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 **3.21%**.

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 **1,279,999.99 sqkm**).

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
East Asia & Pacific	**25.78**	**26.36**
Europe & Central Asia	**37.28**	**38.04**
Latin America & Caribbean	**51.03**	**46.16**
Middle East & North Africa	**1.78**	**2.07**
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 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 **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 **79,200 sqkm**, 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.

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**	**-542,510.00 sqkm**
Indonesia	**East Asia & Pacific**	**-282,193.98 sqkm**
Myanmar	**East Asia & Pacific**	**-107,234.00 sqkm**
Nigeria	**Sub-Saharan Africa**	**-106,506.00 sqkm**
Tanzania	**Sub-Saharan Africa**	**-102,320.00 sqkm**

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 & Carribean** 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
1 (0-25%)	**85**
2 (25-50%)	**72**
3 (50-75%)	**38**
4 (75-100%)	**9**

The largest number of countries in 2016 were found in the **first** 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.

There were **94** countries which had a higher percentage of forestation than the United States in 2016.

Table 3.4: Top Quartile Countries, 2016:

Region	Country	Forestation [%]	Percentile
Latin America & Caribbean	**Suriname**	**98.26**	**4**
East Asia & Pacific	**Micronesia, Fed. Sts.**	**91.86**	**4**
Sub-Saharan Africa	**Gabon**	**90.04**	**4**
Sub-Saharan Africa	**Seychelles**	**88.41**	**4**
East Asia & Pacific	**Palau**	**87.61**	**4**
East Asia & Pacific	**American Samoa**	**87.50**	**4**
Latin America & Caribbean	**Guyana**	**83.90**	**4**
East Asia & Pacific	**Lao PDR**	**82.11**	**4**
East Asia & Pacific	**Solomon Islands**	**77.86**	**4**

5. RECOMMENDATIONS

Within the last 26 years, a forest area larger than a whole country of the size of Peru was lost despite the majority of regions have reached a net increase in forestation. However, that world deforestation has despite occurred, is due to the fact that the regions with the highest forest areas have massively cut down their forests within the last three decades. Regarding the speed of forest loss, especially the Sub-Saharan African countries are extremely threatened. Togo, for example, sacrificed over three quarters of their whole forest area within about 25 years. Three other countries in Central Africa kept pace and also lost more than half of their forestation in this time.

Thus, one should focus on the countries in Latin America & Carribean, especially on Brazil, and prevent further deforestation. However, at least equally important is to concentrate on several countries in Central West Africa. There, deforestation has taken place on a very large scale ending up in loss of far more than 50% up to three quarters of their whole forest areas which they had in 1990. Nigeria is here of particular note. The country had been losing much more than half of its whole forest area from 1990 to 2016. Besides, it was also among the Top 5 countries with the highest overall loss of absolute forest area from 1990 to 2016 world wide.

6. APPENDIX: SQL-QUERIES USED

'(START) Create View for project'

```
CREATE VIEW forestation
AS
SELECT fa.country_code AS country_code_short,
       fa.country_name AS country_name,
       fa.year AS year_short,
       fa.forest_area_sqkm AS forest_area_sqkm,
       (la.total_area_sq_mi*2.59) AS land_area_sqkm,
        r.region AS region, r.income_group AS income_group,
       (forest_area_sqkm/(la.total_area_sq_mi*2.59)) AS 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 r.country_code=la.country_code
```

'(1) Queries related to section 1: GLOBAL SITUATION'

'Paragraph 1-1: SUM forest_areas WORLD in years 1990 and 2016'

```
SELECT country_code_short,
       country_name,
       year_short,
       CAST(SUM(forest_area_sqkm) AS DECIMAL(20,2))
FROM forestation
WHERE country_name='World' AND year_short IN (1990,2016)
GROUP BY 1,2,3
```

'Paragraph 1-1: SUM loss or relative forest_area in world year 2016 compared to 1990'

```
SELECT CAST((sub_2016_to_1990.diff_forest_area*100/sub_2016_to_1990.year_before) AS DECIMAL(4,2)) AS rel_forest_loss_percent
FROM (
SELECT country_code_short AS country_code_short,
                          year_short AS year_short,
                          year_before AS year_before,
                          ((sub_loss.forest_area_sqkm-sub_loss.year_before)*(-1)) AS diff_forest_area,
                          CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(4,2)) AS rel_forest
FROM (SELECT country_code_short,
             country_name,
             year_short,
             lag(forest_area_sqkm) OVER(ORDER BY year_short) AS year_before,
             forest_area_sqkm,
             land_area_sqkm
        FROM forestation
       WHERE country_name='World' AND year_short IN (1990,2016)) sub_loss) sub_2016_to_1990
```

