

Report for ForestQuery into Global Deforestation, 1990 to 2016

ForestQuery is on a mission to combat deforestation around the world and to raise awareness about this topic and its impact on the environment. The data analysis team at ForestQuery has obtained data from the World Bank that includes forest area and total land area by country and year from 1990 to 2016, as well as a table of countries and the regions to which they belong.

The data analysis team has used SQL to bring these tables together and to query them in an effort to find areas of concern as well as areas that present an opportunity to learn from successes.

1. GLOBAL SITUATION

According to the World Bank, the total forest area of the world was **41282694.9 sq km** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.9 sq km**, a loss of **1324449 sq km**, or **-3.21%**.

The forest area lost over this time period is slightly more than the entire land area of **Monaco** listed for the year 2016 (which is **1.9943 sq km**).

2. REGIONAL OUTLOOK

In 2016, the percent of the total land area of the world designated as forest was **31.34%**. The region with the highest relative forestation was **Latin America & Caribbean**, with **46.16%**, and the region with the lowest relative forestation was **Middle East & North Africa**, with **2.07%** forestation.

In 1990, the percent of the total land area of the world designated as forest was **32.21%**. The region with the highest relative forestation was **Latin America & Caribbean**, with **51.03%**, and the region with the lowest relative forestation **Middle East & North Africa**, with **1.78%** forestation.

Table 2.1: Percent Forest Area by Region, 1990 & 2016:

Region	1990 Forest Percentage	2016 Forest Percentage
World	32.21%	31.34%

Latin America & Caribbean	51.03%	46.16%
Middle East & North Africa	1.78%	2.07%

The only regions of the world that decreased in percent forest area from 1990 to 2016 were **Latin America & Caribbean** (dropped from **51.03%** to **46.16%**) and **Sub-Saharan Africa** (**30.67%** to **28.79%**). All other regions actually increased in forest area over this time period. However, the drop in forest area in the two aforementioned regions was so large, the percent forest area of the world decreased over this time period from **32.21%** to **31.34%**.

3. COUNTRY-LEVEL DETAIL

A. SUCCESS STORIES

There is one particularly bright spot in the data at the country level, **Solomon Islands**. This country actually increased in forest area from 1990 to 2016 by **1324449 hectares**. It would be interesting to study what has changed in this country over this time to drive this figure in the data higher. The country with the next largest increase in forest area from 1990 to 2016 was the **Brazil**, but it only saw an increase of **541510 hectares**, much lower than the figure for **Solomon Islands**.

Solomon Islands and **Brazil** are of course very large countries in total land area, so when we look at the largest *percent* change in forest area from 1990 to 2016, we aren't surprised to find a much smaller country listed at the top. **St. Martin (French part)** increased in forest area by **100.00%** from 1990 to 2016.

B. LARGEST CONCERNS

Which countries are seeing deforestation to the largest degree? We can answer this question in two ways. First, we can look at the absolute square kilometer decrease in forest area from 1990 to 2016. The following 3 countries had the largest decrease in forest area over the time period under consideration:

Table 3.1: Top 5 Amount Decrease in Forest Area by Country, 1990 & 2016:

Country	Region	Absolute Forest Area Change
World	World	1324449
Indonesia	East Asia & Pacific	282193.98
Myanmar	East Asia & Pacific	107234.00

The second way to consider which countries are of concern is to analyze the data by percent decrease.

Table 3.2: Top 5 Percent Decrease in Forest Area by Country, 1990 & 2016:

Country	Region	Pct Forest Area Change
St. Martin (French part)	Latin America & Caribbean	100.00
Togo	Sub-Saharan Africa	75.45
Nigeria	Sub-Saharan Africa	61.80

When we consider countries that decreased in forest area percentage the most between 1990 and 2016, we find that four of the top 5 countries on the list are in the region of **Sub-Saharan Africa**. The countries are **Togo**, **Nigeria**, **Uganda**, and **Mauritania**. The 5th country on the list is **St. Martin (French part)**, which is in the **Latin America & Caribbean** region.

