The Value Of Planting Trees

The Scientific evidence.

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1. EXECUTIVE SUMMARY

The science is clear: forests play a critical role in mitigating climate change through the carbon they absorb, as well as in balancing the Earth's water-cycle. Protecting and restoring our forests can make a measureable difference in our fight against greater precipitation extremes and higher temperatures on Earth. Recently confirmed by an Oxford University study, trees are the '*best technology to suck carbon dioxide from the atmosphere and reverse global warming*'[1].

This is evident especially in the tropics, where rainforests contribute to increasing cloud cover and cooling our planet. In addition to this, forests house over two-thirds of known terrestrial species and restore our soils; the source of life.

[1] Caldecott, B., Lomax, G., Workman, M.. (2005), *Stranded Assets and Negative Emissions Technologies,* Oxford, UK: Discussion Paper. Smith School of Enterprise and Environment, University of Oxford.

Through reforestation, we create jobs and uplift entire communities out of poverty, ensuring a better life. The communities become stewards of their forests and see the value of protecting them for the long term.

Reforestation needs to be planned and performed adequately. The economics that trees bring far outweigh the cost of planting and maintaining them[2], an area equivalent to 1,3 times the size of Burkina Faso of additional forests every year would help us stay under the 450 ppm of CO2 by 2030 and limit global warming to +2°C. This would require the planting of **263 billion trees** or the reforestation of 60% of the size of Brazil by 2030.

2. STOPPING DEFORESTATION IS TOO SLOW

"We are consuming our forests and with them the planet's ability to survive the blight of climate change".[3]

Forests cover 31 per cent of the total global land area[4] (i.e. four billion ha) and play a key role in regulating the climate dynamics. Today, 25 per cent of the earth's lands (3,700 million hectares) are highly degraded due to deforestation and land clearing for agriculture. 8.5 million hectares of tropical forests are cut every year[5] with an annual increase of 200,000 hectares. High incidences of deforestation occur along the west coast of the Americas, across the Mediterranean region of Southern Europe and North Africa, across the Sahel and the Horn of Africa, and throughout Asia[6]. This is equivalent to thirty-six football fields being cleared every minute[7].

3. CARBON SEQUESTRATION

Carbon dioxide (CO2) has now exceeded 400 of every million molecules (ppm) in the air. This is the most abundant of the six greenhouse gases, and it is continuing to rise at between one and two ppm per year. The level of CO2 in the air stabilized at a fairly constant 270-280 ppm for hundreds of years until the Industrial Revolution began.

Large quantities of CO2 are being released into the atmosphere. Globally, carbon stocks in forest biomass decreased by an estimated 0.5 Gt annually[8] during the period 2005–2010. This led to large quantities of CO2 being released into the atmosphere, representing 14-21% of all carbon emissions resulting from tropical forest deforestation and degradation[9].

Half of the carbon that enters the atmosphere stays there. The oceans absorb 25 per cent and the remaining 25 per cent must be absorbed by land-based ecosystems such as forests.[10] Through their study, the Oxford University[11] established that trees are the 'best technology to suck carbon dioxide from the atmosphere to reverse global warming'. They called it Negative Emissions Technologies (NET's) which includes reforestation[12] and afforestation[13] biochar and improvements to soil carbon.

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[2] Centre for Urban Forest Research and Southern Center for Urban Forestry Research & Information. (2015), The Large Tree Argument, http://www.fs.fed.us/psw/programs/uesd/uep/products/cufr_511_large_tree_argument.pdf, 02.06.2015

[3] His Royal Highness Prince Charles. (2015), Tropical Forests: A Review. UK: The Prince's Charities' International Sustainability Unit, The Prince of Wales' Charitable Foundation.

[4] Forest Resources Division (2010), Paper-136, Global Forest Resources Assessment, Main Report: Rome, Italy: Forest Resources Development Service, FAO.

[5] Hansen, M.C., et al.. (2013), High-Resolution Global Maps of 21st-Century Forest Cover Change. Science Magazine. 342, 8 50-853.