'Paragraph 1-2: Country with land_area slightly smaller than loss of forest_area in world in year 2016'

```
WITH diff_table AS (SELECT country_code_short AS country_code_short,
                          year_short AS year_short,
                          ((sub_loss.forest_area_sqkm-sub_loss.year_before)*(-1)) AS diff_forest_area
                    FROM (SELECT country_code_short,
                                 country_name,
                                 year_short,
                                 lag(forest_area_sqkm) OVER(ORDER BY year_short) AS year_before,
                                 forest_area_sqkm
                                 FROM forestation
                                 WHERE country_name='World' AND year_short IN (1990,2016))sub_loss
                  WHERE year_short = 2016)

SELECT forestation.country_code_short,
       forestation.country_name,
       CAST(forestation.land_area_sqkm AS INTEGER),
       forestation.year_short,
       CAST(diff_table.diff_forest_area AS DECIMAL(20,2))
FROM forestation
JOIN diff_table
ON diff_table.year_short = forestation.year_short
WHERE forestation.land_area_sqkm<diff_table.diff_forest_area
ORDER BY forestation.land_area_sqkm DESC
LIMIT 1
```

'(2) Queries related to section 2: REGIONAL OUTLOOK'

'Paragraph (2-1): relative forest_area (forest_pct) in world in 2016'

```
SELECT country_name,
       year_short,
       (CAST(SUM(forest_area_sqkm)*100/SUM(land_area_sqkm) AS DECIMAL(20,2))) AS forest_pct,
       CAST(SUM(land_area_sqkm) AS DECIMAL(20,2)) AS land,
       CAST(SUM(forest_area_sqkm) AS DECIMAL(20,2)) AS forest
FROM forestation
WHERE country_name='World' AND year_short =2016
GROUP BY 1,2
```

'Paragraph (2-1): region with highest relative forestation (forest_percent) in 2016'

```
SELECT region,
       year_short,
      CAST((SUM(forest_area_sqkm)/SUM(land_area_sqkm)*100) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =2016 AND region !='World'
GROUP BY 1,2
ORDER BY forest_percent DESC
LIMIT 1
```

'Paragraph (2-1): region with lowest relative forestation (forest_percent) in 2016'

```
SELECT region,
       year_short,
      CAST((SUM(forest_area_sqkm)/SUM(land_area_sqkm)*100) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =2016 AND region !='World'
GROUP BY 1,2
ORDER BY forest_percent ASC
LIMIT 1
```

'Paragraph (2-2): relative forest_area (forest_pct) in world in 1990'

```
SELECT country_name,
       year_short,
       (CAST(SUM(forest_area_sqkm)*100/SUM(land_area_sqkm) AS DECIMAL(20,2))) AS forest_pct,
       CAST(SUM(land_area_sqkm) AS DECIMAL(20,2)) AS land,
       CAST(SUM(forest_area_sqkm) AS DECIMAL(20,2)) AS forest
FROM forestation
WHERE country_name='World' AND year_short =1990
GROUP BY 1,2
```

'Paragraph (2-2): region with highest relative forestation (forest_percent) in 2016'

```
SELECT region,
       year_short,
      CAST((SUM(forest_area_sqkm)/SUM(land_area_sqkm)*100) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =1990 AND region !='World'
GROUP BY 1,2
ORDER BY forest_percent DESC
LIMIT 1
```

'Paragraph (2-2): region with lowest relative forestation (forest_percent) in 2016'

```
SELECT region,
       year_short,
      CAST((SUM(forest_area_sqkm)/SUM(land_area_sqkm)*100) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =1990 AND region !='World'
GROUP BY 1,2
ORDER BY forest_percent ASC
LIMIT 1
```

'Paragraph (2-3): Table (2.1),1st and 2nd column: regions with relative forestation in 1990'

```
SELECT region,
      CAST((SUM(forest_area_sqkm)*100/SUM(land_area_sqkm)) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =1990 AND region !='World'
GROUP BY 1
ORDER BY region ASC
```

'Paragraph (2-3):Table (2.1),3rd column: regions with relative forestation in 2016'

```
SELECT region,
      CAST((SUM(forest_area_sqkm)*100/SUM(land_area_sqkm)) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =2016 AND region !='World'
GROUP BY 1
ORDER BY region ASC
```

