Report for ForestQuery into Global Deforestation, 1990 to 2016

BY

OLUGBENGAFELIX AJIGA

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 sqkm_____ in 1990. As of 2016, the most recent year for which data was available, that number had fallen to _____39958245.9 sqkm____, a loss of ____1324449.0 sqkm____, or _3.2082____%.

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 sqkm___).

2. **REGIONAL OUTLOOK**

In 2016, the percent of the total land area of the world designated as forest was _____31.3756%____. 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
Sub-Saharan Africa	30.67	28.79
World	32.42	31.38

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin America & Caribbean, Sub-Saharan Africa and World (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 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 _____ 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. ____French Polynesia __ increased in forest area by _27.32_% 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	America & Caribbean	541510
Indonesia	East Asia & Pacific	282194
Uganda	East Asia & Pacific	107234
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	75.44
Nigeria	Sub-Saharan Africa	62.80
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 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
1	85

2	73
3	38
4	9

The largest number of countries in 2016 were found in the _____1_____ 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
American Samoa	East Asia & Pacific	0.8750
Micronesia, Fed.Sts	East Asia & Pacific	0.9186
Gabon	Sub-Saharan Africa	0.9004
Guyana	Latin America & Caribbean	0.8390
Lao PDR	East Asia & Pacific	0.8210

5. 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?*

(1) From 1990 to 2016, We can see that the total deforestation amount had reached 1324449.0 sq km. This should be a global concern for everyone and what this mean is that the Ozone layer depletion is on the rise leading to more global warning such as we currently experiencing.
(2) Region like Sub-Saharan Africa countries should of great concerns and all hands must be on deck to see that the region should be made aware of the danger of deforestation.
(3) Because of the low income in the region such as Sub-Saharan Africa the richer countries should be able to help.

APPENDIX 5

SQL QUERIES USED FOR FORESTATION PROJECT

GLOBAL SITUATION

a. What was the total forest area (in sq km) of the world in 1990? Please keep in mind that you can use the country record denoted as “World" in the region table.

b. What was the total forest area (in sq km) of the world in 2016? Please keep in mind that you can use the country record in the table is denoted as “World.”

c. What was the change (in sq km) in the forest area of the world from 1990 to 2016?

d. What was the percent change in forest area of the world between 1990 and 2016?

e. If you compare the amount of forest area lost between 1990 and 2016, to which country's total area in 2016 is it closest to?

```
DROP view IF EXISTS forestation;

CREATE view forestation
AS
  (SELECT f.country_code,
          f.country_name,
          f.year,
          f.forest_area_sqkm,
          l.total_area_sq_mi * 2.59 AS total_area_sqkm,
          r.region,
          r.income_group,
          forest_area_sqkm / ( l.total_area_sq_mi * 2.59 ) AS forest_
perc
   FROM   forest_area f
          JOIN land_area l
            ON f.country_code = l.country_code
               AND f.year = l.year
          JOIN regions r
            ON r.country_code = l.country_code)
```

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

```
SELECT year,
       country_name,
       forest_area_sqkm
FROM   forestation
```

```
WHERE  country_name = 'World'
       AND year = 2016;
```

```
SELECT a.forest_area_sqkm in_1990,
       b.forest_area_sqkm in_2016
FROM   forestation a,
       forestation b
WHERE  a.year = 1990
       AND b.year = 2016
       AND a.country_name = 'World'
       AND b.country_name = 'World'
```

```
WITH forest_area_in_1990_to_2016
     AS (SELECT a.forest_area_sqkm in_1990,
                b.forest_area_sqkm in_2016
         FROM   forestation a,
                forestation b
         WHERE  a.year = 1990
                AND b.year = 2016
                AND a.country_name = 'World'
                AND b.country_name = 'World')
SELECT in_2016 - in_1990 AS forest_area_change_btw_1990_to_2016
FROM   forest_area_in_1990_to_2016;
```

```
WITH forest_loss_perc_1990_2016
     AS (SELECT a.forest_area_sqkm in_1990,
                b.forest_area_sqkm in_2016
         FROM   forestation a,
                forestation b
         WHERE  a.year = 1990
                AND b.year = 2016
                AND a.country_name = 'World'
                AND b.country_name = 'World')
SELECT ( in_2016 - in_1990 ) * 100 / in_1990 forest_loss_perc_btw_199
0_2016
FROM   forest_loss_perc_1990_2016;
```

```
SELECT country_name,
       total_area_sqkm
FROM   forestation
WHERE  year = 2016
AND    total_area_sqkm <= ( with forest_loss_perc_1990_2016 AS
       (
              SELECT a.forest_area_sqkm in_1990,
                     b.forest_area_sqkm in_2016
              FROM   forestation a,
                     forestation b
              WHERE  a.year = 1990
              AND    b.year = 2016
              AND    a.country_name = 'World'
              AND    b.country_name = 'World')
SELECT   abs(in_2016 - in_1990) country_close_to_forest_area_lost
FROM     forest_loss_perc_1990_2016 )
```

```
ORDER BY 2 DESC
LIMIT    1 ;
```

