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 sqkm in 1990. As of 2016, the most recent year for which data was available, that number had fallen to39958245.9 sqkm, a loss of 1324449 sqkm, 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 1279999.9891sqkm).

## 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 American & Carribbean, with 46.16%, and the region with the lowest relative forestation was Middle East and 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 American & Carribbean, with 51.03%, and the region with the lowest relative forestation was Middle East and North Africa,, with 1.78% forestation.

Table 2.1: Percent Forest Area by Region, 1990 & 2016:

|  |  |  |
| --- | --- | --- |
| Region | 1990 Forest Percentage | 2016 Forest Percentage |
| South Asia | 16.51 | 17.51 |
| Sub-Saharan Africa | 30.67 | 28.79 |
| North America | 35.65 | 36.04 |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were Latin American & 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 32.42% 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 sqkm. 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.

United States and China 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 68.11% 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 sqkm |
| Indonesia | East Asia & Pacific | 282193.98 sqkm |
| Myanmar | East Asia & Pacific | 107234.0039 sqkm |

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 | 307.25% |
| Nigeria | Sub-Saharan Africa | 161.77% |
| Uganda | Sub-Saharan Africa | 144.66% |

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 |
| 0-25% | 98 |
| 25-50% | 73 |
| 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 |
| Solomon Islands | East Asian & Pacific | 77.86 |
| Lao PDR | East Asian & Pacific | 82.11 |
| Guyana | Latin American & Caribbean | 83.90 |
| American Samoa | East Asian & Pacific | 87.50 |
| Palau | East Asian & Pacific | 87.60 |
| Seychelles | Sub-Saharan Africa | 88.41 |
| Gabon | Sub-Saharan Africa | 90.03 |
| Micronesia Fed Sts | East Asian & Pacific | 91.86 |
| Suriname | Latin American & Caribbean | 98.26 |

## 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?*

Although certain regions make it appear as if deforestation is a non-issue, because of the incredible decrease in two specific regions, the world as a whole is decreasing. These two areas (mentioned above) tend to have lower SES than other places. Also, the specific countries that are doing the best tend to be lower in actual land and have a tropical climate. When taking all of this information into context, it is easy to see that while certain countries were increasing their overall forestation (i.e. United States) because of their significantly more land availability and SES power, it is on these countries to perform even better with goals of increased forestation percentage year by year as +5% to account for the severe deforestation of other countries like Brazil. However, Brazil and other significant areas of deforestation need to be addressed as well to curb the impact.

## 6. Appendix

CREATE VIEW forestation AS (

SELECT forest\_area.country\_name AS name,

forest\_area.year AS year\_date,

forest\_area.forest\_area\_sqkm,

land\_area.total\_area\_sq\_mi\*2.59 AS land\_sqkm, forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area, regions.region,

CASE WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 >= 75 THEN '75-100'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 50 AND 75 THEN '50-75'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 25 AND 50 THEN '25-50' ELSE '0-25'

END AS quartile

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year ='2016'

GROUP BY name, forest\_area.year,

forest\_area.forest\_area\_sqkm,

land\_sqkm,

regions.region

ORDER BY percent\_forest\_area)

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SELECT forest\_area\_sqkm,

year,

LEAD(forest\_area\_sqkm) OVER (ORDER BY year) AS lead,

forest\_area\_sqkm - LEAD(forest\_area\_sqkm) OVER (ORDER BY year) AS difference,

((forest\_area\_sqkm - LEAD(forest\_area\_sqkm) OVER (ORDER BY year))/forest\_area\_sqkm) \* 100 AS percent\_change

FROM forest\_area

WHERE country\_name = 'World'

AND year IN ('1990', '2016')

ORDER BY 2

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SELECT DISTINCT country\_name,

total\_area\_sq\_mi \* 2.59 AS land\_sq\_km,

year

FROM land\_area

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

AND year = '2016'

ORDER BY 2 DESC

LIMIT 1

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SELECT forest\_area.country\_name AS name,

forest\_area.year AS year\_date,

forest\_area.forest\_area\_sqkm,

land\_area.total\_area\_sq\_mi\*2.59 AS land\_sqkm, forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area,

regions.region

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year IN ('1990', '2016')

GROUP BY name, forest\_area.year,

forest\_area.forest\_area\_sqkm,

land\_sqkm,

regions.region

ORDER BY name

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SELECT forest\_area.year AS year\_date, SUM(forest\_area.forest\_area\_sqkm)/SUM(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area,

regions.region

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year IN ('1990', '2016')

GROUP BY regions.region,

year\_date

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SELECT forest\_area.year AS year\_date, ROUND((SUM(forest\_area.forest\_area\_sqkm)/SUM(land\_area.total\_area\_sq\_mi \*2.59)\*100)::numeric,2) AS percent\_forest\_area,

regions.region

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year IN ('1990', '2016')

GROUP BY regions.region, year\_date

ORDER BY percent\_forest\_area,

regions.region

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SELECT forest\_area\_sqkm, year,

country\_name,

LAG(forest\_area\_sqkm) OVER (PARTITION BY country\_name ORDER BY year) AS lag, forest\_area\_sqkm - LAG(forest\_area\_sqkm) OVER (PARTITION BY country\_name ORDER BY year) AS difference\_forest,