'Paragraph (2-4): regions with decrease forestation in percent from 1990 to 2016'

```
WITH table_1990 AS (SELECT region AS region_1990,
      CAST((SUM(forest_area_sqkm)*100/SUM(land_area_sqkm)) AS DECIMAL(4,2)) AS forest_percent
FROM forestation
WHERE year_short =1990 AND region !='World'
GROUP BY 1
ORDER BY region ASC),

    table_2016 AS (SELECT region AS region_2016,
          CAST((SUM(forest_area_sqkm)*100/SUM(land_area_sqkm)) AS DECIMAL(4,2)) AS forest_percent
    FROM forestation
    WHERE year_short =2016 AND region !='World'
    GROUP BY 1
    ORDER BY region ASC)

    SELECT region_1990,
           table_1990.forest_percent AS forest_pct_1990,
           table_2016.forest_percent AS forest_pct_2016,
           CAST((-1)*(table_1990.forest_percent-table_2016.forest_percent)AS DECIMAL(20,2)) AS forest_pct_loss
    FROM table_1990
    JOIN table_2016
    ON table_1990.region_1990=table_2016.region_2016
    WHERE CAST((-1)*(table_1990.forest_percent-table_2016.forest_percent)AS DECIMAL(20,2))<0
    ORDER BY forest_pct_loss ASC
```

'(3) Queries related to section 3: COUNTRY-LEVEL DETAIL'

'(Paragraph 3-1): Success Stories: Two countries with highest total increase forestation in 1990 vs. 2016'

```
SELECT diff_abs.country_name,
       CAST(diff_abs.lag AS DECIMAL(20,2)) AS forest_1990,
       CAST(diff_abs.forest_area_sqkm AS DECIMAL(20,2)) AS forest_2016,
       CAST((diff_abs.forest_area_sqkm-diff_abs.lag) AS DECIMAL(20,2)) AS change_abs
  FROM ( SELECT country_name,
                lag(forest_area_sqkm) OVER(ORDER BY country_name,year_short ASC) AS lag,
                year_short,
                forest_area_sqkm
           FROM (SELECT country_name,
                        year_short,
                        (SUM(forest_area_sqkm)) AS forest_area_sqkm
                   FROM forestation
                  WHERE year_short IN (1990,2016) AND country_name !='World'
               GROUP BY 1,2
               ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests) diff_abs
WHERE year_short=2016 AND  (diff_abs.forest_area_sqkm-diff_abs.lag) IS NOT NULL
ORDER BY change_abs DESC
LIMIT 2
```

'(Paragraph 3-1): country with highest relative forestation in 1990 vs. 2016'

```
SELECT diff_abs.country_name,
       CAST(diff_abs.lag AS DECIMAL(20,2)) AS forest_1990,
       CAST(diff_abs.forest_area_sqkm AS DECIMAL(20,2)) AS forest_2016,
       CAST((diff_abs.forest_area_sqkm-diff_abs.lag) AS DECIMAL(20,2)) AS change_abs,
       CAST(((diff_abs.forest_area_sqkm-diff_abs.lag)*100)/diff_abs.lag AS DECIMAL(20,2)) AS change_rel_pct
  FROM ( SELECT country_name,
                lag(forest_area_sqkm) OVER(ORDER BY country_name,year_short ASC) AS lag,
                year_short,
                forest_area_sqkm,
                land_area_sqkm
           FROM (SELECT country_name,
                        year_short,
                        (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                        (SUM(land_area_sqkm)) AS land_area_sqkm
                   FROM forestation
                  WHERE year_short IN (1990,2016) AND country_name !='World'
               GROUP BY 1,2
               ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests) diff_abs
WHERE year_short=2016 AND  (diff_abs.forest_area_sqkm-diff_abs.lag) IS NOT NULL
ORDER BY change_rel_pct DESC
LIMIT 1
```

