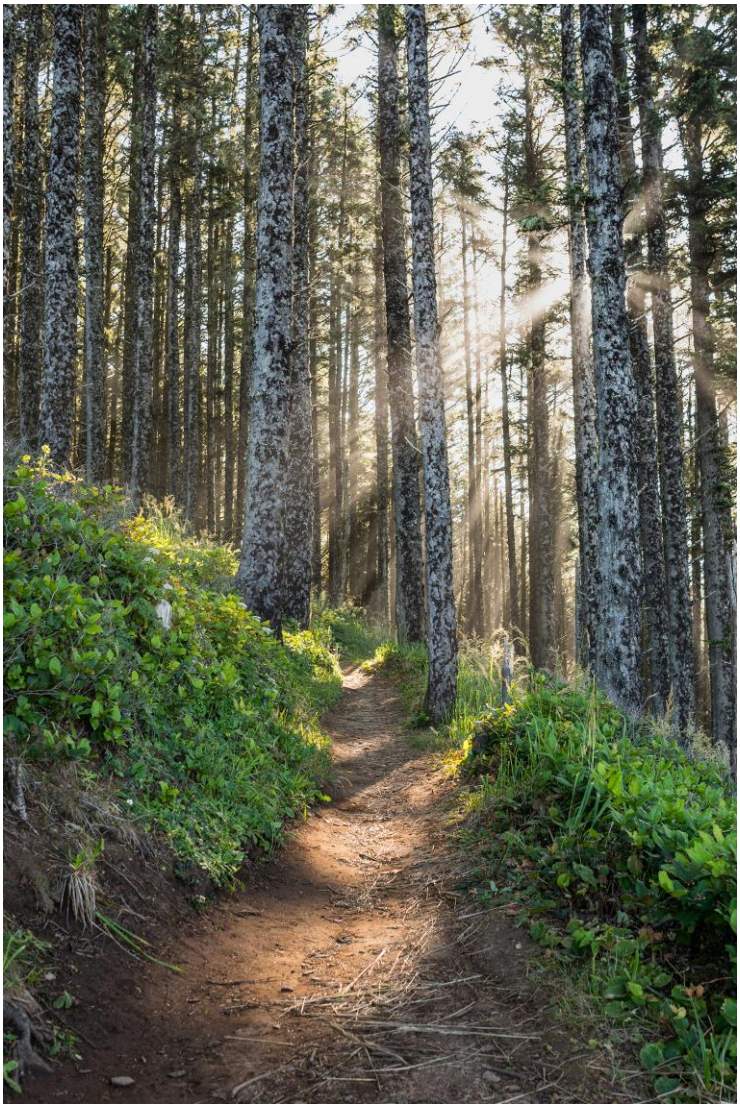

GLOBAL DEFORESTATION

Report for ForestQuery

ABSTRACT

ForestQuery is on a mission to combat deforestation around the world and to raise awareness about this topic and its impact on the environment.

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INTRODUCTION

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 41,282,694.9 km^2 in 1990. As of 2016, the most recent year for which data was available, that number had fallen to 39,958,245.9 km^2, a loss of 1,324,449 km^2 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 1,280,000 km^2).

2. REGIONAL OUTLOOK

In 2016, the percentage 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 percentage 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
World	32.42%.	31.38%
Latin America & Caribbean	51.03%	46.16%
Middle East & North Africa	1.78%	2.07%
East Asia & Pacific	25.78%	26.36%
Europe & Central Asia	37.28%	38.04%
North America	35.65%	36.04%
South Asia	16.51%	17.51%
Sub-Saharan Africa	30.67%	28.79%

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 percentage 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 km^2. 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 km^2, 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 213.67 % 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 5 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	541,510 km^2
Indonesia	East Asia & Pacific	282,193.98 km^2
Myanmar	East Asia & Pacific	107,234 km^2
Nigeria	Sub-Saharan Africa	106,506 km^2
Tanzania	Sub-Saharan Africa	102,320 km^2

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%
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
1st	98
2nd	73
3rd	38
4th	9

The largest number of countries in 2016 were found in the 1st quartile.

