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 to39958245.9, a loss of 1324449, 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).

## 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:

Table

Description automatically generated

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**

### 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​ **527229.06**​. 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 ​**79200.00**​, much lower than the figure for ​**Iceland**​.

**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 ​**213.66**​% from 1990 to 2016.

### 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:

Table

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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:Table

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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.

### QUARTILES

Table 3.3: Count of Countries Grouped by Forestation Percent Quartiles, 2016:

|  |  |
| --- | --- |
| Quadfdrtile | 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:

Table

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Graphical user interface, table

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## 4. RECOMMENDATIONS

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

* *What have you learned from the World Bank data?*
* *Which countries should we focus on over others?*

Deforestation has become increasingly serious from 1990 to 2016. We should primarily focus on countries in the Sub-Saharan Africa Region.

## 5. APPENDIX: SQL queries used

*-- Create a View called “forestation” by joining all three tables - forest\_area, land\_area and regions in the workspace.  
DROP VIEW* IF *EXISTS* forestation;  
  
*CREATE VIEW* forestation *AS  
SELECT* f.country\_code country\_code,  
 f.country\_name country\_name,  
 f.year "year",  
 f.forest\_area\_sqkm forest\_area\_sqkm,  
 l.total\_area\_sq\_mi total\_area\_sq\_mi,  
 l.total\_area\_sq\_mi \* 2.59 total\_area\_sqkm,  
 r.region region,  
 r.income\_group income\_group,  
  
 (f.forest\_area\_sqkm/(l.total\_area\_sq\_mi\*2.59))\*100 pct\_forest  
*FROM* forest\_area f  
*JOIN* land\_area l  
*ON* f.country\_code = l.country\_code *AND* f.year = l.year  
*JOIN* regions r  
*ON* l.country\_code = r.country\_code;  
  
*SELECT* \* *FROM* forestation;  
  
*------------------------ 1. GLOBAL SITUATION ------------------------  
-- Instructions:  
--  
-- Answering these questions will help you add information into the template.  
-- Use these questions as guides to write SQL queries.  
-- Use the output from the query to answer these questions.  
  
DROP VIEW* IF *EXISTS* global\_situation;  
  
*CREATE VIEW* global\_situation *AS  
WITH* t\_2016 *AS* (  
 *SELECT year*, region, forest\_area\_sqkm  
 *FROM* forestation  
 *WHERE* region = 'World' *AND year* = 2016),  
t\_1990 *AS* (  
 *SELECT year*, region, forest\_area\_sqkm  
 *FROM* forestation  
 *WHERE* region = 'World' *AND year* = 1990)  
*SELECT* t\_1990.region,  
 t\_1990.forest\_area\_sqkm forest\_area\_sqkm\_1990,  
 t\_2016.forest\_area\_sqkm forest\_area\_sqkm\_2016  
*FROM* t\_1990, t\_2016;  
  
*--------------------------------------------------------------  
-- a. What was the total forest area (in sq km) of the world in 1990? Please keep in mind that you can use the country record denoted as “World" in the region table.  
SELECT year*, region, forest\_area\_sqkm  
*FROM* forestation  
*WHERE* region = 'World' *AND year* = 1990;  
  
*-- year region forest\_area\_sqkm  
-- 1990 World 41282694.9  
  
--------------------------------------------------------------  
-- b. What was the total forest area (in sq km) of the world in 2016? Please keep in mind that you can use the country record in the table is denoted as “World.”  
SELECT year*, region, forest\_area\_sqkm  
*FROM* forestation  
*WHERE* region = 'World' *AND year* = 2016;  
  
*-- year region forest\_area\_sqkm  
-- 2016 World 39958245.9  
  
--------------------------------------------------------------  
-- c. What was the change (in sq km) in the forest area of the world from 1990 to 2016?  
SELECT* forest\_area\_sqkm\_2016 - forest\_area\_sqkm\_1990 forest\_area\_change\_sqkm  
*FROM* global\_situation;  
  
*-- forest\_area\_change\_sqkm  
-- -1324449  
  
--------------------------------------------------------------  
-- d. What was the percent change in forest area of the world between 1990 and 2016?  
SELECT* (forest\_area\_sqkm\_2016 - forest\_area\_sqkm\_1990)/forest\_area\_sqkm\_1990 \*100 forest\_area\_pct\_change\_sqkm  
*FROM* global\_situation;  
  
