

Report for Forest Query 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 **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 - **32.1%**

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 **1279999.99 Sq Km**.

2. REGIONAL OUTLOOK

In 2016, the percentage of the total land area of the world designated as forest was **13.1%**. The region with the highest relative forestation was “**Latin America & Caribbean**”, with **46.1%**, and the region with the lowest relative forestation was **Middle East & North Africa**, with **2.06%** forestation.

In 1990, the percentage of the total land area of the world designated as forest was **32.4%**. The region with the highest relative forestation was “**Latin America & Caribbean**”, with **51.02%**, and the region with the lowest relative forestation was **Middle East & North Africa**, with **1.77%** forestation.

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

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America & Caribbean	51.02%	46.16%

Europe & Central Asia	37.28%	38.04%
North America	35.65%	36.03%

The only regions of the world that decreased in percent forest area from 1990 to 2016 were **Latin America & Caribbean** (dropped from **51.02 %** 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 **32.42%** to **31.37%**.

3. COUNTRY-LEVEL DETAIL

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 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** increased in forest area increased by 213.66% from 1990 to 2016.

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 American & Caribbean	541510 Sq Km
Indonesia	East Asia & Pacific	282194 Sq km

Myanmar	East Asia & Pacific	107234 Sq Km
Nigeria	Sub-Saharan Africa	106506 Sq Km
Tanzania	Sub-Saharan Africa	106506 Sq Km

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 region. **Latin America & Caribbean**.

From the above analysis, we see that **Brazil** 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.

QUARTILES

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

Quartile	Number of Countries
4th Quartile 75% & above	9

3th Quartile 50%-75%	38
2nd Quartile 25%-50%	72
1st Quartile 0%-25%	85

The largest number of countries in **2016** were found in the **1st** 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	98.26%
Micronesia, Fed.Ets	East Asia & Pacific	91.86%
Gabon	Sub-Saharan Africa	90.04%
Seychelles	Sub-Saharan Africa	88.41%
Palau	East Asia & Pacific	87.61%
American Samoa	East Asia & Pacific	87.50%
Guyana	Latin America & Caribbean	83.90%
Lao PDR	East Asia & Pacific	82.11%
Solomon Islands	East Asia & Pacific	77.86%

4. RECOMMENDATIONS

According to the World Bank report, we are relinquishing our forests repeatedly without realizing its destructive consequences in the near future. Globally, we lost 1.32 million square kilometers

of forest within 26 years (1990 - 2016). Such deforestation is more than the total area of Peru. Imagine we lose countries like Peru one by one every 26 years!

If it goes like that, we will be not only renouncing 51,000 square kilometers every year but also the lives, inhabitants, and the positive environmental impact related to it. Regionally, large regions like Latin America & the Caribbean, and Sub-Saharan Africa are forfeiting their forestation compared to all other small regions.

All large countries, like Brazil, Indonesia, Myanmar, Nigeria, Tanzania, and Pakistan are the main countries that are contributing to deforestation. The recent flood in Pakistan was one of the disastrous results where rain was pouring non-stop continuously for 3 weeks. If we see the quartile percentage, 157 out of 204 countries have designated less than 50% of their land as forest.

Therefore, it is highly crucial to emphasize the importance of afforestation and its positive influence on global warming, green zone, ecosystem, and pollution. Regions and big powerful countries like China, the USA, Russia, India, and France should come together to make a comprehensive policy to promote afforestation.

5. APPENDIX: SQL Queries Used

1. GLOBAL SITUATION

To create view I used following queries

```
CREATE VIEW forestation
AS
(
SELECT fa.country_code,
fa.country_name,
fa.year,
fa.forest_area_sqkm,
la.total_area_sq_mi,
r.region,
r.income_group
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 r.country_code = fa.country_code
);
```

