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 _____41282694.90_____ 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 _____3.21_____%.

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 ____1279999.9891_____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 _____2.06_____% 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 _____1.77524062469353_____% 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	
Europe & Central Asia	37.28	38.04	
North America	35.65	36.04	
World	32.42	31.38	
Sub-Saharan Africa	30.67	28.79	
East Asia & Pacific	25.78	26.36	
South Asia	16.51	17.51	
Middle East & North Africa	1.78	2.07	

The only regions of the world that decreased in percent forest area from 1990 to 2016 were _____Latin America & 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 ___527229.062_____. 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_____.

_____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	
World	World	1324449	
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	75.45	
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.

C. QUARTILES

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

Quartile	Number of Countries
0-25	85
25-50	73
50-75	38
75-100	9

The largest number of countries in 2016 were found in the ___0-25 (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.

Table 3.4: Top Quartile Countries, 2016:

Country	Region	Pct Designated as Forest	
Suriname	Latin America & Caribbean	98.25769	
Micronesia, Fed. Sts.	East Asia & Pacific	91.85724	
Gabon	Sub-Saharan Africa	90.03764	

Seychelles	Sub-Saharan Africa	88.41114	
Palau	East Asia & Pacific	87.60681	
American Samoa	East Asia & Pacific	87.50009	
Guyana	Latin America & Caribbean	83.90145	
Lao PDR	East Asia & Pacific	82.10823	
Solomon Islands	East Asia & Pacific	77.86352	

5. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*
  Although some countries like Iceland or Bahrain are having good performance in increasing green areas, the amount of loss of green areas in other countries such as Tago or Uganda not only cancels out the developments in Iceland or Uruguay but also creates more arid areas. This is readily apparent from the decrease in forest percentage throughout the World.

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

With 4 out of 5 countries with top percent decrease being from Sub- Saharan Africa, we should pay more attention to the less-advantaged parts of the world.
We should stop the trend of ‘richs becoming reacher and poors becoming poorer’ or ‘good becoming better and bad just worsening’.
Every part of the world needs attention. Plus, as it seems, the power(speed) of desertification is more than our speed in creating greenery.

Appendix

Queries:

```
CREATE VIEW Forestation AS
SELECT r.country_name,
 f.year,
 r.income_group,
 r.region,
 l.total_area_sq_mi,
 f.forest_area_sqkm,
 ((forest_area_sqkm)*100 / (total_area_sq_mi*2.59)) AS percentage_forest
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
```

1. GLOBAL SITUATION

A: the total forest area of the world in 1990

```
SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 1990 AND country_name = 'World'
GROUP BY 1
```

B: the total forest area of the world in 2016

```
SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 2016 AND country_name = 'World'
GROUP BY 1
```

C: : loss of total forest area of the world from 1990 to 2016

```
WITH t1 AS
(SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 1990 AND country_name = 'World'
GROUP BY 1),
t2 AS
(SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 2016 AND country_name = 'World'
GROUP BY 1)

SELECT (t1.total_forest_area - t2.total_forest_area) AS difference_in_forestation
FROM t1,t2
```

D: percentage loss of .total forest area of the world from 1990 to 2016

```
WITH t1 AS
(SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 1990 AND country_name = 'World'
GROUP BY 1),
t2 AS
(SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 2016 AND country_name = 'World'
GROUP BY 1)

SELECT (t1.total_forest_area - t2.total_forest_area)*100/(t1.total_forest_area) AS
difference_in_forestation
FROM t1,t2
```

E. forest area lost over this time period is slightly more than the entire land area of which country? How much is that?

```
WITH t1 AS
(SELECT country_name, SUM(forest_area_sqkm) total_forest_area
FROM forestation
WHERE year = 1990 AND country_name = 'World'
GROUP BY 1),
t2 AS
(SELECT country_name, SUM(forest_area_sqkm) AS total_forest_area
FROM forestation
WHERE year = 2016 AND country_name = 'World'
GROUP BY 1)

SELECT (t1.total_forest_area - t2.total_forest_area) AS difference_in_forestation,
forestation.total_area_sq_mi*2.59 AS total_land, forestation.country_name
FROM t1,t2,forestation
WHERE year = 2016
ORDER BY total_land DESC
```

2.REGIONAL OUTLOOK

A: the percent of the total land area of the world designated as forest in 2016

```
SELECT region, ROUND(CAST(world_percentage_forest AS numeric),2)
FROM(SELECT region, SUM(percentage_forest) AS world_percentage_forest
FROM forestation
WHERE year = 2016 AND region = 'World'
GROUP BY 1)sub
ORDER BY 2
```

A.1: region with the highest/lowest relative forestation in 2016

```
SELECT region, ROUND(CAST(region_percentage_forest AS numeric),2)
FROM(SELECT region, Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59) AS
region_percentage_forest
FROM forestation
WHERE year = 2016
GROUP BY region
ORDER BY region_percentage_forest) sub
```

B.1: the percent of the total land area of the world designated as forest in 1990

```
SELECT region, ROUND(CAST(world_percentage_forest AS numeric),2)
FROM(SELECT region, SUM(percentage_forest) AS world_percentage_forest
FROM forestation
WHERE year = 1990 AND region = 'World'
GROUP BY 1)sub
```

