# 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 km2 in 1990. As of 2016, the most recent year for which data was available, that number had fallen to 39958245.9 km2, a loss of 1324449, or 3.2082%.

The forest area lost over this time period is slightly more than the entire land area of Mongolia listed for the year 2016 (which is 1553560 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 & 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 |
|---|---|---|
| East Asia & Pacific | 25.78 | 26.36 |
| World | 32.42 | 31.38 |
| Middle East & North Africa, | 1.78 | 2.07 |
| Europe & Central Asia | 37.28 | 38.04 |
| Latin America & Caribbean | 51.03 | 46.16 |
| North America | 35.65 | 36.04 |
| Sub-Saharan Africa | 30.67 | 28.79 |
| South Asia | 16.51 | 17.51 |

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 31.38%.

# 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 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 79200 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 & Caribbean | -541510.00 |
| Indonesia | East Asia & Pacific | -282193.98 |
| Myanmar | East Asia & Pacific | -107234.00 |
| Nigeria | Sub-Saharan Africa | -106506.00 |
| Tanzania | Sub-Saharan Africa | -102320.00 |

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-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 |
|---|---|
| First (0-25%) | 85 |
| Second (25-50%) | 73 |
| Third (50-75%) | 38 |
| Fourth (75-100%) | 9 |

The largest number of countries in 2016 were found in the first 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 |
| Seychelles | Sub-Saharan Africa | 88.41 |
| Palau | East Asia & Pacific | 87.61 |
| American Samoa | East Asia & Pacific | 87.5 |
| Guyana | Latin America & Caribbean | 83.9 |
| Lao PDR | East Asia & Pacific | 82.11 |

| | | |
|---|---|---|
| Solomon Islands | East Asia & Pacific | 77.86 |

# 4. RECOMMENDATIONS

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

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

Based on my analysis I noticed that the global forest area has decreased in general, the focus should be on the countries that decreased the most by percentage, which is Togo, Nigeria Uganda, Mauritania, and Honduras. I noticed that 4 of these 5 countries are in Sub-Saharan Africa, so the focus should be in this region to find out the main reason for the decrease. A great example of a country that has increased significantly is China.

# 5. APPENDIX: SQL Queries Used

**Query 1: created a View and joined all the 3 tables**

```
CREATE VIEW forestation AS
SELECT
    fo.*,
    la.total_area_sq_mi * 2.59 as total_area_sqkm,
    r.region,
    r.income_group,
    (fo.forest_area_sqkm / (la.total_area_sq_mi * 2.59)) * 100 AS forest_percent
FROM forest_area AS fo
JOIN land_area AS la
    ON la.country_code = fo.country_code
   AND fo.year = la.year
JOIN regions AS r
    ON fo.country_code = r.country_code;
```

**Query 2: the total forest area of the world in 1990**

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

**Query 3: the total forest area of the world in 2016**

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

**Query 4: to find out the change and the percentage of change**

```
WITH table1 AS (
   SELECT
      year,
      forest_area_sqkm
   FROM forestation
   WHERE year = '1990'
     AND country_name = 'World'
),
table2 AS (
   SELECT
      year,
      forest_area_sqkm
   FROM forestation
   WHERE year = '2016'
     AND country_name = 'World'
)
SELECT
   table1.forest_area_sqkm - table2.forest_area_sqkm AS chaange,
   TRUNC(
      CAST(
         ABS(table2.forest_area_sqkm - table1.forest_area_sqkm) / table1.forest_area_sqkm *
100
         AS numeric
      ),
      4
   ) AS per_change
FROM table1, table2;
```

**Query 5 : to find out the which country's total area in 2016 is closest to the amount of forest area lost between 1990 and 2016**

```
WITH table1 AS (
   SELECT
      year,
      forest_area_sqkm
   FROM forestation
```

```
    WHERE year = '1990'
      AND country_name = 'World'
),
table2 AS (
    SELECT
        year,
        forest_area_sqkm
    FROM forestation
    WHERE year = '2016'
      AND country_name = 'World'
),
table3 AS (
    SELECT
        table1.forest_area_sqkm - table2.forest_area_sqkm AS lost
    FROM table1, table2
)
SELECT
    country_name,
    year,
    ROUND(total_area_sqkm)
FROM
    forestation,
    table3
WHERE
    total_area_sqkm >= table3.lost
    AND year = 2016
ORDER BY
    total_area_sqkm ASC
LIMIT 1;
```

