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 _41282694.9__ in 1990. As of 2016, the most recent year for which data was available, that number had fallen to __39958245.9 , a loss of __1324449_, or _____3.3145824351614_____%.

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 ___1279999.9891___).

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
Latin America & Caribbean	51.03	46.16
Sub-Saharan Africa	30.67	28.79
World	32.42	31.38
Europe & Central Asia	37.28	38.04
North America	35.65	36.04
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 & 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 _____527229.06_____. 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 _____79200.00___, much lower than the figure for _____China_____.

_____China_____ and _____United States_____ are of course very large countries in total land area, so when we look at the largest *percent* change in forest area from 1990 to 2016,

we aren't surprised to find a much smaller country listed at the top. __Iceland____increased in forest area by _213.66____% 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	541510
Indonesia	East Asia & Pacific	282193
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	161.78
Nigeria	Sub-Saharan Africa	144.67
Uganda	Sub-Saharan Africa	87.78
Mauritania	Sub-Saharan Africa	81.93
Honduras	Latin America & Caribbean	76.84

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_____, __Ugande_____, 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
4	9
1	85
3	38
2	72

The largest number of countries in 2016 were found in the _____4__ 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	87.50
Guyana	Latin America & Caribbean	83.90
Lao PDR	East Asia & Pacific	82.11
Solomon Islands	East Asia & Pacific	77.86

4. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*
- *I learned that the World is losing a large amount of her forest area, with this data from 1990 to 2016 which shows that the loss is comparable to the land area of Peru*
-
- *Which countries should we focus on over others?*
- *This data also shows that the countries in these region of the World:*
- *Sub:saharan Africa and Latin America & Caribbean are most affected especially NIGERIA as a country in particular.*

5. APPENDIX: SQL Queries Used

```
CREATE VIEW forestation AS
 (SELECT
        forest_area.country_code,
        forest_area.country_name,
        forest_area.year,
        forest_area.forest_area_sqkm,
        land_area.total_area_sq_mi  * 2.59 AS total_area_sqkm,
        regions.region,
        regions.income_group,
        forest_area.forest_area_sqkm/(land_area.total_area_sq_mi  *            2.59) *100 AS
per_land_area
   FROM forest_area
```

```
  INNER JOIN land_area
  ON forest_area.country_code = land_area.country_code
  AND forest_area.year = land_area.year
  INNER JOIN regions
  ON forest_area.country_code = regions.country_code)
```

Q1a&b

```
SELECT country_name, year ,forest_area_sqkm
FROM  forestation
WHERE country_name = 'World'
AND year = 1990;

SELECT country_name, year, forest_area_sqkm
FROM  forestation
WHERE country_name = 'World'
AND year = 2016;
```

Q1c&d

```
WITH year_1990 AS
(SELECT country_name, year ,forest_area_sqkm
FROM  forestation
WHERE country_name = 'World'
AND year = 1990),
year_2016 AS
(SELECT country_name, year, forest_area_sqkm
FROM  forestation
WHERE country_name = 'World'
AND year = 2016)
SELECT ((SELECT forest_area_sqkm FROM year_1990) -
       (SELECT forest_area_sqkm FROM year_2016))/
      (SELECT forest_area_sqkm FROM year_2016) * 100
```

Q1e

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

```
WHERE country_name = 'World'
AND year = 2016)
SELECT (SELECT forest_area_sqkm FROM year_1990) -
      (SELECT forest_area_sqkm FROM year_2016) AS diff, country_name, total_area_sqkm
 FROM forestation
 WHERE total_area_sqkm <=  1324449
 AND year = 2016
 ORDER BY 3 DESC
 LIMIT 3;


Q2.1a
SELECT  country_name,forest_area_sqkm,total_area_sqkm,
   ROUND(CAST(forest_area_sqkm * 100/total_area_sqkm AS NUMERIC),2)  AS
percent_world_forest
FROM forestation
WHERE country_name = 'World'
AND year = 2016

Q2.1b
SELECT  COUNT(*),SUM(forest_area_sqkm),SUM(total_area_sqkm),
   ROUND(CAST(SUM(forest_area_sqkm) * 100/SUM(total_area_sqkm) AS NUMERIC),2)  AS
percent_world_forest, region
FROM forestation
WHERE
 year = 2016
 GROUP BY region
ORDER BY  4 DESC;

Q2.2a
SELECT  country_name,forest_area_sqkm,total_area_sqkm,
   ROUND(CAST(forest_area_sqkm * 100/total_area_sqkm AS NUMERIC),2)  AS
percent_world_forest
FROM forestation
WHERE country_name = 'World'
AND year = 1990;

Q2.2b
SELECT  COUNT(*),SUM(forest_area_sqkm),SUM(total_area_sqkm),
   ROUND(CAST(SUM(forest_area_sqkm) * 100/SUM(total_area_sqkm) AS NUMERIC),2)  AS
percent_world_forest, region
FROM forestation
WHERE
```

```
 year = 1990
 GROUP BY region
ORDER BY  4 ;
```

