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 _ 39958245.90 sqkm _, a loss of ___1324449 sqkm__, 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 _1279999.9891 sqkm_).

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 __32.48___%. 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
Sub-Saharan Africa	30.67	28.79
World	32.42	31.38

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__ (dropped from__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 __.

__ 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
China	East Asia & Pacific	527229.062
Indonesia	East Asia & Pacific	282193.9844
Myanmar	East Asia & Pacific	107234.0039
Nigeria	Sub-Saharan Africa	106506.00098

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	59.13
Mauritania	Sub-Saharan Africa	46.75
Honduras	Latin America & Caribbean	46.75

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
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	98.26
Micronesia, Fed. Sts.	East Asia & Pacific	91.86
Gabon	Sub-Saharan Africa	90.04

5. RECOMMENDATIONS

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

- *What have you learned from the World Bank data?*

  1.There are few countries where deforestation is on large extent.
  2. World lost 3.21% of its total forest land, which is slightly more than the entire land area of a country, Peru, which is concerning.

3. On a good note there are few countries where forestation increases but that's not enough.
4. We need to raise awareness about this topic and its impact on the environment.

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

  Tago, Nigera, Uganda are in top countries where percentage of forestation decrease. we need to focus on those countries.

To create a view

```
DROP VIEW IF EXIST forestation;
CREATE VIEW forestation
AS
  (SELECT f.country_code,
          f.country_name,
          f.year,
          f.forest_area_sqkm,
          l.total_area_sq_mi * 2.59 AS total_area_sqkm,
          r.region,
          r.income_group,
          Round(( ( f.forest_area_sqkm /
                ( l.total_area_sq_mi * 2.59 ) ) * 100 ) ::
                NUMERIC, 2)         AS per_designated_forest
   FROM   forest_area AS f
          join land_area AS l
            ON f.country_code = l.country_code
               AND f.year = l.year
          join regions AS r
            ON r.country_code = l.country_code);

SELECT *
FROM   forestation;
```

1. **GLOBAL SITUATION QUERY**

```
WITH world_1990 AS
(
         SELECT   region,
                  year,
                  Sum(forest_area_sqkm) AS total_forest_area_sqkm_1990
         FROM     forestation
```

```
         WHERE    region = 'World'
         AND      year =1990
         GROUP BY region,
                  year),
world_2016 AS
(
         SELECT   region,
                  year,
                  Sum(forest_area_sqkm) AS total_forest_area_sqkm_2016
         FROM     forestation
         WHERE    region = 'World'
         AND      year =2016
         GROUP BY region,
                  year),
lost_forest AS
(
       SELECT w90.total_forest_area_sqkm_1990 - w16.total_forest_area_
sqkm_2016
          AS diff,
              Round( ( ( w90.total_forest_area_sqkm_1990 - w16.total_f
orest_area_sqkm_2016 ) * 100 / w90.total_forest_area_sqkm_1990 ) :: nu
meric, 2) AS percent_change
       FROM   world_1990 w90
       JOIN   world_2016 w16
       ON     w90.region = w16.region )

SELECT   country_name,
         total_area_sqkm,
         total_area_sqkm-
         (SELECT w90.total_forest_area_sqkm_1990 - w16.total_forest_ar
ea_sqkm_2016 AS diff
                FROM   world_1990 w90
                JOIN   world_2016 w16
                ON     w90.region = w16.region) AS diff_lost_forest_ar
ea
FROM     forestation
ORDER BY Abs(total_area_sqkm-
         (
                SELECT w90.total_forest_area_sqkm_1990 - w16.total_for
est_area_sqkm_2016 AS diff
                FROM   world_1990 w90
                JOIN   world_2016 w16
                ON     w90.region = w16.region)) limit 1
```

