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 **41282694.90 sqkm** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.90 sqkm** , a loss of **1324449.00 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 **1279999.99 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**
Europe & Central Asia	**37.28**	**38.04**
North America	**35.65**	**36.04**
World	**32.42**	**31.38**
Sub-Saharan Africa	**30.67**	**28.79**
East Asia & Pacific	**25.78**	**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 & caribben (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 **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 sqkm**. 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 sqkm** , much lower than the figure for **china**.

china and **Russian** Federation 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. **55390.00 sqkm** increased in forest area by **19.29%** 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**	**0.75**
Nigeria	**Sub-Saharan Africa**	**0.62**
Uganda	**Sub-Saharan Africa**	**0.59**
Mauritania	**Sub-Saharan Africa**	**0.47**
Honduras	**Latin America & Caribbean**	**0.45**

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 **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
American Samoa	**East Asia & Pacific**	**87.50**
Gabon	**Sub-Saharan Africa**	**90.04**
Guyana	**Latin America & Caribbean**	**83.90**
Lao PDR	**East Asia & Pacific**	**82.11**

Micronesia, Fed. Sts.	**East Asia & Pacific**	**91.86**
Palau	**East Asia & Pacific**	**87.61**
Seychelles	**Sub-Saharan Africa**	**88.41**
Solomon Islands	**East Asia & Pacific**	**77.86**
Suriname	**Latin America & Caribbean**	**98.26**

4. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*
  Based on the world bank database I run some different kinds of scenarios first i check each country by the total area and how much the forest area is. I check 1990 to 2016 during that time period the different countries have different changes over time. In some countries, they grow up in that forest area that really good. In some region like Latin America & Caribbean, Europe & Central Asia, and North America these regions are the top 3 regions where forest areas grow really well from 1990 to 2016 and South Asia, East Asia & Pacific this region are very low growth rates for forestation. and Middle East & North Africa is really low at 2.07.
  Based on this analysis we need more focus Middle East & North Africa, East Asia & Pacific region we need to be provided guidelines on to how they more focus on the forest area.
  We need to explain to them the Important of forests in the country and how they control global warming and other factors like pure air and the pure air.
  We need to do awareness camps in this country and make people need to aware of that.

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

We need to focus on China, the United States, India, Russian federation because in these countries forest areas grow very less compared to another country. They provide land and other business.

5. APPENDIX: SQL Queries Used

CREATE VIEW

```
DROP VIEW IF EXISTS forestation;
CREATE VIEW forestation AS
```

```
(
SELECT  f.country_code,
        f.year,
                f.forest_area_sqkm,
            l.total_area_sq_mi,
                r.country_name,
            r.region,
                r.income_group,
        f.forest_area_sqkm / (l.total_area_sq_mi * 2.59) *100 AS forest_sqkm_percent
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);
```

Part- 1 >

Question 1 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 ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_1990
FROM forestation
WHERE year = 1990 AND country_name = 'World';
```

QUESTION > 2

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 ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_2016
FROM forestation
WHERE year = 2016 AND country_name = 'World';
```

QUE. 3 >

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

```
WITH forest_1990 AS (
        SELECT ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_1990
```

```
        FROM forestation
        WHERE year = 1990 AND Country_name = 'World'),
          forest_2016
          AS (
        SELECT ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_2016
        FROM forestation
        WHERE year = 2016 AND Country_name = 'World')
SELECT forest_area_1990 - forest_area_2016 AS diffrence
FROM forest_1990,forest_2016;
```

QUE. 4 > **What was the percent change in forest area of the world between 1990 and 2016?**

```
WITH forest_1990 AS (
        SELECT ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_1990
        FROM forestation
        WHERE year = 1990 AND Country_name = 'World'),
          forest_2016
          AS (
        SELECT ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_2016
        FROM forestation
        WHERE year = 2016 AND Country_name = 'World')
SELECT forest_area_1990 - forest_area_2016 AS diffrence, round((forest_area_2016 -
forest_area_1990)*100/forest_area_1990::numeric,2) AS precentage
FROM forest_1990,forest_2016;
```

QUE. 5 >

If you compare the amount of forest area lost between 1990 and 2016, to which country's total area in 2016 is it closest to?

```
WITH forest_1990 AS (
        SELECT ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_1990
        FROM forestation
        WHERE year = 1990 AND Country_name = 'World'),
          forest_2016
          AS (
        SELECT ROUND(SUM(forest_area_sqkm)::numeric,2) AS forest_area_2016
        FROM forestation
        WHERE year = 2016 AND Country_name = 'World'),
  diff AS (
```

```
        SELECT forest_area_1990, forest_area_2016, forest_area_1990 -
forest_area_2016 AS diffrence
                        FROM forest_1990,forest_2016),
      total_area AS (
            SELECT country_name, total_area_sq_mi * 2.59 AS total_area_sqkm
            FROM forestation)
SELECT distinct   round(total_area_sqkm::numeric, 2) AS area_same, country_name
FROM diff, total_area
WHERE diffrence >= total_area_sqkm
ORDER BY 1 DESC
LIMIT 5;
```

