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The Sahara Desert

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The Sahara Desert

The Sahara is not all sand, and it was once green. This lesson covers its size, its surface, the Sahel, the green past, the heat record and the desert's slow growth.

At a glance

Four key facts on this topic

01 **~9 million km²**About 30 percent of Africa.

02 **Stone, not sand**Most of the surface is bare rock and pebbles.

03 **6,000-11,000 years ago**The Green Sahara period.

04 **~10% since 1920**Growth found by a 2018 study.

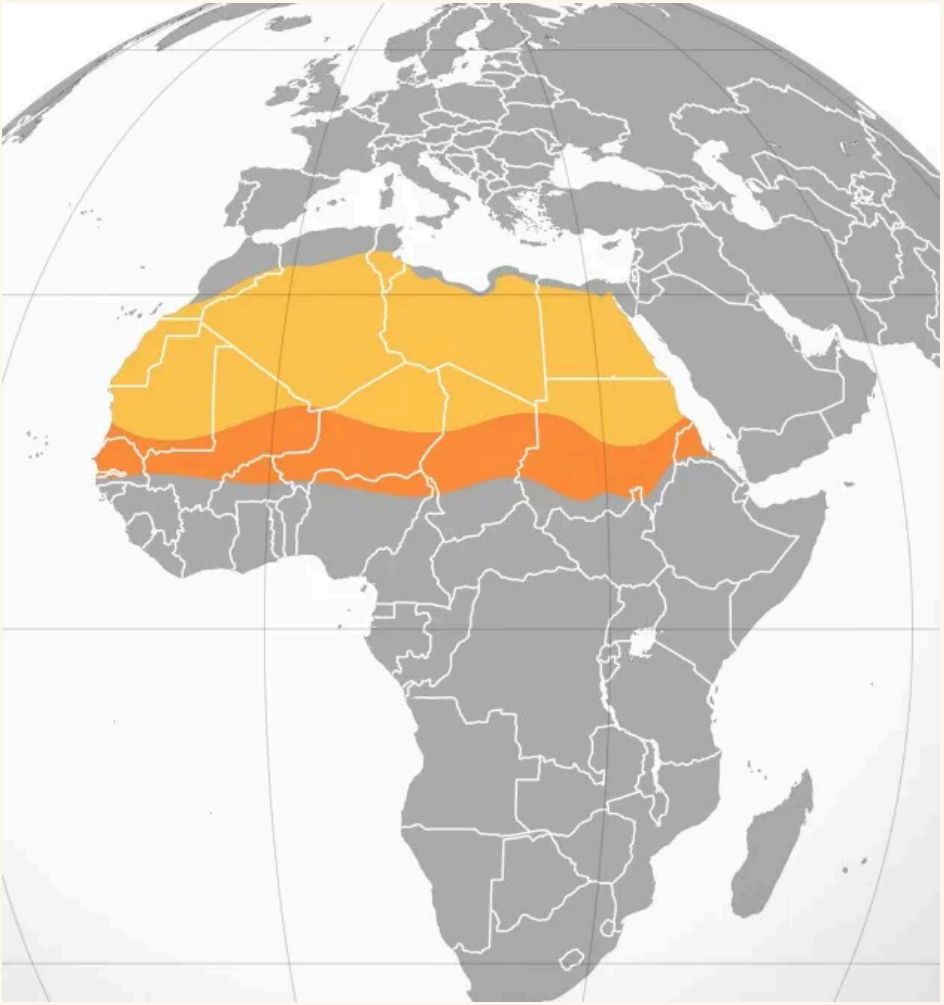
How big is the Sahara, and where does it lie?

1 Size and Place

1.1 Where does the Sahara lie?

The Sahara covers much of **northern Africa**. It spreads over parts of Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Tunisia and Sudan.

Algeria holds a huge share. The Algerian part of the Sahara makes up more than 90 percent of that country's area.



Map of the Sahara and the Sahel, the belt along its southern edge. Map: M.Bitton, CC BY-SA 3.0, via Wikimedia Commons.

1.2 How big is it?

The Sahara covers about **9 million square kilometres**. That is roughly the size of the contiguous United States.

It takes up about 30 percent of the African continent. Africa covers roughly 30 million square kilometres. It is the world's largest warm-weather desert.

