Report for ForestQuery into Global Deforestation, 1990 to 2016

BY

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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 41,282,694.90 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 1,324,449.00 sqkm , or 3.21%.

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 1,279,999.99 sqkm).

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
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 (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 World 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 527,229.06 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 79,200.00 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
World	World	1,324,449.00 sq km
Brazil	Latin America & Caribbean	541,510.00 sq km
Indonesia	East Asia & Pacific	282,193.98 sq km
Myanmar	East Asia & Pacific	107,234.00 sq km
Nigeria	Sub-Saharan Africa	106,506.00 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	75.44
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 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	7
2	2
3	1
4	195

The largest number of countries in 2016 were found in the 4 quartile.

There were 195 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

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?*

APPENDIX 5

SQL QUERIES USED FOR FORESTATION PROJECT

1.GLOBAL SITUATION

```
DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation
AS
  (SELECT b.country_code,
          b.country_name,
          b.year,
          b.forest_area_sqkm,
          c.total_area_sq_mi * 2.59                                    AS
             total_area_sqkm,
          r.region,
          r.income_group,
          forest_area_sqkm * 100 / ( c.total_area_sq_mi * 2.59 ) AS forest_perc
   FROM   forest_area b
          JOIN land_area c
            ON b.country_code = c.country_code

SELECT a.forest_area_sqkm Year_1990, b.forest_area_sqkm Year_2016
FROM forestation a,
     forestation b
WHERE a.year = 1990
    AND b.year = 2016
    AND a.country_name = 'World'
    AND b.country_name = 'World'
              AND b.year = c.year
          JOIN regions r
            ON r.country_code = c.country_code);
```

```
SELECT a.forest_area_sqkm Year_1990,
       b.forest_area_sqkm Year_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 country_name,
       total_area_sqkm
```

```
FROM   forestation
WHERE  year = 2016
       AND total_area_sqkm <= 1324449
ORDER  BY 2 DESC
LIMIT  1;
```

2. REGIONAL OUTLOOK

```
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 ASC
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) AS forest_area_sum,
               Sum(total_area_sqkm)  total_area_sum,
               Round(Cast(Sum(forest_area_sqkm) / Sum(total_area_sqkm) * 100 AS
NUMERIC ), 2) AS forest_area_decrease_btw_1990_2016
        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) AS forest_area_decrease_btw_1990_2016
             FROM   forestation
             WHERE  year = 2016
             GROUP  BY 1
             ORDER  BY 4 DESC) b
         ON a.region = b.region
ORDER  BY 4
LIMIT 3 ;
```

3. COUNTRY-LEVEL DETAIL

```
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 AS 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 )
  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
LIMIT  2;
```

```
WITH top_forest_area_decrease_btw_1990_2016
AS
  (
            SELECT   a.country_name,
                     a.region,
                     a.forest_area_sqkm - b.forest_area_sqkm AS forest_area_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_decrease_btw_1990_2016
  WHERE  forest_area_loss IS NOT NULL
  LIMIT  6
```

```sql
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
  LIMIT  5
```

```sql
WITH forestation_quartiles_2016
     AS (SELECT country_name,
                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 level,
       Count(*)
FROM   forestation_quartiles_2016
GROUP  BY 1
```

```sql
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
ORDER BY forest_perc desc
```

4. RECOMMENDATIONS

1 According to world data, total forest area of the world had decreased to 39,958,245.90 sqkm in 2016 from 41,282,694.90 sqkm in 1990, this represents 3.21%. And records shows that Nigeria has the most land area affected by deforestation which contributes to global warming and if this is not curtail it would have a devasting effect in the long run.

2 The regions of the world most impacted by deforestation is the Sub-Saharan Africa countries which is connected to the poverty experienced in the region which makes the citizens depends heavily on forestry products for survival and heat. And also the ozone layer depletion by developed countries had led to drought and flooding experienced in the Sub-Saharan Africa region which eventually caused famine and death of animals.