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** in 1990. As of 2016, the most recent year for which data was available, that number had fallen to **39958245.9** , a loss of **1324449** , 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 **1279999.9891**).

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:

Latin America & Caribbean	51.03	46.16
Middle East & North Africa	1.78	2.07
North America	35.65	36.04
South Asia	16.51	17.51
Sub-Saharan Africa	30.67	28.79
World	32.42	31.38
East Asia & Pacific	25.78	26.36
Europe & Central Asia	37.28	38.04

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 **527229.062** 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** , 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 **213.66**% from 1990 to 2016.

A. 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 (km^2)
Brazil	Latin America & Caribbean	541510
Indonesia	East Asia & Pacific	282193.98
Myanmar	East Asia & Pacific	107234
Nigeria	Sub-Saharan Africa	106506
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 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.

A. 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 was found in the **First** quartile. There were **9** countries in the top quartile (fourth 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
Solomon Islands	East Asia & Pacific	77.86
Suriname	Latin America & Caribbean	98.26

4. RECOMMENDATIONS

Write out a set of recommendations as an analyst on the ForestQuery team.
What have you learned from the World Bank data?

The amount of forest land we lost is massive, approximately, we have to lost land area greater than the entire country of Peru.

The Sub-Saharan Africa region has also experienced massive forest area loss as seen in table 3.2, the top four countries belong to the Sub-Saharan Africa region. Moreover, there are 85 countries that have less or equal to 25% of the total forest area as seen in table 3.3.

Ironically, there are countries that have increased in terms of their forest areas such as the united states and china. China specifically has seen a great increase in the forest area land by 527229.062 .

Which countries should we focus on over others?

In my opinion, the main focus should be on Tanzania, Brazil, Myanmar, Nigeria, and Indonesia because they are the countries affected the most. Also, countries in Sub- Saharan Africa need more attention.