3.B.1

```
WITH year_1990 AS
(SELECT  forest_area_sqkm, country_name,region
FROM forestation
WHERE  region != 'World' AND
 year = 1990),
 year_2016 AS
   (SELECT  forest_area_sqkm, country_name,region
FROM forestation
WHERE region != 'World' AND
 year = 2016)
  SELECT year_1990.country_name AS country,year_1990.region AS world_region,
year_2016.forest_area_sqkm AS forest_area_2016, year_1990.forest_area_sqkm AS
forest_area_1990,ROUND(CAST((year_1990.forest_area_sqkm -
year_2016.forest_area_sqkm)AS NUMERIC),2) AS forest_diff
  FROM year_1990  INNER JOIN year_2016
  ON year_1990.country_name = year_2016.country_name
  WHERE year_1990.forest_area_sqkm > year_2016.forest_area_sqkm

  ORDER BY 5 DESC
  LIMIT 6;
```

3A a

```
WITH year_1990 AS
(SELECT  forest_area_sqkm, country_name,region, total_area_sqkm
FROM forestation
WHERE
```

```
 year = 1990),
 year_2016 AS
   (SELECT  forest_area_sqkm, country_name,region,  total_area_sqkm
FROM forestation
WHERE
 year = 2016)
  SELECT year_1990.country_name AS country,year_1990.region AS
world_region,year_1990.total_area_sqkm AS land_area, year_2016.forest_area_sqkm AS
forest_area_2016, year_1990.forest_area_sqkm AS
forest_area_1990,ROUND(CAST((year_2016.forest_area_sqkm -
year_1990.forest_area_sqkm)AS NUMERIC),2) AS forest_diff
  FROM year_1990  INNER JOIN year_2016
  ON year_1990.country_name = year_2016.country_name
  WHERE year_1990.forest_area_sqkm < year_2016.forest_area_sqkm
  ORDER BY 6 DESC
  LIMIT 4;
```

3Ab

```
WITH year_1990 AS
(SELECT  forest_area_sqkm, country_name,region
FROM forestation
WHERE
 year = 1990),
 year_2016 AS
   (SELECT  forest_area_sqkm, country_name,region
FROM forestation
WHERE
 year = 2016)
  SELECT year_1990.country_name AS country,year_1990.region AS world_region,
year_2016.forest_area_sqkm AS forest_area_2016, year_1990.forest_area_sqkm AS
forest_area_1990,ROUND(CAST((year_2016.forest_area_sqkm -
year_1990.forest_area_sqkm)AS NUMERIC),2) AS
forest_diff,ROUND(CAST(((year_2016.forest_area_sqkm - year_1990.forest_area_sqkm)/
year_1990.forest_area_sqkm * 100) AS NUMERIC),2)  AS percent_decrease
  FROM year_1990 INNER JOIN year_2016
  ON year_1990.country_name = year_2016.country_name
  WHERE year_1990.forest_area_sqkm < year_2016.forest_area_sqkm
  ORDER BY 6 DESC
  LIMIT 6;
```

3.B.2

```
WITH year_1990 AS
(SELECT  forest_area_sqkm, country_name,region
FROM forestation
WHERE
 year = 1990),
 year_2016 AS
   (SELECT  forest_area_sqkm, country_name,region
FROM forestation
WHERE
 year = 2016)
  SELECT year_1990.country_name AS country,year_1990.region AS world_region,
year_2016.forest_area_sqkm AS forest_area_2016, year_1990.forest_area_sqkm AS
forest_area_1990,ROUND(CAST((year_1990.forest_area_sqkm -
year_2016.forest_area_sqkm)AS NUMERIC),2) AS
forest_diff,ROUND(CAST(((year_1990.forest_area_sqkm - year_2016.forest_area_sqkm)/
year_2016.forest_area_sqkm * 100) AS NUMERIC),2)  AS percent_decrease
  FROM year_1990 INNER JOIN year_2016
  ON year_1990.country_name = year_2016.country_name
  WHERE year_1990.forest_area_sqkm > year_2016.forest_area_sqkm
  ORDER BY 6 DESC
  LIMIT 6;
```

3.3 C

```
WITH country_2016 AS
(SELECT country_name, region, forest_area_sqkm/total_area_sqkm *100  AS pct_forest
FROM forestation
WHERE year = 2016
  AND country_name != 'WORLD'
 AND forest_area_sqkm IS NOT NULL AND total_area_sqkm IS NOT NULL),
 quartile_table AS
   (SELECT *,
      CASE
```

```
      WHEN pct_forest > 75 THEN 4
      WHEN pct_forest > 50 THEN 3
      WHEN pct_forest > 25 THEN 2
      ELSE 1 END AS quartile
 FROM country_2016)
SELECT quartile,COUNT(*)
FROM quartile_table
WHERE quartile IS NOT NULL AND country_name != 'World'
GROUP BY 1
```

3.4. C

```
WITH country_2016 AS
(SELECT country_name, region, forest_area_sqkm/total_area_sqkm *100  AS pct_forest
FROM forestation
WHERE year = 2016),
 quartile_table AS
   (SELECT *,
      CASE
      WHEN pct_forest > 75 THEN 4
      WHEN pct_forest > 50 THEN 3
      WHEN pct_forest > 25 THEN 2
      ELSE 1 END AS quartile
 FROM country_2016),
 quartile_count AS
(SELECT quartile,COUNT(*)
FROM quartile_table
GROUP BY 1)
SELECT country_name, region, ROUND(CAST(pct_forest AS NUMERIC),2)
FROM quartile_table
WHERE quartile = 4
ORDER BY 3 DESC
```