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 in 1990. As of 2016, the most recent year for which data was available, that number had fallen to 39,958,245.9, a loss of 1,324,449, 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 1,279,999.98).

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 Europe & Central Asia, with 38.04%, and the region with the lowest relative forestation was Middle East and 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 and Caribbean, with 51.03%, and the region with the lowest relative forestation Middle East and Noth 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

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin America and 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. 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 79,200.00, much lower than the figure for China.

Russian Federation and China 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 213.664 % 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 American & Caribbean	541510.00
Indonesia	East Asia & Pacific	282193.98
Nigeria	Sub-Saharan Africa	107234.00
Tanzania	Sub-Saharan Africa	106506.00
Zimbabwe	Sub-Saharan Africa	102320.00

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 & 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
First Quartile	75
Second Quartile	73
Third Quartile	38
Forth Quartile	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.

Table 3.4: Top Quartile Countries, 2016:

Country	Region	Pct Designated as Forest
Suriname	Latin American & Caribbean	90.04
Micronesia, Fed. Sts.	East Asia & Pacific	88.41
Gabon	Sub-Saharan Africa	83.90
Seychelles	Sub-Saharan Africa	98.26
Palau	East Asia & Pacific	77.86
American Samoa	East Asia & Pacific	91.86
Guyana	Latin American & Caribbean	82.11
Lao PDR	East Asia & Pacific	87.50
Solomon Islands	East Asia & Pacific	87.61

4. RECOMMENDATIONS

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

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

The forest area of the world decreased from 32.42% to 31.38% within 26 years. The regions which contribute the most to this loss are Latin America and Caribbean by decreasing from 51.03 % to 46.16 %, and Sub-Saharan Africa from 30.67% to 28.79%. In 1990 and 2016 respectively for both regions. This change is a significant deforestation for all over the world and make the world forest area lower by 3.21 %.

Regions which have relatively lower forest area are Middle East and North Africa. Despite the percentage of forestation increased from 1.78% in 1990 to 2.07% in 2016, the region continued to be the lowest in forestation area in the world.

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

We need to focus on the countries which show significant incremental change as well as decremental change with in this period of time and need to learn what the reason to this change. To begin with the country which has changed the figure of their forest area significantly is China, the change of its forest area is 527,229.06 with in this time. And the largest percent change in forest area showed is 213.664% in Iceland.

On the other hand, Nigeria is the only country which decreased both in terms of absolute square kilometer as well as percent decrease in forest area by 107,234sqkm and 61.80% respectively within this time.

In both Nigeria and Iceland case one need to know what their experience and the reason to this significant change within this time of period and evaluate what really help them to increase their forest area or the cause of deforestation. The experience and the methods we would find in these counties can help other countries to gain useful experience to change their afforestation.

5. APPENDIX: SQL Queries Used

#To obtain common view query

```
DROP view if exists forestation;
CREATE view forestation AS
SELECT  f.*,l.total_area_sq_mi,r.region,r.income_group,total_area_sq_mi*2.59 AS
total_area_sqkm
FROM regions AS r
JOIN forest_area AS f
ON r.country_code=f.country_code
JOIN land_area l
ON f.country_code=l.country_code
AND f.year=l.year
WHERE f.year in (1990,2016)
```

#Query to answer Global,Regional and Country level questions

```
WITH ff_area_1990 AS (SELECT DISTINCT region,ROUND(sum(total_area_sqkm)::numeric,2)
tt_sum_area,ROUND(sum(forest_area_sqkm)::numeric,2)
ff_1990,ROUND(sum(forest_area_sqkm)::numeric,2)*100/ROUND(sum(total_area_sqkm)::num
eric,2) pct_1990
FROM forestation
WHERE year=1990
GROUP BY 1),
ff_area_2016 AS (SELECT DISTINCT region,ROUND(sum(total_area_sqkm)::numeric,2)
tt_sum_area,ROUND(sum(forest_area_sqkm)::numeric,2)
ff_2016,ROUND(sum(forest_area_sqkm)::numeric,2)*100/ROUND(sum(total_area_sqkm)::num
eric,2) pct_2016
FROM forestation
WHERE year=2016
GROUP BY 1),
cte_diff AS (SELECT f1.region region,(ff_1990-ff_2016) ff_diff,(ff_2016-ff_1990)*100/ff_1990
diff_pct
FROM ff_area_1990 f1
JOIN ff_area_2016 f2
ON f1.region=f2.region)
```

```
SELECT country_name,total_area_sqkm
FROM forestation AS f
JOIN cte_diff AS c
ON f.region=c.region
WHERE total_area_sqkm < (SELECT ff_diff
FROM(select region,ff_diff
FROM cte_diff
where region='World') sub)
ORDER BY total_area_sqkm desc

SELECT f1.region region,(ff_2016-ff_1990) ff_diff,(ff_2016-ff_1990)*100/ff_1990
diff_pct,ff_1990,ff_2016
FROM ff_area_1990 f1
JOIN ff_area_2016 f2
ON f1.region=f2.region

WITH ff_area_1990 AS (SELECT DISTINCT region,ROUND(sum(total_area_sqkm)::numeric,2)
tt_sum_area,ROUND(sum(forest_area_sqkm)::numeric,2)
ff_1990,ROUND(sum(forest_area_sqkm)::numeric,2)*100/ROUND(sum(total_area_sqkm)::num
eric,2) pct_1990
FROM forestation
WHERE year=1990
GROUP BY 1),
ff_area_2016 AS (SELECT DISTINCT
country_name,region,ROUND(sum(total_area_sqkm)::numeric,2)
tt_sum_area,ROUND(sum(forest_area_sqkm)::numeric,2)
ff_2016,ROUND(sum(forest_area_sqkm)::numeric,2)*100/ROUND(sum(total_area_sqkm)::num
eric,2) pct_2016
FROM forestation
WHERE year=2016
GROUP BY 1,2),

forest_diff AS (SELECT f1.region region,(ff_2016-ff_1990) ff_diff,(ff_2016-ff_1990)*100/ff_1990
diff_pct,ff_1990,ff_2016
FROM ff_area_1990 f1
JOIN ff_area_2016 f2
ON f1.region=f2.region),




T1 AS (select country_name, pct_2016 AS ff_pct_2016Q1
```

```
from ff_area_2016
where pct_2016 <20),

T2 AS (select country_name,pct_2016 AS ff_pct_2016Q2
from ff_area_2016
where pct_2016 <50 and pct_2016>25),

T3 AS (select country_name, pct_2016 AS ff_pct_2016Q3
from ff_area_2016
where pct_2016 <75 and pct_2016>50)

select country_name,pct_2016 AS ff_pct_2016Q4
from ff_area_2016
where pct_2016 >75
```