[6] FAO by Earthscan. (2011), The State of the World's Land and Water Resources for Food and Agriculture, New York, U.S.: Routledge.

[7] WWF. (2015), Threads/Deforestation, http://https://www.worldwildlife.org/threats/deforestation, 02.06.2015

[8] ibid. footnote 4

[9] ibid. footnote 3

[10] United Kingdom Forestry Commission. (2014), Forestry Commission Homepage, http://www.forestry.gov.uk/, 02.06.2015

[11] ibid. footnote 1

[12] The process of planting new trees in areas where they have been removed by cutting or destroyed by fire, disease, etc.

[13] The establishment of a forest or stand of trees in an area where there was no forest.

Growing forests absorb carbon more quickly than mature forests[14]. The carbon absorption of one tree varies according to it's species, climate, rainfall and age. Tropical rainforests grow more rapidly than other forests and can lock in as much as 15 metric tons of carbon per hectare per year.[15] For example, in the Mata Atlantica of Brazil, one hectare will absorb up to 11,3 tons of CO2 per year, whereas in the Sahel desert in Burkina Faso the CO2 absorption will be limited to 1 ton and will nevertheless bring multiple other benefits alongside being a carbon sink.

How much carbon must be absorbed to stay within the 450 ppm of CO2 level and limit global warming to 2°C? Studies in the IPCC AR5 report confirmed a global carbon (C) budget of 1GtC since the industrial revolution. Modern civilization has consumed over 51% of it already or even as much as 65 %, taking into account if all the other GHG (like methane) are included. The remaining budget to stay under a 2°C temperature increase is therefore 0,485 GtC (only CO2 accounted for) and 0,275 GtC (if other GHG are included)[16].

4. WATERCYCLE: ALSO AN OPPORTUNITY FOR CLIMATE

CO2 isn't the only greenhouse gas that is affected by deforestation. Water vapor is also a powerful greenhouse gas, measured in percent, not in ppm. "*The impact of deforestation on the exchange of water vapor and carbon dioxide between the atmosphere and the terrestrial land surface is the biggest concern with regard to the climate system*,"[17] said Daley[18]. Changes in their atmospheric concentration will have a direct effect on climate.

Climate models must take land-use change into account. "Deforestation has decreased global vapor flows from our land by 4% (3,000 km3 / yr), a decrease that is quantitatively as large as the increased vapor flow caused by irrigation (2,600 km3 / yr). Although the net change in global vapor flows is close to zero, the spatial distributions of deforestation and irrigation are different thereby leading to major regional transformations of vapor-flow patterns. According to a study published by the National Academy of Sciences in 2005[19], we need to take into account that at the scale of the Earth as a whole, our climate models are impacted by land-use change, in both land cover and irrigation. A slight change in vapor flows can disrupt natural weather patterns and change current climate models.

Forests are critical to rainfall and inextricably connected to the hydrological cycle through the process of evapotranspiration and cloud formation. In one day, one large tree can lift up to 100 gallons of water out of the ground and discharge it into the air.[20]

Forests help seed low stratocumulus clouds and these clouds cool the Earth system (in contrast to the warming effect of the higher clouds[21]). In 2009, a team led by Fabien Paulot[22] of the Institute of Technology in Pasadena, California demonstrated that the chemical process by which isoprene can and does contribute to the formation of secondary organic aerosols. The work could have important practical value for air quality modeling, showing how a

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[14] ibid. footnote 10

[15] FAO. (2005), FAONewsroom, http://www.fao.org/Newsroom/en/focus/2006/1000247/index.html, 02.06.2015

[16] Kelly Levin. (2013), WRI Blog, http://www.wri.org/blog/2013/09/world%E2%80%99s-carbon-budget-be-spent-three-decades, 02.06.2015

[17] Alina Bradford. (2015), Livescience, http://www.livescience.com/27692-deforestation.html, 02.06.2015

[18] Michael Daley is Associate Professor of environmental science at Lasell College in Newton, Massachusetts, U.S..

