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 **39958245.9** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **41282694.9**, a loss of **-1324449**, or **-3.20824258980244%**.

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 **1,279,999.8**).

## 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 **The 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 **The 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 | 46.2 |
| Europe & Central Asia | 37.28 | 38 |
| North America | 35.65 | 36 |
| Sub-Saharan Africa | 30.67 | 28.8 |
| East Asia & Pacific | 25.78 | 26.4 |
| South Asia | 16.51 | 17.5 |
| 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 46.2%) **Sub-Saharan Africa** (**30.67%** to **28.8%**). 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 527229.06. 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 **79200.00**, much lower than the figures for **Iceland, French Polynesia, Bahrain**, and so on.

**The 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 **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 |
| 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 | Percent 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 |
| 0%-25% | 85 |
| 25%-50% | 73 |
| 50%-75% | 38 |
| 75%-100% | 9 |

The largest number of countries in 2016 were found in the **0% - 25%** 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 |

## 5. RECOMMENDATIONS

*Write out a set of recommendations as an analyst on the ForestQuery team.*

* *What have you learned from the World Bank data?* 
  + **It appears that many regions in the world have experienced rapid growth from 1990 to 2019, but other areas have minimal growth, and the worse of them have decayed instead. I believe that we need to discover the source of the decay and make sure it doesn’t spread to other areas.**
* *Which countries should we focus on over others?*
  + **Focus on countries that are in decline but have a percentage above 5%. Any area that’s less than 5% can be considered a desert and will remain a desert if left unchanged, but the other areas are at risk of decay.**

# Appendix:

-- If this table already exists, Destroy it--

Drop VIEW

IF EXISTS forestation;

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--Create Forestion TABLE--

CREATE VIEW forestation AS

SELECT for\_a.country\_code code, for\_a.country\_name country,

for\_a.year "year", for\_a.forest\_area\_sqkm forest\_area\_sqkm,

lan\_a.total\_area\_sq\_mi total\_area\_sq\_mi,

regi.region region, regi.income\_group income\_group,

100.0\*(for\_a.forest\_area\_sqkm /

(lan\_a.total\_area\_sq\_mi \* 2.59)) AS percentage

FROM forest\_area for\_a, land\_area lan\_a, regions regi

WHERE (for\_a.country\_code = lan\_a.country\_code AND

for\_a.year = lan\_a.year AND

regi.country\_code = lan\_a.country\_code);

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--Show Forestation Table--

SELECT \*

FROM forestation;

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--1. GLOBAL SITUATION

--Total Area Square km (1990)--

SELECT SUM(forest\_area\_sqkm)

FROM forestation

WHERE year = 1990

AND REGION = 'World';

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--Total Area Square km (2016)--

SELECT SUM(forest\_area\_sqkm)

FROM forestation

WHERE year = 2016

AND REGION = 'World';

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--Difference between 1990 and 2016)--

SELECT now.forest\_area\_sqkm - b4.forest\_area\_sqkm

AS diff

FROM forestation AS now

JOIN forestation AS b4

ON (now.country = 'World' AND b4.country = 'World' AND now.year = '2016' AND b4.year = '1990');

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--Percent change between 1990 and 2016)--

SELECT (now.forest\_area\_sqkm - b4.forest\_area\_sqkm) / b4.forest\_area\_sqkm \* 100

AS Percentage

FROM forestation AS now

JOIN forestation AS b4

ON (now.country = 'World' AND b4.country = 'World' AND now.year = '2016' AND b4.year = '1990');

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-- Forest area "metric conversion" (2016)--

SELECT country, (total\_area\_sq\_mi \* 2.59) AS total\_area\_sqkm

FROM forestation

WHERE year = 2016

ORDER BY total\_area\_sqkm;

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-- 2. REGIONAL OUTLOOK

--World Percentage (2016)--

SELECT percentage

FROM forestation

WHERE year = 2016

AND country = 'World';

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--World Percentage (1990)--

SELECT percentage

FROM forestation

WHERE year = 1990

AND country = 'World';

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--Percentage Then -- Now -- And Region ------

SELECT ROUND(CAST((region\_forest\_1990/ region\_area\_1990) \* 100 AS NUMERIC),

2)

AS forest\_percent\_1990,

ROUND(CAST((region\_forest\_2016 / region\_area\_2016) \* 100 AS NUMERIC), 2)

