A GLOBAL DEFORESTATION STORY

Select link below to access interactive dashboard.

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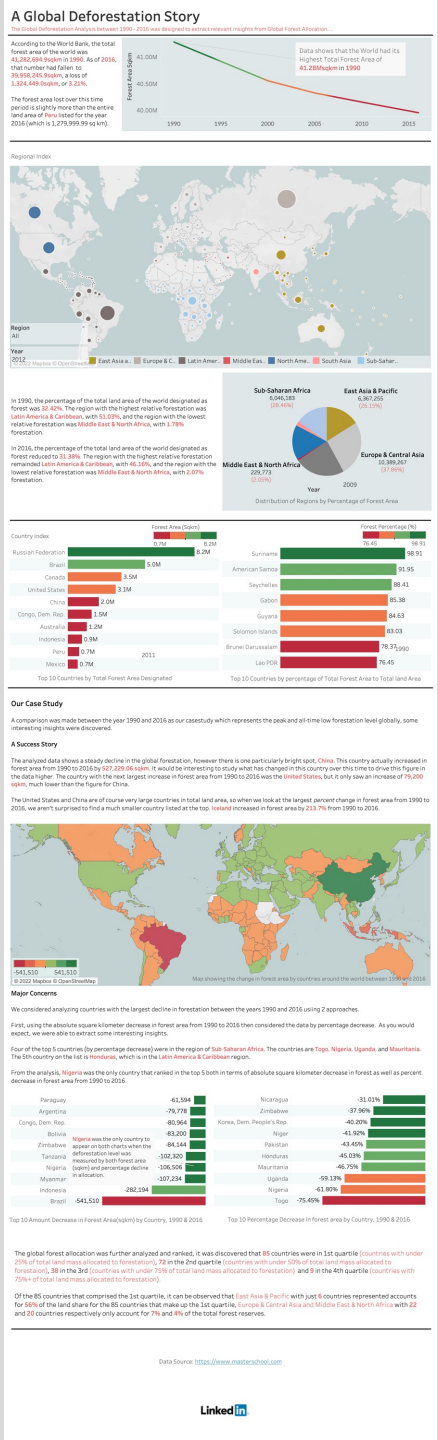

Report for ForestQuery into Global Deforestation, 1990 to 2016

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 **41,282,694.9 sq km** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39,958,245.9 sq km**, a loss of **1,324,449.0 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 **1,279,999.99 sq km**).

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 **1.77%** 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
Sub-Saharan 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**

A. 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 **527,229.06 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**.

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 **213.7%** from 1990 to 2016.

B. 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 sqkm
Indonesia	East Asia & Pacific	282,193.98 sqkm
Myanmar	East Asia & Pacific	107,234.00 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	75.44%
Nigeria	Sub-Saharan Africa	61.80%
Uganda	Sub-Saharan Africa	59.13%

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.

C. 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 **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	87.5
Guyana	Latin America & Caribbean	83.9
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?*
  Ans.

Region	Number of Countries	Forest	Share of land as forest relative to other regions
East Asia & Pacific	6	3,474,155.20	56%
Sub-Saharan Africa	22	897,636.99	14%
South Asia	5	750,667.98	12%
Latin America & Caribbean	9	470,956.8	8%
Europe & Central Asia	22	429,934.90	7%
Middle East & North Africa	20	232,131.00	4%
North America	1	10.00	0%

Of the 85 countries that makes up the 1st quartile, it can be observed that East Asia & Pacific with just 6 countries represented accounts for **56%** of the land share for the 85 countries that make up the 1st quartile, Europe & Central Asia and Middle East & North Africa with 22 and 20 countries respectively only account for **7% and 4%** of the total forest reserves.

- *Which countries should we focus on over others?*
  Ans.
  Looking at the 2016 forest allocation data we need to focus on the 85 countries that makes up the 1st Quartile of the chart and the 72 countries that make up the 2nd Quartile. These countries contribute less than 25% and 50% of their to forestation respectively. A 25% and 15% increase for countries in the 1st and 2nd Quartile respectively results in a Global Forestation of 34.79% which is higher than the forestation record of 1990 thereby regaining the forest loss to deforestation from the time which was 3.21%

Appendix

- **Query to create view**

```
CREATE VIEW deforestation
AS
SELECT *
FROM (
	SELECT r.region
		,f.country_name
		,f.year
		,f.forest_area_sqkm
		,l.total_area_sq_mi * 2.59 AS total_area_sqkm
		,(f.forest_area_sqkm / (l.total_area_sq_mi * 2.59)) * 100 AS forest_percentage
		,income_group
	FROM land_area l
	FULL JOIN forest_area f ON l.country_code = f.country_code
		AND l.year = f.year
	FULL JOIN regions r ON f.country_code = r.country_code
	ORDER BY 2
		,3
	) t1
```

- **Section 1**

```
SELECT forest_area_sqkm
FROM deforestation
WHERE year = 1990
	AND region = 'World'

SELECT country_name
	,total_area_sqkm
FROM (
	SELECT *
	FROM deforestation
	WHERE year = 2016
	) t1
WHERE total_area_sqkm < 1324449
ORDER BY 2 DESC
```

- **Section 2**

```
SELECT (forest_area_sqkm / total_area_sqkm) * 100
FROM deforestation
WHERE year = 2016
	AND region = 'World'

SELECT region
	,sum(forest_area_sqkm) AS forest
	,sum(total_area_sqkm) AS total_land
	,(sum(forest_area_sqkm) / sum(total_area_sqkm)) * 100 AS forest_percent
FROM deforestation
WHERE year = 2016
	AND region != 'World'
GROUP BY 1
ORDER BY 4 DESC
```

