

# 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 Peru listed for the year 2016 (which is 1279999.9891 sq km).

## 2. REGIONAL OUTLOOK

In 2016, the percentage of the total land area of the world designated as forest was 31.39%. The region with the highest relative forestation was Europe & Central Asia, with 46.66%, and the region with the lowest relative forestation was Middle East & North Africa, with 2.08% forestation.

In 1990, the percentage of the total land area of the world designated as forest was 32.43%. The region with the highest relative forestation was Latin America & Caribbean, with 49.71%, and the region with the lowest relative forestation was Middle East & North Africa, with 1.79 % forestation.

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

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America & Caribbean	51.08	46.14
Sub-Saharan Africa	30.65	28.72
Europe & Central Asia	37.20	38.07
East Asia & Pacific	25.57	26.29
South Asia	16.53	17.50
Middle East & North Africa	1.78	2.07
North America	35.66	35.81

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin America & Caribbean (dropped from 51.08% to 46.14%) and Sub-Saharan Africa (30.65 % to 28.72%). 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 32.41% to 31.37 %.

### 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 527229.062 sq km. 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 79200 sq km, much lower than the figure for China.

China and the 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's forest area by 213.664588870028% 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 & Caribbean	541510
Indonesia	East Asia & Pacific	282193.9844
Myanmar	East Asia & Pacific	107234.0039
Nigeria	Sub-Saharan Africa	106506.00098
Tanzania	Sub-Saharan Africa	102320

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	61.80
Uganda	Sub-Saharan Africa	59.13
Mauritania	Sub-Saharan Africa	46.75
Honduras	Latin America & Caribbean	45.03

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 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
0-25%	125
25-50%	153
50-75%	57
75-100%	9

The largest number of countries in 2016 were found in the 2nd 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_name	region	forestation_percentage
American Samoa	East Asia & Pacific	87.50
Gabon	Sub-Saharan Africa	90.04
Guyana	Latin America & Caribbean	83.90
Lao PDR	East Asia & Pacific	82.11
Micronesia, Fed. Sts.	East Asia & Pacific	91.86
Palau	East Asia & Pacific	87.61
Seychelles	Sub-Saharan Africa	88.41
Solomon Islands	East Asia & Pacific	77.86
Suriname	Latin America & Caribbean	98.26

## 4. RECOMMENDATIONS

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

- *China and the United states have had the highest forestation increase between 1990 and 2016*
- *The most effort to regenerate forestation should be put on the sub\_saharan region, especially in Togo, Nigeria, Uganda and Mauritania because these countries saw the largest deforestation percentage.*

## 5. APPENDIX: SQL Queries Used

### GLOBAL SITUATION

#### 1. Total forest in 1990

```
SELECT country_name,year, forest_area_sqkm
FROM forest_area
WHERE country_name='World' AND year=1990
```

#### 2. Total forest in 2016

```
SELECT country_name,year, forest_area_sqkm
FROM forest_area
WHERE country_name='World' AND year=2016
```

#### 3. Sqkm change in forest area of the world between 1990 and 2016

```
WITH table1 AS
(SELECT country_name, forest_area_sqkm AS forest_1990
FROM forest_area
WHERE country_name='World' AND year=1990),
table2 AS
(SELECT country_name, forest_area_sqkm AS forest_2016
FROM forest_area
WHERE country_name='World' AND year=2016)

SELECT t1.country_name, (t1.forest_1990-t2.forest_2016) AS forest_area_change
FROM table1 t1
JOIN table2 t2
```

ON t1.country\_name= t2.country\_name

#### **4. Percent change in forest area of the world between 1990 and 2016**

WITH table1 AS

(SELECT country\_name, forest\_area\_sqkm AS forest\_1990  
FROM forest\_area  
WHERE country\_name='World' AND year=1990),

table2 AS

(SELECT country\_name, forest\_area\_sqkm AS forest\_2016  
FROM forest\_area  
WHERE country\_name='World' AND year=2016)

SELECT

t1.country\_name, ROUND((((t2.forest\_2016-t1.forest\_1990)/t1.forest\_1990)\*100)::Numeric,2) AS forest\_area\_change

FROM table1 t1

JOIN table2 t2

ON t1.country\_name= t2.country\_name;