[19] Line J. Gordon et al.. (2005), Human modification of global water vapor flows from the land surface, USA: University of Wisconsin.

[20] American Forests. (2015), Tree Facts, https://www.americanforests.org/discover-forests/tree-facts/, 02.06.2015

[21] Steve Graham.(1999) The Earth's Climate System Constantly Adjusts. http://earthobservatory.nasa.gov/Features/Clouds/ 05.06.2015.

[22] F. Paulot et al. (2009), Unexpected Epoxide Formation in the Gas-Phase Photooxidation of Isoprene. Science Magazine. 325 no. 5941, 730-733.

volatile molecule released by plants (and trees) helps to form aerosols that can have a profound effect on weather and climate systems"[23].

The 2013 IPCC Q&A report (p29) refers to clouds as an "important but a still very poorly understood driver in climate processes". While it is now recognized that aerosols and nuclei in general govern the levels, types and warming properties of the clouds that are formed, scientists are still studying the complexity of atmospheric hydrology and thus climate, resulting from the balance between two opposing warming and cooling processes driven by 1) haze (formed by Dimethyl sulfide, DMS), dust, pollutant micro-nuclei and 2) precipitation nuclei (formed by larger hygroscopic ice, salt and microbial).
According to Dr. Govindasamy Bala (2006), "tropical forests are very beneficial to the climate because they take up carbon and increase cloudiness, which in turn helps cool the planet"[24].

The dynamics of global hydrology are complex and diverse. Makarieva and colleagues (2014) provided new evidence for the **Biotic Pump**[25] mechanism, which enables forests to 'generate large-scale pressure gradients that cause winds to bring moisture from oceans to the land'. The authors analyzed the relationship between wind direction and surface air pressure across forested and deforested regions of the Amazon basin, highlighting how the intense evaporation from forests create low-pressure zones that draw in moisture-laden air from over the oceans[26].

Besides rainfall and cloud nucleation, **forests are also known to supply 75 per cent of the Earth's fresh water** thereby increasing local **water security**[27]. Forests improve water quality by minimizing **erosion** and intercepting polluted runoff, which will become increasingly important as climate change threatens local water supplies.[28]

For every five per cent of tree-cover added to a community, storm water runoff is reduced by approximately two percent.[29] The Nature Conservancy's Urban Water Blueprint[30] demonstrated how natural solutions, namely reforestation, could measurably improve **water quality** for more than 700 million people in the world's 100 largest cities.

5. BIODIVERSITY

Forests are home to 80% of terrestrial biodiversity and house over two-thirds of known terrestrial species, including the largest share of threatened species.[31]

Forest animals are a vital source of nutrition and income to many people. These are essential in forest ecology, such as pollination, seed predation, dispersal and germination, and predation on potential pest species.

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[23] Royal Society of Chemistry. (2009), RSC, http://www.rsc.org/chemistryworld/News/2009/August/06080902.asp, 02.06.2015

[24] Dr. Bala and Ken Caldeira. (2006), Importance of carbon dioxide physiological forcing to future climate change, Stanford, California, U.S.: Carnegie Institution at Stanford University.

[25] MA. M. Makarieva and V. G. Gorshkov. (2014), Why Does Air Passage over Forest Yield More Rain? Examining the Coupling between Rainfall, Pressure, and Atmospheric Moisture Content. American Meteorological Society, AMS Journals Online. Volume 15, Issue 1, 411–426.

[26] WeForest is also contributing to advancing the forest/water-cycle/climate research by organizing a high level scientific workshop in June 2015 for 40 international researchers with the University of Leuven, Belgium.

