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 sq km, or 3.2%.

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 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 46.09%, 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:

Region	1990 Forest Percentage	2016 Forest Percentage
Latin America & Caribbean	51.03%	46.09%
Europe & Central Asia	37.28%	38.16%
North America	35.65%	36.02%

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 46.09%) 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.

China and the 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 213.6% 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 sq km
Indonesia	East Asia & Pacific	-282,193.98 sq km
Myanmar	East Asia & Pacific	-107,234 sq km
Nigeria	Sub-Saharan Africa	-106,506 sq km
Tanzania	Sub-Saharan Africa	-102,320 sq km

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	-61.79%
Uganda	Sub-Saharan Africa	-59.12%
Mauritania	Sub-Saharan Africa	-46.74%
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.

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 first (0-25%) quartile.

There were 9 countries in the top (75-100%) 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	87.50%
Guyana	Latin America & Caribbean	83.90%
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?*

While much of the world has done a commendable job in increasing their forested areas there is still much work to be done. We must find ways to help the nations with the most severe deforestation overcome their needs for goods and land derived from forested areas. What

specifically needs to be done is beyond the scope of this report and will likely differ from nation to nation.

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

Togo, Nigeria, Uganda, Mauritania, and Honduras, as seen in Table 3.2 have been absolutely devastated by deforestation, and as a result we should be focusing our efforts in those nations, at least in the short term. If we can stop, or even begin to reverse the forest loss in those nations we will see benefit not only on a local level, but a global level as well.

6. APPENDIX

```
DROP
  VIEW IF EXISTS forestation;
CREATE VIEW forestation AS
SELECT
  f.country_code code,
  f.country_name country,
  f.year "year",
  f.forest_area_sqkm forest_sqkm,
  l.total_area_sq_mi area_sqmi,
  r.region region,
  r.income_group ig,
  100.0 *(
    f.forest_area_sqkm / (l.total_area_sq_mi * 2.59)
  ) AS percentage
FROM
  forest_area f,
  land_area l,
  regions r
WHERE
  (
    f.country_code = l.country_code
    AND f.year = l.year
    AND r.country_code = l.country_code
  );

SELECT
  *
FROM
  forestation;
```

```
  SELECT
  *
FROM
  forest_area
WHERE
  country_name = 'World';

SELECT
  *
FROM
  forest_area
WHERE
  country_name = 'World'
  AND (
    year = 2016
    OR year = 1990
  );

SELECT
  crt.forest_area_sqkm - prv.forest_area_sqkm AS difference
FROM
  forest_area AS crt
  JOIN forest_area AS prv ON (
    crt.year = '2016'
    AND prv.year = '1990'
    AND crt.country_name = 'World'
    AND prv.country_name = 'World'
  );


SELECT
  100.0 *(
    crt.forest_area_sqkm - prv.forest_area_sqkm
  ) / prv.forest_area_sqkm AS percentage
FROM
  forest_area AS crt
  JOIN forest_area AS prv ON (
    crt.year = '2016'
    AND prv.year = '1990'
    AND crt.country_name = 'World'
    AND prv.country_name = 'World'
  );
```

```
SELECT
  country,
  (area_sqmi * 2.59) AS total_area_sqkm
FROM
  forestation
WHERE
  year = 2016
ORDER BY
  total_area_sqkm DESC;


SELECT
  ROUND(percentage :: NUMERIC, 2) world
FROM
  forestation
WHERE
  year = 2016
  AND country = 'World';

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(a.forest_sqkm) region_forest_1990,
      SUM(a.area_sqmi * 2.59) region_area_1990,
      a.region,
      SUM(b.forest_sqkm) region_forest_2016,
```

```
    SUM(a.area_sqmi * 2.59) region_area_2016
   FROM
    forestation a,
    forestation b
   WHERE
    a.year = '1990'
    AND a.country != 'World'
    AND b.year = '2016'
    AND b.country != 'World'
    AND a.region = b.region
   GROUP BY
    a.region
  ) region_percent
ORDER BY
  forest_percent_1990 DESC;

SELECT
  ROUND(percentage :: NUMERIC, 2) world
FROM
  forestation
WHERE
  year = 1990
  AND country = 'World';


SELECT
  crt.country_name,
  crt.forest_area_sqkm - prv.forest_area_sqkm AS difference
FROM
  forest_area AS crt
  JOIN forest_area AS prv ON (
    crt.year = '2016'
    AND prv.year = '1990'
  )
  AND crt.country_name = prv.country_name
ORDER BY
  difference DESC;


SELECT
  crt.country_name,
  100.0 *(
    crt.forest_area_sqkm - prv.forest_area_sqkm
  ) / prv.forest_area_sqkm AS percentage
```

```
FROM
  forest_area AS crt
  JOIN forest_area AS prv ON (
    crt.year = '2016'
    AND prv.year = '1990'
  )
  AND crt.country_name = prv.country_name
ORDER BY
  percentage DESC;

SELECT
  crt.country_name,
  crt.forest_area_sqkm - prv.forest_area_sqkm AS difference
FROM
  forest_area AS crt
  JOIN forest_area AS prv ON (
    crt.year = '2016'
    AND prv.year = '1990'
  )
  AND crt.country_name = prv.country_name
ORDER BY
  difference;

SELECT
  country_name,
  region
FROM
  regions
WHERE
  country_name IN (
    'Brazil', 'Indonesia', 'Myanmar',
    'Nigeria', 'Tanzania'
  )


SELECT
  crt.country_name,
  100.0 *(
    crt.forest_area_sqkm - prv.forest_area_sqkm
  ) / prv.forest_area_sqkm AS percentage
FROM
  forest_area AS crt
  JOIN forest_area AS prv ON (
    crt.year = '2016'
```

```
    AND prv.year = '1990'
  )
  AND crt.country_name = prv.country_name
ORDER BY
  percentage;

SELECT
  country_name,
  region
FROM
  regions
WHERE
  country_name IN (
    'Togo', 'Nigeria', 'Uganda', 'Mauritania',
    'Honduras'
  );

SELECT
  DISTINCT(quartiles),
  COUNT(country) OVER (PARTITION BY quartiles)
FROM
  (
    SELECT
      country,
      CASE WHEN percentage <= 25 THEN '0-25%' WHEN percentage > 50
      AND percentage <= 75 THEN '50-75%' WHEN percentage > 25
      AND percentage <= 50 THEN '25-50%' ELSE '75-100%' END AS quartiles
    FROM
      forestation
    WHERE
      percentage IS NOT NULL
      AND year = 2016
      AND country != 'World'
  ) quart;
SELECT
  country,
  region,
  ROUND(percentage :: NUMERIC, 2)
FROM
  forestation
WHERE
  percentage > 75
  AND year = 2016
ORDER BY
```

```
percentage DESC;
```