Country

Selection methodology 2018

How are the key countries and regions in the Forest 500 identified?

About the Forest 500:
Forest 500, a Global Canopy project, identifies and ranks the most influential companies and financial institutions in the race towards a deforestation-free global economy.

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INTRODUCTION

Forest 500 selects countries or jurisdictions that are globally significant for assisting in the shift towards deforestation-free palm oil, soy, beef, leather, timber, pulp and paper products in order to guide selection of the companies and financial institutions that are the most influential in these supply chains.

The below methodology details how these countries and jurisdictions were selected, including: forest-risk commodity producer countries (forest jurisdictions); and; key importing countries (trading jurisdictions).

FOREST JURISDICTIONS

Forest 500 identifies forest jurisdictions as countries with the largest remaining expanses of tropical forest[1], which are losing forest at a rapid rate and high volume in large part due to FRC production. As important producers of FRCs in the tropics, these countries also have considerable influence over forest protection, the way in which FRC are produced and global supply chains.

To identify these countries, the following factors were considered: forest type, overall forest cover, extent and rate of forest loss, change in average deforestation rate, amount of remaining natural forest, amount of intact forest landscape loss, and FRC production quantities.

National forest jurisdictions were selected by the following steps:

1. Countries with tropical forest cover were identified and a subset was selected based on the amount of remaining natural forest cover
2. The subset of countries was ranked based on the overall forest cover, extent and rate of forest loss, change in average deforestation rate, amount of remaining natural forest, amount of intact forest landscape loss, and FRC production quantities. For each country, the ranks for the individual metrics were added together to reach a country specific "total rank" score which was used to organise the countries in descending order.
3. A literature analysis was conducted for the top ranked countries to verify FRC production as a driver of tropical forest deforestation
4. A final set of 30 countries was selected as the top 30 ranked countries where FRC production was driving deforestation

IDENTIFICATION OF COUNTRIES WITH TROPICAL FOREST COVER

Countries with tropical and subtropical forests were identified using The Food and Agriculture Organization's (FAO) 2015 Global Forest Resources Assessments (FAO FRA) data [2] and FAO's 2012 Ecological Zones data[3]. As Forest 500 is limited in scope a subset of countries was chosen based the largest remaining natural forest area, with 100 000 hectares as an arbitrary minimum cut-off area. The amount of natural forest area for each listed country was found using FAO's Forest Resources Assessments 2015. Natural forests generally describe vegetation that evolved naturally in an area and they differ from planted forests which are often established for commodity production and/or protection of soil and water[4]. The amount of natural forest within countries was chosen as natural forests "contribute to conserving the diversity of genotypes and to maintaining the natural tree species composition, structure and ecological dynamics"[5]. There were two exceptions: Puerto Rico was excluded despite a large natural forest area due to the damage its

[1] Within this methodology, 'tropical' forest is understood as forests in both the tropics and subtropics.
[2] Food and Agriculture Organization of the United Nations. (2015) Global Forest Resources Assessments 2015. Available from: http://www.fao.org/forest-resources-assessment/explore-data/en/
[3] Food and Agriculture Organization of the United Nations. (2012) FAO GEONETWORK. Global Ecological Zones (second edition) Available from: http://ref.data.fao.org/map?entryId=2fb209d0-fd34-4e5e-a3d8-a13c241eb61b&tab=about
[4] FAO (2016) Global Forest Resources Assessment 2015 How are the world's forests changing? (Second edition), p. 19 http://www.fao.org/3/a-i4793e.pdf
[5] Ibid.

forests sustained in the 2017 hurricane season; Rwanda was included despite having a smaller natural forest area than the chosen cut off amount as it has a large total forest area and high deforestation rate (see next section).

ANALYSIS OF COUNTRIES BY RANK

Each country in the subset was ranked based on the: overall forest cover, extent and rate of forest loss, change in average deforestation rate, amount of remaining natural forest, amount of intact forest landscape loss, and FRC production quantities. For each country, the ranks for the individual metrics were added together to reach a country specific "total rank" score.

Data from Hansen et al.[6] was used for the overall forest cover and to calculate the extent and rate of forest loss. The FAO FRA data does provide forest cover statistics however this dataset relies on country disclosure and is only updated once every five years. Thus, the Hansen data was used for its consistent independent interpretation of forest cover globally and as it provides the most recent data available on an annual basis across and therefore allows for cross-jurisdictional comparison[7,8].

