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**

Great job all your answers in this section are correct, Kudos.

According to the World Bank, the total forest area of the world was 41282695 km^2 in 1990. As of 2016, the most recent year for which data was available, that number had fallen to 39958246 km^2, a loss of 1324449, 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 1279999.98 km^2).

Yes, **Peru i**s the country with the total land area closest to the amount of forest area lost between 1990 and 2016

2. **REGIONAL OUTLOOK**

The regional outlook section contains the correct answers

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 the Caribbean, with 46.16% and the region with the lowest relative forestation was the Middle East and North Africa, with2.07% 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 the Caribbean, with 51.03%, and the region with the lowest relative forestation was Middle East and North Africa, with 1.78% forestation.

Table 2.1: Percent Forest Area by Region, 1990 & 2016:

Great job, the forest percentages for all the regions in this table is correct.

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America and Caribbean	51.03%	46.16%

Europe and 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 and 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

Country-level detail sections contain the correct answers

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 527,229.06 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 79,200 km^2, much lower than the figure for China.

China and the U.S 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 by213.66% from 1990 to 2016.

Iceland is the country with the largest percent forest increase

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:

All the values in this table are correct, Kudos!

Country	Region	Absolute Forest Area Change
Brazil	Latin America and Caribbean	541,510 km^2
Indonesia	East Asia and Pacific	282,193.98 km^2
Myanmar	East Asia and Pacific	107,234 km^2
Nigeria	Sub-Saharan Africa	106506 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:

Correct, these are the top five countries with the highest forest percent decrease

Country	Region	Pct Forest Area Change
Togo	Sub-Saharan Africa	75.45%
Nigeria	Sub-Saharan Africa	61.8%
Uganda	Sub-Saharan Africa	59.27%
Mauritania	Sub-Saharan Africa	46.75%
Honduras	Latin America and 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 and 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:

The count of countries in the different quartiles is correct. I like that you excluded the country name denoted as **"World"** and the **NULL** values from being counted.

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 bottom or (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:

The top quartile countries below are all correct, kudos!

Country	Region	Pct Designated as Forest
Suriname	Latin America and Caribbean	98.26
Micronesia, Fed. Sts.	East Asia and Pacific	91.86
Gabon	Sub-Saharan Africa	90.04
Seychelles	Sub-Saharan Africa	88.41
Palau	East Asia and Pacific	87.61
American Samoa	East Asia and Pacific	87.5
Guyana	Latin America and Caribbean	83.9
Lao PDR	East Asia and Pacific	82.11
Solomon Islands	East Asia and Pacific	77.86

4. RECOMMENDATIONS

Great job, with your recommendations. The recommendations are very elaborate and you made some very good points.

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?*

According to the World bank report, deforestation is a worldwide big concern, with a decrease in global forest area by 3.2% from 1990 to 2016. In this dataset we found that Togo, Nigeria, Uganda, Mauritania, and Honduras have been the most decreased region and most of them are low to low-middle income countries. These regions should be high priority for focused attention. On the other hand, China has increased their forest area significantly in the period. It is very important to assess the reasons and take steps to regain the green remarks of those areas.

5. APPENDIX: SQL Queries Used

Create a View by joining all three tables - forest_area, land_area and regions

```
CREATE VIEW forestation AS
SELECT fa.country_code,
    fa.country_name,
    fa.year,
    r.region,
```

This creates a View successfully.

```
        r.income_group,
        fa.forest_area_sqkm,
        la.total_area_sq_mi * 2.59 AS total_area_sqkm,
        (fa.forest_area_sqkm /
    (la.total_area_sq_mi*2.59)*100)AS forest_percent

    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
    ORDER BY country_code,
      year;
```

Q1

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(forest_area_sqkm) AS
forest_area_sqkm1990
FROM forestation
WHERE year = 1990 AND country_name = 'World';
```

Q2

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(forest_area_sqkm) AS
forest_area_sqkm2016
FROM forestation
WHERE year = 2016 AND country_name = 'World';
```

Q3
What was the change (in sq km) in the forest area of the world from 1990 to 2016?

```
WITH t1 AS
        (SELECT forest_area_sqkm AS forest_area_sqkm1990
        FROM forestation
        WHERE year = 1990 AND country_name = 'World'),
t2 AS
        (SELECT forest_area_sqkm AS forest_area_sqkm2016
        FROM forestation
        WHERE year = 2016 AND country_name = 'World')
SELECT ROUND(t1.forest_area_sqkm1990 -
t2.forest_area_sqkm2016) AS change_forest_area
FROM t1,
    t2;
```

Q4

What was the percent change in forest area of the world between 1990 and 2016?

```
WITH t1 AS
        (SELECT forest_area_sqkm AS forest_area_sqkm1990
        FROM forestation
        WHERE year = 1990 AND country_name = 'World'),
t2 AS
        (SELECT forest_area_sqkm AS forest_area_sqkm2016
        FROM forestation
        WHERE year = 2016 AND country_name = 'World')
SELECT ROUND(
  (
    (
      (t1.forest_area_sqkm1990 - t2.forest_area_sqkm2016
      )/ t1.forest_area_sqkm1990
    )*100) :: NUMERIC, 2
) :: VARCHAR || '%' AS change_forest_area_percent
FROM t1,
    t2;
```

Q5

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?

```
SELECT country_name, SUM(total_area_sqkm) AS
total_land_area
FROM forestation
WHERE year = 2016
  AND total_area_sqkm IS NOT NULL
GROUP BY country_name
ORDER BY total_land_area DESC;
```

