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 sq_km** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.9 sq_km**, a loss of **1324449 sq_km**, or **3.208242%** decrease.

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 **1279999.989 sq_km**).

2. **REGIONAL OUTLOOK**

In 2016, the percent of the total land area of the world designated as forest was **31.3755 %**. 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 **2.068%** 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 51.02%, and the region with the lowest relative forestation was **Middle East & North Africa**, with **1.77%** forestation.

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

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America & Caribbean	51.02	46.16
Europe & Central Asia	37.28	38.04
North America	35.65	36.03
World	32.42	31.37
Sub-Saharan Africa	30.67	28.78
East Asia & Pacific	25.77	26.35
South Asia	16.51	17.50
Middle East & North Africa	1.77	2.06

The only regions of the world that decreased in percent forest area from 1990 to 2016 were **Latin America & Caribbean** (dropped from 51.02% to 46.16%) and **Sub-Saharan Africa**(30.67% to 28.78%). 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 31.37%.

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 sq_km**. 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 sq_km**, 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 and Caribbean	541510
Indonesia	Indonesia East Asia and Pacific	282193.98
Myanmar	Myanmar East Asia and Pacific	107234
Nigeria	Nigeria Sub-Saharan Africa	106506
Tanzania	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	75.44
Nigeria	Sub-Saharan Africa	61.79
Uganda	Sub-Saharan Africa	59.27
Mauritania	Sub-Saharan Africa	46.74
Honduras	Latin America and Caribbean	45.03

When we consider countries that decreased in forest area 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 and 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	72
50-75	38
75-100	9

The largest number of countries in 2016 were found in the first(0-25) quartile.

There were Nine 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	75-100	98.26
Micronesia, Fed. Sts.	75-100	91.86

Gabon	75-100	90.04
Seychelles	75-100	88.41
Palau	75-100	87.61
American Samoa	75-100	87.50
Guyana	75-100	83.90
Lao PDR	75-100	82.11
Solomon Islands	75-100	77.86

5. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*

The data shows that several regions have seen growth in forest area since 1990. Particularly in the Middle East, South Asia, and East Asia and the Pacific, are increasing both in forest area and forest area percentage. In contrast, the global forest area has decreased from 1990 to 2016, with Latin America & Caribbean and Sub-Saharan Africa having the highest levels of deforestation.