The Hansen data was used to calculate the total amount of forest area lost between 2010 and 2016 showing which countries lost the greatest extent of forest. Using 2010 forest cover data as a baseline the percent of forest loss per year and average deforestation rate between 2010 and 2016 were calculated using the extent of forest loss and the extent of remaining forest cover for each year[9]. The 2010-2016 interval was used in order to mitigate year-on-year data variations as elements such as cloud cover can distort data for an individual year.[10] An average deforestation rate for 2012 to 2014 and 2014 to 2016 were also calculated and compared to establish the change in average deforestation rate.

The extent, rate and change in rate of forest loss were assessed to highlight countries that either recently lost the greatest area of forest, have recent high rates of deforestation, and/or witnessed increasing rates of deforestation in the last few years. Examination of these trends provided a globally consistent proxy to understand contemporary hotspots of deforestation.

The amount of natural forest area and intact forest landscape loss was used so irreplaceable native ecosystems and impacts upon them were taken into consideration. The Hansen data does not differentiate between natural and planted forests hence an added importance of including the amount of natural forest area and intact forest landscape loss into consideration. The amount of natural forest area for each listed country was found using FAO's FRA 2015 (see previous section for details). As this dataset is updated only once every five years, Potapov et al.[11] was used to

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[6] Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. (2013) "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850–53. 2017 update. Data available from: http://earthenginepartners.appspot.com/science-2013-global-forest

[7] For further discussion of the FAO dataset, see Keenan, R. J., *et al.* (2015), 'Dynamics of global forest area: Results from the FAO Global Forest Resources Assessment 2015', *Forest Ecology and Management*, 352, 9-20. Available from: http://www.sciencedirect.com/science/article/pii/S0378112715003400

[8] For a brief discussion on the accuracy of the Hansen data, see here: Weise, M. and Petersen, R. (2015). How accurate is accurate enough? Examining the GLAD global tree cover change data (Part 2). [Online] Available from: http://blog.globalforestwatch.org/data/how-accurate-is-accurate-enough-examining-the-glad-global-tree-cover-change-data-part-2.html

[9] Remaining forest cover was approximated by subtracting loss extents from the 2010 cover baseline. This calculation is used as an indicator of natural forest loss and not an exact measurement as it does not account for forest re-growth and tree cover loss may include loss inside plantations given the inability of Hansen et al. data to distinguish natural forest from planted areas.

[10] Weisse, M. and Petersen, R. (2015). How accurate is accurate enough? Examining the GLAD global tree cover change data. Global Forest Watch. [Online] Available from: http://blog.globalforestwatch.org/data/how-accurate-is-accurate-enough-examining-the-glad-global-tree-cover-change-data-part-2.html

[11] Potapov, P., M. C. Hansen, L. Laestadius, S. Turubanova, A. Yaroshenko, C. Thies, W. Smith, I. Zhuravleva, A. Komarova, S. Minnemeyer, and E. Esipova. 2017. "The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013." Science Advances 3: e1600821. http://advances.sciencemag.org/content/3/1/e1600821.full

obtain the most recent data for intact forest landscapes loss. Intact forest landscape (IFL) is defined as a seamless mosaic of forests and associated natural treeless ecosystems that exhibit no remotely detected signs of human activity or habitat fragmentation and are large enough to maintain all native biological diversity, including viable populations of wide-ranging species[12]. Although the remaining IFLs around the world comprise only 20% of tropical forest area, they account for 40% of the total aboveground tropical forest carbon[13]

FRC production data was used to establish which tropical countries produce FRCs and to understand where production is potentially driving large-scale forest loss. FAO's Statistics Division (FAOSTAT) [14] was used to obtain the most recent data (2014) for the number of cattle, soybean harvested area and palm oil production amount while industrial roundwood production 2016 data was taken from International Tropical Timber Organization (ITTO)[15].

Cattle numbers and soybean-harvested area were used as opposed to meat or soybean production amounts because they were deemed a more appropriate measure for investigating forest area loss. Unfortunately, data for palm oil or timber-harvested area was not available therefore, production quantities had to be used. FRC data for some countries was also not available. As countries were also ranked based on their FRC production this lack of available data could have affected a countries total rank, as a country that did not produce a certain FRC would have ranked the same as one which produced it but for which this data was not available.

ANALYSIS OF FRC PRODUCTION AS A DRIVER OF FOREST LOSS

Production data and forest loss rates alone do not confirm that FRC production is responsible for deforestation. To establish whether FRC production was responsible for an increase in forest loss a literature review into the drivers of deforestation in the top 40 ranked countries was undertaken. REDD+ strategy documents, UNFCCC National Communications, government and non-governmental forest reports as well as peer reviewed-literature detailing drivers of deforestation were used to identify the importance of FRC production as a driver of deforestation in each of the 40 countries. A final set of 30 countries was then selected based on the rank and evidence of FRC driven deforestation risk and impact.