#### **5. Comparing total forest lost between 1990 and 2016 to total land of a country**

SELECT country\_name, (total\_area\_sq\_mi\*2.59) AS land  
FROM land\_area  
WHERE year=2016 AND total\_area\_sq\_mi IS NOT NULL  
ORDER BY 2 DESC

## **2. REGIONAL OUTLOOK**

### **percent forest of the entire world in 2016**

#### **1. Percentage of total land designated as forest area in 1990**

WITH table1 AS

(SELECT f.country\_name, f.country\_code, f.year, f.forest\_area\_sqkm, l.total\_area\_sq\_mi  
FROM forest\_area f  
JOIN land\_area l  
ON l.country\_name=f.country\_name  
WHERE f.year=1990 AND f.country\_name='World')

```

SELECT year,ROUND((forest_area_sqkm/(total_area_sq_mi*2.589)*100)::Numeric,2) as
Percentage
FROM table1
WHERE year=1990
LIMIT 1

```

## 2. Region with the highest relative forest in 1990

```

WITH table1 AS
    (SELECT DISTINCT f.country_name, f.country_code, f.year, f.forest_area_sqkm,
l.total_area_sq_mi, r.region
FROM forest_area f
JOIN land_area l
ON l.country_name=f.country_name
JOIN Regions r
ON l.country_name=r.country_name
WHERE f.year=1990)

    SELECT region,
ROUND((((SUM(forest_area_sqkm)/SUM(total_area_sq_mi*2.59))*100)::numeric,2) AS
Relative_forest
FROM table1
GROUP BY region
ORDER BY relative_forest DESC

```

## 3. Region with the lowest relative forest in 1990

```

WITH table1 AS
    (SELECT DISTINCT f.country_name, f.country_code, f.year, f.forest_area_sqkm,
l.total_area_sq_mi, r.region
FROM forest_area f
JOIN land_area l
ON l.country_name=f.country_name
JOIN Regions r
ON l.country_name=r.country_name
WHERE f.year=1990)

    SELECT region,
ROUND((((SUM(forest_area_sqkm)/SUM(total_area_sq_mi*2.59))*100)::numeric,2) AS
Relative_forest
FROM table1
GROUP BY region
ORDER BY relative_forest

```

#### **4 .Percentage of total land designated as forest area in 2016**

WITH table1 AS

```
(SELECT f.country_name, f.country_code, f.year, f.forest_area_sqkm, l.total_area_sq_mi
FROM forest_area f
JOIN land_area l
ON l.country_name=f.country_name
WHERE f.year=2016 AND f.country_name='World')
```

```
SELECT year,ROUND((forest_area_sqkm/(total_area_sq_mi*2.589)*100)::Numeric,2) as
Percentage
FROM table1
WHERE year=2016
LIMIT 1
```

#### **5. Region with the highest relative forest in 2016**

WITH table1 AS

```
(SELECT DISTINCT f.country_name, f.country_code, f.year, f.forest_area_sqkm,
l.total_area_sq_mi, r.region
FROM forest_area f
JOIN land_area l
ON l.country_name=f.country_name
JOIN Regions r
ON l.country_name=r.country_name
WHERE f.year=2016)
```

```
SELECT region,
ROUND(((SUM(forest_area_sqkm)/SUM(total_area_sq_mi*2.59))*100)::numeric,2) AS
Relative_forest
FROM table1
GROUP BY region
```



ORDER BY relative\_forest DESC

## 6. Region with the lowest relative forest in 2016

```
WITH first_table AS (  
  SELECT r.region, (SUM(f.forest_area_sqkm)/(SUM(l.total_area_sq_mi* 2.59))*100) AS  
relative_forest_1999  
  FROM forest_area f  
  JOIN land_area l  
  ON l.country_name=f.country_name  
  JOIN Regions r  
  ON l.country_name=r.country_name  
  WHERE f.year=1990  
  GROUP BY r.region),  
second_table AS (  
  SELECT r.region, (SUM(f.forest_area_sqkm)/(SUM(l.total_area_sq_mi* 2.59))*100) AS  
relative_forest_2016  
  FROM forest_area f  
  JOIN land_area l  
  ON l.country_name=f.country_name  
  JOIN Regions r  
  ON l.country_name=r.country_name  
  WHERE f.year=2016  
  GROUP BY r.region)
```