[27] Forest Solutions. (2011), WBCSD, http://www.wbcsd.org/work-program/sector-projects/fsg/forestryinfographic.aspx, 02.06.2015

[28] NC State University. (2013), Climate Education for K-12, http://https://www.nc-climate.ncsu.edu/edu/k12/.watercycle, 02.06.2015

[29] ibid. footnote 19

[30] McDonald, R.I. and D. Shemie. (2014), Mapping conservation solutions to the global water challenge, Washington D.C.,U.S.: The Nature Conservancy.

[31] WWF. (2015), Forests/Habitat, https://www.worldwildlife.org/habitats/forest-habitat, 02.06.2015

Wildlife use trees for food, shelter, nesting, and mating. These habitats support the incredible variety of living things on the planet, known as biodiversity. By protecting trees, we also save all the other plants and animals that they shelter.

Reforestation also plays a key role in reducing pressures on natural forests, connecting fragmented ecosystems to intact land and making a meaningful contribution to conserving biodiversity, ecosystem services and human well being[32]. A recent study revealed that 70 per cent of remaining forest land exists within 1 km of an edge, which negatively impacts their fauna, flora, and ecosystem services. In Brazil's Atlantic Forests, for example, less than 9% of the remaining intact areas are farther than 1km from an edge[33].

6. SOILS

Soils are non-renewable - it can take up to 1,000 years to form one cm of topsoil[34]. Soil means life. Without it there is no life, trees, forests, animals or people. Worldwide, 24 billion tons of fertile soil are lost annually[35], leading to half of the topsoil on the planet having been lost in the last 150 years.[36] Increased demand for agricultural commodities generates incentives to convert forests and grasslands to farm fields and pastures: the transition to agriculture from natural vegetation often cannot hold onto the soil and many of these plants, such as coffee, cotton, palm oil, soybean and wheat can actually increase soil erosion beyond the soil's ability to maintain itself.[37]

We have mentioned forests as a critical carbon sink and for their role in biodiversity, yet soils store more carbon than all of the world's forests combined (only the oceans are a larger carbon sink), and are essential to maintaining biodiversity: a handful of fertile soil contains more microorganisms than there are humans on the planet.[38]

Two-thirds of Earth's species live beneath the soil's surface.[39] Reforestation is the solution to protect soil from degradation and water loss. Like the protection of an umbrella, soil cover and reforestation protects the soil, and the microbes within from the impact of sun heat, rain and wind. It stops the soil surface from sealing and reduces the amount of precious rainwater that runs off. [40]

Are forests competing with agriculture? No, trees planted near agricultural land offer many environmental benefits. They reduce erosion and stabilize the soil, increase soil fertility (especially the Nitrogen Fixing Trees (NFT), lower (deeper) water tables, lessen the risks of salinization, enhance the land's capacity to store water and moderate air humidity and soil temperatures.[41]

Trees boost agriculture in arid and semi-arid regions. Tree 'shelter-belts' slow down the rate of desertification and provide suitable conditions for crops, turning degraded landscapes into productive grassland and farmlands.[42]

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[32] ibid. footnote 25

[33] Nick M. Haddad et al. (2015), Habitat fragmentation and its lasting impact on Earth's ecosystems. Science Advances. Vol. 1 no.2e1500052, 1-9.

[34] FAO Knowledge. (2015), Soils Facts, http://www.fao.org/soils-2015/soil-facts/en/, 02.06.2015

[35] Barbara Unmüßig. (2015), Heinrich Boell Foundation Homepage, http://https://www.boell.de/en/2015/04/24/save-our-soils, 02.06.2015

[36] WWF. (2015), Soil Erosion and Degradation, http://https://www.worldwildlife.org/threats/soil-erosion-and-degradation, 02.06.2015

[37] ibid. footnote 34

[38] ibid. footnote 33

[39] ibid. footnote 33

[40] Beat Stauffer et al. (2005), SSWM, www.sswm.info/content/soil-cover-and-reforestation, 02.06.2015

[41] FAO Forest Resources Division. (2010), Global Forest Resources Assessment 2010- Main Report, Rome, Italy: FAO.