There were 85 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%

4. RECOMMENDATIONS

From the World Bank data provided by ForestQuery, we have learned that the total forest area of the world has decreased greatly from 1990 to 2016. This decrease is a cause for concern as deforestation can have a negative impact on the environment. At the regional level, Latin America & Caribbean and Sub-Saharan Africa have experienced the largest drop in percent forest area from 1990 to 2016. When considering country-level data, China, United States and French Polynesia have increased their forest area significantly over the same time period. In contrast, countries such as Brazil, Indonesia, Myanmar, Nigeria, and Tanzania have experienced the largest decrease in forest area in absolute terms. Honduras, Korea, Dem. People's Rep., Zimbabwe, Cambodia, and Timor-Leste have experienced the largest percentage decrease in forest area from 1990 to 2016. Therefore, we should focus on these last countries to combat deforestation and implement strategies to protect and increase forest area, such as the ones in China and French Polynesia.

5. APPENDIX: SQL Queries Used

1. GLOBAL SITUATION

```
DROP VIEW IF EXISTS forestation;
CREATE VIEW forestation AS
SELECT   land_area.total_area_sq_mi * 2.59 AS total_area_sq_km,
        forest_area.country_code,
        forest_area.country_name,
        forest_area.year,
        forest_area.forest_area_sqkm,
        regions.region,
        regions.income_group,
        Sum(forest_area.forest_area_sqkm) / Sum(land_area.total_area_sq_mi * 2.59) * 100 AS f
orest_pct
FROM     forest_area
INNER JOIN     land_area
ON       forest_area.country_code = land_area.country_code
AND      forest_area.year = land_area.year
INNER JOIN     regions
ON       regions.country_code = land_area.country_code
GROUP BY land_area.total_area_sq_mi,
        forest_area.country_code,
        forest_area.country_name,
        forest_area.year,
        forest_area.forest_area_sqkm,
        regions.region,
        regions.income_group;
```

```
     WITH year_1990 AS
(
      SELECT forest_area_sqkm,
            year,
            country_name
      FROM   forestation
      WHERE  year = 1990 ),
year_2016 AS
(
      SELECT forest_area_sqkm,
            year,
            country_name
      FROM   forestation
      WHERE  year = 2016 )
SELECT forest_area_sqkm
FROM   year_1990
WHERE  country_name = 'World'
UNION ALL
SELECT forest_area_sqkm
FROM   year_2016
WHERE  country_name = 'World';



SELECT  DISTINCT
b.total_area_sq_km,
b.country_name,
Abs(b.total_area_sq_km - 1324449) AS dif
FROM
(SELECT *
 FROM forestation
 WHERE year = 1990
) as year_1990
INNER JOIN
(SELECT *
 FROM forestation
 WHERE year = 2016
) as b
ON year_1990.country_name = b.country_name
ORDER BY dif
LIMIT 1
;
```

2. REGIONAL OUTLOOK

```
DROP VIEW IF EXISTS forest_regions ;
CREATE VIEW forest_regions AS
        (
                SELECT   land_area.year,
                        regions.region,
Sum(forest_area.forest_area_sqkm) / Sum(land_area.total_area_sq_mi * 2.59) * 100 AS
forest_pct

                FROM     forest_area
                INNER JOIN     land_area
                ON       forest_area.country_code = land_area.country_code
                AND      forest_area.year = land_area.year
                INNER JOIN     regions
                ON       regions.country_code = land_area.country_code
                WHERE    land_area.year = 1990
                OR       land_area.year = 2016
                GROUP BY       region,
                        land_area.year
);

SELECT forest_pct, region
FROM forest_regions
WHERE year = 2016
ORDER BY forest_pct;


SELECT forest_pct, region
FROM forest_regions
WHERE year = 1990
ORDER BY forest_pct;

WITH year_1990 AS
(
      SELECT forest_pct,
            region
      FROM   forest_regions
      WHERE  year = 1990
),
year_2016 AS
(
      SELECT forest_pct,
            region
      FROM   forest_regions
      WHERE  year = 2016
)
SELECT   (year_1990.forest_pct - year_2016.forest_pct) AS dif,
        year_1990.region
FROM     year_1990
```

```
INNER JOIN     year_2016
ON       year_1990.region = year_2016.region
WHERE    (
               year_1990.forest_pct - year_2016.forest_pct) > 0
ORDER BY dif DESC;
```

