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 sqkm**\_ in 1990. As of 2016, the most recent year for which data was available, that number had fallen to\_\_**39.958.245,9 sqkm**\_\_\_, a loss of \_\_\_**1.324.449 sqkm**\_\_\_\_, or \_\_\_\_\_**3.20**\_\_\_\_\_\_\_\_\_\_%.

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 \_\_\_**494.208 sqmiles or 1.279.999 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 American and Caribbean**\_\_\_, with \_\_\_\_**46.16**\_\_\_\_\_\_\_\_%, and the region with the lowest relative forestation was \_\_**Middle East and 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 and Caribbean**\_\_\_\_\_\_\_\_, with \_\_\_\_**51.03**\_\_\_\_\_\_\_\_\_\_\_\_\_\_%, and the region with the lowest relative forestation was \_\_\_ **Middle East and North Africa** \_\_\_\_\_, with \_\_\_**1.77**\_\_\_\_\_\_\_\_\_\_\_\_\_\_% forestation.

Table 2.1: Percent Forest Area by Region, 1990 & 2016:

|  |  |  |
| --- | --- | --- |
| Region | 1990 Forest Percentage | 2016 Forest Percentage |
| Sub\_Saharan Africa | 37.67 | 28.79 |
| Europe & Central Asia | 37.28 | 38.04 |
| East Asia & Pacific | 25.78 | 26.36 |
| South Asia | 16.51 | 17.51 |
| North America | 35.65 | 36.04 |
| Middle East & North Africa | 1.77 | 2.07 |
| Latin America & Caribbean | 51.03 | 46.16 |
| **World** | **32.42** | **31.38** |

The only regions of the world that decreased in percent forest area from 1990 to 2016 were \_**Sub\_Saharan Africa** \_\_\_ (dropped from \_\_\_**37.67**\_\_% to \_\_\_\_**28.79**\_\_\_\_%) and \_\_Larin America & Caribbean\_\_\_ (\_\_\_**51.03**\_\_\_% to \_\_\_\_**46.16**\_\_\_\_%). 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 \_\_\_\_\_**527.229,1 sqkm**\_\_\_\_\_\_\_. 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 sqkm**\_\_\_\_\_, much lower than the figure for \_\_**448.029 sqkm**\_\_\_\_\_.

\_\_\_**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.

### 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 sqkm |
| Indonesia | East Asia & Pacific | 282.194 sqkm |
| Myanmar | East Asia & Pacific | 107.234 sqkm |
| Nigeria | Sub-Saharan Africa | 106.506 sqkm |
| Tanzania | Sub-Saharan Africa | 102.320 sqkm |

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 | 61.80 |
| 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.

### 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 \_\_\_\_**first (1)**\_\_\_\_\_\_ 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 | 97.26 |
| Micronesia, Fed. Sts. | East Asia & Pacific | 91.86 |
| Gabon | Sub-Saharan Africa | 90.03 |

## 4. RECOMMENDATIONS

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

* *What have you learned from the World Bank data?* 
  + *Most advance countries are fighting to increase their forest areas, while poor ones, are decreasing, probably to extract raw materials from the forest.*
  + *There is a great opportunity to educate countries in how to preserve their forest areas.*
  + *Surprisingly China which is one of the most pollutant emitters, is largest country which increase their forest area.*
* *Which countries should we focus on over others?*
  + *Brazil as one of the biggest countries which are losing forest area, is the one in where most efforts should be done and experiences like the one in Chine which increase its area almost the size of what Brazil lost, could be very helpful.*
  + *Additionally poor countries (specially those in Africa) should be given some advice and education in how to preserve and grow their forests areas, and how to extract economic benefits from them without decreasing the area.*
  + *Countries with a large amount of percentage as forest should be focus too in order to preserve the areas they have. Other countries should pay for the conservation.*

***APPENDIX: Querys used***

***1 GLOBAL SITUATION***

***1a. Creation of view called forestation***

*CREATE VIEW forestation*

*AS (SELECT*

*fa.\*,*

*la.total\_area\_sq\_mi,*

*re.region,*

*re.income\_group,*

*((fa.forest\_area\_sqkm)/(la.total\_area\_sq\_mi\*2.59))\*100 AS percent\_designated\_forest*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code);*

