

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 41282695 in 1990. As of 2016, the most recent year for which data was available, that number had fallen to 39958246, 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 1280000).

2. REGIONAL OUTLOOK

In 2016, the percent of the total land area of the world designated as forest was 31.34. 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 32.21. 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
Sub-Saharan Africa	30.67	28.79
Middle East & North Africa	1.78	2.07
North America	35.65	36.04
East Asia & Pacific	25.78	26.36

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 **32.00** % to **31.31** %.

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**. 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**, much lower than the figure for **China**.

Russian Federation and **China** 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. **French Polynesia** increased in forest area by **27.3** % 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
Nigeria	Sub-Saharan Africa	-106506
Tanzania	Sub-Saharan Africa	-102320

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	-75.4
Nigeria	Sub-Saharan Africa	-61.8
Uganda	Sub-Saharan Africa	-59.3
Mauritania	Sub-Saharan Africa	-46.7
Honduras	Latin America & Caribbean	-45.0

When we consider countries that decreased in forest area 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 **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
Suriname	Latin America & Caribbean	98.3
Micronesia, Fed. Sts.	East Asia & Pacific	91.9
Gabon	Sub-Saharan Africa	90.0
Seychelles	Sub-Saharan Africa	88.4
Palau	East Asia & Pacific	87.6
American Samoa	East Asia & Pacific	87.5
Guyana	Latin America & Caribbean	83.9
Lao PDR	East Asia & Pacific	82.1
Solomon Islands	East Asia & Pacific	77.9

4. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*
- *Which countries should we focus on over others?*

I have learned 3 points from the World Bank data.

1. From "1. Global Situation",

If the deforestation speed is the same, after 30 years about 96% of forest will be lost.

2. From "2. Regional Outlook",

If Latin America & Caribbean make great effort to recover forest, the deforestation speed will be slow.

3. From "3. Country-Level Detail"

It seems that Nigeria is becoming more urbanized.

In order to recover forest, we must focus on Brazil whose decrease area of forest is maximum.

5. APPENDIX: SQL queries used

All queries in the my github repo.

https://github.com/est2mzd/UdaCity_SqlPro01_Intro/tree/master/Project

I show the queries below.

File names are hilighed with yellow marker, and file names means its usage.

If you run the queries in order, you can get the answer for the question.

Project_00_Create_VIEW.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```
CREATE VIEW forestation AS
(
  SELECT f.country_code country_code,
         f.country_name country_name,
         f.year AS year,
         f.forest_area_sqkm forest_area_sqkm,
         l.total_area_sq_mi*2.59 total_area_sqkm,
         r.region region,
         r.income_group income_group,
         (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

SELECT *
FROM forestation;
```

Project_01_Global_Situation_01.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```
CREATE VIEW forestation AS
(
  SELECT f.country_code country_code,
         f.country_name country_name,
         f.year AS year,
         f.forest_area_sqkm forest_area_sqkm,
         l.total_area_sq_mi*2.59 total_area_sqkm,
         r.region region,
```

```

        r.income_group income_group,
        (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

WITH
T_ALL AS (
    SELECT year,
        SUM(forest_area_sqkm) sum_forest,
        SUM(total_area_sqkm) sum_land,
        SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
    FROM forestation
    WHERE country_name = 'World'
    GROUP BY year),
T_1990 AS (
    SELECT sum_forest, sum_land
    FROM T_ALL
    WHERE year = 1990),
T_2016 AS (
    SELECT sum_forest, sum_land
    FROM T_ALL
    WHERE year = 2016),
T_Calc_1 AS (
    SELECT T_1990.sum_forest - T_2016.sum_forest AS forest_loss,
        (T_1990.sum_forest - T_2016.sum_forest)/T_1990.sum_forest*100 AS fore
st_loss_ratio
    FROM T_1990, T_2016),
T_Land_2016 AS (
    SELECT country_name, SUM(total_area_sqkm) sum_land
    FROM forestation
    WHERE year = 2016
    GROUP BY country_name
    ORDER BY sum_land),
T_Calc_2 AS (
    SELECT country_name, sum_land
    FROM T_Calc_1, T_Land_2016
    WHERE T_Calc_1.forest_loss > T_Land_2016.sum_land
    ORDER BY sum_land DESC
    LIMIT 1)