Part 2

QUE. 1 What was the percent forest of the entire world in 2016? Which region had the HIGHEST percent forest in 2016, and which had the LOWEST, to 2 decimal places?

```
SELECT region, ROUND ((SUM(forest_area_sqkm) * 100/ SUM(total_area_sq_mi *
2.59))::numeric, 2) AS percentag
FROM forestation
WHERE year = 2016
GROUP BY region
ORDER BY percentag DESC;
```

QUE. 2> What was the percent forest of the entire world in 1990? Which region had the HIGHEST percent forest in 1990, and which had the LOWEST, to 2 decimal places?

```
SELECT region, ROUND ((SUM(forest_area_sqkm) * 100/ SUM(total_area_sq_mi *
2.59))::numeric, 2) AS percentag
FROM forestation
WHERE year = 1990
GROUP BY region
ORDER BY percentag DESC;
```

Part -3

QUE.1> **Which 5 countries saw the largest amount decrease in forest area from 1990 to 2016? What was the difference in forest area for each?**

```
        WITH fa1990 AS (
        SELECT SUM(forest_area_sqkm) AS sum_1990, country_name, region
        FROM forestation
        WHERE year = 1990 AND forest_area_sqkm IS NOT NULL AND country_name
!= 'World'
   GROUP BY country_name, region
),

        fa2016 AS (
        SELECT SUM(forest_area_sqkm) AS sum_2016, country_name, region
        FROM forestation
        WHERE year = 2016 AND forest_area_sqkm IS NOT NULL AND country_name
!= 'World'
   GROUP BY country_name, region)

SELECT  ROUND((sum_1990 - sum_2016)::numeric, 2) AS di  , a.country_name,
a.region
        FROM fa2016 a
        JOIN fa1990 b
        ON a.country_name = b.country_name
   ORDER BY di DESC;
```

que.2> **Which 5 countries saw the largest percent decrease in forest area from 1990 to 2016? What was the percent change to 2 decimal places for each?**

```
WITH fa1990 AS (
        SELECT forest_sqkm_percent, country_name, region
        FROM forestation
        WHERE year = 1990 AND forest_sqkm_percent IS NOT NULL  AND
country_name !='World'

),
```

```
        fa2016 AS (
                SELECT forest_sqkm_percent, country_name, region
        FROM forestation
        WHERE year = 2016 AND forest_sqkm_percent IS NOT NULL  AND
country_name !='World'
        )

SELECT DISTINCT  ROUND(((b.forest_sqkm_percent -
a.forest_sqkm_percent)/(b.forest_sqkm_percent)) ::numeric, 2) AS pr, a.country_name,
a.region
        FROM fa2016 a
        JOIN fa1990 b
        ON a.country_name = b.country_name
        ORDER BY pr desc;
```

Que. 3 **If countries were grouped by percent forestation in quartiles, which group had the most countries in it in 2016?**

```
WITH
fa2016 AS (
        SELECT country_name, forest_sqkm_percent, CASE WHEN
forest_sqkm_percent >= 75 THEN '75%-100%'
                        WHEN forest_sqkm_percent >= 50 THEN '50%-75%'
                        WHEN forest_sqkm_percent >= 25 THEN '25%-50%'
                    ELSE '0-25%'
                        END AS qurtile
        FROM forestation
        WHERE year = 2016 AND forest_sqkm_percent IS NOT NULL  AND
country_name != 'World'
  )


   SELECT distinct qurtile, count(*)
   FROM fa2016
        GROUP BY 1
  ORDER BY 1;
```

QUE.4>**List all of the countries that were in the 4th quartile (percent forest > 75%) in 2016.**

```
WITH
fa2016 AS (
        SELECT country_name, forest_sqkm_percent, CASE WHEN
forest_sqkm_percent >= 75 THEN '75%-100%'
                        WHEN forest_sqkm_percent >= 50 THEN '50%-75%'
                        WHEN forest_sqkm_percent >= 25 THEN '25%-50%'
                    ELSE '0-25%'
                        END AS qurtile
        FROM forestation
        WHERE year = 2016 AND forest_sqkm_percent IS NOT NULL  AND
country_name != 'World'
  )


   SELECT distinct a.qurtile, a.country_name, b.region,
round(a.forest_sqkm_percent::numeric, 2)
   FROM fa2016 a
        JOIN forestation b
        ON a.country_name = b.country_name
        WHERE A.qurtile = '75%-100%'

  ORDER BY 1 desc;
```

QUE.5> How many countries had a percent forestation higher than the United States in 2016?

```
  SELECT count(*)
FROM forestation f
WHERE year = 2016 AND f.forest_sqkm_percent > (SELECT forest_sqkm_percent
FROM forestation
WHERE forestation.country_name = 'United States' AND year = 2016)
```