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** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.90**, a loss of **1324449**, 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 **1279999.99km^2**).

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	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 & Caribbean** (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**. 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**.

China and **the 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 **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 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%	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
American Samoa	Sub-Saharan Africa	98.26
Micronesia, Fed. Sts	East Asia & Pacific	91.86
Gabon	Sub-Saharan Africa	90.04
Guyana	Latin America & Caribbean	83.90
Lao PDR	East Asia & Pacific	82.11
Palau	East Asia & Pacific	87.61

Solomon Islands	East Asia & Pacific	77.86
Suriname	Latin America & Caribbean	98.26
Seychelles	Sub-Saharan Africa	88.41

4. RECOMMENDATIONS

As an analyst on the ForestQuery team, I am alarmed by these findings. Climate Change is real. Deforestation is real. We have to take this seriously. Our primary focus should be on the countries in the Sub-Saharan Africa Region.

5. APPENDIX: SQL queries used

```
CREATE VIEW deforestation  AS
SELECT f.country_code, f.country_name, r.region,
     f.forest_area_sqkm,(l.total_area_sq_mi * 2.59) AS
total_area_sqkm,
     (100.0* f.forest_area_sqkm /
    (l.total_area_sq_mi * 2.59)) AS land_percentage,
   r.income_group, f.year
FROM forest_area f
JOIN land_area l
    ON f.country_code = l.country_code
        AND f.year = l.year
JOIN regions r
    ON r.country_code = f.country_code;



---------------------------PART 1: Global
Situation------------------

QUESTION: a
SELECT *
FROM forest_area
WHERE country_name = 'World'
AND (year = 1990);

QUESTION: b

SELECT *
FROM forest_area
WHERE country_name = 'World'
AND (year = 2016);
```

```
QUESTION: c

SELECT c.forest_area_sqkm - p.forest_area_sqkm
      AS change_area
FROM forest_area AS p
JOIN forest_area AS c
      ON (p.year = '1990' and c.year = '2016'
         AND p.country_name = 'World'
         AND c.country_name = 'World');


QUESTION: d

SELECT 100.0*((c.forest_area_sqkm -p.forest_area_sqkm) /
         p.forest_area_sqkm) AS change_area
FROM forest_area AS p
JOIN forest_area AS c
      ON (p.year = '1990' and c.year = '2016'
         AND p.country_name = 'World'
         AND c.country_name = 'World');


QUESTION: e
SELECT country_name, total_area_sqkm
FROM deforestation
WHERE year = 2016 AND total_area_sqkm < 1324449
ORDER BY total_area_sqkm DESC LIMIT 1;



————————————————————————Part 2: Regional
Outlook—————————————————————

QUESTION: a

SELECT land_percentage
FROM deforestation
WHERE country_name = 'World'
AND year = '2016';


QUESTION: b

SELECT land_percentage
FROM deforestation
WHERE country_name = 'World'
AND year = '1990';
```

```
QUESTION: c

SELECT
     ROUND(CAST((forest_area_1990/ total_area_1990) * 100
     AS NUMERIC),2) AS forest_perc_1990,
   ROUND(CAST((forest_area_2016 / total_area_2016) * 100
   AS NUMERIC), 2) AS forest_perc_2016, region
FROM
  (SELECT SUM(x.forest_area_sqkm) forest_area_1990,
   SUM(x.total_area_sqkm) total_area_1990, x.region,
   SUM(y.forest_area_sqkm) forest_area_2016,
   SUM(y.total_area_sqkm) total_area_2016
FROM deforestation x, deforestation y
WHERE x.year = '1990'
     AND x.country_name != 'World'
     AND y.year = '2016'
     AND y.country_name!= 'World'
     AND x.region = y.region
GROUP BY x.region) world_regions
ORDER BY forest_perc_1990 DESC;



—————————————————————————Country-Level
Detail——————————————————

QUESTION: a

SELECT new.country_name AS top_counties_with_largest_amount_decrease,
    (new.forest_area_sqkm - bef.forest_area_sqkm) AS forest_difference
FROM forest_area AS new
JOIN forest_area AS bef
    ON  (bef.year = '1990' AND new.year = '2016')
         AND new.country_name = bef.country_name
       WHERE new.forest_area_sqkm IS NOT NULL
           AND bef.forest_area_sqkm IS NOT NULL
           AND new.country_name != 'World'
           AND bef.country_name != 'World'
ORDER BY forest_difference LIMIT 5;
```

```
QUESTION: b

SELECT new.country_name AS top_countires_with_largest_percent_decrease,
    (100*(new.forest_area_sqkm - bef.forest_area_sqkm) /
        bef.forest_area_sqkm) AS forest_difference_percentage
FROM forest_area AS now
JOIN forest_area AS bef
    ON  (bef.year = '1990' AND now.year = '2016')
        AND new.country_name = bef.country_name
        WHERE new.forest_area_sqkm IS NOT NULL
            AND bef.forest_area_sqkm IS NOT NULL
            AND new.country_name != 'World'
            AND bef.country_name != 'World'
ORDER BY forest_difference_percentage LIMIT 5;


QUESTION: c

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

QUESTION: d

SELECT country_name, region, land_percentage
FROM deforestation
WHERE (year = 2016 AND land_percentage > 75)
ORDER BY land_percentage DESC;

QUESTION: e

SELECT new.country_name,
    (new.forest_area_sqkm - bef.forest_area_sqkm) AS forest_difference
FROM forest_area AS new
JOIN forest_area AS bef
    ON  (bef.year = '1990' AND new.year = '2016')
        AND new.country_name = bef.country_name
```

```
        WHERE new.forest_area_sqkm IS NOT NULL
          AND bef.forest_area_sqkm IS NOT NULL
ORDER BY forest_difference DESC LIMIT 3;


SELECT new.country_name,
    (100*(new.forest_area_sqkm - bef.forest_area_sqkm) /
      bef.forest_area_sqkm) AS forest_proportion_change
FROM forest_area AS now
JOIN forest_area AS bef
      ON (bef.year = '1990' AND now.year = '2016')
          AND new.country_name = bef.country_name
        WHERE new.forest_area_sqkm IS NOT NULL
            AND bef.forest_area_sqkm IS NOT NULL
ORDER BY forest_proportion_change DESC LIMIT 3;
```