'(Paragraph 3-2): Table 3.1: Five countries with highest total decrease forestation in 1990 vs. 2016'

```
SELECT region,
       diff_abs.country_name,
       CAST(diff_abs.lag AS DECIMAL(20,2)) AS forest_1990,
       CAST(diff_abs.forest_area_sqkm AS DECIMAL(20,2)) AS forest_2016,
       CAST((diff_abs.forest_area_sqkm-diff_abs.lag) AS DECIMAL(20,2)) AS change_abs
  FROM ( SELECT region,
                country_name,
                lag(forest_area_sqkm) OVER(ORDER BY country_name,year_short ASC) AS lag,
                year_short,
                forest_area_sqkm
           FROM (SELECT region,
                        country_name,
                        year_short,
                        (SUM(forest_area_sqkm)) AS forest_area_sqkm
                   FROM forestation
                  WHERE year_short IN (1990,2016) AND country_name !='World'
               GROUP BY 1,2,3
               ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests) diff_abs
WHERE year_short=2016 AND (diff_abs.forest_area_sqkm-diff_abs.lag) IS NOT NULL
ORDER BY change_abs ASC
LIMIT 5
```

'(Paragraph 3-3): Table 3.2: Five countries with relative decrease forestation in 1990 vs. 2016'

```
SELECT diff_abs.country_name,
       CAST(diff_abs.lag AS DECIMAL(20,2)) AS forest_1990,
       CAST(diff_abs.forest_area_sqkm AS DECIMAL(20,2)) AS forest_2016,
       CAST((diff_abs.forest_area_sqkm-diff_abs.lag) AS DECIMAL(20,2)) AS change_abs,
       CAST(((diff_abs.forest_area_sqkm-diff_abs.lag)*100)/diff_abs.lag AS DECIMAL(20,2)) AS change_rel
  FROM ( SELECT country_name,
                lag(forest_area_sqkm) OVER(ORDER BY country_name,year_short ASC) AS lag,
                year_short,
                forest_area_sqkm,
                land_area_sqkm
           FROM (SELECT country_name,
                        year_short,
                        (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                        (SUM(land_area_sqkm)) AS land_area_sqkm
                   FROM forestation
                  WHERE year_short IN (1990,2016) AND country_name !='World'
               GROUP BY 1,2
               ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests) diff_abs
WHERE year_short=2016 AND  (diff_abs.forest_area_sqkm-diff_abs.lag) IS NOT NULL
ORDER BY change_rel ASC
LIMIT 5
```

'(Paragraph 3-6): Table 3.3: Count of countries in each quartile'

```
SELECT percentiles,
       COUNT(*) AS number_of_countries
FROM ( SELECT country_name,
       CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) AS rel_forest,
       CASE WHEN (forest_area_sqkm*100/land_area_sqkm)  >= 75 THEN 4
            WHEN (forest_area_sqkm*100/land_area_sqkm)  >=50 AND (forest_area_sqkm*100/land_area_sqkm) <75 THEN 3
            WHEN (forest_area_sqkm*100/land_area_sqkm)  >=25 AND (forest_area_sqkm*100/land_area_sqkm) <50 THEN 2
            WHEN (forest_area_sqkm*100/land_area_sqkm)  >0 AND (forest_area_sqkm*100/land_area_sqkm) <25 THEN 1 END AS PERCENTILES
        FROM (SELECT country_name,
                     year_short,
                     (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                     (SUM(land_area_sqkm)) AS land_area_sqkm
                FROM forestation
               WHERE year_short = 2016 AND country_name !='World'
            GROUP BY 1,2
            ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests
               WHERE CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) IS NOT NULL
            ORDER BY rel_forest DESC) sub
GROUP BY percentiles
ORDER BY 1
```

'(Paragraph 3-7): Countries in Top Percentile (Group with highest relative forestation)'

```
SELECT region AS region,
       country_name AS country_with_over_75_percent_forest,
       rel_forest AS rel_forest,
       percentiles AS percentile_group
FROM ( SELECT region,
              country_name,
              CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) AS rel_forest,
              CASE WHEN (forest_area_sqkm*100/land_area_sqkm)  >= 75 THEN 4
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >=50 AND (forest_area_sqkm*100/land_area_sqkm) <75 THEN 3
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >=25 AND (forest_area_sqkm*100/land_area_sqkm) <50 THEN 2
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >0 AND (forest_area_sqkm*100/land_area_sqkm) <25 THEN 1 END AS PERCENTILES
       FROM (SELECT region,
                    country_name,
                    year_short,
                    (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                    (SUM(land_area_sqkm)) AS land_area_sqkm
               FROM forestation
              WHERE year_short = 2016 AND country_name !='World'
           GROUP BY 1,2,3
           ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests
       WHERE CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) IS NOT NULL
       ORDER BY rel_forest DESC) sub_table_rel_forest
WHERE percentiles = 4
```