*-- forest\_area\_pct\_change\_sqkm  
-- -3.20824258980244  
  
--------------------------------------------------------------  
-- e. If you compare the amount of forest area lost between 1990 and 2016, to which country's total area in 2016 is it closest to?  
SELECT* f.country\_name,  
 f.total\_area\_sqkm,  
 ABS(f.total\_area\_sqkm - ( g.forest\_area\_sqkm\_1990 - g.forest\_area\_sqkm\_2016)) diff\_area  
*FROM* forestation f, global\_situation g  
*ORDER BY* diff\_area *ASC*LIMIT 1;  
  
*-- country\_name total\_area\_sqkm diff\_area  
-- Peru 1279999.9891 44449.0109000001  
  
------------------------ 2. REGIONAL OUTLOOK ------------------------  
-- Instructions:  
--  
-- Answering these questions will help you add information into the template.  
-- Use these questions as guides to write SQL queries.  
-- Use the output from the query to answer these questions.  
--  
-- Create a table that shows the Regions and their percent forest area (sum of forest area divided by sum of land area) in 1990 and 2016. (Note that 1 sq mi = 2.59 sq km).  
-- Based on the table you created, ....  
  
DROP VIEW* IF *EXISTS* regional\_outlook;  
  
*CREATE VIEW* regional\_outlook *AS  
WITH* t\_2016 *AS* (  
 *SELECT* region, ROUND(*CAST*(*SUM*(forest\_area\_sqkm)/*SUM*(total\_area\_sqkm)\*100 *AS NUMERIC*), 2) pct\_forest\_area\_2016  
 *FROM* forestation  
 *WHERE year* = 2016  
 *GROUP BY* region),  
t\_1990 *AS* (  
 *SELECT* region, ROUND(*CAST*(*SUM*(forest\_area\_sqkm)/*SUM*(total\_area\_sqkm)\*100 *AS NUMERIC*), 2) pct\_forest\_area\_1990  
 *FROM* forestation  
 *WHERE year* = 1990  
 *GROUP BY* region)  
*SELECT* t\_1990.region, t\_1990.pct\_forest\_area\_1990, t\_2016.pct\_forest\_area\_2016  
*FROM* t\_1990  
*JOIN* t\_2016  
*ON* t\_1990.region = t\_2016.region;  
  
*SELECT* \* *FROM* regional\_outlook;  
  
*-- region pct\_forest\_area\_1990 pct\_forest\_area\_2016  
-- Latin America & Caribbean 51.03 46.16  
-- Sub-Saharan Africa 30.67 28.79  
-- Europe & Central Asia 37.28 38.04  
-- East Asia & Pacific 25.78 26.36  
-- South Asia 16.51 17.51  
-- Middle East & North Africa 1.78 2.07  
-- World 32.42 31.38  
-- North America 35.65 36.04  
  
--------------------------------------------------------------  
-- a. What was the percent forest of the entire world in 2016? Which region had the HIGHEST percent forest in 2016, and which had the LOWEST, to 2 decimal places?  
  
SELECT* region, pct\_forest\_area\_2016  
*FROM* regional\_outlook  
*WHERE* region = 'World';  
  
*-- region pct\_forest\_area\_2016  
-- World 31.38  
  
SELECT* region, pct\_forest\_area\_2016  
*FROM* regional\_outlook  
*WHERE* region != 'World'  
*ORDER BY* pct\_forest\_area\_2016 *DESC*LIMIT 1;  
  
*-- region pct\_forest\_area\_2016  
-- Latin America & Caribbean 46.16  
  
SELECT* region, pct\_forest\_area\_2016  
*FROM* regional\_outlook  
*WHERE* region != 'World'  
*ORDER BY* pct\_forest\_area\_2016 *ASC*LIMIT 1;  
  
*-- region pct\_forest\_area\_2016  
-- Middle East & North Africa 2.07  
  
  
--------------------------------------------------------------  
-- b. What was the percent forest of the entire world in 1990? Which region had the HIGHEST percent forest in 1990, and which had the LOWEST, to 2 decimal places?  
SELECT* region, pct\_forest\_area\_1990  
*FROM* regional\_outlook  
*WHERE* region = 'World'  
  
