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 **39958245.90 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 **1279999.9 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 and Caribbean**, with **41.16%,** 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 and Caribbean**, with **51.42%,** and the region with the lowest relative forestation was **Latin America and Caribbean,** 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	36.0

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 increased in forest area over this time period. However, the drop in forest area in the two 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 increased in forest area from 1990 to 2016 by **527229 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. Iceland increased in forest area by 21.3% 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
Indonesia	East Asia & Pacific	282194
Myanmar	East Asia & Pacific	107234

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

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
0-25%	85
25%-50%	72
50%-75%	38
75%-100%	9

The largest number of countries in 2016 were found in the 1st 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 Forest Query team.

- *What have you learned from the World Bank data?*
- *Which countries should we focus on over others?*
  There are some countries (total 9) in the last quartile in 2016 with a very high percentage of their land designated as forest. Five of these 9 countries are in the region of East Asia & Pacific. China's forest area increased from 1990 to 2016 by 527229 sq km and Unites states was the second largest increase in forest area (79200 sq km).
  Smaller country like Iceland increased in forest area by 21.3%.

Latin America & the Caribbean and Sub-Saharan Africa decreased greatly in percent forest area, and it impacted the percentage of forest area in the world from 32.42% to 31.38% between 1990 to 2016.
The major countries within these regions are Brazil, Honduras Nigeria, Tanzania, Togo, Uganda, and Mauritania.

These two regions and some countries within these regions need to focus more on deforestation.

5. APPENDIX: SQL Queries Used

```
DROP VIEW forestation;

CREATE OR REPLACE VIEW forestation
AS
(
 SELECT fa.country_code,
  fa.country_name,
  fa.year,
  fa.forest_area_sqkm,
  la.total_area_sq_mi,
  r.region,
  r.income_group,
  (fa.forest_area_sqkm/(la.total_area_sq_mi * 2.59))*100
      AS percentage_forest

 FROM forest_area AS fa
 JOIN land_area AS la
  ON fa.country_code=la.country_code
  AND fa.year=la.year
 JOIN regions AS r
  ON r.country_code=fa.country_code
 );

 --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.

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

--Answer: 41282694.9

--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."

SELECT forest_area_sqkm
FROM forestation
```

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

--Answer: 39958245.9


--c. What was the change (in sq km) in the forest area of the world from 1990
to 2016?
SELECT
(
  (SELECT forest_area_sqkm
      FROM forestation
      WHERE year=2016 AND country_name='World')
  -
  (SELECT forest_area_sqkm
      FROM forestation
      WHERE year=1990 AND country_name='World')
) As "change (in sq km)"

--Answer:-1324449

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

--Formula used (new_value-old_value)*100/old_value
SELECT
(
  (
    (SELECT forest_area_sqkm
      FROM forestation
      WHERE year=2016 AND country_name='World')
  -
    (SELECT forest_area_sqkm
      FROM forestation
      WHERE year=1990 AND country_name='World')
  )*100
  /
  (SELECT forest_area_sqkm
      FROM forestation
      WHERE year=1990 AND country_name='World')
) As "percentage change (in sq km)"

--Answer:-3.20824258980244




WITH countries_2016 AS
(
SELECT forest_area_sqkm AS c_2016, country_name, region
FROM forestation
WHERE year = 2016 and forest_area_sqkm IS NOT NULL),
countries_1990 AS
```

```
(
SELECT forest_area_sqkm AS c_1990, country_name, region
FROM forestation
WHERE year = 1990 and forest_area_sqkm IS NOT NULL)
SELECT country_name, (c_2016 - c_1990) AS forest_change,
countries_1990.region
FROM countries_1990
JOIN countries_2016
using (country_name)
ORDER BY forest_change limit 3;

WITH countries_2016 AS
(
SELECT forest_area_sqkm AS c_2016, country_name, region
FROM forestation
WHERE year = 2016 and forest_area_sqkm IS NOT NULL),
countries_1990 AS
(
SELECT forest_area_sqkm AS c_1990, country_name, region
FROM forestation
WHERE year = 1990 and forest_area_sqkm IS NOT NULL)
SELECT country_name,
(c_2016 - c_1990)/c_1990*100 AS forest_change_percentage,
countries_1990.region,
ROUND(((c_2016 - c_1990)*100/c_1990)::NUMERIC,2)AS fc_percentage
FROM countries_1990
JOIN countries_2016
using (country_name)
ORDER BY fc_percentage limit 3




WITH forest_percent_quartiles
AS (SELECT f.country_name,
f.forest_percentage,
CASE
WHEN f.forest_percentage >= 75 THEN '75%-100%'
WHEN f.forest_percentage >= 50 THEN '50%-75%'
WHEN f.forest_percentage >= 25 THEN '25%-50%'
ELSE '0-25%'
END AS quartiles
FROM vw_forestation f
WHERE year = 2016
AND f.forest_percentage IS NOT NULL
AND country_name != 'World')
SELECT quartiles,
Count(*) AS no_of_countries
FROM forest_percent_quartiles
GROUP BY quartiles
ORDER BY quartiles;


WITH forest_percent_quartiles
AS (SELECT f.country_name,
f.region,
```

```
f.forest_percentage,
CASE
WHEN f.forest_percentage >= 75 THEN '75%-100%'
WHEN f.forest_percentage >= 50 THEN '50%-75%'
WHEN f.forest_percentage >= 25 THEN '25%-50%'
```

```
ELSE '0-25%'
END AS quartiles
FROM vw_forestation f
WHERE year = 2016
AND f.forest_percentage IS NOT NULL
AND country_name != 'World')
SELECT country_name,
region,
Round(forest_percentage :: NUMERIC, 2) AS pct_designated_forest
FROM forest_percent_quartiles
WHERE quartiles = '75%-100%'
ORDER BY forest_percentage DESC;
```