**Table 2.1**

```
WITH t1 AS  
(SELECT r.region, (SUM(f.forest_area_sqkm) OVER (PARTITION BY r.region ORDER BY  
r.region)) AS forest_area, (SUM(l.total_area_sq_mi*2.59) OVER (PARTITION BY r.region  
ORDER BY r.region)) AS land_area  
  FROM forest_area f  
  JOIN regions r  
  ON f.country_name=r.country_name  
  JOIN land_area l  
  ON l.country_name=r.country_name  
  WHERE f.year=2016)  
  
  SELECT DISTINCT region, forest_area, land_area,  
ROUND(((forest_area/land_area)*100)::Numeric,2) AS forest_percentage  
  FROM t1  
  ORDER BY forest_percentage
```

### 3. COUNTRY-LEVEL DETAIL

#### 1. 5 countries with the largest amount decrease in forest area from 1990 to 2016

```
WITH t1 AS
(SELECT country_name, forest_area_sqkm AS forest_2016
FROM forest_area
WHERE year=2016 AND country_name!='World'),
t2 AS
(SELECT country_name, forest_area_sqkm AS forest_1990
FROM forest_area
WHERE year=1990 AND country_name!='World')

SELECT t1.country_name, r.region,(forest_2016-forest_1990) AS forest_change
FROM t1
JOIN t2
ON t1.country_name=t2.country_name
JOIN regions r
ON t2.country_name= r.country_name
ORDER BY forest_change
```

#### 2. 5 countries saw the largest percent decrease in forest area from 1990 to 2016

```
WITH t1 AS
(SELECT f.country_name,r.region, f.forest_area_sqkm as forest_1990
FROM forest_area f
JOIN regions r
ON f.country_name=r.country_name
WHERE f.year=1990),

t2 AS
(SELECT f.country_name,r.region, f.forest_area_sqkm AS forest_2016
FROM forest_area f
```

```

JOIN regions r
ON f.country_name=r.country_name
WHERE f.year=2016)

```

```

select
t1.country_name,t1.region,ROUND(((t2.forest_2016-t1.forest_1990)/t1.forest_1990)*100)::Nu
meric,2) AS forest_change
FROM t1
JOIN t2
ON t1.country_name=t2.country_name
WHERE t1.forest_1990>t2.forest_2016
ORDER BY forest_change DESC
LIMIT 5

```

### 3. QUARTILES

```

WITH table1 AS
(SELECT DISTINCT f.year,f.country_name,
ROUND(((f.forest_area_sqkm/(l.total_area_sq_mi*2.59))*100)::numeric,2) as
forestation_percentage
FROM forest_area f
JOIN land_area l
ON f.country_name=l.country_name
WHERE f.year=2016),
table2 AS
( SELECT country_name, forestation_percentage,
CASE
WHEN forestation_percentage<=25 THEN '0-25'
WHEN forestation_percentage>25 AND forestation_percentage<=50 THEN '25-50'
WHEN forestation_percentage>50 AND forestation_percentage<=75 THEN '50-75'
ELSE '75-100' END AS quartile
FROM table1
WHERE year=2016 and forestation_percentage IS NOT NULL)

SELECT COUNT(quartile)
FROM table2
WHERE quartile='0-25'

```

#### Table 3.4

```

WITH sub AS

```

```

(WITH table1 AS
(SELECT DISTINCT f.year,f.country_name,
ROUND(((f.forest_area_sqkm/(l.total_area_sq_mi*2.59))*100)::numeric,2) as
forestation_percentage
FROM forest_area f
JOIN land_area l
ON f.country_name=l.country_name
WHERE f.year=2016),
table2 AS
( SELECT country_name, forestation_percentage,
CASE
WHEN forestation_percentage<=25 THEN '0-25'
WHEN forestation_percentage>25 AND forestation_percentage<=50 THEN '25-50'
WHEN forestation_percentage>50 AND forestation_percentage<=75 THEN '50-75'
ELSE '75-100' END AS quartile
FROM table1
WHERE year=2016 and forestation_percentage IS NOT NULL)

SELECT country_name, quartile,forestation_percentage
FROM table2
WHERE quartile='75-100'
)
SELECT s.country_name,r.region,s.forestation_percentage
FROM sub s
JOIN regions r
ON s.country_name=r.country_name

```