3. COUNTRY-LEVEL DETAIL

```
WITH year_1990 AS
(
      SELECT forest_area_sqkm,
            year,
            country_name
      FROM   forestation
      WHERE  year = 1990 ),
year_2016 AS
(
      SELECT forest_area_sqkm,
            year,
            country_name
      FROM   forestation
      WHERE  year = 2016 )
SELECT   year_1990.country_name,
        year_1990.forest_area_sqkm                    AS forest_area1990 ,
        year_2016.forest_area_sqkm                    AS forest_area2016 ,
        (year_1990.forest_area_sqkm - year_2016.forest_area_sqkm) AS dif
FROM     year_1990
INNER JOIN     year_2016
ON       year_1990.country_name = year_2016.country_name
WHERE    (
               year_1990.forest_area_sqkm - year_2016.forest_area_sqkm) IS NOT NULL
AND      year_1990.country_name <> 'World'
ORDER BY dif DESC
LIMIT 5;
```

```
WITH year_1990 AS ( SELECT forest_area_sqkm, year, country_name FROM forestation
WHERE year = 1990 ),
year_2016 AS ( SELECT forest_area_sqkm, year, country_name FROM forestation
WHERE year = 2016 )
```

```
SELECT
year_1990.country_name,
(year_2016.forest_area_sqkm - year_1990.forest_area_sqkm )/year_1990.forest_area_sqkm *
100 AS dif
```

```
FROM year_1990
INNER JOIN year_2016
ON  year_1990.country_name = year_2016.country_name
WHERE year_2016.forest_area_sqkm IS NOT NULL AND year_1990.forest_area_sqkm IS
NOT NULL
ORDER BY dif
LIMIT 5;


WITH year_1990 AS
 ( SELECT forest_area_sqkm, year, country_name
FROM forestation
WHERE year = 1990 ),
year_2016 AS
 ( SELECT forest_area_sqkm, year, country_name
FROM forestation
WHERE year = 2016 )
SELECT
year_1990.country_name, year_1990.forest_area_sqkm AS forest_area1990 ,
year_2016.forest_area_sqkm AS forest_area2016 , (year_1990.forest_area_sqkm -
year_2016.forest_area_sqkm) AS dif
FROM year_1990
INNER JOIN year_2016
ON year_1990.country_name = year_2016.country_name
WHERE ( year_1990.forest_area_sqkm - year_2016.forest_area_sqkm) IS NOT NULL
AND year_1990.country_name <> 'World'
ORDER BY dif DESC
LIMIT 5;


WITH percentiles AS
(SELECT
country_name,
CASE
WHEN  forest_pct>= 75 THEN '4th'
WHEN  forest_pct> 50 THEN '3rd'
WHEN  forest_pct> 25 THEN '2nd'
ELSE '1st'
END AS percentile
FROM forestation
WHERE year = 2016)

SELECT
COUNT(*),
percentile
FROM percentiles
GROUP BY percentile
ORDER BY percentile;
```

```
SELECT
country_name, forest_pct
FROM forestation
WHERE year = 2016 AND forest_pct >= 75;

SELECT
country_name, forest_pct
FROM forestation
WHERE year = 2016 AND forest_pct >
(SELECT forest_pct
 FROM forestation
WHERE year = 2016 AND country_name = 'United States' );
```