5. Appendix (SQL)

```
CREATE OR REPLACE VIEW forestation AS

SELECT f.country_code AS

forest_country_code,

        f.country_name AS country_n,

        f.year AS f_year,

         f.forest_area_sqkm AS forest_sq_km,

         l.total_area_sq_mi AS

         l_total_area_sq_mi,

         r.region AS r_region, r.income_group AS r_income_group,

         (f.forest_area_sqkm/(l.total_area_sq_mi * 2.59)) * 100 AS perc_forest_area

FROM forest_area f

INNER JOIN land_area l ON f.country_code =

l.country_code INNER JOIN regions r ON r.country_code

= l.country_code;



SELECT *

FROM forestation

WHERE r_region =

'World' and f_year =

1990;


SELECT *
```

```
FROM forestation

WHERE r_region =

'World' and f_year =

2016;
```

```
SELECT b.forest_sq_km -a.forest_sq_km As AreaDiff
FROM forestation b
INNER JOIN forestation a
ON a.forest_country_code = b.forest_country_code
WHERE a.f_year = 2016
and b.f_year = 1990
and a.r_region = 'World'
and b.r_region = 'World'
```

```
SELECT ((sub2.forest_sq_km - sub1.forest_sq_km)/sub2.forest_sq_km)* 100 As
PercentDiff FROM

(SELECT forest_country_code

,forest_sq_km FROM forestation

WHERE f_year = 2016

and r_region =

'World')sub1 INNER

JOIN

(SELECT forest_country_code

,forest_sq_km FROM forestation

WHERE f_year = 1990

and r_region = 'World'
```

```
)sub2 ON sub1.forest_country_code = sub2.forest_country_code;



SELECT l.country_name,
      (SELECT (sub2.forest_sq_km - sub1.forest_sq_km) As areadiff
FROM (SELECT forest_country_code ,forest_sq_km
FROM forestation
WHERE f_year =
2016
and r_region =
'World')sub1 INNER
JOIN
(SELECT forest_country_code
,forest_sq_km FROM forestation



WHERE f_year = 1990
and r_region = 'World'
)sub2 ON sub1.forest_country_code = sub2.forest_country_code

LIMIT 1
) - (l.total_area_sq_mi * 2.59) AS
diff_fa_la_sqkm FROM land_area l
```

```
WHERE l.year = 2016

ORDER BY

diff_fa_la_sqkm;




CREATE VIEW regional

AS SELECT r.region,

l.year,
  SUM(f.forest_area_sqkm) total_forest_area_sqkm,

    SUM(l.total_area_sq_mi*2.59) AS total_area_sqkm,

    SUM((f.forest_area_sqkm)/ (l.total_area_sq_mi*2.59)) * 100 AS forest_region_percent


FROM forest_area f
INNER JOIN land_area l ON f.country_code = l.country_code AND f.year =

l.year INNER JOIN regions r ON l.country_code = r.country_code

GROUP BY r.region,

l.year;


SELECT *
FROM regional

WHERE YEAR =

2016

and region = 'World';
```

```
SELECT

region,MAX(forest_region_percent)

FROM regional

WHERE year = 2016
GROUP BY region

ORDER BY 2 DESC

LIMIT 1;



SELECT

region,MIN(forest_region_percent)

FROM regional

WHERE year = 2016
GROUP BY region

ORDER BY 2

LIMIT 1;


SELECT *
FROM regional

WHERE YEAR =

1990

and region = 'World';
```

```
SELECT

region,MAX(forest_region_percent)

FROM regional

WHERE year = 1990
GROUP BY region

ORDER BY 2 DESC

LIMIT 1;



SELECT region,MIN(forest_region_percent)

FROM regional

WHERE year =

1990

GROUP BY region

ORDER BY 2

LIMIT 1;



SELECT sub1.region,sub1.forest_region_percent_2016,sub2.forest_region_percent_1990 FROM

(SELECT region,forest_region_percent AS forest_region_percent_2016

FROM regional
WHERE year =

2016)sub1 INNER JOIN
```

```
(SELECT region,forest_region_percent AS forest_region_percent_1990

FROM regional

WHERE year = 1990)sub2 ON sub1.region = sub2.region


WHERE sub1.forest_region_percent_2016 < sub2.forest_region_percent_1990;




SELECT sub1.country_name,(sub2.forest_area_1990 - sub1.forest_area_2016) AS AreaDiff FROM



(SELECT country_name,country_code,forest_area_sqkm AS

forest_area_2016 FROM forest_area

WHERE year = 2016
AND forest_area_sqkm IS NOT

NULL and country_name!= 'World'



)sub1

INNER

JOIN

(SELECT country_name,country_code,forest_area_sqkm AS

forest_area_1990 FROM forest_area

WHERE year = 1990
```

```
AND forest_area_sqkm IS NOT

NULL and country_name!= 'World'

)sub2 ON sub1.country_code =

sub2.country_code ORDER BY 2 DESC

LIMIT 5 ;


SELECT sub1.country_name,ROUND(CAST(((sub2.forest_area_1990 -
sub1.forest_area_2016)/sub2.forest_area_1990) AS NUMERIC),2) AS AreaDiff


FROM

(SELECT country_name,country_code,forest_area_sqkm AS

forest_area_2016 FROM forest_area

WHERE year = 2016

AND forest_area_sqkm IS NOT

NULL and country_name!= 'World'

)sub1

INNER

JOIN

(SELECT country_name,country_code,forest_area_sqkm AS

forest_area_1990 FROM forest_area

WHERE year = 1990

AND forest_area_sqkm IS NOT

NULL and country_name!= 'World'

)sub2 ON sub1.country_code =

sub2.country_code ORDER BY 2 DESC
```

```
LIMIT 5 ;


SELECT DISTINCT quartile, COUNT(country_n) OVER (PARTITION BY quartile) AS

country_count FROM

(SELECT country_n, case when perc_forest_area <= 25 Then '0-25'

when perc_forest_area > 25 and perc_forest_area <50 then '25-50'

when perc_forest_area >=50 and perc_forest_area <75 then '50-

75' when perc_forest_area > 75 then '75-100' end AS quartile

FROM forestation


WHERE f_year =

2016 and

perc_forest_area >0

)sub1
 GROUP BY quartile,country_n ;


SELECT DISTINCT country_n FROM


(SELECT DISTINCT quartile,country_n, COUNT(country_n) OVER (PARTITION BY quartile) AS
country_count

FROM

(SELECT country_n, case when perc_forest_area <= 25 Then '0-25'

when perc_forest_area > 25 and perc_forest_area <50 then '25-50'

when perc_forest_area >=50 and perc_forest_area <75 then '50-

75' when perc_forest_area > 75 then '75-100' end AS quartile

FROM forestation
```

```
WHERE f_year =

2016 and

perc_forest_area >0

)sub1
 GROUP BY quartile,country_n ) sub2


where quartile = '75-100';



SELECT count(distinct

country_n) FROM forestation

WHERE perc_forest_area > (select perc_forest_area

from forestation

WHERE country_n = 'United States'
                    AND f_year = '2016'
LIMIT 1)

AND f_year = '2016';
```