```

```

SELECT T_1990.sum_forest forest_1990,
       T_2016.sum_forest forest_2016,
       forest_loss,
       forest_loss_ratio,
       T_Calc_2.country_name,
       T_Calc_2.sum_land
FROM T_1990, T_2016, T_Calc_1, T_Calc_2

```

Project_02_Regional_Outlook_01.pgsql

```

DROP VIEW IF EXISTS forestation;

```

```

CREATE VIEW forestation AS
(
  SELECT f.country_code country_code,
         f.country_name country_name,
         f.year AS year,
         f.forest_area_sqkm forest_area_sqkm,
         l.total_area_sq_mi*2.59 total_area_sqkm,
         r.region region,
         r.income_group income_group,
         (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

```

```

WITH

```

```

  T_2016_Total AS (
    SELECT
      SUM(forest_area_sqkm) sum_forest,
      SUM(total_area_sqkm) sum_land,
      SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
    FROM forestation
    WHERE year = 2016),
  T_2016_Each AS (
    SELECT region,
      SUM(forest_area_sqkm) sum_forest,
      SUM(total_area_sqkm) sum_land,
      SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
    FROM forestation
    WHERE year = 2016

```



```

        GROUP BY 1
        ORDER BY 4 DESC),
T_2016_Max AS (
    SELECT region, forest_ratio
    FROM T_2016_Each
    WHERE forest_ratio = (SELECT MAX(forest_ratio) FROM T_2016_Each) ),
T_2016_Min AS (
    SELECT region, forest_ratio
    FROM T_2016_Each
    WHERE forest_ratio = (SELECT MIN(forest_ratio) FROM T_2016_Each) )

SELECT T_2016_Total.forest_ratio forest_ratio_total,
       T_2016_Max.region    region_max,
       T_2016_Max.forest_ratio forest_ratio_max,
       T_2016_Min.region    region_min,
       T_2016_Min.forest_ratio forest_ratio_min
FROM T_2016_Total, T_2016_Max, T_2016_Min

```

Project_02_Regional_Outlook_02.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```

CREATE VIEW forestation AS
(
    SELECT f.country_code country_code,
           f.country_name country_name,
           f.year AS year,
           f.forest_area_sqkm forest_area_sqkm,
           l.total_area_sq_mi*2.59 total_area_sqkm,
           r.region region,
           r.income_group income_group,
           (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

```

```
WITH
```

```

T_1990_Total AS (
    SELECT
        SUM(forest_area_sqkm) sum_forest,

```

```

        SUM(total_area_sqkm) sum_land,
        SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
FROM forestation
WHERE year = 1990),
T_1990_Each AS (
    SELECT region,
        SUM(forest_area_sqkm) sum_forest,
        SUM(total_area_sqkm) sum_land,
        SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
    FROM forestation
    WHERE year = 1990
    GROUP BY 1
    ORDER BY 4 DESC),
T_1990_Max AS (
    SELECT region, forest_ratio
    FROM T_1990_Each
    WHERE forest_ratio = (SELECT MAX(forest_ratio) FROM T_1990_Each) ),
T_1990_Min AS (
    SELECT region, forest_ratio
    FROM T_1990_Each
    WHERE forest_ratio = (SELECT MIN(forest_ratio) FROM T_1990_Each) )

SELECT T_1990_Total.forest_ratio forest_ratio_total,
    T_1990_Max.region    region_max,
    T_1990_Max.forest_ratio    forest_ratio_max,
    T_1990_Min.region    region_min,
    T_1990_Min.forest_ratio    forest_ratio_min
FROM T_1990_Total, T_1990_Max, T_1990_Min

Project_02_Regional_Outlook_03.pgsql

DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation AS
(
    SELECT f.country_code country_code,
        f.country_name country_name,
        f.year AS year,
        f.forest_area_sqkm forest_area_sqkm,
        l.total_area_sq_mi*2.59 total_area_sqkm,
        r.region region,
        r.income_group income_group,
        (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