From the above analysis, we see that **Nigeria** is the only country that ranks in the top 5 both in terms of absolute square kilometer decrease in forest as well as percent decrease in forest area from 1990 to 2016. Therefore, this country has a significant opportunity ahead to stop the decline and hopefully spearhead remedial efforts.

C. QUARTILES

Table 3.3: Count of Countries Grouped by Forestation Percent Quartiles, 2016:

Quartile	Number of Countries
1	55
2	55
3	45
4	45

The largest number of countries in 2016 were found in the **1st and 2nd** quartile.

There were **55** countries in the top quartile in 2016. These are countries with a very high percentage of their land area designated as forest. The following is a list of countries and their respective forest land, denoted as a percentage.

Table 3.4: Top Quartile Countries, 2016:

Country	Region	Pct Designated as Forest
Solomon Islands	East Asia & Pacific	>75
Lao PDR	East Asia & Pacific	>75
Guyana	Latin America & Caribbean	>75

4. RECOMMENDATIONS

Write out a set of recommendations as an analyst on the ForestQuery team.

- *What have you learned from the World Bank data?*
- *Which countries should we focus on over others?*

From the World Bank data, I have learned that between 1990 and 2016, many countries experienced significant decreases in forest areas. This loss is particularly severe in regions such as Sub-Saharan Africa, with countries like Togo and Nigeria showing notable reductions. The Latin America and Caribbean region also faces severe forest loss, as seen in places like St. Martin (French part). On the positive side, some countries still maintain high forest coverage, especially in regions like East Asia & Pacific and Sub-Saharan Africa.

Based on the data, we should focus on countries like Nigeria, Indonesia, Togo, St. Martin (French part), and Uganda. Nigeria has lost a lot of its forests, so it needs reforestation and efforts to stop deforestation. Indonesia also has a large decrease in forest area and needs urgent reforestation and stricter regulations. Togo's big loss in forest area means it needs sustainable forest management practices. St. Martin (French part) has completely lost its forest area, so we need to understand the causes and work on reforestation. Uganda's significant deforestation highlights the need for effective policies and community involvement to stop further loss. By focusing on these countries, we can have a significant impact on reversing deforestation trends and promoting better forest management.

5. APPENDIX: SQL Queries Used

```
CREATE VIEW forestation AS
```

```
SELECT
```

```
    fa.country_code,  
    fa.country_name,  
    fa.year,
```

```

COALESCE(fa.forest_area_sqkm, 0) AS forest_area_sqkm,
COALESCE(la.total_area_sq_mi, 0) AS total_area_sq_mi,
r.region,
COALESCE(r.income_group, 'Unknown') AS income_group,
((fa.forest_area_sqkm / (la.total_area_sq_mi * 2.59)) * 100) AS percent_fa
FROM
    forest_area AS fa
JOIN
    land_area AS la
ON fa.country_code = la.country_code AND fa.year = la.year
JOIN
    Regions AS r
ON fa.country_code = r.country_code;

```

PART 1 –GLOBAL SITUATION

(a)

```

WITH world_1990 AS
(
    SELECT SUM(forest_area_sqkm) AS total_fa_sqkm
    FROM forestation
    WHERE country_name = 'World' AND year = 1990)
SELECT * FROM world_1990;

```

Input

SCHEMA

↺

forest_area

▼

forestation

▼

land_area

▼

regions

▼

18 WITH world_1990 AS

19 (

20 SELECT SUM(forest_area_sqkm) AS total_fa_sqkm

21 FROM forestation

22 WHERE country_name = 'World' AND year = 1990

23)

24 SELECT * FROM world_1990;

Success!

