

Report for ForestQuery into Global Deforestation, 1990 to 2016

Forest Query 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 41,282,694.9 km² in 1990.

As of 2016, the most recent year for which data was available, that number had fallen to 39,958,245.9 km², a loss of 1,324,449 km², or 3.2 % of the total area.

The forest area lost over this time period is slightly more than the entire land area of AUSTRALIA listed for the year 2016 (which is 1,250,590 km²).

2. REGIONAL OUTLOOK

In 2016, the percent of the total land area of the world designated as forest was 31.38 %.

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 with 2 % forestation.

In 1990, the percent of the total land area of the world designated as forest was 32.42%.

The region with the highest relative forestation was Latin America & Caribbean with 51.03% and the region with the lowest relative forestation was Middle East with 1.78% forestation.

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

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America & Caribbean	51.03%	46.16%
Europe & Central Asia	37.28%	38.04%
North America	35.65%	36.04%
World	32.42%	31.38%
Sub-Sahara Africa	30.67%	28.79%
East Asia & Pacific	16.51%	17.51%
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-Sahara 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 **32.42% to 31.38%**.

3. COUNTRY-LEVEL DETAIL

A. SUCCESS STORIES

There is one particularly bright spot in the data at the country level, **China**. This country actually increased in forest area from 1990 to 2016 by **527,229.06 km²**. 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 United States, but it only saw an increase of **79,200 km²**, much lower than the figure for **China**.

China and **United States** 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. Iceland increased in forest area by **213.66 %** 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
Brazil	Latin America and Caribbean	541,510 km ²
Indonesia	East Asia and Pacific	282,194 km ²
Myanmar	East Asia and Pacific	107,234 km ²
Nigeria	Sub-Saharan Africa	106,506 km ²
Tanzania	Sub-Saharan Africa	102,320 km ²

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
Togo	Sub-Saharan Africa	75.45%
Nigeria	Sub-Saharan Africa	61.8%
Uganda	Sub-Saharan Africa	59.27%
Mauritania	Sub-Saharan Africa	46.75%
Honduras	Latin America & Caribbean	45.03%

When we consider countries that decreased in forest area the most between 1990 and 2016, we find that four of the top 5 countries on the list are in the region of Sub-Sahara Africa. The countries are **Togo, Nigeria, Uganda and Mauritania**. The 5th country on the list is **Honduras**, 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
I : 0-25	85
II: 25-50	72
III: 50-75	38
IV: 75-100	9

The largest number of countries in 2016 were found in the **I** quartile.

There were **9** 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
Suriname	Latin America & Caribbean	98.25
Micronesia, Fed. Sts	East Asia & Pacific	91.85
Gabon	Sub-Sahara Africa	90.03
Seychelles	Sub-Sahara Africa	88.41

Palau	East Asia & Pacific	87.60
American Samoa	East Asia & Pacific	87.50
Guyana	Latin America & Caribbean	83.90
Lao	East Asia & Pacific	82.10
Solomon Islands	East Asia & Pacific	77.86

5. RECOMMENDATIONS

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

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

- I. I did learn the importance of the Data and how to manage it to understand better the concepts that will allow us to take better decision in the future.
- II. Based on an Ecological and Economical point of view I will periodically check the data and the production of the small countries that are raising the production, keeping it sustainable.
Further away, based on an Environment-friendly point of view, I suggest to keep an eye on the largest changes in the forest area (3.1) where the production is high or just slowing down, it does not mean that in terms of percentage is a small portion of the area, a perfect example could be Brazil .
Even if they decreased the forest area from 1990 to 2016, it means only how much those countries and regions have already lost in terms of available forest.

----- SQL QUERIES USED. -----

View:

```
CREATE VIEW Forestation AS
SELECT reg.country_name,
       foa.year,
       reg.income_group,
       reg.region,
       laa.total_area_sq_mi,
       foa.forest_area_sqkm,
       ((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100) perc_forest
FROM forest_area foa
JOIN land_area laa ON foa.country_code = laa.country_code
AND foa.year = laa.year
JOIN regions reg ON reg.country_code = foa.country_code
```

#check

```
SELECT *
FROM forestation;
```

1

A.
SELECT country_name, year, forest_area_sqkm
FROM forestation
WHERE year = 1990 and country_name = 'World'

B.
SELECT country_name, year, forest_area_sqkm
FROM forestation
WHERE year = 2016 and country_name = 'World'

C.
SELECT country_name, year, forest_area_sqkm
FROM forestation
WHERE forest_area_sqkm < 1324449 and year = 2016
ORDER BY forest_area_sqkm desc
LIMIT 3

--- 2 ---

A.

```
SELECT country_name, Round(((Sum(forest_area_sqkm) /  
Sum(total_area_sq_mi*2.59))*100)::Numeric, 2) AS percent_forest  
FROM forestation  
WHERE YEAR = 2016 AND country_name = 'World'  
GROUP BY country_name
```

B.

```
SELECT region,  
Round(((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100)::Numeric, 2) AS  
percent_forest  
FROM forestation  
WHERE YEAR = 2016  
GROUP BY region  
ORDER BY percent_forest DESC
```

C.

```
SELECT country_name,  
Round(((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100)::Numeric,2) AS  
percent_forest  
FROM forestation  
WHERE YEAR = 1990  
AND country_name like 'World'  
GROUP BY country_name
```