WITH
T_ALL_Year AS (
    SELECT year,
           region,
           SUM(forest_area_sqkm) sum_forest,
           SUM(total_area_sqkm) sum_land,
           SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
    FROM forestation
    WHERE region != 'World'
    GROUP BY 1,2
    ORDER BY 4 DESC),
T_1990 AS (
    SELECT region, forest_ratio
    FROM T_ALL_Year
    WHERE year = 1990
    ORDER BY 1 DESC),
T_2016 AS (
    SELECT region, forest_ratio
    FROM T_ALL_Year
    WHERE year = 2016
    ORDER BY 1 DESC),
T_DIFF AS (
    SELECT T_1990.region region,
           T_2016.forest_ratio - T_1990.forest_ratio forest_ratio_diff,
           T_1990.forest_ratio forest_ratio_1990,
           T_2016.forest_ratio forest_ratio_2016
    FROM T_1990
    JOIN T_2016 ON T_1990.region = T_2016.region
    ORDER BY 2)

SELECT region, forest_ratio_1990, forest_ratio_2016, forest_ratio_diff
FROM T_DIFF
ORDER BY forest_ratio_diff
LIMIT 5

```

Project_02_Regional_Outlook_04.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```
CREATE VIEW forestation AS
```

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

```
WITH
```

```
T_1990_Total AS (
  SELECT
    SUM(forest_area_sqkm) sum_forest,
    SUM(total_area_sqkm) sum_land,
    SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
  FROM forestation
  WHERE year = 1990 AND region != 'World'
),
T_2106_Total AS (
  SELECT
    SUM(forest_area_sqkm) sum_forest,
    SUM(total_area_sqkm) sum_land,
    SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
  FROM forestation
  WHERE year = 2016 AND region != 'World'
)
```

```
SELECT T_1990_Total.forest_ratio forest_ratio_total_1990,
       T_2106_Total.forest_ratio forest_ratio_total_2016
FROM T_1990_Total, T_2106_Total
```

Project_03_Country_Level_Detail_01.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```
CREATE VIEW forestation AS
```

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

```
WITH
```

```
T_ALL_Year AS (
  SELECT year,
         country_name,
         SUM(forest_area_sqkm) sum_forest,
         SUM(total_area_sqkm) sum_land,
         SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
  FROM forestation
  WHERE country_name != 'World'
  GROUP BY 1,2
  ORDER BY 4 DESC),
```

```
T_1990 AS (
  SELECT country_name, sum_forest, sum_land
  FROM T_ALL_Year
  WHERE year = 1990
  ORDER BY 1 DESC),
```

```
T_2016 AS (
  SELECT country_name, sum_forest, sum_land
  FROM T_ALL_Year
  WHERE year = 2016
  ORDER BY 1 DESC),
```

```
T_DIFF AS (
  SELECT T_1990.country_name country_name,
         T_2016.sum_forest - T_1990.sum_forest sum_forest_diff,
```

```

        T_1990.sum_forest sum_forest_1990,
        T_2016.sum_forest sum_forest_2016
FROM T_1990
JOIN T_2016 ON T_1990.country_name = T_2016.country_name
ORDER BY 2 DESC)

SELECT *
FROM T_DIFF
WHERE sum_forest_diff IS NOT null
ORDER BY sum_forest_diff DESC

Project_03_Country_Level_Detail_01_2.pgsql
DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation AS
(
    SELECT f.country_code country_code,
           f.country_name country_name,
           f.year AS year,
           f.forest_area_sqkm forest_area_sqkm,
           l.total_area_sq_mi*2.59 total_area_sqkm,
           r.region region,
           r.income_group income_group,
           (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

WITH
T_ALL_Year AS (
    SELECT year,
           country_name,
           SUM(forest_area_sqkm) sum_forest,
           SUM(total_area_sqkm) sum_land,
           SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
FROM forestation
WHERE country_name != 'World'
GROUP BY 1,2
ORDER BY 4 DESC),
T_1990 AS (

```

