape of Eritrea**

**Credit:** Yonas Embye Sisqo, [Creative Commons Attribution-Share Alike 1.0 Generic](#) license

According to the CIA World Factbook, 75.1% of Eritrea is agricultural land of which 6.8% of the total is [arable land](#) and the remainder, 68.3% of the total, is permanent [pasture](#). Agriculture in Eritrea is the major economic activity, employing about 70% of the workforce and accounting for about a third of the [economy](#). The main agricultural products include: [sorghum](#), [millet](#), [barley](#), [wheat](#), [legumes](#), [vegetables](#), [fruits](#), [sesame](#), [linseed](#), [cattle](#), [sheep](#), [goats](#), and [camels](#). Production statistics from the [United Nations Food and Agriculture Organization](#) (FAO) can be found [here](#).



**Figure 7 – Traditional Fishing Boat in Eritrea**

**Credit:** Dawit Rezenè, [Creative Commons Attribution-Share Alike 1.0 Generic](#) license

Fishing is also an [important source of food](#) on the coast of Eritrea and near inland lakes and reservoirs. Most of the fish caught is for local consumption. Statistics on fishing in Eritrea from the FAO can be found [here](#).

Information on food insecurity in Eritrea indicates a severe crisis in the availability of food, more than [one site](#) calls it a [crisis](#). Essentially, Eritrea is a country of desperately poor people who are short of food and who are ruled by a government unable to ease the situation.

### ***Forestry***

The CIA World Factbook indicates that 15.1% of Eritrea is forest. Almost all of this forest is in the [highland regions](#). The main uses of forest in the country is firewood and local construction. Recent studies indicate [ongoing deforestation](#) due to drought and demand on the forest for firewood and building materials. Major tree species in the highland forests include African juniper (*[Juniperus procera](#)*) and African olive (*[Olea africana](#)*).

Further information of the forests can be found [here](#); production statistics from the FAO can be found [here](#).

### ***Mineral Resources***

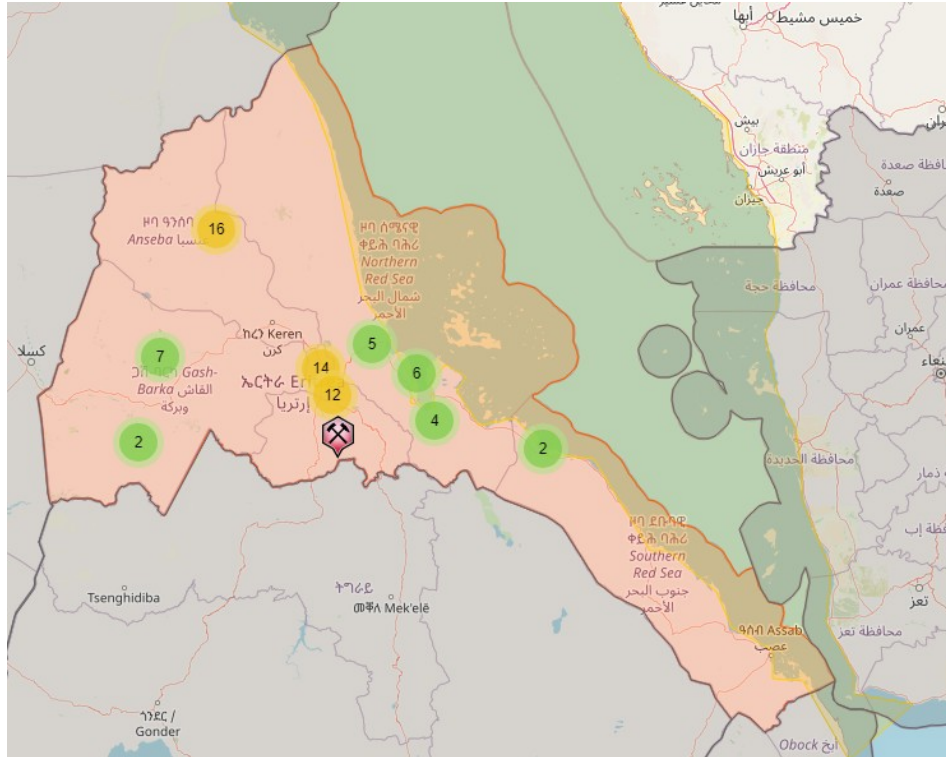


**Figure 8 – Bisha Mine Eritrea**

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

Metallic mineral production in Eritrea, copper, gold, silver, and zinc, comes from a single mine, the [Bisha Mine](#), 150 km west of Asmara. [There are verifiable allegations for the use of slave labour at this mine.](#)

