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 \_\_\_\_\_3.20824258980245\_\_\_\_\_\_\_\_\_\_\_\_\_%.

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\_\_\_ sq km \_\_\_\_\_\_\_\_\_).

## 2. **REGIONAL OUTLOOK**

In 2016, the percent of the total land area of the world designated as forest was \_\_\_\_\_\_\_\_ 31.3755709643095 \_\_\_\_\_\_\_\_\_\_. 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 \_\_\_\_\_\_\_\_ 2.07 \_\_\_\_\_\_\_\_\_\_% forestation.

In 1990, the percent of the total land area of the world designated as forest was \_\_\_\_\_\_\_\_ 32.4222035575689 \_\_\_\_\_\_\_\_\_\_. 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 |
| Latin America & Caribbean | 51.03 | 46.16 |
| Sub-Saharan Africa | 30.67 | 28.79 |
| East Asia & Pacific | 25.78 | 26.36 |
| North America | 35.65 | 36.04 |
| South Asia | 16.51 | 17.51 |
| Middle East & North Africa | 1.78 | 2.07 |
| Europe & Central Asia | 37.28 | 38.04 |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were \_\_\_\_\_\_\_\_\_Latin America & 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 \_\_\_\_\_\_\_32.4222035575689\_\_\_\_\_\_\_\_\_\_\_% to \_\_\_\_\_\_\_31.3755709643095 \_\_\_\_\_\_\_\_\_\_\_%.

## 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 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 | 75.45 |
| 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 |
| %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 |

## 4. 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?*

According to the data analysis, the forest area of the earth has shrunk by more than three percent between 1990 and 2016. Deforestation of Latin America & Caribbean and Sub-Saharan Africa regions has caused a decrease of more than one percent in the forestation percentage of the world. China and Iceland were great at increasing their forestation. It would be wise to further analyze their approaches to the deforestation problem. Countries including Brazil, Indonesia, Myanmar, Togo, Nigeria, and Uganda have the biggest impact on the world's deforestation and it would be better to give priority to these countries. Also, preventing deforestation in the top quartile countries with a high forest percentage, especially those in the deforesting regions, would be a nice way to combat deforestation.

## 5. APPENDIX: SQL Queries Used

-- Creating view

CREATE OR REPLACE VIEW

forestation AS

SELECT

f.country\_code,

f.country\_name,

f.year,

f.forest\_area\_sqkm,

l.total\_area\_sq\_mi,

r.region,

r.income\_group,

(f.forest\_area\_sqkm/(l.total\_area\_sq\_mi \* 2.59)\*100) percent\_forest

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 = l.country\_code;

-- Checking view

SELECT

\*

FROM

forestation;

--1.a

SELECT

f.forest\_area\_sqkm

FROM

forestation f

WHERE

f.region = 'World'

AND f.year = 1990;

--1.b

SELECT

f.forest\_area\_sqkm

FROM

forestation f

WHERE

f.region = 'World'

AND f.year = 2016;

--1.c

SELECT

pre.forest\_area\_sqkm - cur.forest\_area\_sqkm forest\_loss\_sqkm

FROM

forest\_area pre

JOIN

forest\_area cur

ON

(pre.country\_name = 'World'

AND cur.country\_name = 'World'

AND pre.year = '1990'

AND cur.year = '2016');

--1.d

SELECT

((1 - (cur.forest\_area\_sqkm / pre.forest\_area\_sqkm))\*100) percent\_forest\_loss

FROM

forest\_area pre

JOIN

forest\_area cur

ON

(pre.country\_name = 'World'

AND cur.country\_name = 'World'

AND pre.year = '1990'

AND cur.year = '2016');

--1.e

SELECT

l.country\_name,

(l.total\_area\_sq\_mi \* 2.59) total\_area\_sq\_km

FROM

land\_area l

WHERE

(l.total\_area\_sq\_mi \* 2.59) <= 1324449

GROUP BY

l.country\_name,

(l.total\_area\_sq\_mi \* 2.59)

ORDER BY

total\_area\_sq\_km DESC

LIMIT

1;

--2.a.1

SELECT

f.percent\_forest

FROM

forestation f

WHERE

year = 2016

AND region= 'World';

--2.a.2

SELECT

ROUND(100\*(SUM(forest\_area\_sqkm)/SUM(total\_area\_sq\_mi\*2.59))::numeric, 2) percent\_by\_region,

region

FROM

forestation

WHERE

year = 2016

AND region != 'World'

GROUP BY

region

ORDER BY

1 DESC;

--2.b.1

SELECT

f.percent\_forest

FROM

forestation f

WHERE

year = 1990

AND region= 'World';