Part 2: Regional Outlook

Q1

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 sub.*,
      ROUND(
        ((sub.forest_area / sub.total_area) * 100)::NUMERIC, 2
      ) AS forest_percentage
FROM (
  SELECT region,
        SUM(forest_area_sqkm) AS forest_area,
        SUM(total_area_sqkm) AS total_area
  FROM forestation
  WHERE year = 2016
  GROUP BY region, year
) AS sub
ORDER BY region;
```

Q2

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 sub.*,
      ROUND(
        ((sub.forest_area / sub.total_area) * 100)::NUMERIC, 2
      ) AS forest_percentage
FROM (
  SELECT region,
        SUM(forest_area_sqkm) AS forest_area,
        SUM(total_area_sqkm) AS total_area
  FROM forestation
  WHERE year = 1990
  GROUP BY region, year
) AS sub
ORDER BY region;
```

Q3

Based on the table you created, which regions of the world DECREASED in forest area from 1990 to 2016?

```
WITH t1 AS (
  SELECT sub.*,
        ROUND(((sub.forest_area / sub.total_area) *
100)::NUMERIC, 2) AS forest_percent
```

```
  FROM (
    SELECT region,
           SUM(forest_area_sqkm) AS forest_area,
           SUM(total_area_sqkm) AS total_area
    FROM forestation
    GROUP BY region, year
    HAVING year = 2016
  ) AS sub
  ORDER BY forest_percent
),
t2 AS (
  SELECT sub.*,
         ROUND(((sub.forest_area / sub.total_area) *
100)::NUMERIC, 2) AS forest_percent
  FROM (
    SELECT region,
           SUM(forest_area_sqkm) AS forest_area,
           SUM(total_area_sqkm) AS total_area
    FROM forestation
    GROUP BY region, year
    HAVING year = 1990
  ) AS sub
  ORDER BY forest_percent
)
SELECT t1.region,
       t1.forest_percent - t2.forest_percent AS change_percentage
FROM t1
```

```
JOIN t2 ON t1.region = t2.region AND t1.forest_percent <
t2.forest_percent
ORDER BY change_percentage;
```

Part 3: Country_Level_Detail

Q1

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 t1 AS (
  SELECT country_code,
        country_name,
        region,
        forest_area_sqkm
  FROM forestation
  WHERE year = 1990
),
t2 AS (
  SELECT country_code,
        country_name,
        forest_area_sqkm
  FROM forestation
  WHERE year = 2016
)
SELECT t1.country_name,
      t1.region,
```

```
        t1.forest_area_sqkm AS forest_area_1990,
        t2.forest_area_sqkm AS forest_area_2016,
        ROUND((t2.forest_area_sqkm -
t1.forest_area_sqkm)::NUMERIC, 2) AS change
FROM t1
JOIN t2 ON t1.country_code = t2.country_code
WHERE t1.country_name NOT LIKE 'World'
ORDER BY change
LIMIT 5;
```

Q2

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 t1 AS (
  SELECT country_code,
    country_name,
    region,
    forest_area_sqkm
  FROM forestation
  WHERE year = 1990
),
t2 AS (
  SELECT country_code,
    country_name,
    forest_area_sqkm
```

```
  FROM forestation
  WHERE year = 2016
)
SELECT t1.country_name,
t1.region,
t1.forest_area_sqkm AS forest_area_1990, t2.forest_area_sqkm
AS forest_area_2016, ROUND(
-((1 -(t2.forest_area_sqkm / t1.forest_area_sqkm)) *
100)::NUMERIC, 2) AS chng_prc
FROM t1
JOIN t2 ON t1.country_code = t2.country_code AND
t2.forest_area_sqkm < t1.forest_area_sqkm
WHERE t1.country_name NOT LIKE 'World' ORDER BY
chng_prc
LIMIT 5;
```

Q3

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

```
WITH sub AS (
  SELECT country_name,
    CASE
      WHEN forest_percent < 25 THEN '0-25%'
      WHEN forest_percent >= 25 AND forest_percent < 50
THEN '25-50%'
```

```
      WHEN forest_percent >= 50 AND forest_percent < 75
THEN '50-75%'
      ELSE '75-100%'
    END AS quartile
  FROM forestation
  WHERE year = 2016
    AND forest_percent IS NOT NULL
)
SELECT DISTINCT quartile,
  (COUNT(country_name) OVER (PARTITION BY quartile))
AS count
FROM sub
ORDER BY quartile;
```

Q4

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

```
WITH sub AS (
  SELECT country_name,
    CASE
      WHEN forest_percent < 25 THEN '0-25%'
      WHEN forest_percent >= 25 AND forest_percent < 50
THEN '25-50%'
      WHEN forest_percent >= 50 AND forest_percent < 75
THEN '50-75%'
      ELSE '75-100%'
```

```
    END AS quartile
  FROM forestation
  WHERE year = 2016
    AND forest_percent IS NOT NULL
)
SELECT country_name, quartile
FROM sub
WHERE quartile = '75-100%';
```

Q5

How many countries had a percent forestation higher than the United States in 2016?

```
SELECT COUNT(*) AS count
FROM (
  SELECT DISTINCT country_name
  FROM forestation
  WHERE forest_percent > (
    SELECT forest_percent
    FROM forestation
    WHERE country_name = 'United States'
      AND year = 2016
  )
  ORDER BY country_name
) AS sub;
```