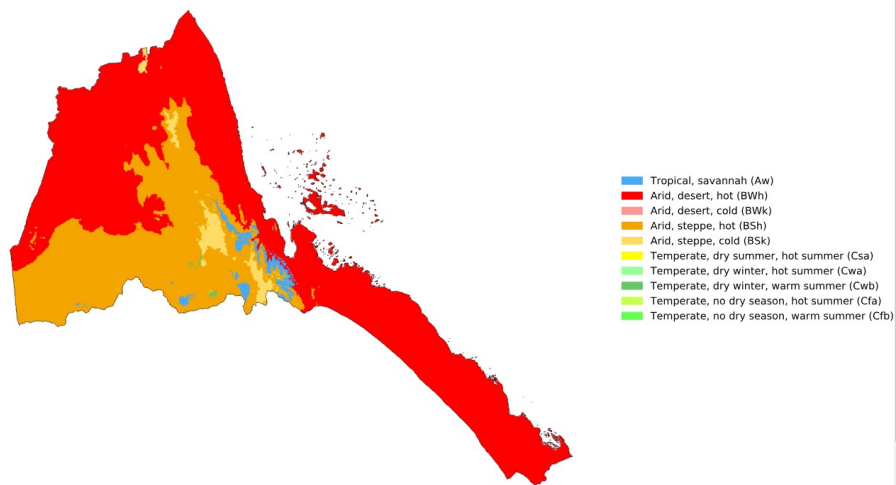
Salt production comes out of [Assab Salt Works](#) and the [Salina Salt Works near Massawa](#). Other mineral production in Eritrea is for construction materials and includes cement, lime, granite [dimension stone](#), crushed stone, sand and gravel. Statistics on mineral production in Eritrea from the [USGS](#) can be found [here](#). Figure 9 links to an interactive mineral occurrence map for Eritrea.



**Figure 9 – Interactive Mineral Occurrence Map for Eritrea**  
 Credit: ©Mindat.org

## Climate

Köppen-Geiger climate classification map for Eritrea (1980-2016)



**Figure 10 – Köppen-Geiger Climate Classification Map for Eritrea**  
 Credit: [Beck et al, 2018](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

The climate of Eritrea varies with distance from the coastline and elevation. There is a hot, dry desert strip along Red Sea coast; the central highlands are cooler and wetter with up to 61 centimetres of annual rainfall annually (heaviest June to September); and semiarid in western hills and lowlands. The Köppen-Geiger Climate types are: tropical savannah ([Aw](#)), hot arid desert ([BWh](#)), cold arid desert ([BWk](#)), hot arid steppe ([BSh](#)), cold arid steppe ([BSk](#)), together with five varieties of temperate climate [Csa](#), [Cwa](#), [Cfa](#) and [Cfb](#).

Eritrea might be a good place to visit, however before you go you should check out the travel advisories [here](#) and [here](#). Basic story: not only should you not go, you might not be allowed in the country at all.

## History and Geopolitics

### *An Ancient Land*



**Figure 11 – Kingdom of Aksum, 3<sup>rd</sup> Century AD**

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

Humans and [prehumans](#) lived in what is now Eritrea since the Early [Pleistocene](#). [In recorded history](#) the main events and periods include:

- The rise and fall of the [Kingdom of Aksum](#), 100–940 AD, Aksum arose out of various preexisting [Iron Age](#) kingdoms;
- The [Zagwe Dynasty](#), [Sultanate of Dahlak](#), [Aussa Sultanate](#), and the [Habesh Eyalet](#) in Medieval times;
- The arrival of the Italians in 1869 and the establishment of [Italian Eritrea](#) and [Italian East Africa](#);
- The [conquest of Eritrea by the British in 1941](#) and establishment of a [British led administration](#) that lasted till 1950;

- The occupation of Eritrea by Ethiopia in 1950 which led to an [Eritrean War of Independence](#) 1961 – 1991;
- Independence and [one party rule](#) since 1993;
- Continuing border disputes with [Djibouti](#) and [Ethiopia](#);
- A [revolt by the Eritrean Army in 2013](#);
- Eritrean support of rebels in the [Ethiopian Tigre War](#).

### *Geopolitics of a Harsh Land*



**Figure 12 – Abandoned Military Vehicles in Eritrea, 2023**

**Credit: [Dan Sloan, Creative Commons Attribution-Share Alike 2.0 Generic](#) license**

Eritrea's history is one of authoritarian governments; this seems to be part of their culture. However, this history cannot be taken as an excuse for current conditions, Eritrea has been independent for 31 years under the same [gang of Marxists](#). As a result of the poor management of the country, Eritrea is currently in a bad way. There are divisions between [Christians, Muslims](#) and the ruling Marxist party. Marxist political parties are [not known for their respect of human rights](#) and the Eritrea is no exception, its government regularly abuses the [rights of its people](#). As well, as indicated above, Eritrea has trouble feeding its people, a prime indicator of bad government.

Consequently, Eritrea has become a major source of refugees. The UN Refugee Agency (UNHCR) reported [345,000](#) Eritrean refugees and asylum seekers in East Africa alone, as of June, out of over [580,000](#) Eritrean refugees and asylum seekers globally. Once out of their country, Eritrean refugees

continue to be [harassed](#) by agents of their former government. Eritrea seems to be the case-study for [Donald Trump's shithole countries](#). The governing class of Eritrea bears full responsibility for this.

Not only does Eritrea treat its own people badly, they seem to be unable to live peacefully with their neighbours. Disputes with [Djibouti](#) and [Ethiopia](#) seem to go on and on and could start again at any time. Eritrea also meddles in the disputes of its neighbours, most notably in [Ethiopia's Tigre War](#) and the [ongoing troubles in Sudan](#). The Ethiopians could wallop the Eritreans and impose order, but then what? I doubt that Ethiopia wants to try to rule that country again, the problems of both countries are too great.

Realistically, I doubt that any country, including the Great Powers, would want to impose peace upon the unruly country Eritrea has become. However, that could change. [Current troubles in Yemen](#) and the [importance of the Red Sea for international shipping](#) might invite outside intervention. Keep an eye on this one.

All in all, it would be nice to be optimistic, but in Eritrea's case there seems to be little cause for optimism. Too bad for the people who live there, they deserve better.

### **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.