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 to39958245.9 sq. km, a loss of 1324449 sq. km, 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 1279999.99).

## 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 51.09%, 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 | 51.09% | 46.14% |
| Sub-Saharan Africa | 30.65% | 28.72% |
| World | 32.42% | 31.38% |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin America & Caribbean (dropped from 51.09% to 46.14%) and Sub-Saharan Africa (30.65% to 28.72%). 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 527,229 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 79,200 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 & Caribbean | 541,510 sq. km |
| Indonesia | East Asia & Pacific | 282,194 sq. km |
| Myanmar | East Asia & Pacific | 107,234 sq. km |
| Nigeria | Sub-Saharan Africa | 106,506 sq. km |
| Tanzania | Sub-Saharan Africa | 102,320 sq. km |

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 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 | 85 |
| 2 | 72 |
| 3 | 38 |
| 4 | 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 | 98.26% |
| Micronesia, Fed. Sts | East Asia & Pacific | 91.86% |
| Gabon | Sub-Saharan Africa | 90.04% |
| Seychelles | Sub-Saharan Africa | 88.41% |
| Palau | East Asia & Pacific | 87.61% |
| American Samoa | East Asia & Pacific | 87.50% |
| Guyana | Latin America & Caribbean | 83.90% |
| Lao PDR | East Asia & Pacific | 82.11% |
| Solomon Islands | East Asia & Pacific | 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?*

From the World Bank data, we can see that Suriname has the most forest area by percentage. Quartile 1 had the most countries in it, followed by 2, 3, and finally 4. The Sub-Saharan Africa region has had a sharp percentage of forest decrease between 1990 and 2016, with Togo leading at a loss of 75.45% of its forest area. By country, Brazil has lost the largest forest area by volume at 541,510 sq. km.

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

To combat deforestation, ForestQuery should set their focus on Brazil, Indonesia, Myanmar, Nigeria, Tanzia based on their forest loss by volume. Together, they lost 1,139,764 sq. km of forest between 1990 and 2016. To put that into perspective, the entire world lost 1,324,449 sq. km in the same time frame.

Appendix: Queries Used

---------------Global Situation queries----------------------

SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE country\_name = 'World' AND year = '1990'

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SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE country\_name = 'World' AND year = '2016'

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SELECT country\_name, forest\_area\_sqkm, year, LEAD(forest\_area\_sqkm) OVER (ORDER BY forest\_area\_sqkm) AS lead, LEAD(forest\_area\_sqkm) OVER (ORDER BY forest\_area\_sqkm) - forest\_area\_sqkm AS lead\_difference

FROM

(SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE country\_name = 'World' AND year = '2016' OR country\_name = 'World' AND year = '1990') sub

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WITH T1 AS

(SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE country\_name = 'World' AND year = '2016'),

T2 AS (SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE country\_name = 'World' AND year = '1990')

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

FROM t1

JOIN t2

ON t1.country\_name = t2.country\_name

----------------Regional Outlook queries--------------------------------------------------------------

SELECT f.country\_name, f.forest\_area\_sqkm/(l.total\_area\_sq\_mi\*2.59)\*100 AS forest\_percentage

FROM forest\_area f

JOIN land\_area l

ON f.country\_name = l.country\_name

WHERE f.country\_name = 'World' AND f.year = '2016' AND l.country\_name = 'World' AND l.year = '2016'

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SELECT total\_forest\_area/total\_area\*100 AS forest\_percentage, region, year

FROM

(SELECT SUM(forest\_area\_sqkm) AS total\_forest\_area, region, SUM(total\_area\_sq\_mi\*2.59) AS total\_area, year

FROM

(SELECT f.country\_name, f.forest\_area\_sqkm/(l.total\_area\_sq\_mi\*2.59)\*100 AS forest\_percentage, r.region, f.forest\_area\_sqkm, l.total\_area\_sq\_mi, f.year

FROM forest\_area f

JOIN land\_area l

ON f.country\_name = l.country\_name

JOIN regions r

ON l.country\_name = r.country\_name

WHERE f.year = '1990' OR f.year = '2016'