***1b. Total forest area in 1990 in the World***

*SELECT*

*fo.forest\_area\_sqkm*

*FROM*

*forestation fo*

*WHERE*

*fo.year=1990 and*

*fo.country\_name='World';*

***1c. Total forest area in 2016 in the World***

*SELECT*

*fo.forest\_area\_sqkm*

*FROM*

*forestation fo*

*WHERE*

*fo.year=2016 and*

*fo.country\_name='World';*

***1d. Calculatiion of absolute and relative change in the World***

*WITH t1 AS(*

*SELECT*

*\**

*FROM*

*forestation fo*

*WHERE*

*fo.year=1990 and*

*fo.country\_name='World'),*

*t2 AS (*

*SELECT*

*\**

*FROM*

*forestation fo*

*WHERE*

*fo.year=2016 and*

*fo.country\_name='World')*

*SELECT*

*t2.forest\_area\_sqkm - t1.forest\_area\_sqkm AS change\_sqkm,*

*((t2.forest\_area\_sqkm/t1.forest\_area\_sqkm)-1)\*100 AS pct\_change\_sqkm*

*FROM*

*t1*

*JOIN t2*

*ON t1.country\_name = t2.country\_name;*

***1d. Which country is similar to the lost area***

*WITH t1 AS(*

*SELECT*

*\**

*FROM*

*forestation fo*

*WHERE*

*fo.year=1990 and*

*fo.country\_name='World'),*

*t2 AS (*

*SELECT*

*\**

*FROM*

*forestation fo*

*WHERE*

*fo.year=2016 and*

*fo.country\_name='World')*

*SELECT*

*fs.country\_name,*

*fs.total\_area\_sq\_mi,*

*fs.total\_area\_sq\_mi\*2.59 as land\_area\_sqkm,*

*(abs((fs.total\_area\_sq\_mi\*2.59) - sub1.change\_sqkm)) as difference\_abs*

*FROM*

*forestation fs,*

*(SELECT*

*t1.forest\_area\_sqkm - t2.forest\_area\_sqkm AS change\_sqkm*

*FROM*

*t1*

*JOIN t2*

*ON t1.country\_name = t2.country\_name) sub1*

*WHERE fs.year=2016*

*and fs.total\_area\_sq\_mi IS NOT NULL*

*ORDER BY difference\_abs*

*LIMIT 1;*

***2. REGIONAL OUTLOOK***

***2a. Creation of table called forestation\_region***

*CREATE VIEW forestation\_region*

*AS (SELECT*

*re.region,*

*fa.year,*

*(sum(fa.forest\_area\_sqkm)/sum(la.total\_area\_sq\_mi\*2.59))\*100 AS percent\_designated\_forest*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*GROUP BY 1,2);*

