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 **41,282,694.9 sqkm** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39,958,245.9 sqkm**, a loss of **1,324,449 sqkm**, or **3.2%.**

The forest area lost over this time period is slightly more than the entire land area of **Brazil** listed for the year 2016 (which is **1,245,977.25sqkm**).

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 the **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 the **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
East Africa & Pacific	25.78	26.36
South Asia	16.51	17.51
North America	35.65	36.04
Europe & Central Asia	37.28	38.04
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**

• 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 **527,229.06 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 **79,200sqkm**, much lower than the figure for **China**.

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.

• 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: **Brazil, Indonesia** and **Myanmar**.

Table 3.1: Top 5 Amount Decrease in Forest Area by Country, 1990 & 2016:

Country	Region	Absolute Forest Area Change

Brazil	Latin America & Caribbean	541,510.00
Indonesia	East Asia & Pacific	282,193.98
Myanmar	East Asia & Pacific	107,234.00
Nigeria	Sub-Saharan Africa	106,506.00
Tanzania	Sub-Saharan Africa	102,320.00

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	61.8
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.

- QUARTILES

Table 3.3: Count of Countries Grouped by Forestation Percent Quartiles, 2016:

Quartile	**Number of Countries**
1st (< 25%)	85
2nd (25.01 - 50%)	73
3rd (50.01 - 75%)	38
4th (> 75%)	9

The largest number of countries in 2016 were found in the **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:

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
Seychelles	Sub-Saharan Africa	88.41
Palau	East Asia & Pacific	87.61
American Samoa	East Asia & Pacific	87.5
Guyana	Latin America & Caribbean	83.9
Lao PDR	East Asia & Pacific	82.11
Solomon Islands	East Asia & Pacific	77.86

4. RECOMMENDATIONS

The regions of Sub-Saharan Africa and Latin America & Caribbean have suffered the most decrease in forest area. However, we lack statistics from 14 countries for which are mainly from the regions of East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean and Sub-Saharan Africa as shown in the table below:

Country	Region	Forest Area 1990	Forest Area 2016
Hong Kong SAR, China	East Asia & Pacific		
Nauru	East Asia & Pacific		
Macao SAR, China	East Asia & Pacific		
Monaco	Europe & Central Asia		
Kosovo	Europe & Central Asia		
San Marino	Europe & Central Asia		
Gibraltar	Europe & Central Asia		
Curaçao	Latin America & Caribbean		
Sint Maarten (Dutch part)	Latin America & Caribbean		
St. Martin (French part)	Latin America & Caribbean	10	

Qatar	Middle East & North Africa		
Sudan	Sub-Saharan Africa		190,355.293
South Sudan	Sub-Saharan Africa		71,570
Ethiopia	Sub-Saharan Africa		125,395.9961

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

To combat deforestation, the focus should be on the regions of Sub-Saharan Africa and Latin America & Caribbean, and mainly the countries of Brazil, Indonesia, Myanmar, Nigeria, Tanzania, Togo, Uganda, Mauritania and Honduras.

5. APPENDIX: SQL Queries Used

Forestation view creation:

```
CREATE VIEW Forestation AS
(SELECT fa.country_code,
        fa.country_name,
        fa.year, fa.forest_area_sqkm,
        la.total_area_sq_mi,
        r.region,
        r.income_group,
        fa.forest_area_sqkm/(la.total_area_sq_mi * 2.59) * 100 percent_forest
 FROM forest_area fa
 JOIN land_area la
 ON fa.country_code = la.country_code
 AND fa.year = la.year
 JOIN regions r
 ON fa.country_code = r.country_code
)
```

What was the total forest area (in sq km) of the world in 1990?

```
SELECT forest_area_sqkm
FROM forest_area
WHERE country_name ='World'
AND year = 1990
```

Output 41282694.9

b. 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 forest_area_sqkm
FROM forest_area
WHERE country_name ='World'
AND year = 1990
```

Output 39958245.9

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

```
WITH world_sqkm_1990 AS
        (SELECT forest_area_sqkm a
        FROM forest_area
        WHERE country_name ='World'
        AND year = 1990
        ),
world_sqkm_2016 AS
        (SELECT forest_area_sqkm b
        FROM forest_area
        WHERE country_name ='World'
        AND year = 2016
        )
SELECT world_sqkm_1990.a sqkm_1990,
        world_sqkm_2016.b sqkm_2016,
        World_sqkm_1990.a,
        world_sqkm_2016.b AS change
FROM world_sqkm_1990,
        world_sqkm_2016
```

Output: Decrease by 1324449

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

