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 **41 282 695 km^2** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39 958 246 km^2**, a loss of **1 324 449 km^2**, or **3.2%**.

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 **1 280 000 km^2**).

2. REGIONAL OUTLOOK

In 2016, the percent of the total land area of the world designated as forest was **39 958 246 km^2**. The region with the highest relative forestation was **Latin America & Caribbean**, with **46.2%**, 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 **41 282 695 km^2**. The region with the highest relative forestation was **Latin America & Caribbean**, with **51%**, and the region with the lowest relative forestation was **Middle East & North Africa**, with **1.8%** 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	**37.3**	**38.06**
North America	**35.65**	**36.04**
Sub-Saharan Africa	**32.19**	**28.72**
East Asia & Pacific	**25.57**	**26.29**
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 **Sub-Saharan Africa** (dropped from **32.19%** to **28.72%**) and **Latin America & Caribbean** (**51.03%** to **46.16%**). 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 km^2**. 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 km^2**, 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%** 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**	**541 510 km^2**
Indonesia	**East Asia & Pacific**	**282 193 km^2**
Myanmar	**East Asia & Pacific**	**107 234 km^2**
Nigeria	**Sub-Saharan Africa**	**106 506 km^2**
Tanzania	**Sub-Saharan Africa**	**102 320 km^2**

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%**
Nigeria	**Sub-Saharan Africa**	**61%**
Uganda	**Sub-Saharan Africa**	**59%**
Mauritania	**Sub-Saharan Africa**	**46%**
Honduras	**Latin America & Caribbean**	**45%**

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
4th quartile	**9**
3rd quartile	**38**
2nd quartile	**72**
1st quartile	**85**

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%**
Micronesia, Fed. Sts.	**East Asia & Pacific**	**92%**
Gabon	**Sub-Saharan Africa**	**90%**
Seychelles	**Sub-Saharan Africa**	**88%**
Paulu	**East Asia & Pacific**	**88%**
American Samoa	**East Asia & Pacific**	**87%**
Guyana	**Latin America & Caribbean**	**83%**
Lao PDR	**East Asia & Pacific**	**82%**
Solomon Islands	**East Asia & Pacific**	**77%**

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?*

Forest are one of main parts of Earth ecosystem. When we learn that earth lost 2% forest, we think that this not so much, but after that we look on square kilometers of disappearing forest and realize how huge this impact is.

Wood is very valuable resource for humanity, but also for our planet. Forest prevent soil from erosion, transporting water and producing oxygen. When we cut all those forests, we not only damage ecosystem, but also air which we breathe and soil from where we eat.

And we have countries like Nigeria or Togo which lost more than half of their forests.
So we need to look on China which increase their forests drastically, and cooperate and plant trees in countries from first quartiles, and then when situation would be better go to countries from second and third quartiles and do this while all the earth will be green.

5. APPENDIX: SQL Queries Used

View

```
DROP VIEW IF EXISTS forestation;
CREATE VIEW forestation AS
(SELECT f.country_code, f.country_name, r.region, f.year, f.forest_area_sqkm,
 l.total_area_sq_mi*2.59 total_area_sqkm, r.income_group
FROM forest_area f
JOIN land_area l
  ON f.country_code = l.country_code
    AND f.country_name = l.country_name
    AND f.year = l.year
JOIN regions r
  ON f.country_code = r.country_code
    AND f.country_name = r.country_name)
```

GLOBAL SITUATION

Square km of forest by years

```
SELECT year, ROUND(forest_area_sqkm::numeric,0) sqkm_of_forest
FROM forest_area
WHERE country_name = 'World'
ORDER BY year DESC
```

Difference in square km between 2016 and 1990

```
WITH sqkm AS
  (SELECT year, ROUND(forest_area_sqkm::numeric,0) sqkm_of_forest
  FROM forest_area
  WHERE country_name = 'World'
  ORDER BY year DESC)

SELECT
  (SELECT sqkm_of_forest
   FROM sqkm
   WHERE year = 1990)
   -
   (SELECT sqkm_of_forest
   FROM sqkm
   WHERE year = 2016)
   AS difference
FROM sqkm
LIMIT 1
```

Difference in % between 2016 and 1990

```
WITH sqkm AS
  (SELECT year, ROUND(SUM(forest_area_sqkm)::numeric,0) sqkm_of_forest
  FROM forest_area
  GROUP BY year
  ORDER BY year)

SELECT
  ((SELECT sqkm_of_forest
     FROM sqkm
     WHERE year = 1990)
     -
    (SELECT sqkm_of_forest
    FROM sqkm
    WHERE year = 2016))
    /
    (SELECT sqkm_of_forest
    FROM sqkm
```

```
    WHERE year = 1990) as present
FROM sqkm
LIMIT 1
```