**Query 6: to find out the percent forest of the entire world in 2016, the region with the highest percent forest in 2016 and the region with the LOWEST**

```
WITH table1 AS (
    SELECT
        region,
        SUM(forest_area_sqkm) AS forest_area,
        SUM(total_area_sqkm) AS land_area
    FROM
        forestation
    GROUP BY
        region,
        year
    HAVING
```

```
        year = 2016
)
SELECT
    region,
    ROUND((table1.forest_area / table1.land_area * 100)::numeric, 2) AS per
FROM
    table1
ORDER BY
    per;
```

**Query 6: to find out the percent forest of the entire world in 2016, the region with the highest percent forest in 1990 and the region with the LOWEST**

```
WITH table1 AS (
    SELECT
        region,
        SUM(forest_area_sqkm) AS forest_area,
        SUM(total_area_sqkm) AS land_area
    FROM
        forestation
    GROUP BY
        region,
        year
    HAVING
        year = 1990
)
SELECT
    region,
    ROUND((table1.forest_area / table1.land_area * 100)::numeric, 2) AS per
FROM
    table1
ORDER BY
    per;
```

**Query 7: to find which regions of the world DECREASED in forest area from 1990 to 2016**

```
WITH table1 AS (
    SELECT
        region,
        SUM(forest_area_sqkm) AS forest_area,
        SUM(total_area_sqkm) AS land_area
    FROM
        forestation
```

```
    GROUP BY
        region,
        year
    HAVING
        year = 2016
),
table2 AS (
    SELECT
        region,
        SUM(forest_area_sqkm) AS forest_area,
        SUM(total_area_sqkm) AS land_area
    FROM
        forestation
    GROUP BY
        region,
        year
    HAVING
        year = 1990
)
SELECT
    table1.region,
    ROUND((table1.forest_area / table1.land_area * 100)::numeric, 2) AS per2016,
    ROUND((table2.forest_area / table2.land_area * 100)::numeric, 2) AS per1990
FROM
    table1
JOIN
    table2 ON table1.region = table2.region;
```

**Query 8: to find out top countries decreased in forest area and top countries decreased in percentage *I adjusted the query with order by and limit for each queston**

```
WITH table1 AS (
    SELECT
        country_code,
        country_name,
        region,
        year,
        forest_area_sqkm
    FROM forestation
    WHERE year = 2016
),
table2 AS (
    SELECT
```

```
        country_code,
        country_name,
        region,
        year,
        forest_area_sqkm
    FROM forestation
    WHERE year = 1990
),
table3 AS (
    SELECT
        table1.country_name,
        table1.region,
        table1.forest_area_sqkm AS forest_area_2016,
        table2.forest_area_sqkm AS forest_area_1990
    FROM table1
    JOIN table2
        ON table1.country_code = table2.country_code
)
SELECT
    country_name,
    region,
    ROUND((forest_area_2016 - forest_area_1990)::numeric, 2) AS forest_area_change,
    ROUND(((forest_area_2016 - forest_area_1990) / forest_area_1990 * 100)::numeric, 2) AS
per_Change
FROM table3
WHERE forest_area_2016 IS NOT NULL
  AND forest_area_1990 IS NOT NULL
ORDER BY 4 ASC;
```

**Query 9: to find out Count of Countries Grouped by Forestation Percent Quartiles, 2016:**

```
WITH table1 AS (
    SELECT
        country_name,
        CASE
            WHEN forest_percent < 25 THEN '0-25%'
            WHEN forest_percent >= 25 AND forest_percent < 50 THEN '25-50%'
            WHEN forest_percent >= 50 AND forest_percent < 75 THEN '50-75%'
            ELSE '75-100%'
        END AS quartile
    FROM forestation
    WHERE year = 2016
      AND forest_percent IS NOT NULL
```

```
)
SELECT
   quartile,
   COUNT(*) AS number_of_Countries
FROM table1
GROUP BY 1;
```

**Query 10: to find out top quartile countries in 2016:**

```
WITH table1 AS (
   SELECT
      country_name,
      region,
  Round(forest_percent::numeric,2),
      CASE
         WHEN forest_percent < 25 THEN '0-25%'
         WHEN forest_percent >= 25 AND forest_percent < 50 THEN '25-50%'
         WHEN forest_percent >= 50 AND forest_percent < 75 THEN '50-75%'
         ELSE '75-100%'
      END AS quartile
   FROM forestation
   WHERE year = 2016
     AND forest_percent IS NOT NULL
)
SELECT *

FROM table1
Where quartile = '75-100%'
order by 3 DESC
```