EVALUATE

Output

1 results

Download CSV

total_fa_sqkm

41282694.9

(b)

```
WITH world_2016 AS
(
  SELECT SUM(forest_area_sqkm) AS total_fa_sqkm
  FROM forestation
  WHERE country_name = 'World' AND year = 2016
)
SELECT * FROM world_2016;
```

The screenshot shows a SQL query editor interface. On the left, there is a 'SCHEMA' panel with a refresh icon and a list of tables: 'forest_area', 'forestation', 'land_area', and 'regions', each with a dropdown arrow. The main area displays a SQL query with line numbers 1 through 7. The query is:
1 WITH world_2016 AS
2 (
3 SELECT SUM(forest_area_sqkm) AS total_fa_sqkm
4 FROM forestation
5 WHERE country_name = 'World' AND year = 2016
6)
7 SELECT * FROM world_2016;
Below the query, a green bar indicates 'Success!'. To the right of this bar is a blue 'EVALUATE' button. Below the query editor, there is an 'Output' section header, '1 results', and a 'Download CSV' button. The output table has a single column 'total_fa_sqkm' and a single row with the value '39958245.9'.

total_fa_sqkm
39958245.9

(c)

```
WITH world_1990 AS
(
  SELECT SUM(forest_area_sqkm) AS total_fa_1990
  FROM forestation
  WHERE country_name = 'World' AND year = 1990
),
world_2016 AS
(
  SELECT SUM(forest_area_sqkm) AS total_fa_2016
  FROM forestation
  WHERE country_name = 'World' AND year = 2016
```

```
)
SELECT
(SELECT total_fa_2016
FROM world_2016) - (SELECT total_fa_1990
FROM world_1990) AS change_fa;
```

Input

HISTORY ▾ MENU ▾

SCHEMA ↺

forest_area ▾

forestation ▾

land_area ▾

regions ▾

```

1  WITH world_1990 AS
2  (
3      SELECT SUM(forest_area_sqkm) AS total_fa_1990
4      FROM forestation
5      WHERE country_name = 'World' AND year = 1990
6  ),
7  world_2016 AS
8  (
9      SELECT SUM(forest_area_sqkm) AS total_fa_2016
10     FROM forestation
11     WHERE country_name = 'World' AND year = 2016
12 )
13 SELECT
14     (SELECT total_fa_2016
15     FROM world_2016) - (SELECT total_fa_1990
16     FROM world_1990) AS change_fa;
```

Success!

EVALUATE

Output

1 results

Download CSV

change_fa

-1324449

(d)

```
WITH world_1990 AS
(
    SELECT SUM(forest_area_sqkm) AS total_fa_1990
    FROM forestation
    WHERE country_name = 'World' AND year = 1990
),
world_2016 AS
(
    SELECT SUM(forest_area_sqkm) AS total_fa_2016
    FROM forestation
    WHERE country_name = 'World' AND year = 2016
)
SELECT
```

((SELECT total_fa_2016 FROM world_2016) -
 (SELECT total_fa_1990 FROM world_1990)) * 100.0 /
 (SELECT total_fa_1990 FROM world_1990) AS percent_change;

Input

SCHEMA

↺

forest_area

▼

forestation

▼

land_area

▼

regions

▼

```

1  WITH world_1990 AS
2  (
3      SELECT SUM(forest_area_sqkm) AS total_fa_1990
4      FROM forestation
5      WHERE country_name = 'World' AND year = 1990
6  ),
7  world_2016 AS
8  (

```

Success!

EVALUATE

Output

1 results

Download CSV

change_fa

-1324449

(e)

WITH world_1990 AS

(

SELECT SUM(forest_area_sqkm) AS total_fa_1990

FROM forestation

WHERE country_name = 'World' AND year = 1990

),

world_2016 AS

(

SELECT SUM(forest_area_sqkm) AS total_fa_2016

FROM forestation

WHERE country_name = 'World' AND year = 2016

),

fa_change AS

(

SELECT

(SELECT total_fa_2016 FROM world_2016) -

(SELECT total_fa_1990 FROM world_1990) AS fa_lost

),


```

country_areas AS
(
    SELECT
        country_name,
        COALESCE(total_area_sq_mi * 2.59, 0) AS total_area_sqkm
    FROM forestation
    WHERE year = 2016 AND COALESCE(total_area_sq_mi, 0) > 0
)
SELECT
    country_name,
    total_area_sqkm
FROM
    country_areas,
    fa_change
ORDER BY
    CASE
        WHEN (fa_lost - total_area_sqkm) < 0 THEN (total_area_sqkm - fa_lost)
        ELSE (fa_lost - total_area_sqkm)
    END
LIMIT 1;

```

Input

HISTORY ▾ MENU ▾

SCHEMA ↺

forest_area ▾

forestation ▾

land_area ▾

regions ▾

```

1  WITH world_1990 AS
2  (
3      SELECT SUM(forest_area_sqkm) AS total_fa_1990
4      FROM forestation
5      WHERE country_name = 'World' AND year = 1990
6  ),
7  world_2016 AS
8  (

```

Success!