[42] ibid. footnote 38

A separate study of agro-ecological farming practices by Jules Pretty in 2006 examined 286 sustainable agro-forestry projects in 57 countries and concluded that crop yields had increased an average of 79%.[43]

7. LIVELIHOOD

Planting trees creates jobs. The World Bank estimates that 1.6 billion people around the world depend to some degree on forests for their livelihoods (or 22% of the total population). Forests provide more than 10% of the GDP in many of the poorest countries. It is estimated that the forestry sector provides formal **employment for 10 million people** and informal employment for additional **30 to 50 million people** in developing countries. FAO[44].

Everyone can benefit with smart planning and investment in 'natural infrastructure' (forests). Cities can recoup a good return on their investment. For example, treating drinking water is expensive and treatment costs will rise even higher if sediment interferes with water supplies, as recently revealed in São Paulo. Investing in relatively cheap natural infrastructure can save money over time by eliminating the need for expensive technological upgrades. Cities that embrace natural solutions alongside traditional man made water infrastructure can improve water quality and availability, and save taxpayers' money.[45]

Jobs to empower women: at present, women make up 70% of the world's poor and earn only 10% of its income, despite producing over half its food[46].

Planting 1 million trees in Brazil provides 240 people with a job for 4 years. In the WeForest reforestation projects, most of the jobs (nursery, weeding) are done by women and WeForest sees that increasing women's income directly impacts the number of children attending school and the available cash for healthcare. Studies suggest that if women's paid employment rates were raised to the same levels as men's, per capita income in some of fastest-growing economies would rise 20 percent by 2030. Studies also show that a woman is apt to invest her income in her family. "Eighty cents of every dollar she earns goes toward health care, nutrition, and housing for her kids."[47]

8. HOW MUCH REFORESTATION IS NEEDED?

There are roughly **3 trillion trees on Earth** according to a tally[48] by an international team of scientists. This recent study (Sept 2015) also finds that around 15 billion trees are cut down each year. Since the onset of agriculture about 12,000 years ago, the number of trees worldwide has dropped by 46%.

Different initiatives are trying to contain this forest destruction: according to the State of the Forest Carbon Markets 2014, avoided deforestation projects globally (REDD) now cover almost 20 million hectares.

Others like WeForest are focusing on restoration. Afforestation/Reforestation projects across the world have restored between 2000 and 2010, about 5 million hectares per year[49] (roughly half of what is being destroyed).

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[43] ibid. footnote 33

[44] ibid. footnote 39

[45] Mark Tercek. (2015), HuffPost Green, http://www.huffingtonpost.com/mark-tercek/three-key-lessons-from-sa_b_6902984.html, 02.06.2015

[46] Clinton Foundation. (2015), Issue Areas, https://www.clintonfoundation.org/our-work/by-topic/women-and-girls, 02.06.2015

[47] ibid. footnote 44

[48] Crowther, T. W. et al. Nature http://dx.doi.org/10.1038/nature14967 (2015).

[49] FAO Forest Resources Division. (2010), Global Forest Resources Assessment 2010- Main Report, Rome, Italy: FAO.

The Bonn Challenge in Sept 2011 announced the restoration of 150 million ha by 2020: 4 years later 39% are committed[50]. In September 2014, the New York Declaration announced a more ambitious target to restore 350 million ha of deforested and degraded forest landscapes by 2030 (10% of the planet's degraded soil), which includes the 150 million ha from the earlier Bonn Challenge pledge.

Using the numbers from the NY declaration scientific advisors[51] (September 2014, and including 177m ha of reduced deforestation by 2030) we can say that the world would need **527m ha** of additional forest protection and restoration by 2030[52] (or the **equivalent of 60% of the surface of Brazil**).

Translated into trees, using 500 trees per ha density (as it is a combination of forest protection and restoration) **263 billion trees**[53] would be needed by 2030 or **36 trees for each of us** (as of June 2015).