AS forest\_percent\_2016,

region

FROM (SELECT SUM(Table\_a.forest\_area\_sqkm) region\_forest\_1990,

SUM(Table\_a.total\_area\_sq\_mi \* 2.59) region\_area\_1990, Table\_a.region,

SUM(Table\_b.forest\_area\_sqkm) region\_forest\_2016,

SUM(Table\_b.total\_area\_sq\_mi \* 2.59) region\_area\_2016

FROM forestation Table\_a, forestation Table\_b

WHERE Table\_a.year = '1990'

AND Table\_a.country != 'World'

AND Table\_b.year = '2016'

AND Table\_b.country != 'World'

AND Table\_a.region = Table\_b.region

GROUP BY Table\_a.region) Regional\_percentage

ORDER BY forest\_percent\_1990 DESC;

--Countries with Difference in forestation between now and then--

SELECT current.country\_name,

current.forest\_area\_sqkm - b4.forest\_area\_sqkm AS difference

FROM forest\_area AS current

JOIN forest\_area AS b4

ON (current.year = '2016' AND b4.year = '1990')

AND current.country\_name = b4.country\_name

ORDER BY difference DESC;

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-- 3. COUNTRY-LEVEL DETAIL--

------ 3-A. SUCCESS STORIES --

--Countries with Percentage growth in forestation between now and then--

SELECT current.country\_name,

ROUND(CAST((current.forest\_area\_sqkm - b4.forest\_area\_sqkm) / b4.forest\_area\_sqkm \* 100 AS NUMERIC), 2) AS Growth

FROM forest\_area AS current

JOIN forest\_area AS b4

ON (current.year = '2016' AND b4.year = '1990')

AND current.country\_name = b4.country\_name

ORDER BY Growth DESC;

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--Countries with Difference in forestation between now and then--

SELECT current.country\_name,

current.forest\_area\_sqkm - b4.forest\_area\_sqkm AS difference

FROM forest\_area AS current

JOIN forest\_area AS b4

ON (current.year = '2016' AND b4.year = '1990')

AND current.country\_name = b4.country\_name

ORDER BY difference DESC;

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---- 3-B. LARGEST CONCERNS --

--Countries with Difference in Absolute forest change between now and then--

SELECT current.country,

current.region,

current.forest\_area\_sqkm - b4.forest\_area\_sqkm AS difference

FROM forestation AS current

JOIN forestation AS b4

ON (current.year = '2016' AND b4.year = '1990')

AND current.country = b4.country

WHERE current.forest\_area\_sqkm IS NOT NULL

AND b4.forest\_area\_sqkm IS NOT NULL

AND b4.country != 'World'

AND current.country != 'World'

ORDER BY difference

Limit 5;

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--Countries with Difference in Percent forest change between now and then--

SELECT current.country,

current.region,

ROUND(CAST((current.forest\_area\_sqkm - b4.forest\_area\_sqkm) / b4.forest\_area\_sqkm \* 100 AS NUMERIC), 2) AS Percentage

FROM forestation AS current

JOIN forestation AS b4

ON (current.year = '2016' AND b4.year = '1990')

AND current.country = b4.country

WHERE current.forest\_area\_sqkm IS NOT NULL

AND b4.forest\_area\_sqkm IS NOT NULL

AND b4.country != 'World'

AND current.country != 'World'

ORDER BY Percentage

LIMIT 5;

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--- 3-C. QUARTILES --

-- Countries Grouped by Forestation Percent Quartiles----

SELECT DISTINCT(Quartiles), COUNT(Country) OVER (PARTITION BY Quartiles) AS Number\_of\_Countries

FROM (SELECT country,

CASE WHEN percentage >= 0 AND percentage <= 25 THEN '0% - 25%'

WHEN percentage > 25 AND percentage <= 50 THEN '25% - 50%'

WHEN percentage > 50 AND percentage <= 75 THEN '50% - 75%'

WHEN percentage > 75 AND percentage <= 100 THEN '75% - 100%'

ELSE 'INVALID'

END AS Quartiles FROM forestation

WHERE Percentage IS NOT NULL AND year = 2016) quart;

-- 3.4 Top Quartile Countries ---

SELECT country, Region, Percentage

FROM forestation

WHERE year = 2016 AND Percentage > 75

ORDER BY percentage DESC;