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 km2**\_ in 1990. As of 2016, the most recent year for which data was available, that number had fallen to\_**39958245.9 km2**\_, a loss of \_**1324449 km2**\_, 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 \_**1279999.98 km2**\_).

## 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 \_**46.16**\_%, 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 \_**32.42%**\_. 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% |
| Europe & Central Asia | 37.28% | 38.04% |
| North America | 35.65% | 36.04% |
| World | 32.42% | 31.38% |
| Sub-Sahara Africa | 30.67% | 28.79% |
| East Asia & Pacific | 25.78% | 26.36% |
| South Asia | 16.51% | 17.51% |
| Middle East & North Africa | 1.78% | 2.07% |

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 \_**32.42**\_% 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 km2**\_. 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 km2**\_, 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 km2 |
| Indonesia | East Asia & Pacific | 282193.98 km2 |
| Myanmar | East Asia & Pacific | 107234 km2 |
| Nigeria | Sub-Saharan Africa | 106506 km2 |
| Tanzania | Sub-Saharan Africa | 102320 km2 |

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 | 59.27% |
| 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** |
| 0-25 | 85 |
| 25-50 | 72 |
| 50-75 | 38 |
| 75-100 | 9 |

The largest number of countries in 2016 were found in the \_**1st**\_ 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?***

*In the world there is a deforestation of 3.21%, the regions with the highest deforestation are Latin America & Caribbean and Sub-Sahara Africa. In Latin America, the square areas of deforestation are in Brazil, while in Sub-Sahara there are several countries that contribute to deforestation.*

*On the other hand, China and the United States have helped in the afforestation of the planet in terms of square areas, increasing in flora and fauna, although in percentage terms the United States has to improve in the afforestation campaign since 94 countries exceed it. It is also surprising that a small country like Iceland increased in forest area by 213.66% from 1990 to 2016.*

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

*In Brazil, Indonesia and Nigeria are the countries that should concern us due to the accelerated deforestation in terms of square areas, also in the region of Sub-Saharan Africa they have increased their deforestation significantly in percentage terms.*

**Appendix**

CREATE VIEW forestation AS

SELECT f.\*, r.region, r.income\_group, l.total\_area\_sq\_mi,

l.total\_area\_sq\_mi \* 2.59 total\_area\_sqkm,

(f.forest\_area\_sqkm \* 100 / (l.total\_area\_sq\_mi \* 2.59)) 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 l.country\_code = r.country\_code

1a.

SELECT SUM(forest\_area\_sqkm) total\_forest\_area

FROM forestation

WHERE region = 'World' AND year = 1990

1b.

SELECT SUM(forest\_area\_sqkm) total\_forest\_area

FROM forestation

WHERE region = 'World' AND year = 2016

1c.

SELECT (SUM(a.forest\_area\_sqkm) - SUM(b.forest\_area\_sqkm)) change\_forest\_area

FROM forestation a

JOIN forestation b

ON a.country\_code = b.country\_code AND a.region = 'World'

AND a.year = 1990 AND b.year = 2016

1d.

WITH

    forest\_area AS (

        SELECT (SUM(a.forest\_area\_sqkm) - SUM(b.forest\_area\_sqkm)) change\_forest\_area

        FROM forestation a

        JOIN forestation b

        ON a.country\_code = b.country\_code AND a.region = 'World'

        AND a.year = 1990 AND b.year = 2016

    )

SELECT ((SELECT \* FROM forest\_area) \* 100 / SUM(forest\_area\_sqkm)) percent\_forest\_area

FROM forestation

WHERE region = 'World' AND year = 1990

1e.

WITH

    forest\_area AS (

        SELECT (SUM(a.forest\_area\_sqkm) - SUM(b.forest\_area\_sqkm)) change\_forest\_area

        FROM forestation a

        JOIN forestation b

        ON a.country\_code = b.country\_code AND a.region = 'World'

        AND a.year = 1990 AND b.year = 2016

    )

SELECT country\_name, total\_area\_sqkm

FROM forestation

WHERE year = 2016 AND (SELECT change\_forest\_area FROM forest\_area) >= total\_area\_sqkm

ORDER BY total\_area\_sqkm DESC

LIMIT 1

2a.

SELECT ROUND(SUM(percent\_forest)::Numeric, 2) percent\_forest\_area

FROM forestation

WHERE region = 'World' AND year = 2016

SELECT region, ROUND((SUM(forest\_area\_sqkm) \* 100 / SUM(total\_area\_sqkm))::Numeric, 2) percent\_forest\_area

FROM forestation

WHERE year = 2016

GROUP BY region

ORDER BY percent\_forest\_area DESC

2b.

SELECT ROUND(SUM(percent\_forest)::Numeric, 2) percent\_forest\_area

FROM forestation

WHERE region = 'World' AND year = 1990

SELECT region, ROUND((SUM(forest\_area\_sqkm) \* 100 / SUM(total\_area\_sqkm))::Numeric, 2) percent\_forest\_area

FROM forestation

WHERE year = 1990

GROUP BY region

ORDER BY percent\_forest\_area DESC

2c.