9. HOW MUCH WOULD IT COST?

The economics are clear. The benefits of trees far outweigh the cost of planting and maintaining them. Restoring the surfaces of these degraded soils would require between **$79 and $131 Bn** (or an average $7 Bn per annum over the next 15 years), based on the WeForest current project costs.

In 2014, global GDP amounted to about 77.3 trillion U.S. dollars[54], this total investment to contain global warming represents merely 0,001% of 1 years' global GDP or 0,08% of 1 years' global military spending[55].

In 2006 Nicholas Stern estimated that *"capping climate change would cost around 1% of global GDP, while sitting back and letting it hit us would cost between 5 and 20%*". In June 2008, Stern increased the estimate for the annual cost of achieving stabilization between 500 and 550 ppm CO2e to 2% of GDP to account for faster than expected climate change[56].

10. THE BEST WAY TO GET THE JOB DONE

The simplest way to restore vegetative cover is to protect it from the causes of degradation which mostly constitutes exploitation (harvesting and grazing) and fires. With Natural Regeneration (NR), vegetation can spread naturally, even on bare lands but the process is often slow. Planting trees, bushes and grass will speed up the process[57]. This is called **assisted natural regeneration** (ANR) which we use across most of our planting sites.

Why plant in tropical regions and not in Europe or North America? The northern hemisphere[58] would benefit from more trees for soil, biodiversity and water, not however for poverty alleviation and neither for their cooling effect. According to Dr. Govindasamy Bala (2006), planting trees in **tropical regions** rather than in northern latitudes is more beneficial for climate: "the darkening of the surface by new forest canopies in the high-latitude boreal regions

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[50] IUCN. (2015), Bonn Challenge, http://www.bonnchallenge.org, 02.06.2015

[51] Michael Wolosin. (2014), Quantifying Benefits of the New York Declaration on Forests, US: Climate Advisers.

[52] 350m ha + 177m ha of forest protection= 527m ha

[53] Assuming a density of 500 trees per ha resulting from protection and reforestation

[54] Global Gross Domestic Product (GDP) at current prices from 2010-2020 (in billion U.S. dollars):
Statista. (2015), http://www.statista.com/statistics/268750/global-gross-domestic-product-gdp/, 02.06.2015

[55] Reuters. (2015), Top News, http://www.reuters.com/article/2007/06/11/us-arms-sipri-idUSL1119646120070611, 02.06.2015

[56] Nicholas Stern. (2007), The Economics of Climate Change, Cambridge, UK: Cambridge University Press.

[57] M. Malagnoux, E.H. Sène and N. Atzmon. (2007), Forests, trees and water in arid lands: a delicate balance, Rome, Italy: FAO.

[58] Forest Resources Division,. (2010), Forestry Paper- 136, Global Forest Resources Assessment, Main Report, Rome, Italy: Forest Resources Development Service, FAO.

allows absorption of more sunlight that helps to warm the surface. In fact, planting more trees in high latitudes could be counterproductive from a climate perspective."[59]

It's not just about planting. Forests must be protected in the long term and this can only be achieved by making standing forests more valuable for local communities. This requires education programs, participation of local groups and leaders in the development of the project as well as long-term income generation either through agroforestry models or participation in long-term carbon certification schemes as done in India by WeForest.

The types of trees matter. Indigenous trees (or native trees) have evolved over thousands of years in a particular region and have adapted to that geography, hydrology, and climate. They are the ones that should be preferred for reforestation. When climate permits, 10% of the trees planted in the WeForest projects are fruit trees, which directly provide food and income to local communities.

11. CREATING A MOVEMENT

We need *'to catapult restoration on to the global policy agenda, raise awareness of restoration's benefits, trigger active identification of suitable areas for restoration, create enabling conditions, and mobilize the human and financial resources needed for restoration at scale*.' HRH The Prince of Wales.[60]

In summary, if planned and performed adequately, reforestation facilitates:

- The restoration of ecosystem services provided by forests including carbon storage, water cycling and wildlife habitat
- The absorption of the carbon dioxide excess in the atmosphere
- The empowerment of women, creating jobs in communities that alleviate poverty
- The rebuilding of wildlife habitats

WeForest is contributing to the cause in 3 ways:

1. Demonstrating that this is possible with implementing scalable best practices on the ground. Close to 10 million trees have been planted to date and expectations are to plant 50 million in the next 4 years.

