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 to **39958245.9 Sq Km** , a loss of **1324449 Sq Km**, or **3.2%**.

The forest area lost over this time period is slightly more than the entire land area of **Peru** sted for the year 2016 (which is **1279999.9891sq Km)**.

2. **REGIONAL OUTLOOK**

In 2016, the percent of the total land area of the world designated as forest was **36.04.** The region with the highest relative forestation was **Latin America & Caribbean**, with **46.16**%, and the region with the lowest relative forestation was **Europe & Central Asia,** with **38.04** forestation.

In 1990, the percent of the total land area of the world designated as forest was **35.65.** The region with the highest relative forestation was **Latin America & Caribbean**, with **51.03%**, and the region with the lowest relative forestation was **Europe & Central Asia**, with **0.00%** 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-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 _____33.55%___. 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 _____2.62%_____, 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.

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	541510
Indonesia	East Asia & Pacific	282193.9844
Myanmar	East Asia & Pacific	107234.0039
Nigeria	Sub-Saharan Africa	106506.001
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	Pct Forest Area Change
Togo	Sub-Saharan Africa	75.45
Nigeria	Sub-Saharan Africa	61.8
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 percentage 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
0%-25%	85
25%-50%	72
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
American Samoa	East Asia & Pacific	87.5
Gabon	Sub-Saharan Africa	90.04
Guyana	Latin America & Caribbean	83.9
Lao PDR	East Asia & Pacific	82.11

Micronesia, Fed. Sts.	East Asia & Pacific	91.86
Palau	East Asia & Pacific	87.61
Seychelles	Sub-Saharan Africa	88.41

4. RECOMMENDATIONS

The globe lost 3.2% of its forest area Between 1990 and 2016 an area slightly larger than Peru.
The greatest loss of forest land is occurring in sub-Saharan Africa and Latin America & the Caribbean. Due to the high percentage of forest in these areas, this reduction has an impact on the entire planet, even while the amount of forest is growing in other areas.

larger nations like China and the United States made progress in reducing the effect of deforestation however because of the size of these countries this is not as obvious as it is in smaller nations, like Iceland, which seem to have made significant efforts and succeeded in increasing their forest acreage, in larger proportions due to the smaller land to forest ratio. We should be able to capture the best practices by these nations with the intent of sharing it with other nations who are suffering the bigger impact of deforestation.
Brazil exhibits a significant reduction in forest area, some nations show a significant decline in the percentage of forests, and some nations, like Nigeria, show a significant decline in both.
The first quartile of forest area contains 89 countries (less than 25%).
Only nine nations make up the bottom quartile.
Focus should be given to the sub-Saharan African nations that have seen the highest loss of forest area (mentioned above).

5. APPENDIX: SQL Queries Used

```
DROP VIEW IF EXISTS forestation;
CREATE VIEW forestation
AS
(SELECT forest_area.country_code,
forest_area.year,
forest_area.forest_area_sqkm,
land_area.country_name,
land_area.total_area_sq_mi,
 regions.region,
```

```
regions.income_group,
land_area.total_area_sq_mi*2.59 total_area_sqkm,
forest_area.forest_area_sqkm/(land_area.total_area_sq_mi*2.59)*100
FROM forest_area
INNER JOIN land_area
ON land_area.country_code=forest_area.country_code
AND land_area.year=forest_area.year
INNER JOIN regions
ON forest_area.country_code=regions.country_code);
```

1. GLOBAL SITUATION QUERIES

```
---Question 1a
SELECT forest_area_sqkm,year
FROM forestation
WHERE country_name='World' AND year=1990;


--Question 1b
 SELECT forest_area_sqkm,year
FROM forestation
WHERE country_name='World' AND year=2016;


--Question 1c
WITH area_1990 AS
(SELECT forest_area_sqkm AS fas_1990
FROM forestation
WHERE country_name='World' AND year=1990),

area_2016 AS
 (SELECT forest_area_sqkm AS fas_2016
FROM forestation
WHERE country_name='World' AND year=2016)

SELECT fas_1990-fas_2016 AS difference
FROM  area_2016, area_1990;

--Question 1d
WITH areaperc_1990 AS
```

```
 (SELECT forest_area_sqkm AS pfi_1990
 FROM forestation
 WHERE country_name='World' AND year=1990),

 areaperc_2016 AS
  (SELECT forest_area_sqkm AS pfi_2016
 FROM forestation
 WHERE country_name='World' AND year=2016)

 SELECT (pfi_1990-pfi_2016)/pfi_1990 *100 AS delta_forest
 FROM  areaperc_1990,areaperc_2016;
```

```
--Question 1e
--Question 1e
SELECT total_area_sqkm,country_name,year
FROM forestation
WHERE year=2016 AND total_area_sqkm<=1324449
ORDER BY total_area_sqkm DESC ;
```