2. **REGIONAL OUTLOOK QUERY**

```
WITH forest_percent_1990 AS
(
         SELECT   region,
                  year,
                  Sum(total_area_sqkm)
                    AS desig_forest_area,
                  Round(((Sum(forest_area_sqkm)/ Sum(total_area_sqkm))
*100)::numeric, 2) AS percent_1990
         FROM     forestation
         WHERE    year =1990
         GROUP BY region,
                  year
         ORDER BY percent_1990 DESC ),
forest_percent_2016 AS
(
         SELECT   region,
                  year,
                  Sum(total_area_sqkm)
                    AS desig_forest_area,
                  Round(((Sum(forest_area_sqkm) / Sum(total_area_sqkm)
)*100)::numeric, 2) AS percent_2016
         FROM     forestation
         WHERE    year =2016
         GROUP BY region,
                  year
         ORDER BY percent_2016 DESC )
SELECT   f16.region,
         f90.percent_1990 ,
         f16.percent_2016,
         f90.percent_1990 -f16.percent_2016 AS dec_forest_area
FROM     forest_percent_2016                AS f16
JOIN     forest_percent_1990                AS f90
ON       f16.region=f90.region
WHERE    f16.percent_2016<f90.percent_1990
ORDER BY dec_forest_area DESC
```

3. **COUNTRY-LEVEL DETAIL QUERIES**

A. SUCCESS STORIES

```
WITH country_detail_1990 AS
(
         SELECT   country_name,
                  year,
                  forest_area_sqkm
         FROM     forestation
         WHERE    year=1990
         ORDER BY forest_area_sqkm ),
country_detail_2016 AS
(
         SELECT   country_name,
                  year,
                  forest_area_sqkm
         FROM     forestation
         WHERE    year=2016
         ORDER BY forest_area_sqkm )
SELECT   c16.country_name,c16.forest_area_sqkm-
c90.forest_area_sqkm AS increase_forest_area,
         Round(( (( c16.forest_area_sqkm-
c90.forest_area_sqkm) / ( c90.forest_area_sqkm ) ) * 100 ) :: numeric,
 2) AS per_increase
FROM     country_detail_1990 AS c90
JOIN     country_detail_2016 AS c16
ON       c16.country_name=c90.country_name
WHERE    (c90.forest_area_sqkm - c16.forest_area_sqkm) IS NOT NULL
ORDER BY increase_forest_area DESC

--Replace above line with below given line to get information about
percentage increase in forest (get info about iceland).

ORDER BY per_increase desc limit 5
```

B. LARGEST CONCERNS

```
WITH country_detail_1990
     AS (SELECT country_name,
```

```
                year,
                forest_area_sqkm,
                region
         FROM   forestation
         WHERE  year = 1990
         ORDER  BY forest_area_sqkm ASC),
     country_detail_2016
     AS (SELECT country_name,
                year,
                forest_area_sqkm,
                region
         FROM   forestation
         WHERE  year = 2016
         ORDER  BY forest_area_sqkm ASC)
SELECT c16.country_name,
       c16.region,
       Abs(( c90.forest_area_sqkm - c16.forest_area_sqkm )) AS
       abc_forest_area_change,
       Round(( ( ( c90.forest_area_sqkm - c16.forest_area_sqkm ) / (
                 c90.forest_area_sqkm ) )
                     *
                   100 ) :: NUMERIC, 2)    AS per_decrease
FROM   country_detail_1990 AS c90
       join country_detail_2016 AS c16
         ON c16.country_name = c90.country_name
WHERE  Abs(( c90.forest_area_sqkm - c16.forest_area_sqkm ))IS NOT NULL
       AND c90.country_name != 'World'
ORDER BY abc_forest_area_change DESC limit 5

--For Top 5 Percent Decrease in Forest Area by Country, 1990 & 2016
use below query in place of above order by

order by per_decrease DESC limit 5 ;
```

C. QUARTILES

```
SELECT CASE
         WHEN per_designated_forest <= 25 THEN '0-25%'
         WHEN per_designated_forest <= 50
              AND per_designated_forest > 25 THEN '25-50%'
```

```
          WHEN per_designated_forest <= 75
               AND per_designated_forest > 50 THEN '50-75%'
          ELSE '75-100%'
        END      AS quartiles,
        Count(*) AS number_of_countries
FROM    forestation
WHERE   year = 2016 and per_designated_forest is not null
GROUP   BY quartiles
ORDER   BY quartiles ASC

-- To get 'Top Quartile Countries, 2016'

SELECT country_name,
        region,
        per_designated_forest
FROM    forestation
WHERE   per_designated_forest > 75
        AND year = 2016
        AND per_designated_forest IS NOT NULL
ORDER   BY per_designated_forest DESC
```