2. Promoting the scientific exchange and dissemination on the dynamics of global hydrology and trees for climate. WeForest is advancing the forest/water-cycle/climate research by organizing a high level scientific conference in June 2015 for 40 international researchers with the University of Leuven, Belgium.

3. Creating a movement with corporate brands (over 140 to date) who use trees as a currency to engage consumers, drawing on marketing and CSR budgets to Make Earth Cooler.

We need not lose this vital race! We urge all corporations, all governments and all of the rest of us to choose life for our planet by grasping this natural solution for our children and for us all!

12. FACT SHEET

- **Earth Surface Area:** (510,066,000 km2)
- **Land Area:** (148,429,000 km2)= 29.1% of the Earth
- **Forest coverage:** (2010 FAO) Forests cover 31 percent of total land area, the world's total forest area is just over 4 billion hectares (40 m km2)

[59] Jonathan Amos. (2005), BBC News, http://news.bbc.co.uk/2/hi/science/nature/6184577.stm, 02.06.2015

[60] The Prince's Charities' International Sustainability Unit. (2015), Tropical Forests, UK: The Prince of Wales' Charitable Foundation.

- **Deforestation**
  FAO (2010): 13 million hectares (130 000 km2) of forests continue to be lost each year, contributing up to 20 per cent of annual global greenhouse gas emissions[61](4 X Belgium), which is 37 percent lower than that in the 1990s, and equals a loss of 0.13 percent of the remaining forest area each year during this period.
- **Net loss (FAO 2010**)
  The net change in forest area in the period 2000–2010 is estimated at -5.2 million hectares per year.
  (Other source is Hansen: Earth observation satellite data: global forest loss (2.3 million square kilometers) and gain (0.8 million square kilometers) from 2000 to 2012 [62]).
- **How much degraded land?**
  UN (2014): 2 billion hectares (20 million km2) of degraded forests and other lands – all around the globe – need to be restored[63].
  FAO (2010): today 25% of the earth's lands (3700 million ha, 37 m km2) are highly degraded due to deforestation and land clearing for agriculture.
- **How much reforestation/landscape restoration happening already?**
  9,6 million ha on average annually (FAO number from 2011) (= 3X Belgium) number including large-scale plantation (Eucalyptus or oil palm) that should not qualify as detrimental to the environment.
- **New York Declaration[64]** (Sept. 2014)
  NY Declaration suggests 350mha by 2030 (3,5 m km2) to keep global temperature increases to less than two degrees Celsius[65] (or 17% of the total degraded land).
  Reduce deforestation by 50% by 2020 (up to 177 million hectares in total)
  Restore 350 m ha by 2030 (Inclusive of the 200 m ha Bonn Challenge pledge)
  Would reduce 4,5-8,8 bT CO2 by 2030 (or 1 billion cars)
- **How many trees would be needed to stay under 2°C or 450 ppm,** stabilizing global warming?
  Total of 527 million ha (5,270,000 km2/ = 60% Brazil) of additional forest protection and expansion (based on assumptions by NYD Climate Advisors) would be needed by 2030 = 35 m ha p.a. (350,000km2= 1,3 BF). 17 billion trees p.a. or 263 billion trees by 2030.

[61] UN Climate Summit in New York. (2014), Action Areas, http://www.un.org/climatechange/summit/action-areas/, 02.06.2015

[62] Hansen, M.C., et al. (2013), High-Resolution Global Maps of 21st Century Forest Cover Change. Science Magazine. 342, 850-853.

[63] ibid. footnote 57

[64] ibid. footnote 57

[65] ibid. footnote 57