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 3.208%.

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 1275057.9042).

## 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 46.14%, 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 32.42. The region with the highest relative forestation was Latin America & Caribbean, with 51.08%, 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 |
| --- | --- | --- |
| Latin America & Caribbean | 51.08 | 46.14 |
| Sub-Saharan Africa | 30.67 | 28.79 |
| North America | 35.66 | 36.02 |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin America & Caribbean (dropped from 51.08% to 46.14%) 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**

### 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.

### 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 | 541510.00 |
| Indonesia | East Asia & Pacific | 282193.98 |
| Myanmar | East Asia & Pacific | 107234.00 |
| Nigeria | Sub-Saharan Africa | 106506.00 |
| Tanzania | 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.

### QUARTILES

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

| Quartile | Number of Countries |
| --- | --- |
| 1 | 55 |
| 2 | 54 |
| 3 | 54 |
| 4 | 43 |

The largest number of countries in 2016 were found in the 1st quartile.

There were 55 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 |
| --- | --- | --- |
| Algeria | Middle East & North Africa | 17.79 |
| Azerbaijan | Europe & Central Asia | 36.81 |
| Bahrain | Middle East & North Africa | 177.27 |

## 4. RECOMMENDATIONS

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

* *What have you learned from the World Bank data?*
* *From the data I have found that because of the decline in forest area in* Latin America & Caribbean & Sub-Saharan Africa *regions has affected the total world forest area the most.*
* *Which countries should we focus on over others?*
* *The main countries to focus over the others are Nigeria and Brazil for the reduce in forest area and China for the increase in forest area.*

## 5. APPENDIX: SQL Queries Used

1.

/\*Q1\*/

SELECT

country\_name,

year,

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 1990 AND

country\_name = 'World'

GROUP BY

1, 2, 3;

/\*Q2\*/

SELECT

country\_name,

year,

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 2016 AND

country\_name = 'World'

GROUP BY

1, 2, 3;

/\*Q3\*/

SELECT DISTINCT

(SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 1990 AND

country\_name = 'World'

) - (SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 2016 AND

country\_name = 'World'

) AS area\_change

FROM

forest\_area

/\*Q4\*/

SELECT DISTINCT

((SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 1990 AND

country\_name = 'World'

) - (SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 2016 AND

country\_name = 'World'

)) \* 100 / (SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 1990 AND

country\_name = 'World'

)

AS percent\_area\_change

FROM

forest\_area

/\*Q5\*/

SELECT

(SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 1990 AND

country\_name = 'World'

) - (SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 2016 AND

country\_name = 'World'

)

AS area\_change, l.country\_name, (l.total\_area\_sq\_mi \*2.58) AS land\_area\_in\_km

FROM

forest\_area AS f

JOIN land\_area AS l

ON f.country\_code = l.country\_code AND

l.year = 2016

WHERE (l.total\_area\_sq\_mi \* 2.58) <= (SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 1990 AND

country\_name = 'World'

) - (SELECT

forest\_area\_sqkm

FROM

forest\_area

WHERE

year = 2016 AND

country\_name = 'World'

)

ORDER BY l.total\_area\_sq\_mi DESC;

/\*2.\*/

CREATE TABLE per\_fa AS (

SELECT

r.region,

SUM(CASE WHEN f.year = 1990 THEN forest\_area\_sqkm ELSE 0 END) /

(SUM(CASE WHEN f.year = 1990 THEN total\_area\_sq\_mi ELSE 0 END) \*2.59)

AS per\_area\_1990,

SUM(CASE WHEN f.year = 2016 THEN forest\_area\_sqkm ELSE 0 END) /

(SUM(CASE WHEN f.year = 2016 THEN total\_area\_sq\_mi ELSE 0 END) \* 2.59)

AS per\_area\_2016

FROM

forest\_area AS f

JOIN land\_area AS l

ON f.country\_code=l.country\_code

AND (f.year = 1990 OR f.year = 2016)

JOIN regions AS r

ON r.country\_code=l.country\_code

GROUP BY 1

)

/\*2a\*/

SELECT region, ROUND((per\_area\_2016\*100)::numeric, 2)

FROM per\_fa

ORDER BY 2 DESC;

/\*2b\*/

SELECT region, ROUND((per\_area\_1990\*100)::numeric, 2)

FROM per\_fa

ORDER BY 2 DESC;

/\*2c\*/

ALTER TABLE per\_fa ADD COLUMN per\_change numeric;

UPDATE per\_fa SET per\_change = ((per\_area\_1990 - per\_area\_2016)/per\_area\_1990)\*100;

SELECT region,

ROUND((per\_area\_1990\*100)::numeric, 2) AS A1990,

ROUND((per\_area\_2016\*100)::numeric, 2) AS A2016,

ROUND((per\_change)::numeric, 2) AS TOTALCHANGE

FROM per\_fa

ORDER BY per\_change DESC;

/\* 3 a\*/

CREATE TABLE fa\_change AS (

SELECT DISTINCT

t1.country\_name,

r.region,

t1.forest\_area\_sqkm AS fa\_1990,

t2.forest\_area\_sqkm AS fa\_2016,

(t1.forest\_area\_sqkm - t2.forest\_area\_sqkm) AS A\_change,

(((t1.forest\_area\_sqkm - t2.forest\_area\_sqkm) / t1.forest\_area\_sqkm) \* 100) AS pct\_change

FROM

(SELECT \* FROM forest\_area WHERE year = 1990) AS t1

FULL JOIN

(SELECT \* FROM forest\_area WHERE year = 2016) AS t2

ON

t1.country\_name = t2.country\_name

JOIN regions AS r

ON r.country\_code = t2.country\_code

ORDER BY 1, 2

)

/\* 3b \*/

SELECT country\_name, region, ROUND(pct\_change::numeric,2)

FROM fa\_change

ORDER BY pct\_change DESC

/\* 3.1 \*/

SELECT country\_name, region,

ROUND(a\_change::numeric,2) AS area\_change,

ROUND(pct\_change::numeric,2) AS per\_cha

FROM fa\_change

ORDER BY a\_change DESC

/\* 3.2 \*/

SELECT country\_name, region,

ROUND(a\_change::numeric,2) AS area\_change,

ROUND(pct\_change::numeric,2) AS per\_cha

FROM fa\_change

ORDER BY pct\_change DESC

/\* 3.3 \*/

SELECT quartile, COUNT(fa\_2016)

FROM (

SELECT DISTINCT

NTILE(4) OVER (ORDER BY pct\_change) AS quartile,

fa\_2016

FROM

fa\_change

) AS t

GROUP BY quartile

ORDER BY quartile;

/\* 3.4 \*/

SELECT country\_name,

region,

quartile,

pc\_cha

FROM (

SELECT DISTINCT

country\_name,

region,

NTILE(4) OVER (ORDER BY pct\_change) AS quartile,

ROUND((((fa\_1990 - fa\_2016)/fa\_1990)\*100) :: numeric,2) AS pc\_cha

FROM

fa\_change

) AS t

GROUP BY country\_name, region, quartile, pc\_cha

ORDER BY quartile;