# 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_ in 1990. As of 2016, the most recent year for which data was available, that number had fallen to __39958245.9__, a loss of _____1,324,449_, or _____3.2_____%.

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___).

## 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 & Carribean with ___46.16__%, and the region with the lowest relative forestation was Middle East & N.Africa, with ___2.1__% 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 & Carribean_, with _____51___%, and the region with the lowest relative forestation was __Middle East & N.Africa__, with ___1.7___% forestation.

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

| Region | 1990 Forest Percentage | 2016 Forest Percentage |
|---|---|---|
| North America | 35.65 | 36.04 |
| South Asia | 16.5 | 17.5 |
| Sub-Saharan Africa | 30.67 | 28.79 |
| World | 32.42 | 31.38 |
| Latin America & Caribbean | 51.03 | 46.16 |
| East Asia & Pacific | 25.78 | 26.36 |
| Europe & Central Asia | 37.28 | 38.04 |
| Middle East & North Africa | 1.78 | 2.08 |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were _Sub-Saharan Africa___ (dropped from ___30.67 ___% to _____28.79 __%) and __Latin America & Caribbean_ (__51.03__% to ____46.16___%). 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 _527229.06 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 KM__, much lower than the figure for _China_.

___China_ and ____the U.S,A__ 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. __Icelans__ 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 & Caribbean | 541,510 |

| | | |
|---|---|---|
| Indonesia | East Asia & Pacific | 282,194 |
| Myanamar | East Asia & Pacific | 107,234 |
| Nigeria | Sub-Saharan Africa | 106506 |
| 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% | Number of countries with percent forestation under 25% 85 |
| 25% -50% | Number of countries with percent forestation 25% - 50% 38 |
| 50% - 75% | Number of countries with percent forestation between 50% to 75% 72 |
| 75% - 100% | Number of countries with percent forestation over 75% 9 |

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

There were __250___ 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-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 |

# 5. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*

  From a global point of view there has been a small loss of forests (about 3%). If we look more closely at different regions and countries we can analyze that some have seen forest increase and some a very large decrease. Also I wonder if data from countries like China who is said to have the largest increase in forest area is precise as it is a country closed to the outside world and organizations.

- *Which countries should we focus on over others?* Effort should be made to improve the situation of countries who over the years lost forest area. We should also focus on countries that saw an increase in forest areas in order to learn methods of preserving and increasing forests.

# Appendix

```
/*Create a View called "forestation" by joining all three tables -
forest_area, land_area and regions in the workspace.
The forest_area and land_area tables join on both country_code AND
year.
The regions table joins these based on only country_code.
In the 'forestation' View, include the following:

All of the columns of the origin tables
A new column that provides the percent of the land area that is
designated as forest.*/
DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation
AS
  (SELECT f.country_code,
          f.country_name,
          f.year,
          f.forest_area_sqkm
   FROM   forest_area AS f
          JOIN land_area AS l
            ON f.country_code = l.country_code
```

```
               AND f.year = l.year
           JOIN regions AS r
             ON r.country_code = f.country_code);

-------------------------------------

---1. GLOBAL SITUATION---

SELECT (SELECT Sum(forest_area_sqkm)
        FROM   forestation
        WHERE  country_name = 'World'
        AND year = '1990') -
       (SELECT Sum(forest_area_sqkm)
        FROM   forestation
        WHERE  country_name = 'World'
        AND year = '2016')
AS amount_change

--- percentage of change 1990-2016
SELECT ( (SELECT Sum(forest_area_sqkm)
          FROM   forestation
          WHERE  country_name = 'World'
          AND year = '1990') -
      (SELECT Sum(forest_area_sqkm)
          FROM   forestation
          WHERE  country_name = 'World'
          AND year = '2016') ) /
         (SELECT Sum(forest_area_sqkm)
          FROM forestation
          WHERE
          country_name = 'World'
          AND year = '1990')
AS percent_change

-------------------------------------

---2016 country in sq km similar to lost forest area
SELECT year,
       country_name,
       total_area_sq_mi * 2.59 AS total_area_sq_km
FROM   land_area
WHERE  year = '2016'
       AND ( total_area_sq_mi * 2.59 ) >= 1200000
       AND ( total_area_sq_mi * 2.59 ) <= 1400000
ORDER  BY total_area_sq_mi * 2.59 ASC
```

```
-----------------------------------
/*Create a table that shows the Regions and their percent forest area
(sum of forest area divided by sum of land area) in 1990 and 2016

SELECT f_p_1990.region,
       f_p_1990.year AS y_1990,
       f_p_2016.year AS y_2016,
       ( Sum(f_p_1990.forest_area_sqkm) /
Sum(f_p_1990.total_area_sq_mi * 2.59)
         * 100 )
                     AS percent_1990,
       ( Sum(f_p_2016.forest_area_sqkm) /
Sum(f_p_2016.total_area_sq_mi * 2.59)
         * 100 )
                     AS percent_2016
FROM   forestation AS f_p_1990
       JOIN forestation AS f_p_2016
         ON f_p_1990.region = f_p_2016.region
WHERE  f_p_1990.year = '1990'
       AND f_p_2016.year = '2016'
GROUP  BY f_p_1990.region,
          f_p_1990.year,
          f_p_2016.region,
          f_p_2016.year
```

## ---2. REGIONAL OUTLOOK---

What was the percent forest of the entire world in 2016? */

```
SELECT *

FROM   forestation

WHERE  year = 2016

       AND country_name = 'World'
```