REGIONAL OUTLOOK

a. What was the percent forest of the entire world in 2016? Which region had the HIGHEST percent forest in 2016, and which had the LOWEST, to 2 decimal places?
b. What was the percent forest of the entire world in 1990? Which region had the HIGHEST percent forest in 1990, and which had the LOWEST, to 2 decimal places?
c. Based on the table you created, which regions of the world DECREASED in forest area from 1990 to 2016?

```
SELECT *
FROM   forestation
WHERE  country_name = 'World'
       AND year = 2016;
```

```
SELECT   region,
         Sum(forest_area_sqkm)
              AS forest_area_sum,
         Sum(total_area_sqkm)
              AS total_area_sum,
         round(cast(Sum(forest_area_sqkm)/Sum(total_area_sqkm)*100 AS
 numeric), 2) AS highest_percent_forest_2016
FROM     forestation
WHERE    year = 2016
GROUP BY 1
ORDER BY 4 DESC
LIMIT    1;
```

```
SELECT   region,
         Sum(forest_area_sqkm)
              AS forest_area_sum,
         Sum(total_area_sqkm)
              AS total_area_sum,
         round(cast(Sum(forest_area_sqkm)/Sum(total_area_sqkm)*100 AS
 numeric), 2) AS highest_percent_forest_2016
FROM     forestation
WHERE    year = 2016
GROUP BY 1
ORDER BY 4 ASC
LIMIT    1
```

```
SELECT *
FROM   forestation
WHERE  country_name = 'World'
       AND year = 1990;
```

```
SELECT   region,
         Sum(forest_area_sqkm)
              forest_area_sum,
         Sum(total_area_sqkm)
```

```
             total_area_sum,
         round(cast(Sum(forest_area_sqkm)/Sum(total_area_sqkm)*100 AS
 numeric), 2) highest_percent_forest_1990
FROM     forestation
WHERE    year = 1990
GROUP BY 1
ORDER BY 4 DESC
LIMIT    1
```

```
SELECT   region,
         Sum(forest_area_sqkm)
              forest_area_sum,
         Sum(total_area_sqkm)
              total_area_sum,
         round(cast(Sum(forest_area_sqkm)/Sum(total_area_sqkm)*100 AS
 numeric), 2) highest_percent_forest_1990
FROM     forestation
WHERE    year = 1990
GROUP BY 1
ORDER BY 4
LIMIT    1
```

```
SELECT a.region,
       a.forest_area_decrease_btw_1990_2016
       AS forest_perc_1990,
       b.forest_area_decrease_btw_1990_2016
       AS forest_perc_2016,
       b.forest_area_decrease_btw_1990_2016 -
       a.forest_area_decrease_btw_1990_2016 AS
       forest_perc_decrease
FROM   (SELECT region,
               Sum(forest_area_sqkm) forest_area_sum,
               Sum(total_area_sqkm)  total_area_sum,
               Round(Cast(Sum(forest_area_sqkm) / Sum(total_area_sqkm
) * 100 AS
                          NUMERIC
                     ), 2)
                                     forest_area_decrease_btw_1990_20
16
        FROM   forestation
        WHERE  year = 1990
        GROUP  BY 1
        ORDER  BY 4 DESC) a
       JOIN (SELECT region,
                    Sum(forest_area_sqkm) forest_area_sum,
                    Sum(total_area_sqkm)  total_area_sum,
                    Round(Cast(Sum(forest_area_sqkm) / Sum(total_area
_sqkm) *
                               100 AS
                               NUMERIC
                          ), 2)
                                          forest_area_decrease_btw_19
90_2016
```

```
            FROM   forestation
            WHERE  year = 2016
            GROUP  BY 1
            ORDER  BY 4 DESC) b
         ON a.region = b.region
ORDER  BY 4;
```