***2b.* percent of the total land area of the world designated as forest in 2016**

*SELECT \**

*FROM forestation\_region*

*WHERE*

*region = 'World' and*

*year = 2016;*

***2c.* region with the highest numbers in 2016**

*SELECT \**

*FROM forestation\_region*

*WHERE year = 2016 and region != 'World'*

*ORDER BY percent\_designated\_forest DESC*

*LIMIT 1;*

***2d.* region with the lowest numbers in 2016**

*SELECT \**

*FROM forestation\_region*

*WHERE year = 2016 and region != 'World'*

*ORDER BY percent\_designated\_forest*

*LIMIT 1;*

***2d.* percent of the total land area of the world designated as forest in 1990**

*SELECT \**

*FROM forestation\_region*

*WHERE*

*region = 'World' and*

*year = 1990;*

***2e.* region with the highest numbers in 1990**

*SELECT \**

*FROM forestation\_region*

*WHERE year = 1990 and region != 'World'*

*ORDER BY percent\_designated\_forest DESC*

*LIMIT 1;*

***2f.* region with the lowest numbers in 1990**

*SELECT \**

*FROM forestation\_region*

*WHERE year = 1990 and region != 'World'*

*ORDER BY percent\_designated\_forest*

*LIMIT 1;*

***2e. table 2.1***

*WITH region\_1990 AS(*

*SELECT*

*\**

*FROM*

*forestation\_region fo*

*WHERE*

*fo.year=1990 ),*

*region\_2016 AS (*

*SELECT*

*\**

*FROM*

*forestation\_region fo*

*WHERE*

*fo.year=2016)*

*SELECT*

*r90.region,*

*r90.percent\_designated\_forest as perc\_1990,*

*r16.percent\_designated\_forest as perc\_2016*

*FROM*

*region\_1990 r90*

*JOIN region\_2016 r16*

*ON r90.region = r16.region;*

***3. COUNTRY DETAIL***

***3a. Data of first paragraph***

*WITH country\_1990 AS*

*(SELECT*

*fa.country\_name,*

*fa.forest\_area\_sqkm AS forest\_area\_1990,*

*la.total\_area\_sq\_mi AS land\_area\_1990*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*WHERE*

*fa.year=1990),*

*country\_2016 AS*

*(SELECT*

*fa.country\_name,*

*fa.forest\_area\_sqkm AS forest\_area\_2016,*

*la.total\_area\_sq\_mi AS land\_area\_2016*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*WHERE*

*fa.year=2016)*

*SELECT*

*c90.\*,*

*c16.forest\_area\_2016,*

*c16.land\_area\_2016,*

*c16.forest\_area\_2016-c90.forest\_area\_1990 AS diff\_absolute\_fa,*

*(LEAD (c16.forest\_area\_2016-c90.forest\_area\_1990) OVER (ORDER BY (c16.forest\_area\_2016-c90.forest\_area\_1990))) - (c16.forest\_area\_2016-c90.forest\_area\_1990) AS diff\_with\_previous,*

*((c16.forest\_area\_2016/c90.forest\_area\_1990)-1)\*100 AS diff\_relative\_fa*

*FROM*

*country\_1990 c90*

*JOIN country\_2016 c16*

*ON c90.country\_name = c16.country\_name*

*WHERE forest\_area\_1990 IS NOT NULL and*

*forest\_area\_2016 IS NOT NULL*

*ORDER BY diff\_absolute\_fa DESC;*

***3b. Largest increases in forest area - relative***

*WITH country\_1990 AS*

*(SELECT*

*fa.country\_name,*

*fa.forest\_area\_sqkm AS forest\_area\_1990,*

*la.total\_area\_sq\_mi AS land\_area\_1990*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*WHERE*

*fa.year=1990),*

*country\_2016 AS*

*(SELECT*

*fa.country\_name,*

*fa.forest\_area\_sqkm AS forest\_area\_2016,*

*la.total\_area\_sq\_mi AS land\_area\_2016*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*WHERE*

*fa.year=2016)*

*SELECT*

*c90.\*,*

*c16.forest\_area\_2016,*

*c16.land\_area\_2016,*

*c16.forest\_area\_2016-c90.forest\_area\_1990 AS diff\_absolute\_fa,*

*(LEAD (c16.forest\_area\_2016-c90.forest\_area\_1990) OVER (ORDER BY (c16.forest\_area\_2016-c90.forest\_area\_1990))) - (c16.forest\_area\_2016-c90.forest\_area\_1990) AS diff\_with\_previous,*

*((c16.forest\_area\_2016/c90.forest\_area\_1990)-1)\*100 AS diff\_relative\_fa*

*FROM*

*country\_1990 c90*

*JOIN country\_2016 c16*

*ON c90.country\_name = c16.country\_name*

*WHERE forest\_area\_1990 IS NOT NULL and*

*forest\_area\_2016 IS NOT NULL*

*ORDER BY diff\_relative\_fa DESC;*

***3c.* Table 3.1: Top 5 Amount Decrease in Forest Area by Country**

*WITH country\_1990 AS*

*(SELECT*

*fa.country\_name,*

*re.region,*

*fa.forest\_area\_sqkm AS forest\_area\_1990,*

*la.total\_area\_sq\_mi AS land\_area\_1990*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*WHERE*

*fa.year=1990),*

*country\_2016 AS*

*(SELECT*

*fa.country\_name,*

*fa.forest\_area\_sqkm AS forest\_area\_2016,*

*la.total\_area\_sq\_mi AS land\_area\_2016*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*WHERE*