The Sahara in numbers

Feature	Value
Area	About 9 million km²
Share of Africa	About 30 percent
Comparison	Roughly the contiguous United States
Desert rainfall limit	Usually under about 250 mm a year

Figures from ESA and the University of Maryland.

1.3 What lies under the sand and stone?

Major oil and natural gas deposits lie beneath the Sahara's surface.

These deposits help make Algeria one of the wealthier African nations.

> 9. **Think it through:** Is a desert always hot and sandy? See answer ↓

> **Quick check 1.** True or false: A desert is defined mainly by how hot it gets. *(True or False?)* See answer ↓

Sources: esa.int; aosc.umd.edu

Is the Sahara all sand?

2 Stone and Sand

2.1 Is the Sahara mostly sand?

No. Most of the Sahara's surface is **bare stone and pebbles**, not sand.

The famous rolling dunes are only part of the picture. Many travellers cross hard, rocky ground for days.

2.2 What shapes the land?

There is very little plant cover. So strong, nearly constant wind wears the land away.

In sandy parts the wind piles sand into dunes. Some are small star dunes that grow upward, not sideways.



Sand dunes at Erg Chebbi, in the Sahara, at sunset. Erg Chebbi at sunset: Thomas Fuhrmann, CC BY-SA 4.0, via Wikimedia Commons.

2.3 Which place is called the land of terror?

The **Tanezrouft Basin** in south-central Algeria has that nickname. It has almost no water or plants.

It shows how empty the Sahara's core can be.

- **Stone and pebbles:** cover most of the surface.
- **Sand dunes:** cover only part of it.
- **Wind:** is the main force that shapes the land.

> **Quick check 2.** True or false: Most of the Sahara's surface is soft sand. *(True or False?)* See answer ↓

What do hamada, erg and Sahel mean?

3 Key Terms

3.1 What is a hamada?

A **hamada** is a flat plateau of bare rock. Wind has blown away the loose sand and dust, leaving stone behind.

Think of a dry, rocky tabletop with almost nothing growing on it. Much of the Sahara looks like this.

It matters because many people picture only sand. Knowing about the hamada helps you answer questions about the desert's true surface.

3.2 What is an erg?

An **erg** is a large area of wind-blown sand, often called a sand sea. Dunes roll across it in waves.

The postcard photos of camels on golden dunes show an erg. Erg Chebbi in the photo above is one.

It matters because ergs cover only part of the Sahara. So the claim ‘the Sahara is all sand’ is wrong.

3.3 What is the Sahel?

The **Sahel** is the semi-arid transition belt between the Sahara and the fertile savannas further south.

Think of a strip of dry grassland where farmers and herders depend on short rainy seasons.

It matters because the Sahara expands as the Sahel retreats. This is why the Sahel appears in exam questions and in desertification news.

> **Quick check 3.** True or false: The Sahel lies on the southern edge of the Sahara. *(True or False?)* See answer ↓

Was the Sahara once green?

4 The Green Sahara

4.1 Was the Sahara always a desert?

No. About **6,000 to 11,000 years ago** it was green. It held wooded savannah, rivers and lakes.

This covered land that is now in Libya, Niger, Chad and Mali. The time is called the Green Sahara, or North African Humid Period.

4.2 Why did it turn green?

Earth wobbles slowly as it spins. This wobble is called **orbital precession**.

At times it brings the Northern Hemisphere closer to the sun in summer. Warmer summers strengthened the West African Monsoon and pushed the rain belt north.

4.3 How often did it happen?

Sediment records show over 230 greenings in the past eight million years. They came about every **21,000 years**.

Ice ages blocked them. Large ice sheets cooled the air and stopped the monsoon from spreading north.

> 10. **Think it through:** Does a 21,000-year cycle mean the desert greens every few centuries? See answer ↓

4.4 What proof did the green Sahara leave?

Algeria's Tassili n'Ajjer plateau is a national park of about 72,000 km². It holds over 15,000 etchings and paintings. Ahaggar National Park, at about 450,000 km², is larger. Tassili is also a UNESCO World Heritage site.

Some are as much as 11,000 years old. They record a region that had water and animals, unlike the dry rock of today.

The Green Sahara in brief

Question	Answer
When?	About 6,000 to 11,000 years ago

Question	Answer
Cause	Orbital precession and a stronger monsoon
Rhythm	About every 21,000 years
Evidence	Tassili n’Ajjer rock art

Dates and cycle from The Conversation and the University of Bristol.