'(Paragraph 3-8): Number of countries in Top Percentile'

```
SELECT COUNT(*) AS number_of_countries_in_top_quartile
FROM (
SELECT region AS region,
       country_name AS country_with_over_75_percent_forest,
       rel_forest AS rel_forest,
       percentiles AS percentile_group
FROM ( SELECT region,
              country_name,
              CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) AS rel_forest,
              CASE WHEN (forest_area_sqkm*100/land_area_sqkm)  >= 75 THEN 4
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >=50 AND (forest_area_sqkm*100/land_area_sqkm) <75 THEN 3
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >=25 AND (forest_area_sqkm*100/land_area_sqkm) <50 THEN 2
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >0 AND (forest_area_sqkm*100/land_area_sqkm) <25 THEN 1 END AS PERCENTILES
       FROM (SELECT region,
                    country_name,
                    year_short,
                    (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                    (SUM(land_area_sqkm)) AS land_area_sqkm
               FROM forestation
              WHERE year_short = 2016 AND country_name !='World'
           GROUP BY 1,2,3
           ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests
       WHERE CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) IS NOT NULL
       ORDER BY rel_forest DESC) sub_table_rel_forest
WHERE percentiles = 4) sub_percentile_4
```

'(Paragraph 3-9): Number of countries with higher percentage of forestation than the US'

```
WITH table_countries AS (SELECT region AS region,
                            country_name AS country_name,
                            rel_forest AS rel_forest,
                            percentiles AS percentile_group
                       FROM ( SELECT region, country_name,
                              CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) AS rel_forest,
                              CASE WHEN (forest_area_sqkm*100/land_area_sqkm)  >= 75 THEN 4
                                   WHEN (forest_area_sqkm*100/land_area_sqkm)  >=50 AND (forest_area_sqkm*100/land_area_sqkm) <75 THEN 3
                                   WHEN (forest_area_sqkm*100/land_area_sqkm)  >=25 AND (forest_area_sqkm*100/land_area_sqkm) <50 THEN 2
                                   WHEN (forest_area_sqkm*100/land_area_sqkm)  >0 AND (forest_area_sqkm*100/land_area_sqkm) <25 THEN 1
                              END AS PERCENTILES
                              FROM (SELECT region,
                                           country_name,
                                           year_short,
                                          (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                                          (SUM(land_area_sqkm)) AS land_area_sqkm
                                      FROM forestation
                                     WHERE year_short = 2016 AND country_name !='World'
                                  GROUP BY 1,2,3
                                  ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests
                         WHERE CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) IS NOT NULL
                         ORDER BY rel_forest DESC) sub_table_rel_forest),

       table_US AS (SELECT country_name,
                           rel_forest AS rel_forest_US
                      FROM table_countries
                     WHERE country_name LIKE 'United States')

SELECT COUNT(*) AS number_of_countries_with_higher_forestation_than_US
FROM table_countries
WHERE rel_forest > (SELECT rel_forest_US FROM table_us)
```

'(Paragraph 3-10): Table3.4: Countries in Top Percentile (Group with highest relative forestation)'

```
SELECT region AS region,
       country_name AS country_with_over_75_percent_forest,
       rel_forest AS rel_forest,
       percentiles AS percentile_group
FROM ( SELECT region,
              country_name,
              CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) AS rel_forest,
              CASE WHEN (forest_area_sqkm*100/land_area_sqkm)  >= 75 THEN 4
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >=50 AND (forest_area_sqkm*100/land_area_sqkm) <75 THEN 3
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >=25 AND (forest_area_sqkm*100/land_area_sqkm) <50 THEN 2
              WHEN (forest_area_sqkm*100/land_area_sqkm)  >0 AND (forest_area_sqkm*100/land_area_sqkm) <25 THEN 1 END AS PERCENTILES
       FROM (SELECT region,
                    country_name,
                    year_short,
                    (SUM(forest_area_sqkm)) AS forest_area_sqkm,
                    (SUM(land_area_sqkm)) AS land_area_sqkm
               FROM forestation
              WHERE year_short = 2016 AND country_name !='World'
           GROUP BY 1,2,3
           ORDER BY forest_area_sqkm ASC) sub_country_absolute_forests
       WHERE CAST((forest_area_sqkm*100/land_area_sqkm) AS DECIMAL(20,2)) IS NOT NULL
       ORDER BY rel_forest DESC) sub_table_rel_forest
WHERE percentiles = 4
```