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   -3.21%.

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.)

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 Middle East & North Africa, with 2.07%.

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
Middle East & North Africa	1.78%	2.07%
South Asia	16.51%	17.51%
East Asia & Pacific	25.78%	26.36%
Sub-Saharan Africa	30.67%	28.79%
North America	35.65%	36.04%
Europe & Central Asia	37.28%	38.04%
Latin America & Caribbean	51.03%	46.16%

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Sub-Saharan Africa (dropped from 30.76% % to 28.79%) 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%. in 1990 to 31.38%. in 2016.

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 sqkm, much lower than the figure for China.

China and United State 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 343.99 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	282193.9844
Myanmar	East Asia & Pacific	107234.0039
Nigeria	Sub-Saharan Africa	106506.00098
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	-59.12%
Mauritania	Sub-Saharan Africa	-46.74%
Honduras	Latin America & 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 & 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 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	98.2576939676578
Micronesia, Fed. Sts.	East Asia & Pacific	91.8572390715248
Gabon	Sub-Saharan Africa	90.0376418700565
Seychelles	Sub-Saharan Africa	88.4111367385789
Palau	East Asia & Pacific	87.6068085491204

American Samoa	East Asia & Pacific	87.5000875000875
Guyana	Latin America & Caribbean	83.9014489110682
Lao PDR	East Asia & Pacific	82.1082317640861
Solomon Islands	East Asia & Pacific	77.8635177945066

5. 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?*

It can be seen from the data that there have been changes in the global climate, and this is reflected in a global decrease in the amount of forests from 1990 to 2016. Although the global change in percentages is relatively small (approximately 3%), it must be taken into consideration that this is in relation to the entire world, and therefore it is a large forest area that has been lost (sqkm1324449).

Due to the fact that there is **global responsibility** for the state of forests in the world, it is important to pay attention to a few things:

1. Attention should be paid to the countries that are concerned about the **decrease** in a large amount of forests in their country. Examine why the decline occurred and how this decline should be prevented or stopped.

2. We must learn from the countries where there has been an **increase** in the amount of forests- how did it happened and how to project this into other countries as well.

3. It is worth examining stricter measures in countries where there has been a large decrease in the area of forests. The responsibility is ours to prevent and stop this deterioration.

In addition to all above, it is important to conduct additional research towards the year 2023 in order to examine additional climate changes.

It is even possible to **expand** the climatic affect and research to deal not only with forests decreasing but with other concerned climatic changes such as global warming,

the decrease in the amount of water in the world and the consumption culture of humans.

The query appendix

```
SELECT *
FROM forest_area
```
___
```
SELECT *
FROM land_area
```

```
SELECT *
FROM regions
```

1. GLOBAL SITUATION
```
CREATE VIEW Forestation
AS
(SELECT
f.year AS year,
f.forest_area_sqkm AS forest_area_sqkm,
f.country_name AS country_name,
f.country_code AS country_code,
(l.total_area_sq_mi*2.59) AS land_total_area_sqkm,
r.region AS region,
r.income_group AS income_group,
 (f.forest_area_sqkm) /
 (l.total_area_sq_mi*2.59)*100 AS percentage_forest_area
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
)
```
land total area sqmi = **land_total_area_sqkm**
```
SELECT (land_total_area_sq_mi *2.59) AS land_total_area_sqkm
FROM forestation
```
a.
```
SELECT country_name , year, forest_area_sqkm
FROM forestation
WHERE region= 'World' and year=1990
```

b.
```
SELECT country_name , year, forest_area_sqkm
FROM forestation
WHERE region= 'World' and year='2016'
```

c.
WITH CTE_1990 AS
 (SELECT country_name , year, forest_area_sqkm
FROM forestation
WHERE region= 'World' and year=1990),

CTE_2016 AS
(SELECT country_name , year, forest_area_sqkm
FROM forestation
WHERE region= 'World' and year=2016)

SELECT (CTE_1990.forest_area_sqkm-CTE_2016.forest_area_sqkm) AS new_area
FROM CTE_1990
JOIN CTE_2016
ON CTE_1990.country_name=CTE_2016.country_name

d.
WITH CTE_1990 AS

(SELECT country_name , year, forest_area_sqkm
FROM forestation
WHERE region= 'World' and year=1990),

CTE_2016 as
(SELECT country_name , year, forest_area_sqkm
FROM forestation
WHERE region= 'World' and year=2016)

SELECT (CTE_1990.forest_area_sqkm-CTE_2016.forest_area_sqkm) AS new_area,
ROUND(((CTE_2016.forest_area_sqkm-
CTE_1990.forest_area_sqkm)*100/CTE_1990.forest_area_sqkm)::numeric,2) AS
percent_change
FROM CTE_1990
JOIN CTE_2016
ON CTE_1990.country_name=CTE_2016.country_name

e.
SELECT year, country_name, land_total_area_sqkm, forest_area_sqkm
FROM forestation
WHERE year='2016'
AND land_total_area_sqkm BETWEEN 1200000 and 140000