ORDER BY region, forest\_percentage DESC) sub

GROUP BY region, year) sub2

ORDER BY year, forest\_percentage

-------------Country-Level Detail queries----------------------

WITH t1 AS (SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE year = '2016'

ORDER BY country\_name),

t2 AS (SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE year = '1990'

ORDER BY country\_name)

SELECT t1.country\_name, t2.forest\_area\_sqkm - t1.forest\_area\_sqkm AS area\_change, r.region

FROM t1

JOIN t2

ON t1.country\_name = t2.country\_name

JOIN regions r

ON t2.country\_name = r.country\_name

ORDER BY area\_change DESC, country\_name

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WITH t1 AS (SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE year = '2016'

ORDER BY country\_name),

t2 AS (SELECT country\_name, forest\_area\_sqkm, year

FROM forest\_area

WHERE year = '1990'

ORDER BY country\_name)

SELECT t1.country\_name, (t1.forest\_area\_sqkm-t2.forest\_area\_sqkm)\*100/t2.forest\_area\_sqkm AS percent\_area\_change, r.region

FROM t1

JOIN t2

ON t1.country\_name = t2.country\_name

JOIN regions r

ON t2.country\_name = r.country\_name

ORDER BY percent\_area\_change, country\_name

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SELECT country\_name, CASE WHEN percent\_forest\_area <25 THEN '1st'

WHEN percent\_forest\_area >=25 AND percent\_forest\_area <50 THEN '2rd'

WHEN percent\_forest\_area >=50 AND percent\_forest\_area <75 THEN '3rd'

ELSE '4th' END AS quartile, percent\_forest\_area

FROM (SELECT l.country\_name, f.forest\_area\_sqkm/(l.total\_area\_sq\_mi\*2.59)\*100 AS percent\_forest\_area

FROM land\_area l

JOIN forest\_area f

ON f.country\_name = l.country\_name

WHERE l.year = '2016' AND f.year = '2016') sub

WHERE percent\_forest\_area IS NOT NULL

ORDER BY quartile

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SELECT COUNT(quartile), quartile

FROM (SELECT country\_name, CASE WHEN percent\_forest\_area <25 THEN '1st'

WHEN percent\_forest\_area >=25 AND percent\_forest\_area <50 THEN '2rd'

WHEN percent\_forest\_area >=50 AND percent\_forest\_area <75 THEN '3rd'

ELSE '4th' END AS quartile, percent\_forest\_area

FROM (SELECT l.country\_name, f.forest\_area\_sqkm/(l.total\_area\_sq\_mi\*2.59)\*100 AS percent\_forest\_area

FROM land\_area l

JOIN forest\_area f

ON f.country\_name = l.country\_name

WHERE l.year = '2016' AND f.year = '2016') sub

WHERE percent\_forest\_area IS NOT NULL AND country\_name <> 'World'

ORDER BY quartile) sub2

GROUP BY 2

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SELECT country\_name, region, CASE WHEN percent\_forest\_area <25 THEN '1st' WHEN percent\_forest\_area >=25 AND percent\_forest\_area <50 THEN '2rd' WHEN percent\_forest\_area >=50 AND percent\_forest\_area <75 THEN '3rd' ELSE '4th' END AS quartile, percent\_forest\_area

FROM (SELECT l.country\_name, r.region, f.forest\_area\_sqkm/(l.total\_area\_sq\_mi\*2.59)\*100 AS percent\_forest\_area

FROM land\_area l

JOIN forest\_area f

ON f.country\_name = l.country\_name

JOIN regions r

ON l.country\_name = r.country\_name

WHERE l.year = '2016' AND f.year = '2016') sub

WHERE percent\_forest\_area IS NOT NULL

ORDER BY quartile DESC, percent\_forest\_area DESC

-----------------CREATE VIEW-----------------------------------

CREATE VIEW combined\_tables AS

SELECT f.country\_name, f.year, f.forest\_area\_sqkm, l.total\_area\_sq\_mi, r.region

FROM forest\_area f

JOIN land\_area l

ON f.country\_name = l.country\_name

JOIN regions r

ON r.country\_name = l.country\_name