*fa.year=2016)*

*SELECT*

*c90.\*,*

*c16.forest\_area\_2016,*

*c16.land\_area\_2016,*

*c16.forest\_area\_2016-c90.forest\_area\_1990 AS diff\_absolute\_fa,*

*(LEAD (c16.forest\_area\_2016-c90.forest\_area\_1990) OVER (ORDER BY (c16.forest\_area\_2016-c90.forest\_area\_1990))) - (c16.forest\_area\_2016-c90.forest\_area\_1990) AS diff\_with\_previous,*

*((c16.forest\_area\_2016/c90.forest\_area\_1990)-1)\*100 AS diff\_relative\_fa*

*FROM*

*country\_1990 c90*

*JOIN country\_2016 c16*

*ON c90.country\_name = c16.country\_name*

*WHERE forest\_area\_1990 IS NOT NULL and*

*forest\_area\_2016 IS NOT NULL and*

*c90.country\_name != 'World'*

*ORDER BY diff\_absolute\_fa*

*LIMIT 5;*

***3d.* Table 3.2: Top 5 Percent Decrease in Forest Area by Country**

*WITH country\_1990 AS*

*(SELECT*

*fa.country\_name,*

*re.region,*

*fa.forest\_area\_sqkm AS forest\_area\_1990,*

*la.total\_area\_sq\_mi AS land\_area\_1990*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*WHERE*

*fa.year=1990),*

*country\_2016 AS*

*(SELECT*

*fa.country\_name,*

*fa.forest\_area\_sqkm AS forest\_area\_2016,*

*la.total\_area\_sq\_mi AS land\_area\_2016*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*WHERE*

*fa.year=2016)*

*SELECT*

*c90.\*,*

*c16.forest\_area\_2016,*

*c16.land\_area\_2016,*

*c16.forest\_area\_2016-c90.forest\_area\_1990 AS diff\_absolute\_fa,*

*(LEAD (c16.forest\_area\_2016-c90.forest\_area\_1990) OVER (ORDER BY (c16.forest\_area\_2016-c90.forest\_area\_1990))) - (c16.forest\_area\_2016-c90.forest\_area\_1990) AS diff\_with\_previous,*

*((c16.forest\_area\_2016/c90.forest\_area\_1990)-1)\*100 AS diff\_relative\_fa*

*FROM*

*country\_1990 c90*

*JOIN country\_2016 c16*

*ON c90.country\_name = c16.country\_name*

*WHERE forest\_area\_1990 IS NOT NULL and*

*forest\_area\_2016 IS NOT NULL and*

*c90.country\_name != 'World'*

*ORDER BY diff\_relative\_fa*

*LIMIT 5;*

***QUARTILES***

***3e.* Table 3.3: Count of Countries Grouped by Forestation Percent Quartiles**

*WITH country\_2016 AS*

*(SELECT*

*fa.country\_name,*

*((fa.forest\_area\_sqkm)/(la.total\_area\_sq\_mi\*2.59))\*100 AS percent\_designated\_forest*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*WHERE*

*fa.year=2016)*

*SELECT*

*quartile,*

*count(quartile)*

*FROM*

*(SELECT*

*country\_name,*

*CASE*

*WHEN percent\_designated\_forest<=25 THEN '0%-25%'*

*WHEN percent\_designated\_forest<=50 AND percent\_designated\_forest>25 THEN '25%-50%'*

*WHEN percent\_designated\_forest<=75 AND percent\_designated\_forest>50 THEN '50%-75%'*

*ELSE '75%-100%'*

*END AS quartile*

*FROM country\_2016*

*WHERE percent\_designated\_forest IS NOT NULL*

*ORDER BY percent\_designated\_forest) sub1*

*GROUP BY 1*

*ORDER BY 1;*

***3f.* Table 3.4: Top Quartile Countries, 2016**

*WITH country\_2016 AS*

*(SELECT*

*fa.country\_name,*

*re.region,*

*((fa.forest\_area\_sqkm)/(la.total\_area\_sq\_mi\*2.59))\*100 AS percent\_designated\_forest*

*FROM forest\_area fa*

*JOIN land\_area la*

*ON fa.country\_code=la.country\_code and fa.year = la.year*

*JOIN regions re*

*ON la.country\_code=re.country\_code*

*WHERE*

*fa.year=2016)*

*SELECT*

*country\_name,*

*region,*

*percent\_designated\_forest*

*FROM country\_2016*

*WHERE percent\_designated\_forest >75*

*ORDER BY percent\_designated\_forest DESC;*