EVALUATE

Output

1 results

Download CSV

country_name	total_area_sqkm
Monaco	1.9943

PART 2- REGIONAL OUTLOOK

WITH region_percent AS

```
(
  SELECT
    r.region,
    SUM(CASE WHEN f.year = 1990 THEN f.forest_area_sqkm ELSE 0 END) /
    (SUM(CASE WHEN f.year = 1990 THEN la.total_area_sq_mi ELSE 0 END) * 2.59) *
    100 AS percent_1990,
    SUM(CASE WHEN f.year = 2016 THEN f.forest_area_sqkm ELSE 0 END) /
    (SUM(CASE WHEN f.year = 2016 THEN la.total_area_sq_mi ELSE 0 END) * 2.59) *
    100 AS percent_2016
  FROM
    forestation AS f
  JOIN
    land_area la
  ON f.country_code = la.country_code AND f.year = la.year
  JOIN
    Regions AS r
  ON f.country_code = r.country_code
  GROUP BY
    r.region
)
SELECT * FROM region_percent;
```

Input		HISTORY ▾	MENU ▾
SCHEMA ↻		<pre>1 WITH region_percent AS 2 (3 SELECT 4 r.region, 5 SUM(CASE WHEN f.year = 1990 THEN f.forest_area_sqkm ELSE 0 END) / (SUM(CASE WHEN f.year = 1990 THEN la.total_area_sq_mi ELSE 0 END) * 2.59) * 100 AS percent_1990, 6 SUM(CASE WHEN f.year = 2016 THEN f.forest_area_sqkm ELSE 0</pre>	
forest_area ▾			
forestation ▾			
land_area ▾			
regions ▾			
Success!		EVALUATE	
Output		8 results	Download CSV
region	percent_1990	percent_2016	
East Asia & Pacific	25.77609539731745	26.3586765000485	
World	32.42220355756894	31.375570964309528	
Middle East & North Africa	1.7752406246935268	2.0682648687150125	
Europe & Central Asia	37.28393985640194	38.04142160325166	
Latin America & Caribbean	51.02997986675144	46.16207219960474	
North America	35.651179000901536	36.03936096814378	
Sub-Saharan Africa	30.674145461000617	28.788188355046408	
South Asia	16.51076700142095	17.505863408153374	

(a)

WITH world_2016 AS

(

SELECT

SUM(f.forest_area_sqkm) / (SUM(f.total_area_sq_mi) * 2.59) * 100 AS

world_2016_percent

FROM

forestation AS f

WHERE f.year = 2016

),

region_2016 AS

(

SELECT

f.region,

SUM(f.forest_area_sqkm) / (SUM(f.total_area_sq_mi) * 2.59) * 100 AS

region_2016_percent

FROM

forestation AS f

WHERE f.year = 2016

GROUP BY f.region

)

SELECT

w.world_2016_percent,

highest.region AS highest_region,

highest.region_2016_percent AS highest_region_percent,

lowest.region AS lowest_region,

lowest.region_2016_percent AS lowest_region_percent

FROM

world_2016 AS w,

(SELECT region, region_2016_percent

FROM region_2016 ORDER BY region_2016_percent DESC

LIMIT 1) AS highest,

(SELECT region, region_2016_percent

FROM region_2016

ORDER BY region_2016_percent ASC

LIMIT 1) AS lowest;

Input

SCHEMA

↺

forest_area

▼

forestation

▼

land_area

▼

regions

▼

18

WITH world_2016 AS (

19

SELECT

20

SUM(f.forest_area_sqkm) / (SUM(f.total_area_sq_mi) * 2.59) *

100 AS world_2016_percent

21

FROM

22

forestation f

23

WHERE f.year = 2016

24

);

Success!