```
WITH world_sqkm_1990 AS
        (SELECT forest_area_sqkm a
        FROM forest_area
        WHERE country_name ='World' AND year = 1990
        ),
world_sqkm_2016 AS
        (SELECT forest_area_sqkm b
        FROM forest_area
        WHERE country_name ='World' AND year = 2016
        )
```

```
SELECT world_sqkm_1990.a sqkm_1990,
        world_sqkm_2016.b sqkm_2016,
        World_sqkm_1990.a -
        world_sqkm_2016.b AS change,
        (world_sqkm_1990.a -
        world_sqkm_2016.b)/world_sqkm_1990.a *100 AS percent_change
FROM world_sqkm_1990,
        world_sqkm_2016
```

Decrease by 3.20824258980244

e. 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 world_sqkm_1990 AS
        (SELECT forest_area_sqkm a
        FROM forest_area
        WHERE country_name ='World'
        AND year = 1990
        ),
world_sqkm_2016 AS
        (SELECT forest_area_sqkm b
        FROM forest_area
        WHERE country_name ='World'
        AND year = 2016
        ),
change_world_sqkm AS
        (SELECT world_sqkm_1990.a sqkm_1990,
                world_sqkm_2016.b sqkm_2016,
                world_sqkm_1990.a - world_sqkm_2016.b AS change
        FROM world_sqkm_1990, world_sqkm_2016),
```

```
change_to_miles AS
        (SELECT change * 2.59 change_inmiles
        FROM change_world_sqkm)

SELECT country_name, total_area_sq_mi,
        total_area_sq_mi/2.59 total_area_sq_km,
        change_inmiles FROM land_area,
        change_to_miles
WHERE total_area_sq_mi <= change_inmiles
AND year=2016
ORDER BY total_area_sq_mi DESC
LIMIT 1
```

country_name	total_area_sq_mi	total_area_sq_km	change_inmiles
Brazil	3227081.08	1245977.25096525	3430322.91

- Create a table that shows the Regions and their percent forest area (sum of forest area divided by sum of land area) in 1990 and 2016. (Note that 1 sq mi = 2.59 sq km). Based on the table you created, ...

Creation of table

```
WITH T1 AS
        (SELECT r.region reg1,
                la.year land_area_year,
                SUM(la.total_area_sq_mi * 2.59) total_land_area_sq_km
        FROM land_area la
        LEFT JOIN regions r
        ON la.country_code = r.country_code
        HAVING la.year = 2016
        OR la.year =1990
        GROUP BY 1,2
        ORDER BY 2),
T2 AS
        (SELECT r.region reg2,
                fa.year forest_area_year,
                SUM(fa.forest_area_sqkm) total_forest_area_sq_km
        FROM forest_area fa
        LEFT JOIN regions r
        ON fa.country_code = r.country_code
        HAVING fa.year = 2016
        OR fa.year =1990
        GROUP BY 1,2
        ORDER BY 2)
SELECT reg2,
        forest_area_year,
        total_forest_area_sq_km,
        total_land_area_sq_km,
        CAST(total_forest_area_sq_km/total_land_area_sq_km * 100 AS DECIMAL(5, 2))
        percent_forest_area
FROM T1
```

```
JOIN T2
ON T1.reg1 = T2.reg2
AND T1.land_area_year = T2.forest_area_year
```

a. 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?

```
WITH T1 AS
        (SELECT r.region reg1,
                la.year land_area_year,
                SUM(la.total_area_sq_mi * 2.59) total_land_area_sq_km
        FROM land_area la
        LEFT JOIN regions r
        ON la.country_code = r.country_code
        GROUP BY 1,2
        HAVING la.year = 2016
        OR la.year =1990
        ORDER BY 2),
T2 AS
        (SELECT r.region reg2,
                fa.year forest_area_year,
                SUM(fa.forest_area_sqkm) total_forest_area_sq_km
        FROM forest_area fa
        LEFT JOIN regions r
        ON fa.country_code = r.country_code
        GROUP BY 1,2
        HAVING fa.year = 2016
        OR fa.year =1990
        ORDER BY 2),
T3 AS
```

```
(SELECT reg2,
        forest_area_year,
        total_forest_area_sq_km, total_land_area_sq_km,
        CAST(total_forest_area_sq_km/total_land_area_sq_km * 100 AS DECIMAL(5,
        2)) percent_forest_area
FROM T1
JOIN T2
ON T1.reg1 = T2.reg2
AND T1.land_area_year = T2.forest_area_year)
```

