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** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.9,** a loss of **1324449.0**, 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 **1279999.99**).

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
Europe & Central Asia	37,28	38,04
North America	35,65	36,04
Sub-Saharan Africa	30,67	28,79
East Asia & Pacific	27,78	26,36
South Asia	16,51	17,51
Middle East & North Africa	1,78	2,07

The only regions of the world that decreased in percent forest area from 1990 to 2016 were **Latin America & Caribbean** (dropped from **51,06%** 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**.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 **79200,00**,much lower than the figure for Iceland.

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	541510,00
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 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 **0-25%** 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	87,50
Guyana	Latin America & Caribbean	83,90
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?*

As a data analyst working on this topic, I found out that the global deforestation of the forests decreased from 1990 to 2016, but we have to focus on the largest forests and further deforestation in these regions (Latin America & Caribbean and East Asia & Pacific).

- Which countries should we focus on over others?

In addition to the regions of the world where actual forest area has been lost, we also need to focus on the countries that have lost a large percentage of their own forest cover. The countries mentioned in 3.1 are very important for climate change, as there is a large amount of forest in question. In addition, deforestation in the countries mentioned in 3.2 must be avoided.

5. SQL Queries used

```
--- Projekt Deforestination ---

CREATE VIEW forestation AS
SELECT f.country_code as code, f.country_name as name, f.year as year, f.forest_a
rea_sqkm as forest_area_sqkm,
l.total_area_sq_mi as total_area_sq_mi, r.region as region, r.income_group as inc
ome_group,
 (f.forest_area_sqkm/(l.total_area_sq_mi * 2.59))*100 AS percent_from_total
FROM forest_area f
JOIN land_area l
ON f.country_code = l.country_code
AND f.year = l.year
JOIN regions r
ON l.country_code = r.country_code
```

```sql
-- Immer in Quadratkilometer!!!

-- 1. Global Situation

SELECT year, country_name, forest_area_sqkm
FROM forest_area
WHERE (year = '1990' OR  year = '2016')
AND country_name ='World'

SELECT c.forest_area_sqkm - o.forest_area_sqkm AS lost
FROM forest_area AS c
JOIN forest_area AS o
ON  (c.year = '2016' AND o.year = '1990'
AND c.country_name = 'World' AND o.country_name = 'World');
-1324449

SELECT (c.forest_area_sqkm - o.forest_area_sqkm)*100/o.forest_area_sqkm AS dif_pe
rcent
FROM forest_area AS c
JOIN forest_area AS o
ON  (c.year = '2016' AND o.year = '1990'
AND c.country_name = 'World' AND o.country_name = 'World');

SELECT name, year, (total_area_sq_mi*2.59) AS total_area_sqkm
FROM forestation
WHERE year = 2016 AND (total_area_sq_mi*2.59) <1324449
ORDER BY total_area_sqkm DESC
Peru   2016   1279999.9891

-- 2. Regional Outlook

CREATE VIEW regional_outlook AS
SELECT
c.region,
a.year,
sum(a.forest_area_sqkm) as forest_area_sqkm,
sum(b.total_area_sq_mi*2.59) as total_area_sqkm
FROM forest_area a
JOIN land_area b on a.country_code=b.country_code and a.year=b.year
JOIN regions c on a.country_code=c.country_code
WHERE a.year in (1990,2016)
GROUP BY 1,2
ORDER BY 1,2 asc

SELECT percent_from_total, year, name
```

```sql
FROM forestation
WHERE year = '2016'
AND name = 'World'

SELECT percent_from_total, name, year, forest_area_sqkm
FROM forestation
WHERE year = 2016
AND percent_from_total IS NOT NULL
ORDER BY 4 DESC
LIMIT 5

SELECT region, year,(forest_area_sqkm/total_area_sqkm)*100 AS percent
FROM regional_outlook
ORDER BY 3

SELECT region, year,(forest_area_sqkm/total_area_sqkm)*100 AS percent
FROM regional_outlook
WHERE year = '1990'
ORDER BY 3 DESC

SELECT region, year,(forest_area_sqkm/total_area_sqkm)*100 AS percent
FROM regional_outlook
WHERE year = '2016'
ORDER BY 3 DESC

-- 3. Country-Level Detail

SELECT old.country_name, old.forest_area_sqkm - prev.forest_area_sqkm AS differen
ce
FROM forest_area AS old
JOIN forest_area AS prev
ON (old.year = '2016' AND prev.year = '1990')
AND old.country_name = prev.country_name
ORDER BY 2 DESC

SELECT old.country_name,
  100.0*(old.forest_area_sqkm - prev.forest_area_sqkm) /
  prev.forest_area_sqkm AS percent
FROM forest_area AS old
JOIN forest_area AS prev
ON  (old.year = '2016' AND prev.year = '1990')
AND old.country_name = prev.country_name
ORDER BY percent DESC

SELECT old.country_name, r.region,
```

```sql
  (prev.forest_area_sqkm - old.forest_area_sqkm) AS change
FROM forest_area AS old
JOIN forest_area AS prev
ON  (old.year = '2016' AND prev.year = '1990')
AND old.country_name = prev.country_name
JOIN regions AS r
ON old.country_name = r.country_name
ORDER BY change DESC

SELECT old.country_name, r.region,
  100*((prev.forest_area_sqkm - old.forest_area_sqkm)/prev.forest_area_sqkm) AS c
hange_percent
FROM forest_area AS old
JOIN forest_area AS prev
ON  (old.year = '2016' AND prev.year = '1990')
AND old.country_name = prev.country_name
JOIN regions AS r
ON old.country_name = r.country_name
ORDER BY change_percent DESC

SELECT distinct(quartiles), COUNT(name) OVER (PARTITION BY quartiles)
FROM
(SELECT name, CASE WHEN percent_from_total <= 25 THEN '0-25%'
WHEN percent_from_total <= 75 AND percent_from_total > 50 THEN '50-75%'
WHEN percent_from_total <= 50 AND percent_from_total > 25 THEN '25-50%'
ELSE '75-100%'
END AS quartiles FROM forestation
WHERE percent_from_total IS NOT NULL AND year = 2016) quart;

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