> **Quick check 4.** True or false: The Sahara has been a dry desert throughout human history. *(True or False?)* See answer ↓

Sources: theconversation.com; bristol.ac.uk

How hot does the Sahara get?

5 Heat and Records

5.1 How hot has the Sahara got?

At Ouargla in Algeria the thermometer read **51.3°C** in 2018.

This is the highest reliably measured temperature on record for Africa.

5.2 Was the world record once held in Libya?

Yes. For 90 years the record was 58°C at El Azizia in Libya. It was set in 1922.

On 13 September 2012 the World Meteorological Organization disqualified it.

5.3 Why was the old record thrown out?

A team of experts found the original log book. They found five major problems with the reading.

A new and untrained observer took it.

- The instrument was antiquated even at that time.
- The site was not representative of its surroundings.
- The reading did not match other temperatures measured nearby.
- It did not match later temperatures taken at the site.

5.4 Who holds the record now?

The official record is now **56.7°C**. It was measured at Death Valley, USA, on 10 July 1913.

So the hottest official reading on Earth is not from the Sahara.

Three famous readings

Place	Reading	Status
Death Valley, USA	56.7°C (1913)	Official world record
El Azizia, Libya	58°C (1922)	Disqualified in 2012
Ouargla, Algeria	51.3°C (2018)	Highest reliable reading in Africa

Figures from Guinness World Records and Weather Underground.

> **Quick check 5.** True or false: The Sahara holds the official world record for the hottest temperature. *(True or False?)* See answer ↓

Sources: wunderground.com; guinnessworldrecords.com; csmonitor.com

Is the Sahara growing?

6 A Growing Desert

6.1 Is the Sahara growing?

University of Maryland scientists studied African rainfall from 1920 to 2013. They found the Sahara grew by about **10 percent**.

The study appeared in the Journal of Climate in March 2018.

6.2 How did they measure it?

They used rainfall records. A desert is usually a place with under about 250 mm of rain a year. This study drew its line at 100 mm.

When the 100 mm line moves, the desert's border moves with it.

6.3 When did it grow most?

In summer. The desert's average seasonal area rose nearly **16 percent** over the 93 years.

The biggest changes came along its northern and southern boundaries.

6.4 What caused the growth?

The results point to human-caused climate change plus natural cycles. One such cycle is the Atlantic Multidecadal Oscillation.

The Sahara expands as the Sahel retreats. This disrupts grassland and the people who live there.

11. **Think it through:** Did the Sahara grow 10 percent every decade? See answer ↓

Quick check 6. True or false: The study found the Sahara shrank between 1920 and 2013. *(True or False?)* See answer ↓

What is the Great Green Wall?

7 Great Green Wall

7.1 What is the Great Green Wall?

It is an African-led plan to restore damaged land along the Sahel. The **African Union** launched it in 2007.

The wall is not a solid barrier. It is a belt of restored land that stretches 8,000 km across Africa.

7.2 What does it aim to achieve?

The plan is being carried out across 22 African countries. More than USD 14 billion has been raised and pledged.

The goals are set for 2030.

- **Land:** restore 100 million hectares of degraded land.
- **Carbon:** sequester 250 million tons of carbon.
- **Jobs:** create 10 million green jobs.

> **Quick check 7.** True or false: The African Union launched the Great Green Wall initiative in 2007. *(True or False?)* See answer ↓

Sources: unccd.int

What do exams ask about the Sahara?

8 Exam Traps

8.1 What do exams ask about the Sahara?

The Sahel is a favourite. Know that it is the belt on the **southern edge** of the Sahara.

> 12. **Exam angle:** NDA-NA (II) 2016, Q57 asked what the Sahel region of the Sahara desert is associated with. See answer ↓
>
> - (a) core area of Sahara desert
> - (b) southern moving edge of Sahara desert
> - (c) northern fringe of Sahara desert bordering Mediterranean sea
> - (d) another name of Sahara desert

8.2 Which mix-ups cost marks?

Questions usually test one of four confusions.

- Calling the Sahel the **core** of the Sahara. It lies on the southern edge.
- Saying the Sahara is **all sand**. Most of it is bare stone and pebbles.