*-- region pct\_forest\_area\_1990  
-- World 32.42  
  
SELECT* region, pct\_forest\_area\_1990  
*FROM* regional\_outlook  
*WHERE* region != 'World'  
*ORDER BY* pct\_forest\_area\_1990 *DESC*LIMIT 1;  
  
*-- region pct\_forest\_area\_1990  
-- Latin America & Caribbean 51.03  
  
SELECT* region, pct\_forest\_area\_1990  
*FROM* regional\_outlook  
*WHERE* region != 'World'  
*ORDER BY* pct\_forest\_area\_1990 *ASC*LIMIT 1;  
  
*-- region pct\_forest\_area\_1990  
-- Middle East & North Africa 1.78  
  
  
--------------------------------------------------------------  
-- c. Based on the table you created, which regions of the world DECREASED in forest area from 1990 to 2016?  
SELECT* region, pct\_forest\_area\_1990, pct\_forest\_area\_2016  
*FROM* regional\_outlook;  
  
*-- region pct\_forest\_area\_1990 pct\_forest\_area\_2016  
-- Latin America & Caribbean 51.03 46.16  
-- Sub-Saharan Africa 30.67 28.79  
-- Europe & Central Asia 37.28 38.04  
-- East Asia & Pacific 25.78 26.36  
-- South Asia 16.51 17.51  
-- Middle East & North Africa 1.78 2.07  
-- World 32.42 31.38  
-- North America 35.65 36.04  
  
SELECT* region, pct\_forest\_area\_1990, pct\_forest\_area\_2016  
*FROM* regional\_outlook  
*WHERE* pct\_forest\_area\_1990 > pct\_forest\_area\_2016;  
  
*-- region pct\_forest\_area\_1990 pct\_forest\_area\_2016  
-- Latin America & Caribbean 51.03 46.16  
-- Sub-Saharan Africa 30.67 28.79  
-- World 32.42 31.38  
  
------------------------ 3. COUNTRY-LEVEL DETAIL ------------------------  
-- Instructions:  
--  
-- Answering these questions will help you add information into the template.  
-- Use these questions as guides to write SQL queries.  
-- Use the output from the query to answer these questions.  
  
DROP VIEW* IF *EXISTS* country\_detail;  
  
*CREATE VIEW* country\_detail *AS  
WITH* t\_2016 *AS* (  
 *SELECT* country\_name, forest\_area\_sqkm  
 *FROM* forestation  
 *WHERE year* = 2016 *AND* forest\_area\_sqkm *IS NOT NULL*),  
t\_1990 *AS* (  
 *SELECT* country\_name, region, forest\_area\_sqkm  
 *FROM* forestation  
 *WHERE year* = 1990 *AND* forest\_area\_sqkm *IS NOT NULL*)  
*SELECT* t\_1990.country\_name,  
 t\_1990.region,  
 t\_1990.forest\_area\_sqkm forest\_area\_sqkm\_1990,  
 t\_2016.forest\_area\_sqkm forest\_area\_sqkm\_2016  
*FROM* t\_1990  
*JOIN* t\_2016  
*ON* t\_1990.country\_name = t\_2016.country\_name;  
  
*SELECT* \* *FROM* country\_detail;  
  
*-- a. Which 5 countries saw the largest amount decrease in forest area from 1990 to 2016? What was the difference in forest area for each?  
  
--- SUCCESS STORIES  
SELECT* country\_name, forest\_area\_sqkm\_2016 - forest\_area\_sqkm\_1990 diff\_forest\_area  
*FROM* country\_detail  
*WHERE* country\_name != 'World'  
*ORDER BY* diff\_forest\_area *DESC*LIMIT 5;  
  
*-- country\_name diff\_forest\_area  
-- China 527229.062  
-- United States 79200  
-- India 69213.9844  
-- Russian Federation 59395  
-- Vietnam 55390  
  
-- LARGEST CONCERNS  
SELECT* country\_name,  
 region,  
 ROUND(*CAST*(forest\_area\_sqkm\_2016 - forest\_area\_sqkm\_1990 *AS NUMERIC*), 2) diff\_forest\_area  
*FROM* country\_detail  
*WHERE* country\_name != 'World'  
*ORDER BY* diff\_forest\_area *ASC*LIMIT 5;  
  