EVALUATE

Output

1 results

Download CSV

world_2016_percent	highest_region	highest_region_percent	lowest_region	lowest_region_percent
31.344178735773156	Latin America & Caribbean	46.16207219960474	Middle East & North Africa	2.06826481

(b)

WITH world_1990 AS

(

SELECT

SUM(f.forest_area_sqkm) / (SUM(f.total_area_sq_mi) * 2.59) * 100 AS

world_1990_percent

FROM

forestation AS f

WHERE f.year = 1990

),

region_1990 AS

(

SELECT

f.region,

SUM(f.forest_area_sqkm) / (SUM(f.total_area_sq_mi) * 2.59) * 100 AS

region_1990_percent

FROM

forestation AS f

WHERE f.year = 1990

GROUP BY f.region

(c)

WITH regions AS

(

SELECT

f.region,

SUM(CASE WHEN f.year = 1990 THEN f.forest_area_sqkm ELSE 0 END) AS

fa_1990,

SUM(CASE WHEN f.year = 2016 THEN f.forest_area_sqkm ELSE 0 END) AS

fa_2016

FROM

forestation AS f

GROUP BY

f.region

)

SELECT

regions.region AS r,

regions.fa_1990 AS fa_1990,

regions.fa_2016 AS fa_2016,

regions.fa_2016 - regions.fa_1990 AS forest

FROM

regions

WHERE

regions.fa_2016 < regions.fa_1990;

Input		HISTORY ▾	MENU ▾
SCHEMA ↻		<pre>93 WITH regions AS (94 SELECT 95 f.region, 96 SUM(CASE WHEN f.year = 1990 THEN f.forest_area_sqkm ELSE 0 97 END) AS fa_1990, 98 SUM(CASE WHEN f.year = 2016 THEN f.forest_area_sqkm ELSE 0 99 END) AS fa_2016 100 FROM 101 forestation AS f 102 GROUP BY 103 f.region 104) 105 SELECT 106 regions.region AS r, 107 regions.fa_1990 AS fa_1990, 108 regions.fa_2016 AS fa_2016, 109 regions.fa_2016 - regions.fa_1990 AS forest 110 FROM 111 regions 112 WHERE 113 regions.fa_2016 < regions.fa_1990;</pre>	
forest_area ▾			
forestation ▾			
land_area ▾			
regions ▾			
Success!		EVALUATE	
Output		3 results	
		Download CSV	
r	fa_1990	fa_2016	forest
World	41282694.9	39958245.9	-1324449
Latin America & Caribbean	10242341.796304759	9250585.884135248	-991755.9121695105
Sub-Saharan Africa	6515615.1999664	6115290.9152861	-400324.2846803004

PART 3 – COUNTRY LEVEL

(a)

WITH forest AS (

SELECT

f1990.country_name,

f1990.region,

(f1990.forest_area_sqkm - f2016.forest_area_sqkm) AS forest_area

FROM

forestation AS f1990

JOIN

forestation AS f2016

ON f1990.country_code = f2016.country_code

AND f1990.year = 1990

AND f2016.year = 2016)

SELECT

country_name,

region,

forest_area

FROM

forest

ORDER BY

forest_area DESC

LIMIT 5;

Input

HISTORY ▼ MENU ▼

SCHEMA

country_name
year
forest_area_sqkm
total_area_sq_mi
region

1 WITH forest AS
2 (
3 SELECT
4 f1990.country_name,
5 f1990.region,
6 (f1990.forest_area_sqkm - f2016.forest_area_sqkm) AS
forest_area
7 FROM

Success!