Land area = deforested area

```
WITH sqkm AS
  (SELECT year, ROUND(SUM(forest_area_sqkm)::numeric,0) sqkm_of_forest
  FROM forest_area
  GROUP BY year
  ORDER BY year),

land AS
(SELECT country_name, year, total_area_sq_mi*2.59 total_area_sqkm
FROM land_area
WHERE year = 2016)

SELECT country_name, ROUND(total_area_sqkm::numeric,0)
FROM land
WHERE total_area_sqkm <=
(SELECT
  (SELECT sqkm_of_forest
   FROM sqkm
   WHERE year = 1990)
   -
   (SELECT sqkm_of_forest
   FROM sqkm
   WHERE year = 2016)
   AS difference
FROM sqkm
LIMIT 1)
ORDER BY total_area_sqkm DESC
LIMIT 1
```

REGIONAL OUTLOOK

Countries with the highest/lowest forest areas

```
WITH sixteen AS
(SELECT r.region region, (SUM(f.forest_area_sqkm)*100)/SUM(l.total_area_sq_mi
*2.59) forest
FROM forest_area f
JOIN land_area l
  ON f.country_code = l.country_code
    AND f.country_name = l.country_name
    AND f.year = l.year
JOIN regions r
  ON f.country_code = r.country_code
    AND f.country_name = r.country_name
WHERE f.year = '2016'
    AND f.forest_area_sqkm IS NOT NULL
GROUP BY r.region
ORDER BY 2 DESC),

ninety AS
(SELECT r.region region, (SUM(f.forest_area_sqkm)*100)/SUM(l.total_area_sq_mi
*2.59) forest
FROM forest_area f
JOIN land_area l
  ON f.country_code = l.country_code
    AND f.country_name = l.country_name
    AND f.year = l.year
JOIN regions r
  ON f.country_code = r.country_code
    AND f.country_name = r.country_name
WHERE f.year = '1990'
    AND f.forest_area_sqkm IS NOT NULL
GROUP BY r.region
ORDER BY 2 DESC)

SELECT s.region, ROUND(n.forest::numeric, 2) ninety, ROUND(s.forest::numeric,
 2) sixteen
FROM sixteen s
JOIN ninety n
  ON s.region = n.region
```

3. COUNTRY-LEVEL DETAIL

SUCCESS STORIES & LARGEST CONCERNS

```
WITH sixteen AS
(SELECT country_name country, forest_area_sqkm forest
FROM forest_area
WHERE year = 2016
  AND forest_area_sqkm IS NOT NULL
  AND country_name != 'World'
ORDER BY 2 DESC),

ninety AS
(SELECT country_name country, forest_area_sqkm forest
FROM forest_area
WHERE year = 1990
  AND forest_area_sqkm IS NOT NULL
  AND country_name != 'World'
ORDER BY 2 DESC),

dec_sqkm AS
(SELECT s.country country, r.region region, n.forest - s.forest decrease
FROM sixteen s
JOIN ninety n
  ON s.country = n.country
JOIN regions r
  ON s.country = r.country_name
ORDER BY 3 DESC),

pct AS
(SELECT s.country, ((n.forest-s.forest)/n.forest)*100 pct
FROM sixteen s
JOIN ninety n
  ON s.country = n.country
JOIN regions r
  ON s.country = r.country_name
ORDER BY 2 DESC)

SELECT d.country, d.region, d.decrease, p.pct
FROM dec_sqkm d
JOIN pct p
  ON d.country = p.country
ORDER BY 3 DESC
```

QUARTILES

```
WITH sixteen AS
(SELECT f.country_code code, f.country_name country, f.forest_area_sqkm fores
t, (l.total_area_sq_mi)*2.59 land
FROM forest_area f
JOIN land_area l
  ON f.country_code = l.country_code
  AND f.country_name = l.country_name
  AND f.year = l.year
WHERE f.year = 2016
  AND f.forest_area_sqkm IS NOT NULL
  AND f.country_name != 'World'
ORDER BY 2 DESC),

pct AS
(SELECT s.country, r.region, (s.forest/s.land)*100 pct
FROM sixteen s
JOIN regions r
  ON s.code = r.country_code
WHERE (s.forest/s.land)*100 IS NOT NULL
ORDER BY 2 DESC)

SELECT COUNT(country),
  CASE
    WHEN pct > 75 AND pct <= 100 THEN ('4th quartile')
    WHEN pct > 50 AND pct <= 75 THEN ('3rd quartile')
    WHEN pct > 25 AND pct <= 50 THEN ('2nd quartile')
    WHEN pct > 0 AND pct <= 25 THEN ('1st quartile')
    ELSE ('<0') END quartile
FROM pct
WHERE pct IS NOT NULL
  AND country != 'World'
GROUP BY 2
ORDER BY 2 DESC
```