```

SELECT country_name, sum_forest, sum_land
FROM T_ALL_Year
WHERE year = 1990
ORDER BY 1 DESC),
T_2016 AS (
SELECT country_name, sum_forest, sum_land
FROM T_ALL_Year
WHERE year = 2016
ORDER BY 1 DESC),
T_DIFF AS (
SELECT T_1990.country_name country_name,
       T_2016.sum_forest - T_1990.sum_forest sum_forest_diff,
       T_1990.sum_forest sum_forest_1990,
       T_2016.sum_forest sum_forest_2016
FROM T_1990
JOIN T_2016 ON T_1990.country_name = T_2016.country_name
ORDER BY 2 DESC)

SELECT *
FROM T_2016
WHERE sum_land IS NOT null
ORDER BY sum_land DESC

```

Project_03_Country_Level_Detail_02.pgsql

```

DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation AS
(
SELECT f.country_code country_code,
       f.country_name country_name,
       f.year AS year,
       f.forest_area_sqkm forest_area_sqkm,
       l.total_area_sq_mi*2.59 total_area_sqkm,
       r.region region,
       r.income_group income_group,
       (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code

```

```
);
```

```
WITH
```

```
T_ALL_Year AS (  
    SELECT year,  
           country_name,  
           SUM(forest_area_sqkm) sum_forest,  
           SUM(total_area_sqkm) sum_land,  
           SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio  
    FROM forestation  
    WHERE country_name != 'World'  
    GROUP BY 1,2  
    ORDER BY 4 DESC),  
T_1990 AS (  
    SELECT country_name, sum_forest, sum_land, forest_ratio  
    FROM T_ALL_Year  
    WHERE year = 1990  
    ORDER BY 1 DESC),  
T_2016 AS (  
    SELECT country_name, sum_forest, sum_land, forest_ratio  
    FROM T_ALL_Year  
    WHERE year = 2016  
    ORDER BY 1 DESC),  
T_DIFF AS (  
    SELECT T_1990.country_name country_name,  
           T_2016.forest_ratio - T_1990.forest_ratio forest_ratio_diff,  
           T_1990.forest_ratio forest_ratio_1990,  
           T_2016.forest_ratio forest_ratio_2016  
    FROM T_1990  
    JOIN T_2016 ON T_1990.country_name = T_2016.country_name  
    ORDER BY 2 DESC)
```

```
SELECT *  
FROM T_DIFF  
WHERE forest_ratio_diff IS NOT null  
ORDER BY forest_ratio_diff DESC
```

```
Project_03_Country_Level_Detail_03.pgsql
```

```
DROP VIEW IF EXISTS forestation;
```

```
CREATE VIEW forestation AS  
(
```



```

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

```

WITH

```

T_ALL_Year AS (
  SELECT year,
         country_name,
         SUM(forest_area_sqkm) sum_forest,
         SUM(total_area_sqkm) sum_land,
         SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
  FROM forestation
  WHERE country_name != 'World'
  GROUP BY 1,2),
T_1990 AS (
  SELECT country_name, sum_forest, sum_land, forest_ratio
  FROM T_ALL_Year
  WHERE year = 1990),
T_2016 AS (
  SELECT country_name, sum_forest, sum_land, forest_ratio
  FROM T_ALL_Year
  WHERE year = 2016),
T_DIFF AS (
  SELECT T_1990.country_name country_name,
         region,
         T_2016.sum_forest - T_1990.sum_forest sum_forest_diff
  FROM T_1990
  JOIN T_2016 ON T_1990.country_name = T_2016.country_name
  JOIN regions ON T_1990.country_name = regions.country_name)

```

```

SELECT *
FROM T_DIFF
WHERE sum_forest_diff IS NOT null

```

```
ORDER BY sum_forest_diff
LIMIT 5
```

Project_03_Country_Level_Detail_04.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```
CREATE VIEW forestation AS
```