((forest\_area\_sqkm - LAG(forest\_area\_sqkm) OVER (PARTITION BY country\_name ORDER BY year))/forest\_area\_sqkm) \* 100 AS percent\_change

FROM forest\_area

WHERE year IN ('1990', '2016')

ORDER BY percent\_change DESC

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SELECT forest\_area.forest\_area\_sqkm,

forest\_area.year,

forest\_area.country\_name AS name,

regions.region,

LAG(forest\_area.forest\_area\_sqkm) OVER (PARTITION BY forest\_area.country\_name ORDER BY forest\_area.year) AS lag,

forest\_area.forest\_area\_sqkm - LAG(forest\_area.forest\_area\_sqkm) OVER (PARTITION BY forest\_area.country\_name ORDER BY forest\_area.year) AS difference\_forest, ((forest\_area.forest\_area\_sqkm - LAG(forest\_area.forest\_area\_sqkm) OVER (PARTITION BY forest\_area.country\_name ORDER BY forest\_area.year))/forest\_area.forest\_area\_sqkm) \* 100 AS percent\_change

FROM forest\_area

JOIN regions

ON forest\_area.country\_code = regions.country\_code

WHERE year IN ('1990', '2016')

ORDER BY difference\_forest

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SELECT forest\_area.forest\_area\_sqkm,

forest\_area.year,

forest\_area.country\_name AS name,

regions.region,

LAG(forest\_area.forest\_area\_sqkm) OVER (PARTITION BY forest\_area.country\_name ORDER BY forest\_area.year) AS lag,

forest\_area.forest\_area\_sqkm - LAG(forest\_area.forest\_area\_sqkm) OVER (PARTITION BY forest\_area.country\_name ORDER BY forest\_area.year) AS difference\_forest, ((forest\_area.forest\_area\_sqkm - LAG(forest\_area.forest\_area\_sqkm) OVER (PARTITION BY forest\_area.country\_name ORDER BY forest\_area.year))/forest\_area.forest\_area\_sqkm) \* 100 AS percent\_change

FROM forest\_area

JOIN regions

ON forest\_area.country\_code = regions.country\_code

WHERE year IN ('1990', '2016')

ORDER BY percent\_change

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SELECT forest\_area.country\_name AS name,

forest\_area.year AS year\_date,

forest\_area.forest\_area\_sqkm, land\_area.total\_area\_sq\_mi\*2.59 AS land\_sqkm, forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area, regions.region,

CASE WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 >= 75 THEN '75-100'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 50 AND 75 THEN '50-75'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 25 AND 50 THEN '25-50'

ELSE '0-25'

END AS quartile

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year ='2016'

GROUP BY name,

forest\_area.year,

forest\_area.forest\_area\_sqkm,

land\_sqkm,

regions.region

ORDER BY percent\_forest\_area

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SELECT forest\_area.country\_name AS name,

forest\_area.year AS year\_date,

forest\_area.forest\_area\_sqkm,

land\_area.total\_area\_sq\_mi\*2.59 AS land\_sqkm, forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area, regions.region,

CASE WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 >= 75 THEN '75-100'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 50 AND 75 THEN '50-75'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 25 AND 50 THEN '25-50'

ELSE '0-25'

END AS quartile

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year ='2016'

GROUP BY name,

forest\_area.year,

forest\_area.forest\_area\_sqkm,

land\_sqkm,

regions.region

HAVING forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 > 75

ORDER BY percent\_forest\_area

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forest\_area.forest\_area\_sqkm,

land\_area.total\_area\_sq\_mi\*2.59 AS land\_sqkm, forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area, regions.region,

CASE WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 >= 75 THEN '75-100'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 50 AND 75 THEN '50-75'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 25 AND 50 THEN '25-50'

ELSE '0-25'

END AS quartile

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year ='2016'

GROUP BY name,

forest\_area.year,

forest\_area.forest\_area\_sqkm,

land\_sqkm,

regions.region

HAVING forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 <25

ORDER BY percent\_forest\_area

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SELECT forest\_area.country\_name AS name,

forest\_area.year AS year\_date,

forest\_area.forest\_area\_sqkm,

land\_area.total\_area\_sq\_mi\*2.59 AS land\_sqkm, forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 AS percent\_forest\_area, regions.region,

CASE WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 >= 75 THEN '75-100'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 50 AND 75 THEN '50-75'

WHEN forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 BETWEEN 25 AND 50 THEN '25-50'

ELSE '0-25'

END AS quartile

FROM forest\_area

JOIN land\_area

ON land\_area.country\_code = forest\_area.country\_code

AND land\_area.country\_name = forest\_area.country\_name

AND land\_area.year = forest\_area.year

JOIN regions

ON regions.country\_code = land\_area.country\_code

WHERE forest\_area.year ='2016'

GROUP BY name,

forest\_area.year,

forest\_area.forest\_area\_sqkm,

land\_sqkm,

regions.region

HAVING forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 <50 AND forest\_area.forest\_area\_sqkm/(land\_area.total\_area\_sq\_mi \*2.59)\*100 >25

ORDER BY percent\_forest\_area