- **Section 3**

```
SELECT country_name
	,forest_area_sqkm AS forest_2016
	,forest_area_1990
	,forest_area_sqkm - forest_area_1990 AS forest_change
	,((forest_area_sqkm - forest_area_1990) / forest_area_1990) * 100 AS
percentage_forest_change
FROM (
	SELECT country_name
		,year
		,(forest_area_sqkm)
		,lag(forest_area_sqkm) OVER (
			PARTITION BY country_name ORDER BY year
			) forest_area_1990
	FROM deforestation
	WHERE year = 1990
		OR year = 2016
		AND forest_percentage IS NOT NULL
	ORDER BY 1
		,2
	) t1
WHERE (forest_area_sqkm - forest_area_1990 / forest_area_1990) * 100 IS NOT NULL
	AND country_name != 'World'
ORDER BY 4 DESC
```

- **Section 3 Table 1**

```
--WARNING! ERRORS ENCOUNTERED DURING SQL PARSING!
SELECT country_name
	,forest_area_sqkm AS forest_2016
	,forest_area_1990
	,forest_area_sqkm - forest_area_1990 AS forest_change
	,((forest_area_sqkm - forest_area_1990) / forest_area_1990) * 100 AS
percentage_forest_change
FROM (
	SELECT country_name
		,year
		,(forest_area_sqkm)
		,lag(forest_area_sqkm) OVER (
			PARTITION BY country_name ORDER BY year
			) forest_area_1990
	FROM deforestation
	WHERE year = 1990
		OR year = 2016
		AND forest_percentage IS NOT NULL
	ORDER BY 1
		,2
	) t1
WHERE (forest_area_sqkm - forest_area_1990 / forest_area_1990) * 100 IS NOT NULL
ORDER BY 5 DESC ) t2
WHERE forest_change < 0
	AND country_name != 'World'
ORDER BY 4 DESC
```

- **Section 3 Table 2**

```
SELECT country_name
	,forest_2016
	,forest_area_1990
	,abs(forest_change) AS forest_change
	,abs(percentage_forest_change) AS PERCENT
FROM (
	SELECT country_name
		,forest_area_sqkm AS forest_2016
		,forest_area_1990
		,forest_area_sqkm - forest_area_1990 AS forest_change
		,((forest_area_sqkm - forest_area_1990) / forest_area_1990) * 100 AS
percentage_forest_change
	FROM (
		SELECT country_name
			,year
			,(forest_area_sqkm)
```

```
                ,lag(forest_area_sqkm) OVER (
                        PARTITION BY country_name ORDER BY year
                        ) forest_area_1990
                FROM deforestation
                WHERE year = 1990
                        OR year = 2016
                        AND forest_percentage IS NOT NULL
                ORDER BY 1
                        ,2
                ) t1
        WHERE (forest_area_sqkm - forest_area_1990 / forest_area_1990) * 100 IS NOT NULL
        ORDER BY 5 DESC
        ) t2
WHERE forest_change < 0
        AND country_name != 'World'
ORDER BY 5 DESC
```

- **Section 3b Table 3**

```
SELECT rank
        ,count(rank)
FROM (
        SELECT region
                ,country_name
                ,round(forest_percentage::NUMERIC, 2)
                ,CASE
                        WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 0.00
                                AND 25.00
                        THEN 1
                        WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 25.01
                                AND 50.00
                        THEN 2
                        WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 50.01
                                AND 75.00
                        THEN 3
                        WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 75.01
                                AND 100
                        THEN 4
                        ELSE 5
                        END rank
        FROM (
                SELECT *
                FROM deforestation
                WHERE year = 2016
                        AND forest_percentage IS NOT NULL
                        AND region != 'World'
                ORDER BY 6 DESC
```

```
            ) t1
    ) t2
GROUP BY 1
```

- **Section 3 table 4**

```
SELECT *
FROM (
    SELECT region
        ,country_name
        ,forest_percentage
        ,CASE
            WHEN floor(forest_percentage) BETWEEN 0
                    AND 25
                THEN 1
            WHEN floor(forest_percentage) BETWEEN 26
                    AND 50
                THEN 2
            WHEN floor(forest_percentage) BETWEEN 51
                    AND 75
                THEN 3
            WHEN floor(forest_percentage) BETWEEN 76
                    AND 100
                THEN 4
            ELSE 5
            END rank
    FROM (
        SELECT *
        FROM deforestation
        WHERE year = 2016
            AND forest_percentage IS NOT NULL
            AND region != 'World'
        ORDER BY 6 DESC
        ) t1
    ) t2
WHERE rank = 4
```

- **Deductions**

```
CREATE VIEW analysis
AS
SELECT region
	,country_name
	,forest_area_sqkm
	,total_area_sqkm
	,forest_percentage
	,CASE
		WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 0.00
				AND 25.00
			THEN 1
		WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 25.01
				AND 50.00
			THEN 2
		WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 50.01
				AND 75.00
			THEN 3
		WHEN round(forest_percentage::NUMERIC, 2) BETWEEN 75.01
				AND 100
			THEN 4
		ELSE 5
		END rank
FROM (
	SELECT *
	FROM deforestation
	WHERE year = 2016
		AND forest_percentage IS NOT NULL
		AND region != 'World'
	ORDER BY 6 DESC
	) t1


SELECT sum(new_forest) / sum(total_area_sqkm)
FROM (
	SELECT *
		,CASE
			WHEN rank = 1
				THEN forest_area_sqkm * 1.25
			WHEN rank = 2
				THEN forest_area_sqkm * 1.15
			ELSE forest_area_sqkm
			END new_forest
	FROM analysis
	) t1
```