--2.b.2

SELECT

ROUND(100\*(SUM(forest\_area\_sqkm)/SUM(total\_area\_sq\_mi\*2.59))::numeric, 2) percent\_by\_region,

region

FROM

forestation

WHERE

year = 1990

AND region != 'World'

GROUP BY

region

ORDER BY

1 DESC;

--2.c

SELECT

f.region,

(f1.percent\_by\_region\_1990 > f.percent\_by\_region\_2016) decreased,

f1.percent\_by\_region\_1990,

f.percent\_by\_region\_2016

FROM (

SELECT

ROUND(100\*(SUM(f.forest\_area\_sqkm)/SUM(f.total\_area\_sq\_mi\*2.59))::numeric, 2) percent\_by\_region\_2016,

f.region

FROM

forestation f

WHERE

year = 2016

AND region != 'World'

GROUP BY

f.region) f

JOIN (

SELECT

ROUND(100\*(SUM(f1.forest\_area\_sqkm)/SUM(f1.total\_area\_sq\_mi\*2.59))::numeric, 2) percent\_by\_region\_1990,

region

FROM

forestation f1

WHERE

year = 1990

AND region != 'World'

GROUP BY

f1.region) f1

ON

f.region = f1.region

GROUP BY

f.region,

f1.percent\_by\_region\_1990,

f.percent\_by\_region\_2016

ORDER BY

2 DESC;

--3.a

SELECT

f.country\_name,

SUM(f.forest\_area\_sqkm) AS forest\_area\_2016,

SUM(f1.forest\_area\_sqkm) AS forest\_area\_1990,

(SUM(f.forest\_area\_sqkm)-SUM(f1.forest\_area\_sqkm)) AS area\_diff

FROM

forestation f

JOIN

forestation f1

ON

f.country\_name = f1.country\_name

AND f.year = 2016

AND f1.year = 1990

AND f.forest\_area\_sqkm IS NOT NULL

AND f1.forest\_area\_sqkm IS NOT NULL

GROUP BY

f.country\_name

ORDER BY

4

LIMIT

5;

--3.b

SELECT

f.country\_name,

SUM(f.forest\_area\_sqkm) AS forest\_area\_2016,

SUM(f1.forest\_area\_sqkm) AS forest\_area\_1990,

ROUND((100.0\*(SUM(f.forest\_area\_sqkm)-SUM(f1.forest\_area\_sqkm))/ SUM(f1.forest\_area\_sqkm) )::numeric,2) AS area\_diff\_percent,

(SUM(f.forest\_area\_sqkm)-SUM(f1.forest\_area\_sqkm)) AS area\_diff,

f.region

FROM

forestation f

JOIN

forestation f1

ON

f.country\_name = f1.country\_name

AND f.year = 2016

AND f1.year = 1990

AND f.forest\_area\_sqkm IS NOT NULL

AND f1.forest\_area\_sqkm IS NOT NULL

GROUP BY

f.country\_name,

f.region

ORDER BY

5

LIMIT

5;

--3.c

SELECT

percentile,

COUNT(percent\_forest) count

FROM (

SELECT

country\_name,

percent\_forest,

CASE

WHEN percent\_forest > 75 THEN '%75-100'

WHEN percent\_forest > 50

AND percent\_forest <=75 THEN '%50-75'

WHEN percent\_forest > 25 AND percent\_forest <=50 THEN '%25-50'

ELSE

'%0-25'

END

AS percentile

FROM

forestation

WHERE

year = 2016

AND country\_name != 'World') sub

GROUP BY

1

ORDER BY

2 DESC;

--3.d

SELECT

country\_name,

percent\_forest,

CASE

WHEN percent\_forest > 75 THEN '%75-100'

WHEN percent\_forest > 50

AND percent\_forest <=75 THEN '%50-75'

WHEN percent\_forest > 25 AND percent\_forest <=50 THEN '%25-50'

ELSE

'%0-25'

END

AS percentile

FROM

forestation

WHERE

year = 2016

GROUP BY

1,

2

HAVING

percent\_forest > 75

ORDER BY

2 DESC;

--

SELECT

country\_name,

region,

percent\_forest

FROM

forestation

WHERE

year = 2016

GROUP BY

1,

2,

3

HAVING

percent\_forest > 75

ORDER BY

3 DESC;

-- 3.e

WITH

USA AS (

SELECT

percent\_forest

FROM

forestation

WHERE

country\_name = 'United States'

AND year = 2016)

SELECT

COUNT (\*) AS count

FROM (

SELECT

country\_name,

percent\_forest

FROM

forestation

WHERE

year = 2016

GROUP BY

1,

2

HAVING

percent\_forest > (

SELECT

\*

FROM

USA)

ORDER BY

2 DESC) SUB