

# 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 41,282,694.9 sqkm in 1990. As of 2016, the most recent year for which data was available, that number had fallen to 39,958,245.90 sqkm, a loss of 1,324,449 sqkm, or 3.31 %.

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 494,208.49 sqmi, or 1,279,994.11 sqkm).

## 2. REGIONAL OUTLOOK

In 2016, the percent of the total land area of the world designated as forest was 31.36%. 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 32.42%. 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 & North Africa, 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
Middle East & North America	1.78	2.07
World	32.42	31.36

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 32.42 % to 31.36 %.

### 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 sqkm. 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 sqkm, 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 68.12 % 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	541,510.00
Indonesia	East Asia & Pacific	282,193.98
Myanmar	East Asia & Pacific	107,234.00

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
Togo	Sub-Sahara Africa	307.25%
Nigeria	Sub-Sahara Africa	161.78%
Uganda	Sub-Sahara Africa	144.67%

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-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
1 <sup>st</sup>	85
2 <sup>nd</sup>	74
3 <sup>rd</sup>	38
4 <sup>th</sup>	9

The largest number of countries in 2016 were found in the 1<sup>st</sup> 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. Sts.	East Asia & Pacific	91.86%
Gabon	Sub-Saharan Africa	90.04%

## 4. RECOMMENDATIONS

*After reviewing this dataset, I've learned a lot about forest changes since 1990, where some countries have taken a good effort in re-planting and growing their forests, others have been doing vastly the opposite, leading to a decrease of 3.31% in total forest area. This is not something I was aware of without this massive dataset, and am hopeful the nations of the world can gather together to make sure this doesn't become an epidemic. I know with minimal control the best we can do is to try and get the information out there and try to start fund raising/campaigns to get monies to these countries that are losing majority of their forests each year.*

*Based on the data gathered in this research, it would be best to try and focus efforts on Nigera due to the high volume of percentage decrease since 1990, as well as one of the most net loss of land overall, being in the top 5 percentile and Absolute loss sections. Along with this, focusing on other areas of high impact loss like the top 5 percentage and top 5 absolute loss areas are all at high risk, as we need to make sure the decrease is at minimum slowed down in these areas.*

*The largest area of impact was for sure the Amazon rain forest however, even though this is the biggest forest in the world, it still needs to be upkeep, as the amount of forest lost since 1990 is astounding.*

*However, even though there are a lot of things that seem to have changed since the 1990's, we as a world need to take action. We'd initially need to take action in the mentioned top 5 percentile and top 5 absolute loss areas, and we need to make sure that all foresting companies around the world are given a government based stipend to replant trees as they cut them down. I feel like this would be a worth while investment to try and keep the forests from completely dying out.*

*If governments aren't willing to give a stipend to these countries, I would motion that the governments try to pass laws in these states that either ban additional forestation or put a law in place to when there is a tree cut down, there is to be a tree planted, to try their best efforts at replanting the forests they are cutting down.*

*Something at a grand scale of this around the world needs to be taken action upon, and if the governments aren't willing to assist in these efforts, I would suggest that we go directly to the lumber/forestry companies to see what they need in order to re-plant trees, as some companies may already have something of this sort in place. If they don't already have this process in place, I'd recommend we'd need to start a non-profit company and get this information out to the public so that more people are informed and will try to help the cause and save the forests of the world.*

*Those would be my 3 best recommendations to how we as a world can try and combat these issues with forests decreasing year over year. I do hope this research project provides insight into this grand issue, and if there is anything further I can do to assist in this research, I'd love to help.*

## 5. APPENDIX: SQL Queries Used

- **Initial query – to get forest areas:**  
SELECT country\_name, forest\_area\_sqkm  
FROM forest\_area  
WHERE year = '1990' (use 2016 for next query)  
AND country\_name = 'World'  
ORDER BY forest\_area\_sqkm DESC;
- **Did math on calc for KM > MI to get this info:**  
SELECT country\_name, total\_area\_sq\_mi  
FROM land\_area  
WHERE year = '2016'  
AND total\_area\_sq\_mi < 511372.6177794  
ORDER BY total\_area\_sq\_mi DESC;
- **World regional outlook:**  
SELECT f.country\_name, forest\_area\_sqkm \* 0.38610 / total\_area\_sq\_mi as  
percentage\_forested  
FROM forest\_area as f  
INNER JOIN land\_area as l  
USING(country\_code)  
WHERE f.year = '2016' (used 1990 for next query)  
AND f.country\_name = 'World'  
ORDER BY forest\_area\_sqkm DESC;