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

```
WITH
```

```
T_ALL_Year AS (
  SELECT year,
         country_name,
         SUM(forest_area_sqkm) sum_forest,
         SUM(total_area_sqkm) sum_land,
         SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
  FROM forestation
  WHERE country_name != 'World'
  GROUP BY 1,2
  ORDER BY 4 DESC),
```

```
T_1990 AS (
  SELECT country_name, sum_forest, sum_land, forest_ratio
  FROM T_ALL_Year
  WHERE year = 1990
  ORDER BY 1 DESC),
```

```
T_2016 AS (
  SELECT country_name, sum_forest, sum_land, forest_ratio
  FROM T_ALL_Year
```

```

        WHERE year = 2016
        ORDER BY 1 DESC),
T_DIFF AS (
    SELECT T_1990.country_name country_name,
           region,
           (T_2016.forest_ratio - T_1990.forest_ratio)/T_1990.forest_ratio*100 f
orest_ratio_diff
    FROM T_1990
    JOIN T_2016 ON T_1990.country_name = T_2016.country_name
    JOIN regions ON T_1990.country_name = regions.country_name
    ORDER BY 2 DESC)

SELECT *
FROM T_DIFF
WHERE forest_ratio_diff IS NOT null
ORDER BY forest_ratio_diff
LIMIT 5

```

Project_03_Country_Level_Detail_05.pgsql

```

DROP VIEW IF EXISTS forestation;

CREATE VIEW forestation AS
(
    SELECT f.country_code country_code,
           f.country_name country_name,
           f.year AS year,
           f.forest_area_sqkm forest_area_sqkm,
           l.total_area_sq_mi*2.59 total_area_sqkm,
           r.region region,
           r.income_group income_group,
           (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

WITH
T_ALL_Year AS (
    SELECT year,
           country_name,
           SUM(forest_area_sqkm) sum_forest,

```

```

        SUM(total_area_sqkm)  sum_land,
        SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
FROM forestation
WHERE country_name != 'World'
GROUP BY 1,2
ORDER BY 4 DESC),
T_1990 AS (
    SELECT country_name, sum_forest, sum_land, forest_ratio
    FROM T_ALL_Year
    WHERE year = 1990
    ORDER BY 1 DESC),
T_2016 AS (
    SELECT country_name, sum_forest, sum_land, forest_ratio
    FROM T_ALL_Year
    WHERE year = 2016
    ORDER BY 1 DESC),
T_QUARTILE_2016 AS (
    SELECT CASE
        WHEN forest_ratio <= 25 THEN '0-25%'
        WHEN forest_ratio <= 50 THEN '25-50%'
        WHEN forest_ratio <= 75 THEN '50-75%'
        ELSE '75-100%'
    END AS ratio_category,
    COUNT(*)
    FROM T_2016
    WHERE forest_ratio IS NOT NULL
    GROUP BY ratio_category)

SELECT *
FROM T_QUARTILE_2016
ORDER BY 1

```

Project_03_Country_Level_Detail_06.pgsql

```
DROP VIEW IF EXISTS forestation;
```

```

CREATE VIEW forestation AS
(
    SELECT f.country_code country_code,
           f.country_name country_name,
           f.year AS year,
           f.forest_area_sqkm forest_area_sqkm,
           l.total_area_sq_mi*2.59 total_area_sqkm,
           r.region region,

```

```

        r.income_group income_group,
        (f.forest_area_sqkm/l.total_area_sq_mi/2.59)*100 forest_area_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 r.country_code = f.country_code
);

WITH
T_ALL_Year AS (
    SELECT year,
           country_name,
           SUM(forest_area_sqkm) sum_forest,
           SUM(total_area_sqkm) sum_land,
           SUM(forest_area_sqkm) / SUM(total_area_sqkm) *100 forest_ratio
    FROM forestation
    WHERE country_name != 'World'
    GROUP BY 1,2
    ORDER BY 4 DESC),
T_1990 AS (
    SELECT country_name, sum_forest, sum_land, forest_ratio
    FROM T_ALL_Year
    WHERE year = 1990
    ORDER BY 1 DESC),
T_2016 AS (
    SELECT country_name, sum_forest, sum_land, forest_ratio
    FROM T_ALL_Year
    WHERE year = 2016
    ORDER BY 1 DESC),
T_QUARTILE_2016 AS (
    SELECT T_2016.country_name,
           region,
           forest_ratio
    FROM T_2016
    JOIN regions ON T_2016.country_name = regions.country_name
    WHERE forest_ratio > 75)

SELECT *
FROM T_QUARTILE_2016
ORDER BY 3 DESC

```