Which region had the HIGHEST percent forest in 2016, and which had the LOWEST, to 2 decimal places?

```
SELECT region,

       year,
```

```
       Round((( SUM(forest_area_sqkm) / ( SUM(total_area_sq_mi) *
2.59 ) * 100 )) ::NUMERIC, 2) AS percent_forest_km_region

FROM   forestation

WHERE  year = 2016

GROUP  BY region,year

ORDER  BY percent_forest_km_region DESC
```

What was the percent forest of the entire world in 1990?

```
SELECT year, country_name,  area_designated_forest_percent

FROM   forestation

WHERE  year = 1990

       AND country_name = 'World'
```

Which region had the HIGHEST percent forest in 1990, and which had the LOWEST, to 2 decimal places?

```
DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation
AS
  (SELECT f.country_code,
          f.country_name,
          f.year,
          f.forest_area_sqkm,
          f.forest_area_sqkm / ( l.total_area_sq_mi / 2.59 ) AS
          area_designated_forest_percent,
          r.country_name                                     AS
country
   FROM   forest_area AS f
          JOIN land_area AS l
            ON f.country_code = l.country_code
               AND f.year = l.year
          JOIN regions AS r
```

```
            ON r.country_code = f.country_code);

SELECT region,area_designated_forest_percent,
       year,
       Round((( SUM(forest_area_sqkm) / ( SUM(total_area_sq_mi) *
2.59 ) * 100 )) ::NUMERIC, 2) AS percent_forest_km_region
FROM   forestation
WHERE  year = 1990
GROUP  BY region,year
ORDER  BY percent_forest_km_region DESC
```

## ---3.COUNTRY-LEVEL DETAIL---

a. Which 5 countries saw the largest amount decrease in forest area from 1990 to 2016? What was the difference in forest area for each?

```
SELECT f_p_1990.country_name,
       f_p_1990.forest_area_sqkm
AS
       forest_1990,
       f_p_2016.country_name,
       f_p_2016.forest_area_sqkm
AS
       forest_2016,
```

```
       ( f_p_1990.forest_area_sqkm ) - ( f_p_2016.forest_area_sqkm )
AS decrease
FROM   forestation AS f_p_1990
       JOIN forestation AS f_p_2016
         ON f_p_1990.country_name = f_p_2016.country_name
WHERE  f_p_1990.year = '1990'
       AND f_p_2016.year = '2016'
       AND f_p_1990.country_name <> 'World'
       AND ( f_p_1990.forest_area_sqkm - f_p_2016.forest_area_sqkm )
IS NOT NULL
GROUP  BY f_p_1990.forest_area_sqkm,
          f_p_2016.forest_area_sqkm,
          f_p_1990.country_name,
          f_p_2016.country_name
ORDER  BY decrease DESC
LIMIT  5
```

b. Which 5 countries saw the largest percent decrease in forest area from 1990 to 2016? What was the percent change to 2 decimal places for each?

```
WITH forest_2016 AS
(
       SELECT forest_area_sqkm AS f_2016,
              country_name,
              region
       FROM   forestation
       WHERE  year = 2016
       AND    forest_area_sqkm IS NOT NULL
       AND    country_name <> 'World'), forest_1990 AS
(
       SELECT forest_area_sqkm AS f_1990,
              country_name,
              region
```

```
        FROM   forestation
        WHERE  year = 1990
        AND    forest_area_sqkm IS NOT NULL
        AND    country_name <> 'World')
SELECT   forest_1990.country_name,
         (f_2016 - f_1990) AS forest_change,
         forest_1990.region,
         Round((((f_2016 - f_1990)/f_1990)*100)::numeric,2) AS
f_change
FROM     forest_1990
JOIN     forest_2016
ON       forest_1990.country_name = forest_2016.country_name
ORDER BY f_change ASC
LIMIT 5
```

```
DROP VIEWIF EXISTS forestation;CREATE VIEW forestation AS
            (
                   SELECT f.country_code,
                          f.country_name,
                          f.year,
                          f.forest_area_sqkm,
                          (f.forest_area_sqkm / ( l.total_area_sq_mi
/ 2.59 ))* 100 AS forest_percent,
                          country,
                          forest_percent,
                          r.region,
                          r.country_name AS country
                   FROM   forest_area    AS f
                   JOIN   land_area      AS l
                   ON     f.country_code = l.country_code
                   AND    f.year = l.year
                   JOIN   regions AS r
                   ON     r.country_code = f.country_code
```

```
            );
SELECT
       case
              when forest_percent <= 25 THEN 'first'
              WHEN forest_percent >25
              AND    forest_percent <=50 THEN 'second'
              WHEN forest_percent > 50
              AND    forest_percent <=75 THEN 'third'
              ELSE 'fourth'
       END AS quartile
FROM   forestation
```

## C. QUARTILES

```
WITH quart
     AS (SELECT country,
                forest_percent,
                CASE
                  WHEN forest_percent <= 25 THEN 'first'
                  WHEN forest_percent > 25
                       AND forest_percent <= 50 THEN 'second'
                  WHEN forest_percent > 50
                       AND forest_percent <= 75 THEN 'third'
                  ELSE 'fourth'
                END AS quartile
         FROM   forestation
         WHERE  year = '2016'
                AND forest_percent IS NOT NULL
                AND country <> 'World')
SELECT quartile,
       Count(quartile)
FROM   quart
GROUP  BY quartile
```

**Top quartile countries**

```
SELECT country,
       forest_percent,
       region
FROM   forestation
WHERE  year = '2016'
       AND forest_percent IS NOT NULL
       AND country <> 'World'
       AND forest_percent > 75
```

```
ORDER  BY forest_percent DESC
```