- **All regional outlook numbers besides world:**

```
SELECT DISTINCT(region), SUM(forest_area_sqkm) * 0.38610 / SUM(total_area_sq_mi) as
percentage_forested
FROM forest_area as f
INNER JOIN land_area as l
USING(country_code)
LEFT JOIN regions as r
USING(country_code)
WHERE f.year = '1990' AND l.year = '1990' (used 2016 as well)
GROUP BY r.region
ORDER BY percentage_forested ASC; (used DESC as well)
```

- **Success stories (largest increase in forest area)**

```
SELECT
t1.country_name,
t1.forest_2016,
t2.forest_1990,
(t1.forest_2016 - t2.forest_1990) as diff_forest
FROM (SELECT country_name,
forest_area_sqkm as
forest_2016
FROM forest_area
WHERE year = '2016') t1
JOIN (SELECT country_name,
forest_area_sqkm as
forest_1990
FROM forest_area
WHERE year = '1990') t2
ON t1.country_name = t2.country_name
WHERE t1.forest_2016 - t2.forest_1990 > 0
ORDER BY diff_forest DESC;
```

- **Success Stories (percent diff)**

```
SELECT
t1.country_name,
t1.forest_2016,
t2.forest_1990,
(t1.forest_2016 - t2.forest_1990)/ t1.forest_2016 as perc_diff_forest
FROM (SELECT country_name,
      forest_area_sqkm as
      forest_2016
      FROM forest_area
      WHERE year = '2016') t1
JOIN (SELECT country_name,
      forest_area_sqkm as
      forest_1990
      FROM forest_area
      WHERE year = '1990') t2
ON t1.country_name = t2.country_name
WHERE t1.forest_2016 - t2.forest_1990 > 0
ORDER BY perc_diff_forest DESC;
```

- **Total decrease:**

```
SELECT
t1.country_name,
region,
t1.forest_2016,
t2.forest_1990,
(t1.forest_2016 - t2.forest_1990) as diff_forest
FROM (SELECT country_name,
      forest_area_sqkm as
      forest_2016
      FROM forest_area
      WHERE year = '2016') t1
JOIN (SELECT country_name,
      forest_area_sqkm as
      forest_1990
      FROM forest_area
      WHERE year = '1990') t2
ON t1.country_name = t2.country_name
JOIN regions as r
ON t1.country_name = r.country_name
WHERE t1.forest_2016 - t2.forest_1990 < 0
ORDER BY diff_forest ASC;
```

- **Perc Decrease:**

```
SELECT
t1.country_name,
region,
t1.forest_2016,
t2.forest_1990,
(t1.forest_2016 - t2.forest_1990)/t1.forest_2016 as perc_diff_forest
FROM (SELECT country_name,
      forest_area_sqkm as
      forest_2016
      FROM forest_area
      WHERE year = '2016') t1
JOIN (SELECT country_name,
      forest_area_sqkm as
      forest_1990
      FROM forest_area
      WHERE year = '1990') t2
ON t1.country_name = t2.country_name
JOIN regions as r
ON t1.country_name = r.country_name
WHERE t1.forest_2016 - t2.forest_1990 < 0
ORDER BY perc_diff_forest ASC;
```

- **Quartile Percentile numbers:**

```
SELECT
DISTINCT(f.country_name),
MAX(forest_area_sqkm * 0.38610 / total_area_sq_mi) as perc_forest
FROM forest_area as f
JOIN land_area as l
USING(country_code)
WHERE f.year = '2016'
      AND (forest_area_sqkm * 0.38610 / total_area_sq_mi) IS NOT NULL
      AND (forest_area_sqkm * 0.38610 / total_area_sq_mi) > .75 (0, .25, .5, .75)
      AND (forest_area_sqkm * 0.38610 / total_area_sq_mi) <= 1 (.25, .5, .75, 1)
GROUP BY f.country_name
ORDER BY perc_forest DESC;
```



- **To see most percentage forested countries in the world:**

```
SELECT
DISTINCT(f.country_name),
region,
(forest_area_sqkm * 0.38610 / total_area_sq_mi) as perc_forest
FROM forest_area as f
JOIN land_area as l
USING(country_code)
JOIN regions as r
USING(country_code)
WHERE f.year = '2016'
      AND (forest_area_sqkm * 0.38610 / total_area_sq_mi) IS NOT NULL
ORDER BY perc_forest DESC;
```