SELECTED COUNTRIES

The below countries were selected in 2018. Globally, these 30 countries represent 84.3% of tropical forest cover (2010), 78.6% natural forest area[16] and 90.4% of tropical forest loss from 2010-2016[17]. 27 of the 30 have experienced a reduction in intact forest landscape area between 2000–2013[18].

They also account for a significant proportion of reported global risk commodity production in tropical regions, including just over 96.5% of tropical timber produced[19], 96.4% of the area harvested for soybean[20], 96.9% of palm oil production[21], and 67.1% of cattle production[22].

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[12] P. Potapov, A. Yaroshenko, S. Turubanova, M. Dubinin, L. Laestadius, C. Thies, D. Aksenov, A. Egorov, Y. Yesipova, I. Glushkov, M. Karpachevskiy, A. Kostikova, A. Manisha, E. Tsybikova, I. Zhuravleva, Mapping the world's intact forest landscapes by remote sensing. Ecol. Soc. 13, 51 (2008). https://www.ecologyandsociety.org/vol13/iss2/art51/main.html
[13] Ibid.
[14] FAO (2015). FAOSTAT. Data. [Online] Available from: http://faostat3.fao.org/download/Q/*/E
[15] ITTO (2014). Annual Review Statistics Database. [Online] Available from: http://www.itto.int/annual_review_output/
[16] Natural forest area, FAO FRA (2015) (canopy cover >10%).
[17] Forest Cover 2010 (NB Gain not accounted for), Hansen (2010) (canopy cover >30%)
[18] IFL area reduction, Potapov (2017) (canopy cover >20%).
[19] ITTO (2016)
[20] FAOSTAT (2014)
[21] Ibid.
[22] Heads of cattle, Ibid.

Country	Important FRC Drivers of Deforestation	23Forest Cover 2010 [24]	Deforested Area 2010-2016[25]	IFL area reduction 2000–2013 [26]	Natural forest area [27]
Indonesia	Palm oil, timber	158118	10799	10.8	86064
Brazil	Palm oil, soy, cattle, timber	498198	17619	6.3	485802
Myanmar	Palm oil, timber	40916	1493	30.9	28097
Vietnam	Soy, timber	16576	1408	25.5	11110
Malaysia	Palm oil, timber	28619	3005	25.1	20229
Mexico	Palm oil, soy, cattle, timber	50347	1194	2.8	65953
Bolivia	Soy, cattle, timber	62714	1783	19.6	54738
Democratic Republic of the Congo	Palm oil, soy, cattle, timber	198393	5960	4.2	152518
Paraguay	Soy, cattle, timber	20453	2156	79.3	15225
India	Palm oil, soy, cattle, timber	34420	615	1.6	58651
Colombia	Palm oil, soy, cattle, timber	81718	1216	1.3	58431
Laos	Soy, cattle, timber	17931	1353	47.9	18648
Madagascar	Cattle, timber	16436	1611	19	12161
Côte d'Ivoire	Palm oil, cattle, timber	13953	1027	17.5	9974
Cameroon	Palm oil, cattle, timber	30543	527	25.2	18790
Argentina	Soy, cattle	38380	1832	2	25910
Thailand	Palm oil, soy, timber	19962	859	7.8	12413
Angola	Palm oil, soy, timber	53870	984	13.7	57731
Guatemala	Palm oil, cattle, timber	7034	479	13.3	3355
Honduras	Palm oil, cattle, timber	7555	428	28.6	4592
Venezuela	Cattle, timber	57274	585	1.5	46126
Nigeria	Palm oil, cattle, timber	10934	286	0	6573
Cambodia	Palm oil, soy, timber	7642	983	38.2	9388
Peru	Palm oil, soy, cattle, timber	78763	1274	6.1	72816
Papua New Guinea	Palm oil, timber	42937	669	13.3	33559
Liberia	Palm oil, timber	9284	740	32.2	4171
Nicaragua	Palm oil, cattle, timber	7622	458	38.1	3066
Philippines	Palm oil, timber	18599	552	9.5	6795
Guinea	Palm oil	8024	669	0	6260
Mozambique	Soy, timber	26965	920	0	37865

[24] (NB Gain not accounted for) (canopy cover >30%)(1000ha) - Hansen et al. (2010)
[25] (NB Gain not accounted for) (canopy cover >30%) (1000ha) - Hansen et al. (2013; 2017 update)
[26] (canopy cover >20%) (%) - Potapov et al. (2017)
[27] (canopy cover >10%) (1000ha) - FAO FRA (2015)

TRADING JURSIDICTIONS

Forest 500 also identifies the 15 most important national jurisdictions with respect to the import and trade of FRCs.