EVALUATE

Output

5 results

Download CSV

country_name	region	forest_area
World	World	1324449
Brazil	Latin America & Caribbean	541510
Indonesia	East Asia & Pacific	282193.98439999996
Myanmar	East Asia & Pacific	107234.00390000001
Nigeria	Sub-Saharan Africa	106506.00098

(b)

WITH percent_decrease AS

(

SELECT

 f1990.country_name,

 f1990.region,

 CASE

 WHEN f1990.forest_area_sqkm = 0 THEN 0

 ELSE ROUND(((f1990.forest_area_sqkm::numeric -

f2016.forest_area_sqkm::numeric) / f1990.forest_area_sqkm::numeric) * 100, 2)

 END AS percent

FROM

 forestation AS f1990

JOIN

 forestation AS f2016

ON f1990.country_code = f2016.country_code

AND f1990.year = 1990

AND f2016.year = 2016

)

SELECT

 country_name,

 region,

 percent

FROM

 percent_decrease

ORDER BY

 percent DESC

LIMIT 5;

Input

SCHEMA

regions

country_name

country_code

region

income_group

↺

↻

HISTORY ▾

MENU ▾

```

1  WITH percent_decrease AS
2  (
3      SELECT
4          f1990.country_name,
5          f1990.region,
6          CASE
7              WHEN f1990.forest_area_sqkm = 0 THEN 0
8              ELSE ROUND(((f1990.forest_area_sqkm::numeric -

```

EVALUATE

Output

5 results

[Download CSV](#)

country_name	region	percent
St. Martin (French part)	Latin America & Caribbean	100.00
Togo	Sub-Saharan Africa	75.45
Nigeria	Sub-Saharan Africa	61.80
Uganda	Sub-Saharan Africa	59.13
Mauritania	Sub-Saharan Africa	46.75

(c)

WITH forestation_quartiles AS

```

(
    SELECT
        country_name,
        percent_fa,
        NTILE(4) OVER (ORDER BY percent_fa DESC) AS quartile
    FROM
        forestation
    WHERE
        year = 2016
)

```

```

SELECT
    quartile,
    COUNT(country_name) AS countries
FROM

```

```

    forestation_quartiles
GROUP BY
    quartile
ORDER BY
    quartile;

```

Input

SCHEMA

region

income_group

percent_fa

land_area

regions

↺

↻

```

1  WITH forestation_quartiles AS
2  (
3      SELECT
4          country_name,
5          percent_fa,
6          NTILE(4) OVER (ORDER BY percent_fa DESC) AS quartile
7      FROM
8          forestation

```

Success!

EVALUATE

Output

4 results

Download CSV

quartile	countries
1	55
2	55
3	54
4	54

(d)

```

WITH quartiles AS (
    SELECT
        country_name,
        percent_fa,
        NTILE(4) OVER (ORDER BY percent_fa) AS quartile
    FROM
        forestation
    WHERE
        year = 2016
)
SELECT

```

```

country_name
FROM
  quartiles
WHERE
  quartile = 4
  AND percent_fa > 75;

```

Input

HISTORY ▾ MENU ▾

SCHEMA ↺

forest_area ▾

forestation ▾

land_area ▾

regions ▾

```

1
2 WITH quartiles AS (
3   SELECT
4     country_name,
5     percent_fa,
6     NTILE(4) OVER (ORDER BY percent_fa) AS quartile
7   FROM
8     forestations

```

Success!

EVALUATE

Output

9 results

Download CSV

country_name

Solomon Islands

Lao PDR

Guyana

American Samoa

Palau

Seychelles

Gabon

Micronesia, Fed. Sts.

Suriname

(e)

```

WITH forestation_US AS (
  SELECT
    percent_fa
  FROM
    forestation
  WHERE
    country_name = 'United States'
    AND year = 2016),
higher AS (
  SELECT
    country_name

```

```

FROM
    forestation, forestation_US
WHERE
    forestation.percent_fa > forestation_US.percent_fa
    AND forestation.year = 2016)
SELECT
    COUNT(*) AS counteries
FROM
    higher;

```

Input		HISTORY ▾	MENU ▾
SCHEMA	↻	<pre> 1 WITH forestation_US AS (2 SELECT 3 percent_fa 4 FROM 5 forestation 6 WHERE 7 country_name = 'United States' 8 AND year = 2016 </pre>	
forest_area	▾		
forestation	▾		
land_area	▾		
regions	▾		
Success!		EVALUATE	
Output		1 results	Download CSV
counteries			
<div>94</div>			