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**

### 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.

### 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.

### 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

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