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 km², 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 km²).

2. **REGIONAL OUTLOOK**

In 2016, the percent of the total land area of the world designated as forest was 31.37. 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
Middle East & North Africa	1.78	2.07
South Asia	16.51	17.5
East Asia & Pacific	25.78	26.36
Sub-Saharan Africa	30.67	28.79
North America	35.65	36.04
Europe & Central Asia	37.28	38.04
Latin America & Caribbean	51.04	46.16
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 51.04 % 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 527229.062. 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, much lower than the figure for China.

United States and China 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 km²
Indonesia	East Asia & Pacific	282193.9844 km²
Myanmar	East Asia & Pacific	107234.0039 km²

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	61.8&
Uganda	Sub-Saharan Africa	59.13%

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
0-25%	85
25-50%	73
50-75%	38
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%

5. RECOMMENDATIONS

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

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

I learned that there are some good and bad news that happened to forest are between 1990 and 2016. The good thing is that the forest area has increased in all regions except Latin America & Caribbean and Sub-Saharan Africa and that forest area has increased for both countries China and United States given that these two countries are big ones in terms of distance and their effect on efforts done to increase forest area. The major bas news is that forest area has decreased in Latin America & Caribbean region and due the high distance of forest it ha, that lead to a decrease in world`s forest area.

- *Which countries should we focus on over others?*

We should focus more on countries in Latin America & Caribbean region since they suffered from huge deforestation, and also focus on Nigeria as the country ranked in the top 5 both in terms of absolute square kilometer decrease in forest as well as percent decrease in forest area.

Appendix:

```
CREATE VIEW forestation AS
SELECT f.country_code country_code, f.country_name country_name, f.year, r.region region,
r.income_group income_group, f.forest_area_sqkm forest_area_sqkm, l.total_area_sq_mi
total_area_sq_mi, total_area_sq_mi*2.59 land_area_sqkm,
(forest_area_sqkm/(total_area_sq_mi*2.59))*100 forest_area_percentage
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;
```

1. GLOBAL SITUATION

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

SELECT forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='2016';

WITH t1 AS (SELECT country_name, forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='1990'),
t2 as (SELECT country_name, forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='2016')
Select t1.forest_area_sqkm - t2.forest_area_sqkm as diff
FROM t1
JOIN t2
ON t1.country_name = t2.country_name;

SELECT ((t1.forest_area_sqkm - t2.forest_area_sqkm)/t1.forest_area_sqkm)*100
percentage_diff
FROM (SELECT country_name, forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='1990') t1
JOIN (SELECT country_name, forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='2016') t2
ON t1.country_name = t2.country_name;

SELECT country_name, land_area_sqkm FROM forestation
where year = 2016 AND land_area_sqkm < (WITH t1 AS (SELECT country_name,
forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='1990'),
t2 as (SELECT country_name, forest_area_sqkm FROM forest_area
WHERE  country_name = 'World' AND year ='2016')
Select t1.forest_area_sqkm - t2.forest_area_sqkm as diff
```

```
FROM t1
JOIN t2
ON t1.country_name = t2.country_name)
ORDER BY land_area_sqkm DESC
LIMT 1;
```

2. REGIONAL OUTLOOK

```
SELECT country_name, year, forest_area_percentage FROM Forestation
WHERE country_name = 'World' AND year= 2016;

SELECT region, year, (((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100))
region_forest_area_percentage
FROM  forestation
GROUP BY 1,2
Having year = 2016
ORDER BY 3;

SElECT country_name, year, forest_area_percentage FROM Forestation
WHERE country_name = 'World' AND year= 1990;

Select region, year, (((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100))
region_forest_area_percentage
FROM  forestation
GROUP BY 1,2
Having year = 1990
ORDER BY 3;

With t1 AS (SELECT region, year, (((Sum(forest_area_sqkm) /
Sum(total_area_sq_mi*2.59))*100)) region_forest_area_percentage_2016
FROM  forestation
GROUP BY 1,2
Having year = 2016
ORDER BY 3),
t2 AS (SELECT region, year, (((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100))
region_forest_area_percentage_1990
FROM  forestation
GROUP BY 1,2
Having year = 1990
ORDER BY 3)
SELECT t1.region, t2.region_forest_area_percentage_1990,
t1.region_forest_area_percentage_2016, t1.region_forest_area_percentage_2016 -
t2.region_forest_area_percentage_1990 AS diff
FROM t1
```

```
JOIN t2
ON t1.region = t2.region
ORDER BY diff;
```

3.COUNTRY-LEVEL DETAIL

SUCCESS STORIES

```
SELECT t1.country_name, t2.forest_area_sqkm_2016 - t1.forest_area_sqkm_1990 AS diff
FROM (SELECT country_name, forest_area_sqkm AS forest_area_sqkm_1990
FROM forestation
WHERE year = 1990) t1
JOIN (SELECT country_name, forest_area_sqkm AS forest_area_sqkm_2016
FROM forestation
WHERE year = 2016) t2
ON t1.country_name = t2.country_name
ORDER BY 2 DESC;
```

```
SELECT t1.country_name, ((t2.forest_area_sqkm_2016 -
t1.forest_area_sqkm_1990)/t1.forest_area_sqkm_1990)*100 AS perc_diff
FROM (SELECT country_name, forest_area_sqkm AS forest_area_sqkm_1990
FROM forestation
WHERE year = 1990) t1
JOIN (SELECT country_name, forest_area_sqkm AS forest_area_sqkm_2016
FROM forestation
WHERE year = 2016) t2
ON t1.country_name = t2.country_name
ORDER BY 2 DESC;
```

LARGEST CONCERNS

```
SELECT t1.country_name, t1.region, t2.forest_area_sqkm_2016 - t1.forest_area_sqkm_1990
AS diff
FROM (SELECT country_name, region, forest_area_sqkm AS forest_area_sqkm_1990
FROM forestation
WHERE year = 1990) t1
JOIN (SELECT country_name, forest_area_sqkm AS forest_area_sqkm_2016
FROM forestation
WHERE year = 2016) t2
ON t1.country_name = t2.country_name
ORDER BY 3;
```

```
SELECT t1.country_name, t1.region, ((t2.forest_area_sqkm_2016 -
t1.forest_area_sqkm_1990)/t1.forest_area_sqkm_1990)*100 AS perc_diff
FROM (SELECT country_name, region,forest_area_sqkm AS forest_area_sqkm_1990
```

```
FROM forestation
WHERE year = 1990) t1
JOIN (SELECT country_name, forest_area_sqkm AS forest_area_sqkm_2016
FROM forestation
WHERE year = 2016) t2
ON t1.country_name = t2.country_name
ORDER BY 3;
```

QUARTILES

```
SELECT COUNT(*), quartiles FROM
(SELECT country_name,
CASE WHEN forest_area_percentage <= 25 THEN '0-25%'
WHEN forest_area_percentage > 25 AND forest_area_percentage <= 50 THEN '25-50%'
WHEN forest_area_percentage > 50 AND forest_area_percentage <= 75 THEN '50-75%'
WHEN forest_area_percentage > 75 AND forest_area_percentage <= 100 THEN '75-100%'
END quartiles
FROM forestation
WHERE year = 2016) sub
GROUP BY quartiles
ORDER BY quartiles;
```

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