D.

```
SELECT region,  
Round(((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100)::Numeric,2) AS  
percent_forest  
FROM Forestation  
WHERE YEAR = 1990  
GROUP BY region  
ORDER BY percent_forest DESC
```

TABLE 2.1.

```
SELECT region,
  Round(((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100)::Numeric, 2) AS
percent_forest
FROM Forestation
WHERE YEAR = 1990
GROUP BY region
ORDER BY percent_forest DESC
```

```
SELECT region, Round(((Sum(forest_area_sqkm) /
Sum(total_area_sq_mi*2.59))*100)::Numeric, 2) AS percent_forest
FROM Forestation
WHERE YEAR = 2016 GROUP BY region
ORDER BY percent_forest DESC
```

--- 3 ---

A.

```
WITH T1 AS (SELECT country_name, SUM(forest_area_sqkm) forest_area_1
FROM forestation
WHERE YEAR = 1990
GROUP BY country_name, forest_area_sqkm), T2 AS
(SELECT country_name, SUM(forest_area_sqkm) forest_area_2
FROM forestation
WHERE YEAR = 2016
GROUP BY country_name, forest_area_sqkm)
SELECT f.country_name, (f.forest_area_1 - t.forest_area_2) forest_change
FROM T1 f JOIN T2 t ON f.country_name = t.country_name
ORDER BY forest_change
LIMIT 2
```


B.

```
WITH T1 AS
(SELECT country_name,
(SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100 percent_forestation_1
FROM forestation
WHERE YEAR = 1990
GROUP BY country_name,
forest_area_sqkm),
T2 AS (SELECT country_name,
(SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100 percent_forestation_2
FROM forestation
WHERE YEAR = 2016
GROUP BY country_name, forest_area_sqkm)
SELECT f.country_name,
Round((((f.percent_forestation_1 -
t.percent_forestation_2)/(f.percent_forestation_1))*100)::Numeric, 2) percent_change
FROM T1 f
JOIN T2 t ON f.country_name = t.country_name
ORDER BY percent_change
LIMIT 1
```

Table 3.1

```
WITH T1 AS
(SELECT country_name,
SUM(forest_area_sqkm) forest_area_1
FROM forestation
WHERE YEAR = 1990
GROUP BY country_name,
forest_area_sqkm),
T2 AS
(SELECT country_name,
SUM(forest_area_sqkm) forest_area_2
FROM forestation
WHERE YEAR = 2016
GROUP BY country_name,
forest_area_sqkm)
SELECT f.country_name,
(f.forest_area_1 - t.forest_area_2) forest_change
FROM T1 f
JOIN T2 t ON f.country_name = t.country_name
WHERE f.forest_area_1 IS NOT NULL
AND t.forest_area_2 IS NOT NULL
AND f.country_name != 'World'
ORDER BY forest_change DESC LIMIT 5
```

Table 3.2

```
WITH T1 AS
(SELECT country_name, (SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100
percent_forestation_1
FROM forestation
WHERE YEAR = 1990
GROUP BY country_name, forest_area_sqkm), T2 AS
(SELECT country_name, (SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100
percent_forestation_2
FROM forestation
WHERE year = 2016 GROUP BY country_name, forest_area_sqkm)
SELECT f.country_name, Round((((f.percent_forestation_1 -
t.percent_forestation_2)/(f.percent_forestation_1))*100)::Numeric, 2) percent_change
FROM T1 f
JOIN T2 t
ON f.country_name = t.country_name
WHERE f.percent_forestation_1
IS NOT NULL AND t.percent_forestation_2
IS NOT NULL AND f.country_name != 'World'
ORDER BY percent_change DESC
LIMIT 5
```

Table 3.3

```
WITH T1 AS
(SELECT country_name,
YEAR,
(SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100 percent_forestation
FROM forestation
WHERE YEAR = 2016
GROUP BY country_name,
YEAR,
forest_area_sqkm)
SELECT Distinct(quartiles),
count(country_name) Over (PARTITION BY quartiles)
FROM
(SELECT country_name,
CASE
WHEN percent_forestation<25 THEN '0-25'
WHEN percent_forestation>=25
AND percent_forestation<50 THEN '25-50'
WHEN percent_forestation>=50
AND percent_forestation<75 THEN '50-75'
ELSE '75-100'
END AS quartiles
FROM T1
WHERE percent_forestation IS NOT NULL
AND YEAR = 2016) sub
```

Table 3.4

```
WITH T2 AS
(WITH T1 AS
(SELECT country_name,
YEAR,
(SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100 percent_forestation
FROM forestation
WHERE YEAR = 2016
GROUP BY country_name,
YEAR,
forest_area_sqkm) SELECT Distinct(quartiles),
count(country_name)Over(PARTITION BY quartiles),
country_name,
percent_forestation
FROM
(SELECT country_name,
percent_forestation,
CASE
WHEN percent_forestation<=25 THEN '0-25'
WHEN percent_forestation>25
AND percent_forestation<=50 THEN '25-50'
WHEN percent_forestation>50
AND percent_forestation<=75 THEN '50-75'
ELSE '75-100'
END AS quartiles
FROM T1
WHERE percent_forestation IS NOT NULL
AND YEAR = 2016) sub)
SELECT country_name,
quartiles,
Round(percent_forestation::Numeric, 2) percent_forestation
FROM T2
WHERE quartiles = '75-100'
ORDER BY percent_forestation DESC
```