Note: *Subqueries T1 to T3 must be present along with the following queries to produce the following results.*

Percent forest of the entire world in 2016: 31.38

```
SELECT reg2,
        percent_forest_area
FROM T3
WHERE reg2 = 'World'
AND forest_area_year= 2016
```

Region with highest percent forest in 2016:

```
SELECT reg2,
        percent_forest_area
FROM T3
WHERE forest_area_year= 2016
ORDER BY percent_forest_area DESC
LIMIT 1
```

reg2	percent_forest_area
Latin America & Caribbean	46.16

Region with lowest percent forest in 2016:

```
SELECT reg2,
        percent_forest_area
FROM T3
WHERE forest_area_year= 2016
ORDER BY percent_forest_area
LIMIT 1
```

reg2	percent_forest_area

Middle East & North Africa 2.07

b. 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?

percent forest of the entire world in 1990?

```
SELECT reg2,
        percent_forest_area
FROM T3
WHERE reg2 = 'World'
AND forest_area_year= 1990
```

reg2	percent_forest_area

World 32.42

Which region had the HIGHEST percent forest in 1990

```
SELECT reg2,
        percent_forest_area
FROM T3
WHERE forest_area_year= 1990
ORDER BY percent_forest_area DESC
LIMIT 1
```

reg2	percent_forest_area

Latin America & Caribbean	51.03

and which had the LOWEST, to 2 decimal places?

```
SELECT reg2,
        percent_forest_area
FROM T3
WHERE forest_area_year= 1990
ORDER BY percent_forest_area
LIMIT 1
```

reg2	**percent_forest_area**

Middle East & North Africa 1.78

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

Note: *This query is complete*

```
WITH T1 AS
        (SELECT r.region reg1,
                la.year land_area_year,
                SUM(la.total_area_sq_mi * 2.59) total_land_area_sq_km
        FROM land_area la
        LEFT JOIN regions r
        ON la.country_code = r.country_code
        GROUP BY 1,2
        HAVING la.year = 2016
        OR la.year =1990
        ORDER BY 2),
T2 AS
        (SELECT r.region reg2,
                fa.year forest_area_year,
                SUM(fa.forest_area_sqkm) total_forest_area_sq_km
        FROM forest_area fa
        LEFT JOIN regions r
        ON fa.country_code = r.country_code
```

```
 GROUP BY 1,2
HAVING fa.year = 2016
OR fa.year =1990
ORDER BY 2),


T3 AS
(SELECT reg2,
        CAST(total_forest_area_sq_km/total_land_area_sq_km * 100 AS DECIMAL(5,
        2)) percent_forest_area,
        forest_area_year,
        total_forest_area_sq_km,
        total_land_area_sq_km
 FROM T1
JOIN T2
ON T1.reg1 = T2.reg2
AND T1.land_area_year = T2.forest_area_year
AND T1.land_area_year = 1990
ORDER BY reg2),
T40 AS
(SELECT reg2,
        CAST(total_forest_area_sq_km/total_land_area_sq_km * 100 AS DECIMAL(5,
        2)) percent_forest_area,
        forest_area_year,
        total_forest_area_sq_km,
        total_land_area_sq_km
 FROM T1
JOIN T2
ON T1.reg1 = T2.reg2
AND T1.land_area_year = T2.forest_area_year
AND T1.land_area_year = 2016
```

```
        ORDER BY reg2),
T4 AS
        (SELECT T3.reg2,
                T3.percent_forest_area AS percent_forest_area_1990,
                T40.percent_forest_area AS percent_forest_area_2016
        FROM T3
        JOIN T40
        ON T3.reg2 = T40.reg2
        ORDER BY 1),
T5 AS
        (SELECT T4.reg2,
                percent_forest_area_1990,
                Percent_forest_area_2016,
                CASE
                WHEN percent_forest_area_1990 > percent_forest_area_2016 THEN 'Decrease'
                ELSE 'Increase'
                END AS forest_population
        FROM T4
        ORDER BY 4)
 SELECT * FROM T5
```

reg2	percent_forest_area_1990	percent_forest_area_2016	forest_population
Latin America & Caribbean	51.03	46.16	Decrease
Sub-Saharan Africa	30.67	28.79	Decrease
World	32.42	31.38	Decrease
East Asia & Pacific	25.78	26.36	Increase
South Asia	16.51	17.51	Increase
North America	35.65	36.04	Increase

Europe & Central Asia	37.28	38.04	Increase
Middle East & North Africa	1.78	2.07	Increase

3. COUNTRY-LEVEL DETAIL

Instructions:

- Answering these questions will help you add information to the template.
- Use these questions as guides to write SQL queries.
- Use the output FROM the query to answer these questions.

a. Which 5 countries saw the largest amount decrease in forest area FROM 1990 to 2016? What was the difference in forest area for each?