WITH

    forest\_area\_2016 AS (

        SELECT region, ROUND((SUM(forest\_area\_sqkm) \* 100 / SUM(total\_area\_sqkm))::Numeric, 2) percent\_forest\_area

        FROM forestation

        WHERE year = 2016

        GROUP BY region

    ),

    forest\_area\_1990 AS (

        SELECT region, ROUND((SUM(forest\_area\_sqkm) \* 100 / SUM(total\_area\_sqkm))::Numeric, 2) percent\_forest\_area

        FROM forestation

        WHERE year = 1990

        GROUP BY region

    )

SELECT a.region, b.percent\_forest\_area percent\_forest\_1990, a.percent\_forest\_area percent\_forest\_2016

FROM forest\_area\_2016 a

JOIN forest\_area\_1990 b

ON a.region = b.region

WHERE a.percent\_forest\_area < b.percent\_forest\_area

3a.

WITH

    forest\_area\_2016 AS (

        SELECT country\_name, SUM(forest\_area\_sqkm) forest\_area

        FROM forestation

        WHERE year = 2016

        GROUP BY country\_name

    ),

    forest\_area\_1990 AS (

        SELECT country\_name, SUM(forest\_area\_sqkm) forest\_area

        FROM forestation

        WHERE year = 1990

        GROUP BY country\_name

    )

SELECT a.country\_name, (a.forest\_area - b.forest\_area) diff\_forest\_area

FROM forest\_area\_2016 a

JOIN forest\_area\_1990 b

ON a.country\_name = b.country\_name

WHERE (a.forest\_area - b.forest\_area) IS NOT NULL

ORDER BY diff\_forest\_area DESC

LIMIT 5

3b.

WITH

    forest\_area\_2016 AS (

        SELECT country\_name, SUM(percent\_forest) percent\_forest\_area

        FROM forestation

        WHERE year = 2016

        GROUP BY country\_name

    ),

    forest\_area\_1990 AS (

        SELECT country\_name, SUM(percent\_forest) percent\_forest\_area

        FROM forestation

        WHERE year = 1990

        GROUP BY country\_name

    )

SELECT a.country\_name, ROUND(((a.percent\_forest\_area - b.percent\_forest\_area) \* 100 / b.percent\_forest\_area)::Numeric, 2)  diff\_forest\_area

FROM forest\_area\_2016 a

JOIN forest\_area\_1990 b

ON a.country\_name = b.country\_name

WHERE (a.percent\_forest\_area - b.percent\_forest\_area) IS NOT NULL

ORDER BY diff\_forest\_area DESC

LIMIT 5

Table 3.1

WITH

    forest\_area\_2016 AS (

        SELECT country\_name, region, SUM(forest\_area\_sqkm) forest\_area

        FROM forestation

        WHERE year = 2016

        GROUP BY country\_name, region

    ),

    forest\_area\_1990 AS (

        SELECT country\_name, region, SUM(forest\_area\_sqkm) forest\_area

        FROM forestation

        WHERE year = 1990

        GROUP BY country\_name, region

    )

SELECT a.country\_name, a.region, (b.forest\_area - a.forest\_area) "Absolute Forest Area Change"

FROM forest\_area\_2016 a

JOIN forest\_area\_1990 b

ON a.country\_name = b.country\_name

WHERE (a.forest\_area - b.forest\_area) IS NOT NULL AND a.country\_name != 'World'

ORDER BY "Absolute Forest Area Change" DESC

LIMIT 5

Table 3.2

WITH

    forest\_area\_2016 AS (

        SELECT country\_name, region, SUM(percent\_forest) percent\_forest\_area

        FROM forestation

        WHERE year = 2016

        GROUP BY country\_name, region

    ),

    forest\_area\_1990 AS (

        SELECT country\_name, region, SUM(percent\_forest) percent\_forest\_area

        FROM forestation

        WHERE year = 1990

        GROUP BY country\_name, region

    )

SELECT a.country\_name, a.region, ROUND(((b.percent\_forest\_area - a.percent\_forest\_area) \* 100 / b.percent\_forest\_area)::Numeric, 2) "Pct Forest Area Change"

FROM forest\_area\_2016 a

JOIN forest\_area\_1990 b

ON a.country\_name = b.country\_name

WHERE (a.percent\_forest\_area - b.percent\_forest\_area) IS NOT NULL AND a.country\_name != 'World'

ORDER BY "Pct Forest Area Change" DESC

LIMIT 5

3c.

WITH

    forest\_quartile AS (

        SELECT CASE WHEN percent\_forest >= 75 THEN '75-100'

        WHEN percent\_forest >= 50 THEN '50-75'

        WHEN percent\_forest >= 25 THEN '25-50'

        ELSE '0-25' END AS quartile, country\_name

        FROM forestation

        WHERE year = 2016 AND country\_name != 'World' AND percent\_forest IS NOT NULL

    )

SELECT DISTINCT (quartile), COUNT(\*) OVER (PARTITION BY quartile) AS "Number of Countries"

FROM forest\_quartile

ORDER BY quartile

3d.

SELECT country\_name, region, ROUND(percent\_forest::Numeric, 2) "Pct Designated as Forest"

FROM forestation

WHERE year = 2016 AND country\_name != 'World' AND percent\_forest IS NOT NULL

AND percent\_forest >= 75

ORDER BY percent\_forest DESC

3e.

SELECT count(\*)

FROM forestation

WHERE year = 2016 AND country\_name != 'World' AND percent\_forest IS NOT NULL

AND percent\_forest > (SELECT percent\_forest FROM forestation WHERE country\_name = 'United States' AND year = 2016)