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 sq km in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.9 sq km**, a loss of 1324449 sq km, 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 494208.49 sq miles or 1279994.11 sq km).

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 51.08%, and the region with the lowest relative forestation was Middle East & North Africa, with 1.77 % 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 Latin America & Caribbean, with 48.32%, and the region with the lowest relative forestation was Middle East & North Africa, with 1.93% forestation.

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

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America & Caribbean	51.083 %	46.14 %
Europe & Central Asia	37.20 %	38.07 %
North America	35.65 %	36.02 %
Sub-Saharan Africa	30.67 %	28.79%
East Asia & Pacific	25.78 %	26.36 %
South Asia	16.53 %	17.50%
Middle East & North Africa	1.77 %	2.07 %

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin America & Caribbean (dropped from 51.083 % to 46.14%) 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 527229.062 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	Latin America & Caribbean	541510 sq km
Indonesia	East Asia & Pacific	282193.9844 sq km
Myanmar	East Asia & Pacific	107234.0039 sq km
Nigeria	Sub-Saharan Africa	106506.00098 sq km
Tanzania	Sub-Saharan Africa	102320 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	75.4452559270073 %
Nigeria	Sub-Saharan Africa	61.7999309388418 %
Uganda	Sub-Saharan Africa	59.1286034729531 %
Mauritania	Sub-Saharan Africa	46.7469879518072 %
Honduras	Latin America & Caribbean	45.0344149459194 %

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
4	9
3	38
2	72
1	85

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
Suriname	Latin America & Caribbean	98.2576939676578 %
Micronesia, Fed. Sts.	East Asia & Pacific	91.8572390715248 %
Gabon	Sub-Saharan Africa	90.0376418700565 %
Seychelles	Sub-Saharan Africa	88.4111367385789 %
Palau	East Asia & Pacific	87.6068085491203 %
American Samoa	East Asia & Pacific	87.5000875000875 %
Guyana	Latin America & Caribbean	83.9014489110682 %
Lao PDR	East Asia & Pacific	82.1082317640861 %
Solomon Islands	East Asia & Pacific	77.8635177945066 %

5. RECOMMENDATIONS

From this data, we learn that there has been a slow but still significant reduction in total forest cover of the world. Although most of the regions have increased forest cover but two regions have seen a decrease in forest cover and brought down the world total between the years 1990 and 2016.

China, USA and India shows a large growth in their forest cover. They are of course huge in terms pf area but other countries should still consider learning some methods that they used to increase their forest cover.

The huge concern for the world are Latin American and North African countries. In Latin America, sustainable development should be promoted. Ecological organizations and rich nations should help these countries in their sustainable development. In case of Northern Africa, the expansion of the Sahara desert needs to be kept under check. Research shield be conducted to investigate why its happening and how to stop it. Richer countries and organizations should provide them with funds projects to stop deforestation.

6. Appendix:

SQL queries

```
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,
           (f.forest_area_sqkm*100)/(total_area_sq_mi*2.59) AS percent_for
FROM forest_area f
JOIN land_area l
ON f.country_code=l.country_code AND f.year=l.year
```

```
JOIN regions r
ON f.country_code=r.country_code;



SELECT country_code, country_name,
            lag(forest_area_sqkm) OVER (ORDER BY year)-forest_area_sqkm AS diff,
            100*(lag(forest_area_sqkm) OVER (ORDER BY year)-forest_area_sqkm )/(
lag(forest_area_sqkm) OVER (ORDER BY year)) AS per
FROM forestation
WHERE country_name='World' AND year=2016;

SELECT country_code, country_name ,
          lag(forest_area_sqkm) OVER (ORDER BY year)-forest_area_sqkm AS  diff,
          100*(lag(forest_area_sqkm) OVER (ORDER BY
year)-forest_area_sqkm)/(lag(forest_area_sqkm) OVER (ORDER BY year)) AS per
FROM forestation
WHERE country_name='World' AND year=1990;



SELECT country_name,country_code,
            ABS(2.5899*total_area_sq_mi-
          (SELECT lag(forest_area_sqkm)      OVER (ORDER BY year)-forest_area_sqkm AS diff
          FROM forestation
          WHERE country_name='World' AND (year=2016 or year =1990)
          ORDER BY year DESC
          LIMIT 1) )
FROM land_area
WHERE year = 2016
ORDER BY abs;

SELECT DISTINCT region, year,SUM(forest_area_sqkm), percent_for
FROM forestation
WHERE year=1990
GROUP BY 1,2,4
ORDER BY 2,4 DESC;

SELECT t1.country_code,t1.country_name, region,f1-f2 AS diff, 100*(f1-f2)/f2 AS per_inc
FROM (
          SELECT DISTINCT country_code,country_name, forest_area_sqkm AS f1
          FROM forestation
          WHERE year=2016) t1
JOIN (
```

```
        SELECT DISTINCT country_code,country_name, forest_area_sqkm AS f2
        FROM forestation
        WHERE year=1990) t2
ON  t1.country_code=t2.country_code
JOIN regions r
ON r.country_code = t1.country_code
ORDER BY 5;


SELECT quartile, COUNT(*) AS no_of_cn
FROM
(
  SELECT *,
  CASE WHEN percent_for >=75 THEN '4'
  WHEN percent_for <75 AND percent_for >=50 THEN '3'
  WHEN percent_for <50 AND percent_for >=25 THEN '2'
  WHEN percent_for <25 THEN '1' END AS quartile
  FROM
        (SELECT *
        FROM forestation
        WHERE year=2016 AND region NOT LIKE 'World' AND percent_for is NOT NULL
        ) temp )temp2
GROUP BY 1
ORDER BY 1 DESC;

SELECT country_name,region, percent_for
FROM forestation
WHERE percent_for > 75 AND year = 2016
ORDER BY 3 DESC
```