COUNTRY-LEVEL DETAIL

```
WITH top_forest_area_largest_perc_increase_btw_1990_2016
AS
  (
           SELECT   a.country_name,
                    a.region,
                    (a.forest_area_sqkm-
b.forest_area_sqkm)/a.forest_area_sqkm AS forest_area_perc_loss
           FROM     (
                           SELECT country_name,
                                  region,
                                  forest_area_sqkm
                           FROM   forestation
                           WHERE  year = 1990) a
           JOIN
                    (
                           SELECT country_name,
                                  region,
                                  forest_area_sqkm
                           FROM   forestation
                           WHERE  year = 2016) b
           ON       a.country_name = b.country_name
           ORDER BY 3 DESC
           LIMIT    20)
  SELECT *
  FROM   top_forest_area_largest_perc_increase_btw_1990_2016
  WHERE  forest_area_perc_loss IS NOT NULL
```

```
WITH countries_with_highest_foerestation_loss
AS
  (
           SELECT   a.country_name,
                    a.forest_area_sqkm                    forest_90,
                    b.forest_area_sqkm                    forest_16,
                    a.forest_area_sqkm-b.forest_area_sqkm forest_loss
           FROM     (
                           SELECT country_name,
                                  forest_area_sqkm
                           FROM   forestation
                           WHERE  year = 1990) a
           JOIN
                    (
                           SELECT country_name,
                                  forest_area_sqkm
```

```
                            FROM   forestation
                            WHERE  year = 2016) b
            ON       a.country_name = b.country_name
            ORDER BY 4
            LIMIT    20 )
  SELECT *
  FROM   countries_with_highest_foerestation_loss
  WHERE  forest_loss IS NOT NULL
```

```
SELECT a.country_name,
       a.forest_perc                 forest_90,
       b.forest_perc                 forest_16,
       a.forest_perc - b.forest_perc forest_loss
FROM   (SELECT country_name,
               forest_perc
        FROM   forestation
        WHERE  year = 1990) a
       JOIN (SELECT country_name,
                    forest_perc
             FROM   forestation
             WHERE  year = 2016) b
         ON a.country_name = b.country_name
ORDER  BY 4
```

```
SELECT ntile,
       Count(*)
FROM   (SELECT country_name,
               forest_perc,
               Ntile(4)
                 OVER (
                   partition BY forest_perc)
        FROM   forestation
        WHERE  year = 2016
               AND forest_perc IS NOT NULL) sub
GROUP  BY 1;
```

```
SELECT a.country_name,
       a.forest_area_sqkm                       forest_90,
       b.forest_area_sqkm                       forest_16,
       a.forest_area_sqkm - b.forest_area_sqkm forest_loss
FROM   (SELECT country_name,
               forest_area_sqkm
        FROM   forestation
        WHERE  year = 1990) a
       JOIN (SELECT country_name,
                    forest_area_sqkm
             FROM   forestation
             WHERE  year = 2016) b
         ON a.country_name = b.country_name
ORDER  BY 4
LIMIT  2;
```

```
WITH quartile_countries_2016
     AS (SELECT country_name,
                region,
```

```
                forest_perc,
                CASE
                  WHEN forest_perc > 0.75 THEN 4
                  WHEN forest_perc <= 0.75
                       AND forest_perc > 0.5 THEN 3
                  WHEN forest_perc <= 0.5
                       AND forest_perc > 0.25 THEN 2
                  WHEN forest_perc <= 0.25 THEN 1
                END AS level
         FROM   forestation
         WHERE  year = 2016)
SELECT country_name,
       region,
       forest_perc
FROM   quartile_countries_2016
WHERE  level = 4
```