2. REGIONAL OUTLOOK

Finding percentage forest from the whole world
<mark>Create table by instructions</mark>
CREATE VIEW regional_area as
 (SELECT
        region,
        year,
         country_name,
 SUM (forest_area_sqkm) AS total_forest_area_sqkm,
SUM (forest_area_sqkm)/SUM (land_total_area_sqkm)*100 AS percentage_forest_area
FROM forestation
 WHERE year='2016' or year='1990'
 GROUP BY 1,2,3
 ORDER BY 1,2)
<mark>FILL IN Table 2.1</mark>
<mark>forest percent of world 1990</mark>
SELECT
region,
round(percentage_forest_area::numeric,2)
FROM regional_area
WHERE year=1990
ORDER BY 2
<mark>forest percent of world 2016</mark>
SELECT
region,
ROUND (percentage_forest_area::numeric,2)
FROM regional_area
WHERE year=2016
ORDER BY 2

<mark>Region highest </mark>2016
SELECT
region,
ROUND(percentage_forest_area::numeric,2)
FROM regional_area
WHERE year='2016'
ORDER BY 2 desc

<mark>Region lowest </mark>2016
SELECT
region,

```
ROUND (percentage_forest_area::numeric,2)
FROM regional_area
WHERE year='2016'
ORDER BY 2
```

Region lowest 1990
```
SELECT
region,
ROUND (percentage_forest_area::numeric,2)
FROM regional_area
WHERE year='1990'
ORDER BY 2
```
Region highest 1990
```
SELECT
region,
ROUND (percentage_forest_area::numeric,2)
FROM regional_area
WHERE year='1990'
 ORDER BY 2 desc
```

3. **COUNTRY-LEVEL DETAIL**

Fill in the success stories
```
WITH
forest_increas_90 AS
  (select country_name AS name_90,
  forest_area_sqkm AS forest_90
  FROM forestation
  WHERE year =1990 AND forest_area_sqkm IS NOT NULL
  ORDER BY 2 desc),

forest_increas_16 AS
(SELECT
country_name AS name_16,
  forest_area_sqkm AS forest_16
  FROM forestation
 WHERE year =2016 AND forest_area_sqkm IS NOT NULL
  ORDER BY 1 desc)

SELECT
name_90,
```
ABS(forest_16-forest_90) AS forest_new

```
FROM forest_increas_90
JOIN forest_increas_16
ON forest_increas_90.name_90=forest_increas_16.name_16
ORDER BY 2 DESC
LIMIT 5
```
(ABC func. I put into the code in order to have the absolute prectenge+ desc in order by)

Fill in table 3.1
```
WITH
forest_increas_90 AS
  (select country_name AS name_90,
  forest_area_sqkm AS forest_90
  FROM forestation
  WHERE year =1990 AND forest_area_sqkm IS NOT NULL
  ORDER BY 2 desc),
forest_increas_16 AS
(SELECT
country_name AS name_16,
  region,
 forest_area_sqkm AS forest_16

  FROM forestation
 WHERE year =2016 AND forest_area_sqkm IS NOT NULL
  ORDER BY 1 desc)

SELECT
name_90,
(forest_90-forest_16) AS forest_new,
region
FROM forest_increas_90
JOIN forest_increas_16
ON forest_increas_90.name_90=forest_increas_16.name_16
ORDER BY 2 DESC
LIMIT 6 (choose 6 and not 5 because I didn't calculate the "World" which came first)
```

b. LARGEST CONCERNS

5 countries which have increase their forest
```
WITH
country_years  AS
(
  SELECT forestation.*
  FROM forestation where
  year in (1990 , 2016)
```

```
   AND country_code !='WLD' /*excluded*/
   ORDER BY country_code , year desc
 ),
y2016 AS
(select year, forest_area_sqkm,country_name, region
FROM country_years
WHERE year=2016 AND forest_area_sqkm IS NOT NULL) ,
y1990 AS
(SELECT year, forest_area_sqkm,country_name, region
FROM country_years
WHERE year=1990 AND forest_area_sqkm IS NOT NULL)
SELECT
   y2016.country_name,y2016.region,
   (y2016.forest_area_sqkm-y1990.forest_area_sqkm)/y1990.forest_area_sqkm*100 AS
diff_perc
   FROM  y2016
JOIN y1990 ON y2016.country_name=y1990.country_name
ORDER BY 3 desc
LIMIT 5
```

4 .QUARTILES

```
WITH tab_2016
AS (SELECT *
FROM   forestation
WHERE  year = 2016),
quar1
AS (SELECT *
FROM   tab_2016
WHERE  percentage_forest_area BETWEEN 0 AND 25),
quar2
AS (SELECT *
FROM   tab_2016
WHERE  percentage_forest_area BETWEEN 25 AND 50 AND country_name NOT IN ('World')),
quar3
AS (SELECT *
FROM   tab_2016
WHERE  percentage_forest_area BETWEEN 50 AND 75),
quar4
AS (SELECT *
FROM   tab_2016
```

```
WHERE  percentage_forest_area BETWEEN 75 AND 100),
quarentiles
AS (SELECT '1' AS quarentile,
Count(*)
FROM   quar1
UNION
SELECT '2' AS quarentile,
Count(*)
FROM   quar2
UNION
SELECT '3' AS quarentile,
Count(*)
FROM   quar3
UNION
SELECT '4' AS quarentile,
Count(*)
FROM   quar4)
SELECT *
FROM   quarentiles
ORDER  BY quarentile_____
```

```
WITH tab_2016
AS (SELECT *
FROM   forestation
WHERE  year = 2016),

quar4
AS (SELECT *
FROM   tab_2016
WHERE  percentage_forest_area BETWEEN 75 AND 100)

SELECT country_name,region, percentage_forest_area

FROM  quar4
ORDER  BY 3 desc
```