Forgot to add percentage_forest

```

DROP VIEW IF EXISTS forestation;
CREATE VIEW forestation
AS
(
SELECT fa.country_code,
fa.country_name, ROUND((forest_area_sqkm/(total_area_sq_mi*2.59)*100)::NUMERIC,2) as
fp,
fa.year,
fa.forest_area_sqkm,
la.total_area_sq_mi,
r.region,
r.income_group,
fa.forest_area_sqkm /(la.total_area_sq_mi * 2.59)*100 AS percentage_forest
FROM forest_area AS fa
JOIN land_area AS la
ON fa.country_code =la.country_code
AND fa.year = la.year
INNER JOIN regions AS r
ON r.country_code = fa.country_code
);

```

Total area of the World in 1990

```

SELECT forest_area_sqkm AS fa_1990
FROM forestation
WHERE year= 1990 AND country_name = 'World'
ORDER BY country_name DESC;

```

Total area of the World in 2016

```

SELECT forest_area_sqkm AS fa_2016
FROM forestation
WHERE year= 2016 AND country_name = 'World'
ORDER BY country_name DESC;

```

I got the difference

```

SELECT
(SELECT forest_area_sqkm AS fa_2016
FROM forestation
WHERE year= 2016 AND country_name = 'World'
ORDER BY country_name DESC)

```

-

```
(SELECT forest_area_sqkm AS fa_1990
FROM forestation
WHERE year= 1990 AND country_name = 'World'
ORDER BY country_name DESC) AS difference;
```

Difference in percentage

```
WITH areas_2016
  AS (SELECT forest_area_sqkm AS a_2016,
    year
  FROM forestation
  WHERE country_name = 'World'
    AND year = 2016),
areas_1990
  AS (SELECT forest_area_sqkm AS a_1990,
    year
  FROM forestation
  WHERE country_name = 'World'
    AND year = 1990),
difference
  AS (SELECT a_2016,
    a_1990,
    a_2016 - a_1990 AS difference,
    ( a_2016 - a_1990 ) / a_1990 * 100 AS difference_percentage
  FROM areas_2016,
    areas_1990)
SELECT a_2016,
  a_1990,
  difference,
  ROUND (difference_percentage:: NUMERIC,2) AS Difference_percentage
FROM difference
```

Forest lost was more than the area of PERU

```
SELECT country_name,
ROUND ((total_area_sq_mi*2.59)::NUMERIC,2) AS ta_sqkm
FROM forestation
WHERE year= 2016 AND total_area_sq_mi <'1324449'
ORDER BY total_area_sq_mi DESC
LIMIT 13;
```

2. REGIONAL OUTLOOK

Selected percentage

```
SELECT SUM(forest_area_sqkm)/  
(SUM(total_area_sq_mi)*2.59) *100 AS forest_percentage, region  
FROM forestation  
WHERE year = 2016 AND country_name ='World'  
GROUP BY region  
ORDER BY 1 DESC;
```

```
SELECT SUM(forest_area_sqkm)/  
(SUM(total_area_sq_mi)*2.59)*100 AS forest_percentage, region  
FROM forestation  
WHERE year = 2016  
GROUP BY region  
ORDER BY 1 DESC;
```

```
SELECT SUM(forest_area_sqkm)/  
(SUM(total_area_sq_mi)*2.59)*100 AS forest_percentage, region  
FROM forestation  
WHERE year = 1990 AND country_name ='World'  
GROUP BY region  
ORDER BY 1 DESC;
```

```
SELECT SUM(forest_area_sqkm)/  
(SUM(total_area_sq_mi)*2.59)*100 AS forest_percentage, region  
FROM forestation  
WHERE year = 1990  
GROUP BY region  
ORDER BY 1 DESC;
```