2. **REGIONAL OUTLOOK**

```
– Question 2
SELECT region, sum (forest_area_sqkm)/sum (total_area_sqkm)*100 AS reg_for_perc
FROM forestation
WHERE year=1990
GROUP BY region
ORDER BY reg_for_perc Desc;

SELECT region, sum (forest_area_sqkm)/sum (total_area_sqkm)*100 AS reg_for_perc
FROM forestation
WHERE year=2016
GROUP BY region
ORDER BY reg_for_perc Desc;

WITH forest_1990 AS
(SELECT region, sum (forest_area_sqkm)/sum (total_area_sqkm)*100 AS reg_for_perc90
FROM forestation
WHERE year=1990
```

```
GROUP BY region),

forest_2016 AS
(SELECT region, sum (forest_area_sqkm)/sum (total_area_sqkm)*100 AS reg_for_perc2016
FROM forestation
WHERE year=2016
GROUP BY region)

SELECT f90.region,ROUND(reg_for_perc90::numeric,2) AS reg_for_perc90,
ROUND(reg_for_perc2016::numeric,2) AS reg_for_perc2016
FROM forest_1990 AS f90
INNER JOIN forest_2016
USING (region)
ORDER BY 2 DESC,3 DESC;
```

3. COUNTRY-LEVEL DETAIL

```
--Question 3a

With fas90 AS
(SELECT year, country_name,region, forest_area_sqkm AS fas_90,total_area_sqkm AS tas_90
FROM forestation
WHERE year=1990 AND forest_area_sqkm IS NOT NULL AND country_name<>'World'
GROUP BY year,country_name,region,forest_area_sqkm,total_area_sqkm
ORDER BY forest_area_sqkm),

fas2016 AS
 (SELECT year, country_name,region, forest_area_sqkm AS fas_16,total_area_sqkm AS
tas_16
FROM forestation
WHERE year=2016 AND forest_area_sqkm IS NOT NULL AND country_name<>'World'
GROUP BY year,country_name,region,forest_area_sqkm,total_area_sqkm
ORDER BY forest_area_sqkm)


SELECT fas90.country_name,fas90.region,fas_90,fas_16,fas_90-fas_16 AS delta_9016,
ROUND(CAST(( fas_90-fas_16) * 100/fas_90 AS numeric),2) AS Perc_Delta
FROM fas90
INNER JOIN fas2016
USING(country_name)
```

```
ORDER BY delta_9016 DESC
LIMIT 5;

--Question 3b
With fas90 AS
(SELECT year, country_name,region, forest_area_sqkm AS fas_90,total_area_sqkm AS tas_90
FROM forestation
WHERE year=1990 AND forest_area_sqkm IS NOT NULL AND country_name<>'World'
GROUP BY year,country_name,region,forest_area_sqkm,total_area_sqkm
ORDER BY forest_area_sqkm),

fas2016 AS
 (SELECT year, country_name,region, forest_area_sqkm AS fas_16,total_area_sqkm AS
tas_16
FROM forestation
WHERE year=2016 AND forest_area_sqkm IS NOT NULL AND country_name<>'World'
GROUP BY year,country_name,region,forest_area_sqkm,total_area_sqkm
ORDER BY forest_area_sqkm)


SELECT fas90.country_name,fas90.region,fas_90,fas_16,fas_90-fas_16 AS delta_9016,
ROUND(CAST(( fas_90-fas_16) * 100/fas_90 AS numeric),2) AS Perc_Delta
FROM fas90
INNER JOIN fas2016
USING(country_name)
ORDER BY perc_delta DESC
LIMIT 5;

--Question 3c
WITH pfq AS
(SELECT country_name, region, perc_forest_inland,
CASE
WHEN f.perc_forest_inland>=75 THEN '75%-100%'
WHEN f.perc_forest_inland>=50 THEN '50%-75%'
WHEN f.perc_forest_inland>=25 THEN '25%-50%'
ELSE '0%-25%'
END AS quartiles
FROM forestation AS f
WHERE year=2016 AND perc_forest_inland IS NOT NULL AND country_name<>'World')

SELECT  quartiles, count(*)
FROM pfq
GROUP BY quartiles
```

```
ORDER BY quartiles;

--Question 3d
WITH pfq AS
(SELECT country_name, region, perc_forest_inland,
CASE
WHEN f.perc_forest_inland>=75 THEN '75%-100%'
WHEN f.perc_forest_inland>=50 THEN '50%-75%'
WHEN f.perc_forest_inland>=25 THEN '25%-50%'
ELSE '0%-25%'
END AS quartiles
FROM forestation AS f
WHERE year=2016 AND perc_forest_inland IS NOT NULL AND country_name<>'World')

SELECT country_name,region, quartiles,ROUND(perc_forest_inland::numeric,2), count(*)
FROM pfq
WHERE quartiles='75%-100%'
GROUP BY country_name,region,quartiles,perc_forest_inland
ORDER BY country_name;


--Question 3e
SELECT perc_forest_inland AS us_pfi
FROM forestation
WHERE year=2016 and country_name= 'United States';


SELECT COUNT (*) AS country_count
FROM forestation
WHERE perc_forest_inland >
(SELECT perc_forest_inland AS us_pfi
FROM forestation
WHERE year=2016 and country_name= 'United States') AND year=2016;
```

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