Note: *The following set of queries and sub queries are not related to the ones above. They must be executed independent of the ones above in order to produce the required results.*

```
WITH T1 AS
        (SELECT r.country_name country_name1,
                la.year land_area_year,
                SUM(la.total_area_sq_mi * 2.59) total_land_area_sq_km
        FROM land_area la
        LEFT JOIN regions r
        ON la.country_code = r.country_code
        GROUP BY 1,2
        HAVING la.year = 2016
        OR la.year =1990
```

```
        ORDER BY 2),
T2 AS
        (SELECT r.country_name country_name2,
                fa.year forest_area_year,
                SUM(fa.forest_area_sqkm) total_forest_area_sq_km
        FROM forest_area fa
        LEFT JOIN regions r
        ON fa.country_code = r.country_code
        GROUP BY 1,2
        HAVING fa.year = 2016
        OR fa.year =1990
        ORDER BY 2),
T3 AS
        (SELECT country_name2,
        CAST(total_forest_area_sq_km/total_land_area_sq_km * 100 AS DECIMAL(5, 2))
        percent_forest_area,
        forest_area_year,
        total_forest_area_sq_km,
        total_land_area_sq_km
        FROM T1
        JOIN T2
        ON T1.country_name1 = T2.country_name2
        AND T1.land_area_year = T2.forest_area_year
        ORDER BY country_name2),
T4 AS
        (SELECT country_name2,
                total_forest_area_sq_km AS total_forest_area_sq_km_1990
        FROM T2
        WHERE forest_area_year = 1990
        ORDER BY 1),
```

```
 T5 AS
        (SELECT country_name2,
                total_forest_area_sq_km AS total_forest_area_sq_km_2016
        FROM T2
        WHERE forest_area_year = 2016
        ORDER BY 1),
T6 AS
        (SELECT T5.country_name2,
                total_forest_area_sq_km_1990,
                Total_forest_area_sq_km_2016,
                Total_forest_area_sq_km_1990,
                total_forest_area_sq_km_2016 Difference,
        CASE
                WHEN total_forest_area_sq_km_1990 > total_forest_area_sq_km_2016 THEN
                'Decrease'
                 WHEN total_forest_area_sq_km_1990 = total_forest_area_sq_km_2016 THEN
                 'No Change'
                WHEN total_forest_area_sq_km_1990 IS NULL THEN 'No Data'
                WHEN total_forest_area_sq_km_2016 IS NULL THEN 'No Data'
                ELSE 'Increase'
        END AS forest_population
        FROM T4
        JOIN T5
        ON T4.country_name2 = T5.country_name2
        ORDER BY 4 DESC, 5 )
SELECT country_name2,
        r.region,
        difference,
        forest_population
FROM T6
```

```
JOIN regions r
ON r.country_name = T6.country_name2
AND T6.forest_population = 'Decrease'
AND country_name2 <> 'World'
ORDER BY 3 DESC
LIMIT 5
```

country_name2	region	difference	forest_population
Brazil	Latin America & Caribbean	541510	Decrease
Indonesia	East Asia & Pacific	282193.9844	Decrease
Myanmar	East Asia & Pacific	107234.0039	Decrease
Nigeria	Sub-Saharan Africa	106506.001	Decrease
Tanzania	Sub-Saharan Africa	102320	Decrease

Note: *The questions below require all the subqueries listed above. Most of the subqueries are connected, so to be sure not to get confused, all the subqueries above need to be included in the workspace along with the queries listed in each of the questions below.*

b. 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?

```
SELECT country_name2 country,
        r.region,
        CAST(difference/total_forest_area_sq_km_1990 * 100 AS DECIMAL (5, 2))
        percent_forest_difference,
        forest_population
FROM T6
JOIN regions r
ON r.country_name = T6.country_name2
AND T6.forest_population = 'Decrease'
```

```
AND country_name2 <> 'World'
ORDER BY 3 DESC
LIMIT 5
```

country	region	percent_forest_difference	forest_population
Togo	Sub-Saharan Africa	75.45	Decrease
Nigeria	Sub-Saharan Africa	61.8	Decrease
Uganda	Sub-Saharan Africa	59.13	Decrease
Mauritania	Sub-Saharan Africa	46.75	Decrease
Honduras	Latin America & Caribbean	45.03	Decrease