*-- country\_name region diff\_forest\_area  
-- Brazil Latin America & Caribbean -541510.00  
-- Indonesia East Asia & Pacific -282193.98  
-- Myanmar East Asia & Pacific -107234.00  
-- Nigeria Sub-Saharan Africa -106506.00  
-- Tanzania Sub-Saharan Africa -102320.00  
  
--------------------------------------------------------------  
-- b. Which 5 countries saw the largest percent decrease in forest area from 1990 to 2016? What was the percent change to 2 decimal places for each?  
  
--- SUCCESS STORIES  
SELECT* country\_name,  
 ROUND(*CAST*((forest\_area\_sqkm\_2016 - forest\_area\_sqkm\_1990) / forest\_area\_sqkm\_1990 *AS NUMERIC*) \* 100, 2) forest\_area\_pct\_change  
*FROM* country\_detail  
*WHERE* country\_name != 'World'  
*ORDER BY* forest\_area\_pct\_change *DESC*LIMIT 5;  
  
*-- country\_name forest\_area\_pct\_change  
-- Iceland 213.66  
-- French Polynesia 181.82  
-- Bahrain 177.27  
-- Uruguay 134.11  
-- Dominican Republic 82.46  
  
-- LARGEST CONCERNS  
SELECT* country\_name,  
 region,  
 ROUND(*CAST*((forest\_area\_sqkm\_2016 - forest\_area\_sqkm\_1990) / forest\_area\_sqkm\_1990 *AS NUMERIC*) \* 100, 2) forest\_area\_pct\_change  
*FROM* country\_detail  
*WHERE* country\_name != 'World'  
*ORDER BY* forest\_area\_pct\_change *ASC*LIMIT 5;  
  
*-- country\_name region forest\_area\_pct\_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 -45.03  
  
--------------------------------------------------------------  
-- c. If countries were grouped by percent forestation in quartiles, which group had the most countries in it in 2016?  
WITH* t\_quartile *AS* (  
 *SELECT* country\_name, *CASE WHEN* pct\_forest <= 25 *THEN* '0-25%'  
 *WHEN* pct\_forest <= 50 *AND* pct\_forest> 25 *THEN* '25-50%'  
 *WHEN* pct\_forest <= 75 *AND* pct\_forest> 50 *THEN* '50-75%'  
 *ELSE* '75-100%'  
 *END* quartile  
 *FROM* forestation  
 *WHERE* pct\_forest *IS NOT NULL AND* country\_name != 'World' *AND year* = 2016)  
*SELECT* quartile, *COUNT*(country\_name)  
*FROM* t\_quartile  
*GROUP BY* quartile  
*ORDER BY* quartile *ASC*;  
  
*-- quartile count  
-- 0-25% 85  
-- 25-50% 72  
-- 50-75% 38  
-- 75-100% 9  
  
--------------------------------------------------------------  
-- d. List all of the countries that were in the 4th quartile (percent forest > 75%) in 2016.  
  
SELECT* country\_name, ROUND(*CAST*(pct\_forest *AS NUMERIC*), 2) pct\_forest  
*FROM* forestation  
*WHERE* pct\_forest > 75 *AND* country\_name != 'World' *AND year* = 2016;  
  
*-- country\_name pct\_forest  
-- American Samoa 87.50  
-- Micronesia, Fed. Sts. 91.86  
-- Gabon 90.04  
-- Guyana 83.90  
-- Lao PDR 82.11  
-- Palau 87.61  
-- Solomon Islands 77.86  
-- Suriname 98.26  
-- Seychelles 88.41  
--------------------------------------------------------------  
-- e. How many countries had a percent forestation higher than the United States in 2016?  
SELECT COUNT*(country\_name) country\_num  
*FROM* forestation  
*WHERE* pct\_forest > (*SELECT* pct\_forest *FROM* forestation  
 *WHERE* country\_name = 'United States' *AND year*=2016)  
 *AND* country\_name != 'World'  
 *AND year* = 2016;  
  
*-- country\_num  
-- 94*