3. COUNTRY-LEVEL DETAIL

To get the Sq- Km difference between 1990 & 2016

```
WITH f1  
AS (SELECT DISTINCT country_name,  
                    region,  
                    ROUND(forest_area_sqkm::NUMERIC, 0)fa_1990
```



```

FROM forestation
WHERE year ='1990'
    AND country_name NOT LIKE 'World'
    AND forest_area_sqkm IS NOT NULL
ORDER BY country_name),
f2
AS (SELECT DISTINCT country_name,
                    region,
                    ROUND(forest_area_sqkm::NUMERIC,0) fa_2016

FROM forestation
WHERE year ='2016'
    AND country_name NOT LIKE 'World'
    AND forest_area_sqkm IS NOT NULL
ORDER BY country_name)
SELECT f1.country_name, f1.region,
fa_1990,
fa_2016,
ROUND((f1.fa_1990 - f2.fa_2016):: NUMERIC,0) AS Difference,
ROUND(( (f1.fa_1990 - f2.fa_2016) / f1.fa_1990*100) :: NUMERIC, 2) AS Percentage

FROM f1
    INNER JOIN f2
    ON f1.country_name = f2.country_name
ORDER BY Difference DESC;

```

To get the Percentage difference between 1990 & 2016

```

WITH f1
AS (SELECT DISTINCT country_name,
                    region,
                    ROUND(forest_area_sqkm::NUMERIC, 2)fa_1990

FROM forestation
WHERE year ='1990'
    AND country_name NOT LIKE 'World'
    AND forest_area_sqkm IS NOT NULL
ORDER BY country_name),
f2
AS (SELECT DISTINCT country_name,
                    region,
                    ROUND(forest_area_sqkm::NUMERIC,2) fa_2016

FROM forestation
WHERE year ='2016'

```

```

AND country_name NOT LIKE 'World'
AND forest_area_sqkm IS NOT NULL
ORDER BY country_name)
SELECT f1.country_name, f1.region,
fa_1990,
fa_2016,
ROUND((f1.fa_1990-f2.fa_2016):: NUMERIC,2) AS Difference,
ROUND(( (f1.fa_1990-f2.fa_2016) / f1.fa_1990*100) :: NUMERIC, 2) AS Percentage
FROM f1
        INNER JOIN f2
        ON f1.country_name = f2.country_name
ORDER BY Percentage DESC;

```

To get the output difference for para 2 for Iceland.

```

WITH f1
AS (SELECT DISTINCT country_name,
                    region,
                    ROUND(forest_area_sqkm::NUMERIC, 0)fa_1990
FROM forestation
WHERE year ='1990'
AND country_name NOT LIKE 'World'
AND forest_area_sqkm IS NOT NULL
ORDER BY country_name),
f2
AS (SELECT DISTINCT country_name,
                    region,
                    ROUND(forest_area_sqkm::NUMERIC,0) fa_2016
FROM forestation
WHERE year ='2016'
AND country_name NOT LIKE 'World'
AND forest_area_sqkm IS NOT NULL
ORDER BY country_name)
SELECT f1.country_name, f1.region,
fa_1990,
fa_2016,
ROUND((f2.fa_2016 - f1.fa_1990):: NUMERIC,0) AS Difference,
ROUND(( (f2.fa_2016 - f1.fa_1990) / f1.fa_1990*100) :: NUMERIC, 2) AS Percentage

FROM f1
        INNER JOIN f2
        ON f1.country_name = f2.country_name
ORDER BY percentage DESC;

```

QUARTILES

```
WITH qr
AS (SELECT region,
    country_name, ROUND((forest_area_sqkm/(total_area_sq_mi*2.59)*100)::NUMERIC,2) AS
fp,
CASE
WHEN fp <= 25 THEN '1st Quartile'
WHEN fp >25 and fp <= 50 THEN '2nd Quartile'
WHEN fp >50 and fp <= 75 then '3rd Quartile'
ELSE '4th Quartile'
END AS Percentile
FROM forestation
Where fp IS NOT NULL
AND country_name NOT LIKE 'World'
AND year =2016
Order by fp )
SELECT Percentile,
count(*) AS COUNT
FROM qr
GROUP BY Percentile
ORDER BY Percentile desc ;
```

TOP NINE COUNTRIES

```
SELECT country_name,
region,ROUND((forest_area_sqkm/(total_area_sq_mi*2.59)*100)::NUMERIC,2) AS fp
FROM forestation
WHERE percentage_forest > 75
AND country_name NOT LIKE 'World'
AND year =2016
Order by fp DESC;
```

The END.