To identify these countries, the following metrics were considered:

1. Importance as a trading partner with the 30 forest countries for each FRC supply chain
2. Total value of all FRCs imports from the 30 forest countries

These indicators are discussed in detail below:

ANALYSIS OF FRC IMPORTERS

Trade data tracking FRC chain of custody was obtained from UN Comtrade, categorised according to commodity-specific Harmonised System (HS) codes selected for each commodity[28,29].Trade data for each of the FRCs identified as driving deforestation in the 30 forest jurisdictions was analysed. The value of imports (USD) was used as a metric by which to understand the importance of a trading partner for each commodity supply chain. To account for any significant variation in trade patterns between years, whilst ensuring the most recent information was considered, total figures for 2012 to 2014 were used[30]. As a few countries do not report imports for this date range, export data was also examined to corroborate trade patterns and supplement any unreported data points for imports.

Jurisdictions importing FRCs from the 30 forest jurisdictions were ranked according to trade value of FRC imports within each supply chain. Countries that are the largest trading partners within individual commodities were selected. Subsequently, once the largest importers for each supply chain were identified, countries were selected according to their global importance across multiple FRC supply chains given that major importing countries source a variety of FRC products.

It is worth noting that since UN Comtrade provides official trade data, illegal trade flows are not counted within figures. As illegal trade flows are, by nature of their illegality, difficult to monitor or estimate it is worth recognising their absence but not possible to accurately incorporate these flows into the selection process. It is also important to note that the selection of trading countries is based on imports and these countries may not be the final consumer due to the re-export of goods. Thus the trade data, and selection, is skewed towards countries with major trading ports.

Due to the ease and frequency in which products are moved between European countries, the European Economic Area (EEA), which unites the European Union (EU) member states and three European Free Trade Association (EFTA) countries (Norway, Iceland and Liechtenstein), has been considered as a single trading jurisdiction. For the purpose of this research, this also includes Switzerland, which is part of the EFTA but not officially the EEA, although it has signed bilateral agreements with the EU. Assessment of the EEA was undertaken through consultation of inter-jurisdictional policies established, for example, by the European Commission. As four jurisdictions within the EFTA are within the top eleven importers of FRCs globally, these countries were also

[28] UN Comtrade (2016). UN Comtrade Database. [Online] Available from: http://comtrade.un.org/db/ Data accessed: March 2016.

[29] The following HS codes were used for export/import analysis: Palm Oil: 120710, 1511, 151329, 151321, 230660; Soya: 1201, 120810, 1507, 210310, 230400; Cattle: 0102, 0201, 0202, 020610, 020621, 020622, 020629, 021020, 160250, 4101, 4104, 4107; Timber: 44; Pulp & Paper: 48, 4701, 4702, 4703, 4704, 4705. Code definitions are available from: World Customs Organization (2016). Nomenclature and Classification of Goods. [Online] Available from: http://www.wcoomd.org/en/topics/nomenclature.aspx

[30] Data for 2015 was not used since at the time of selection, reporting for this year was too incomplete globally.

included separately. These are The Netherlands (5th largest FRC importer globally), Germany (6th), Italy (8th), and Spain (11th).

SELECTED COUNTRIES

The 15 trading jurisdictions selected below represent the largest importers by value of FRC commodities from the 30 forest countries from 2014 to 2016, accounting for over 83.5% of the total value of FRC imports from the forest countries globally[31].

National Trading Jurisdiction	Top 10 FRC Importer[32]
Germany	Palm, Soya, Cattle
The Netherlands	Palm, Soya
Spain	Palm, Soya
EEA	Palm, Soya, Cattle, Timber, Pulp
Italy	Palm, Cattle
Japan	Timber, Pulp
USA	Palm, Cattle, Timber, Pulp
China & Hong Kong	Palm, Soya, Cattle, Timber, Pulp
India	Palm, Soya, Timber, Pulp
Republic of Korea	Timber, Pulp
Russian Federation	Cattle
Vietnam	Soya, Cattle, Timber, Pulp
Iran	Soya, Cattle[33]
Malaysia	Palm, Pulp
Thailand	Soya, Cattle

[31] Excludes Iran, COMTRADE (2018)
[32] Calculated using data from UN Comtrade for global imports of FRCs identified as driving deforestation in the 30 forest countries. Accessed March 2016.
[33] Data reported by Iran for imports was not available for 2012 to 2014 and the country's inclusion is therefore based upon export data. Exports from producer countries to Iran have been compared to exports to other countries to determine the listed commodities.

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