B.2: region with the highest/lowest relative forestation in 2016

```
SELECT region, ROUND(CAST(region_percentage_forest AS numeric),2)
FROM(SELECT region, Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59) AS
region_percentage_forest
FROM forestation
WHERE year = 1990
GROUP BY region
ORDER BY region_percentage_forest) sub
```

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

```
WITH t1 as
(SELECT region, ROUND(CAST(region_percentage_forest AS numeric),2)
FROM(SELECT region, Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59) AS
region_percentage_forest
FROM forestation
WHERE year = 2016
GROUP BY region
ORDER BY region_percentage_forest) sub),
t2 as
(SELECT region, ROUND(CAST(region_percentage_forest AS numeric),2)
FROM(SELECT region, Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59) AS
region_percentage_forest
FROM forestation
WHERE year = 1990
GROUP BY region
ORDER BY region_percentage_forest) sub)

SELECT t1.region,  t2.round as region_1990_percentage_forest, t1.round as
region_2016_percentage_forest
FROM t1
JOIN t2
ON t1.region = t2.region
ORDER BY region_2016_percentage_forest DESC
```

3.COUNTRY-LEVEL DETAIL

A. Table3.1: Top 5 Amount Decrease in Forest Area by Country, 1990 & 2016

```
WITH t1 as
(SELECT country_name, SUM(forest_area_sqkm) forest_area, year
FROM Forestation
WHERE year = 1990
GROUP BY 1,3
ORDER BY year),

t2 as
(SELECT country_name, SUM(forest_area_sqkm) forest_area, year
FROM Forestation
WHERE year = 2016
GROUP BY 1,3
ORDER BY year)

SELECT t1.country_name, region,  (t1.forest_area - t2.forest_area)  as
difference_in_forest_area_km
FROM t1
JOIN t2
ON t1.country_name = t2.country_name
JOIN regions r
ON r.country_name = t1.country_name
WHERE (t1.forest_area - t2.forest_area) IS NOT NULL
ORDER BY difference_in_forest_area_km  DESC
LIMIT 6;
```

B. Table 3.2: Top 5 Percent Decrease in Forest Area by Country, 1990 & 2016

```
WITH t1 as
(SELECT country_name, SUM(forest_area_sqkm) forest_area, year
FROM Forestation
WHERE year = 1990
GROUP BY 1,3
ORDER BY year),

t2 as
(SELECT country_name, SUM(forest_area_sqkm) forest_area, year
FROM Forestation
WHERE year = 2016
GROUP BY 1,3
```

```
ORDER BY year)
SELECT sub.country_name, sub.region,
ROUND(CAST(percentage_difference_in_forest_area  as NUMERIC),2)
FROM(SELECT t1.country_name, region,  ((t1.forest_area -
t2.forest_area)*100/t1.forest_area)  as percentage_difference_in_forest_area
FROM t1
JOIN t2
ON t1.country_name = t2.country_name
JOIN regions r
ON r.country_name = t1.country_name
WHERE (t1.forest_area - t2.forest_area) IS NOT NULL
ORDER BY percentage_difference_in_forest_area      DESC
LIMIT 5) sub
```

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

```
WITH t1 as
(SELECT country_name, Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59)
AS region_percentage_forest, year
FROM forestation
WHERE year = 2016
GROUP BY country_name, year
ORDER BY region_percentage_forest)

SELECT DISTINCT quartiles, COUNT(country_name) OVER (Partition BY quartiles)
FROM(SELECT country_name,
    CASE
 WHEN region_percentage_forest<25 THEN '0-25'
 WHEN region_percentage_forest>=25
 AND region_percentage_forest<50 THEN '25-50'
 WHEN region_percentage_forest>=50
 AND region_percentage_forest<75 THEN '50-75'
 ELSE '75-100'
 END AS quartiles
   FROM t1
   WHERE year = 2016 and region_percentage_forest IS NOT NULL )sub
   Order by quartiles
```

D: Top Quartile Countries, 2016:

```
SELECT country_name, percentage_forest
FROM forestation
WHERE year = 2016 AND percentage_forest>=75 AND percentage_forest IS NOT
NULL
 _____OR_____
```

```
WITH t1 as
(SELECT country_name, Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59)
AS country_percentage_forest, year
FROM forestation
WHERE year = 2016
GROUP BY country_name, year
ORDER BY country_percentage_forest)

SELECT country_name, country_percentage_forest
FROM t1
WHERE country_percentage_forest>=75
ORDER BY     country_percentage_forest DESC
```

E. Countries with forest percentage more than that of US

```
WITH t1 as
(SELECT Sum(forest_area_sqkm)*100 / Sum(total_area_sq_mi*2.59) AS
country_percentage_forest
FROM forestation
WHERE year = 2016 AND country_name = 'United States'
GROUP BY country_name, year
ORDER BY country_percentage_forest)
SELECT COUNT(country_name)
FROM forestation
JOIN t1
ON forestation.percentage_forest > t1.country_percentage_forest
WHERE year = 2016 aND percentage_forest IS NOT NULL
```