- Giving the world heat record to the Sahara. It belongs to **Death Valley**.
- Thinking the Sahara was always dry. It was **green** 6,000 to 11,000 years ago.

Quick check 8. True or false: The Sahel is another name for the Sahara. *(True or False?)* See answer ↓

Remember this

- **Size:** about 9 million km², roughly the contiguous United States.
- **Surface:** mostly bare stone and pebbles, not sand.
- **Sahel:** the semi-arid belt on the southern edge.
- **Green Sahara:** 6,000 to 11,000 years ago, driven by orbital precession.
- **Growth:** about 10 percent between 1920 and 2013.

Explain it back: Say in your own words why the Sahara was green 11,000 years ago.

Practice MCQs

1. Roughly how large is the Sahara Desert?

A. About 90 million square kilometres

B. About 90,000 square kilometres

C. About 900,000 square kilometres

D. About 9 million square kilometres

See answer ↓

2. In relation to the Sahara, where is the Sahel?

A. The core of the desert

B. Another name for the desert

C. The northern fringe on the Mediterranean Sea

D. A semi-arid belt along its southern edge

See answer ↓

3. What mainly drove the repeated green phases of the Sahara?

A. Shifts in ocean salinity

B. Changes in Earth's orbital precession

C. Volcanic eruptions

D. Changes in the Moon's orbit

See answer ↓

4. Which place holds the official world record for the hottest temperature?

A. El Azizia, Libya

B. Ouargla, Algeria

C. Death Valley, USA

D. Timbuktu, Mali

See answer ↓

5. By roughly how much did the Sahara grow between 1920 and 2013, according to a University of Maryland study?

A. About 90 percent

B. About 50 percent

C. About 1 percent

D. About 10 percent

See answer ↓

6. What does the rock art of Algeria's Tassili n'Ajjer plateau help to show?

A. The Sahara had water and animals in the past

B. The Sahara was always sandy

C. Ice sheets once covered the Sahara

D. The Sahara has never changed

See answer ↓

Answer Key

1. **D.**
   The Sahara covers about 9 million square kilometres. That is roughly the size of the contiguous United States and about 10 percent of Africa.
   ↑ Q1
2. **D.**
   The Sahel is the semi-arid transition zone between the Sahara and the fertile savannas further south. The Sahara expands as the Sahel retreats.
   ↑ Q2
3. **B.**
   Earth's orbital precession warmed Northern Hemisphere summers. That strengthened the West African Monsoon and spread savannah across the desert about every 21,000 years.
   ↑ Q3
4. **C.**
   In 2012 the WMO disqualified the 58°C reading from El Azizia. The official record is now 56.7°C at Death Valley, USA, in 1913.
   ↑ Q4
5. **D.**
   The study used African rainfall records and found the Sahara grew by about 10 percent. In summer its average area rose nearly 16 percent.
   ↑ Q5
6. **A.**
   The plateau holds over 15,000 etchings and paintings, some as much as 11,000 years old. They record a wetter Sahara with savannah, rivers and lakes.
   ↑ Q6

Quick-check answers

1. **False.** A desert is usually a place with under about 250 mm of rain a year. ↑ 1
2. **False.** Most of it is bare stone and pebbles. Sand covers only part. ↑ 2
3. **True.** It is the semi-arid belt between the desert and the savannas to its south.
   ↑ 3

4. **False.** It was green with savannah, rivers and lakes about 6,000 to 11,000 years ago. ↑ 4
5. **False.** The record is 56.7°C at Death Valley, USA, in 1913. ↑ 5
6. **False.** It found the Sahara grew by about 10 percent. ↑ 6
7. **True.** It aims to restore degraded land across the Sahel. ↑ 7
8. **False.** It is the semi-arid belt along the Sahara's southern edge. ↑ 8
9. **Think it through.** Scientists usually call a place a desert when it gets under about 250 mm of rain a year. Low rain is the test, not heat or sand. ↑ 9
10. **Think it through.** A cycle of 21,000 years is very long. Whole civilisations rise and fall inside one small part of it. ↑ 10
11. **Think it through.** The 10 percent is the total change across 93 years, from 1920 to 2013. ↑ 11
12. **Think it through.** The answer is (b), the southern moving edge of the desert. View this question on the full NDA-NA (II) 2016 paper. ↑ 12

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