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

Brazil, Indonesia, Myanmar, Nigerian & Tanzania

SQL-CODE

```
CREATE VIEW Deforest_report AS
SELECT r.country_name, r.income_group, r.region, l.total_area_sq_mi, f.year,
f.forest_area_sqkm,
((Sum(forest_area_sqkm) / Sum(total_area_sq_mi * 2.59))*100) AS forest_percent
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
GROUP BY 1, 2, 3, 4, 5, 6


--Part 1: Global Situation--

--1(a)--
SELECT SUM(forest_area_sqkm) AS total_forest_area
FROM Deforest_report
WHERE YEAR = 1990
AND country_name = 'World'

--1(b)--
SELECT SUM(forest_area_sqkm) total_forest_area
FROM deforest_report
WHERE YEAR = 2016
 AND country_name = 'World'

--1(c)--
SELECT
((SELECT SUM(forest_area_sqkm) total_forest_area
FROM deforest_report
WHERE YEAR = 1990
 AND country_name = 'World')-
(SELECT SUM(forest_area_sqkm) total_forest_area
FROM deforest_report
WHERE YEAR = 2016
 AND country_name = 'World')) AS Loss

--1(d)--
SELECT (1324449/41282694.9) * 100 AS Loss_percent
FROM deforest_report
LIMIT 1
```

```
--1(e)--
SELECT country_name, SUM(total_area_sq_mi*2.59) AS total_land_area
FROM deforest_report
WHERE YEAR = 2016
GROUP BY 1
ORDER BY total_land_area DESC

--2(a)--
SELECT country_name, ((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100) AS
forest_area
FROM deforest_report
WHERE YEAR = 2016
AND country_name = 'World'
GROUP BY 1

--2(b)--
SELECT region, ((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100) AS forest_area
FROM deforest_report
WHERE YEAR = 2016
GROUP BY 1
ORDER BY forest_area DESC

--2(c)--
SELECT region, ((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100) AS forest_area
FROM deforest_report
WHERE YEAR = 1990
AND country_name = ‘World’
GROUP BY 1

--2(d)--
SELECT region, ((Sum(forest_area_sqkm) / Sum(total_area_sq_mi*2.59))*100) AS forest_area
FROM deforest_report
WHERE YEAR = 1990
GROUP BY 1
ORDER BY forest_area DESC


--Part 2: Regional Outlook--

--1(a,b,c,d)--
WITH T1 AS
 (SELECT country_name,
 SUM(forest_area_sqkm) forest_area_1
```

```
 FROM deforest_report
 WHERE YEAR = 1990
 GROUP BY 1),
 T2 AS
 (SELECT country_name,
 SUM(forest_area_sqkm) forest_area_2
 FROM deforest_report
  WHERE YEAR = 2016
 GROUP BY 1)
SELECT f.country_name,
 (f.forest_area_1 - c.forest_area_2) forest_change
FROM T1 f
JOIN T2 c ON f.country_name = c.country_name
ORDER BY forest_change DESC

--2(a,b)--
SELECT f.country_name,
 (((f.forest_area_1 -
c.forest_area_2)/(f.forest_area_1))*100) AS percent_change
FROM T1 f
JOIN T2 c ON f.country_name = c.country_name
ORDER BY percent_change
LIMIT 1

--Table 3.1--
WITH T1 AS
 (SELECT country_name,
 SUM(forest_area_sqkm) forest_area_1
 FROM deforest_report
 WHERE YEAR = 1990
 GROUP BY 1),
 T2 AS
 (SELECT country_name,
 SUM(forest_area_sqkm) forest_area_2
 FROM deforest_report
  WHERE YEAR = 2016
 GROUP BY 1)
SELECT f.country_name,
 (f.forest_area_1 - c.forest_area_2) forest_change
FROM T1 f
JOIN T2 c ON f.country_name = c.country_name
WHERE f.forest_area_1 IS NOT NULL
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```
AND c.forest_area_2 IS NOT NULL
AND f.country_name != 'World'
ORDER BY forest_change DESC

 --Table 3.2--
WITH T1 AS
 (SELECT country_name,
 ((SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100) AS forest_area_1
 FROM deforest_report
 WHERE YEAR = 1990
 GROUP BY 1),
 T2 AS
 (SELECT country_name,
 ((SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100) AS forest_area_2
 FROM deforest_report
  WHERE YEAR = 2016
 GROUP BY 1)
SELECT f.country_name,
 ((f.forest_area_1 - c.forest_area_2)/(f.forest_area_1))*100 forest_change
FROM T1 f
JOIN T2 c ON f.country_name = c.country_name
WHERE f.forest_area_1 IS NOT NULL
AND c.forest_area_2 IS NOT NULL
AND f.country_name != 'World'
ORDER BY forest_change DESC

--Table 3.3--
WITH T1 AS
 (SELECT country_name, YEAR,
 (SUM(forest_area_sqkm) / SUM(total_area_sq_mi*2.59))*100 AS forest_percent
 FROM deforest_report
 WHERE forest_percent IS NOT NULL
 AND YEAR = 2016
 GROUP BY 1, 2)

SELECT Distinct(quartiles),
count(country_name)Over(PARTITION BY quartiles)
FROM
 (SELECT country_name,
 CASE
 WHEN forest_percent <25 THEN '0-25'
 WHEN forest_percent >=25
```

```
 AND forest_percent <50 THEN '25-50'
 WHEN forest_percent >=50
 AND forest_percent <75 THEN '50-75'
 ELSE '75-100'
 END AS quartiles
 FROM T1
 WHERE forest_percent IS NOT NULL
AND country_name != 'World'
AND YEAR = 2016) sub

--Table 3.4--
WITH T2 AS
(WITH T1 AS
(SELECT country_name, YEAR, (SUM(forest_area_sqkm) /
SUM(total_area_sq_mi*2.59))*100 AS forest_percent
FROM deforest_report
 WHERE YEAR = 2016
GROUP BY 1, 2)

SELECT Distinct(quartiles),
count(country_name)Over(PARTITION BY quartiles), country_name, forest_percent
FROM (SELECT country_name, forest_percent,
CASE WHEN forest_percent<=25 THEN '0-25'
WHEN forest_percent>25
AND forest_percent<=50 THEN '25-50'
WHEN forest_percent>50
AND forest_percent<=75 THEN '50-75'
ELSE '75-100'
END AS quartiles
FROM T1
WHERE forest_percent IS NOT NULL
AND YEAR = 2016) sub)

SELECT country_name, quartiles, forest_percent
FROM T2
WHERE quartiles = '75-100' ORDER BY forest_percent DESC
```