Countries with percentage forest increase:

```
 TTT AS
        (SELECT country_name2 country,
                r.region,
                CAST(difference/total_forest_area_sq_km_1990 * 100 AS DECIMAL (5, 2))
                percent_forest_difference,
                forest_population
        FROM T6
        JOIN regions r
        ON r.country_name = T6.country_name2
        AND T6.forest_population = 'Increase'
        AND country_name2 <> 'World'
        ORDER BY 3 )
SELECT country,
        region,
        ABS(percent_forest_difference) percent_increase
FROM TTT
ORDER BY 3 DESC
```

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

```
T6 AS
        (SELECT T5.country_name2,
                total_forest_area_sq_km_1990,
                Total_forest_area_sq_km_2016,
                total_forest_area_sq_km_1990 - total_forest_area_sq_km_2016 Difference,
        CASE
                WHEN total_forest_area_sq_km_1990 > total_forest_area_sq_km_2016 THEN
                'Decrease'
                WHEN total_forest_area_sq_km_1990 = total_forest_area_sq_km_2016 THEN
                'No Change'
                WHEN total_forest_area_sq_km_1990 IS NULL THEN 'No Data'
                WHEN total_forest_area_sq_km_2016 IS NULL THEN 'No Data'
        ELSE 'Increase'
        END AS forest_population
        FROM T4
        JOIN T5
        ON T4.country_name2 = T5.country_name2
        ORDER BY 4 DESC, 5 ),
T01 AS
        (SELECT country_name2 country,
                r.region, CAST(difference/total_forest_area_sq_km_1990 * 100 AS DECIMAL (5,
                2)) percent_forest_difference,
                forest_population
        FROM T6
        JOIN regions r
        ON r.country_name = T6.country_name2
        AND T6.forest_population = 'Decrease'
```

```
        AND country_name2 <> 'World'
        ORDER BY 3 DESC
        LIMIT 5),
T7 AS
        (SELECT country_name2,
                CAST(difference/total_forest_area_sq_km_1990 * 100 AS DECIMAL (5, 2))
                percent_forest_difference,
                forest_population
        FROM T6
        WHERE forest_population <> 'No Data'
        AND country_name2 <> 'World'
        ORDER BY 2 DESC),
T8 AS
        ( SELECT country_name2,
                percent_forest_area,
        CASE WHEN percent_forest_area BETWEEN 75.001 AND 100  THEN 4
                WHEN percent_forest_area BETWEEN 50.001 AND 75  THEN 3
                WHEN percent_forest_area BETWEEN 25.001 AND 50  THEN 2
                WHEN percent_forest_area BETWEEN 0 AND 25  THEN 1
                ELSE 0
        END AS quartile
        FROM T3
        WHERE forest_area_year = 2016
        AND percent_forest_area IS NOT NULL
        ORDER BY percent_forest_area DESC)

SELECT quartile, count(quartile) AS group_number_quartile
FROM T8
GROUP BY quartile
ORDER BY group_number_quartile DESC
```

quartile	group_number_quartile
1	85
2	73
3	38
4	9

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

```
SELECT T8.country_name2 country,
        r.region,
        T8.percent_forest_area
FROM T8
JOIN regions r
ON r.country_name = T8.country_name2
AND T8.percent_forest_area > 75
ORDER BY 3 DESC
```

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

```
SELECT count(country_name2) number_of_countries_forestarea_above_unitedstates
FROM T9
WHERE percent_forest_area > 33.93
```

Answer is 94

List of countries with increase in forest area FROM 1990 to 2016

```
SELECT country_name2 country,
        r.region,
        ABS(difference) increase_sqkm,
        forest_population
```

```
FROM T6
JOIN regions r
ON r.country_name = T6.country_name2
AND T6.forest_population = 'Increase'
AND country_name2 <> 'World'
ORDER BY 3 DESC
LIMIT 5
```

Countries with limited or no data

```
No_Data AS
        (SELECT T6.country_name2 country,
                r.region,
                T6.forest_population
        FROM T6
        JOIN regions r
        ON T6.country_name2 = r.country_name
        AND T6.forest_population = 'No Data')

SELECT T6.country_name2 country,
        r.region,
        total_forest_area_sq_km_1990 forest_area_1990,
        total_forest_area_sq_km_2016 forest_area_2016
FROM T6
JOIN regions r
ON T6.country_name2 = r.country_name
AND forest_population = 'No Data'
ORDER BY 2
```