

# Amazon Rainforest: Why the world must not tolerate its destruction

In the previous edition, I talked about the impacts of food-based agriculture, and how many of our food-related choices can come with a large deforestation-footprint and how for this reason, it is crucial to be mindful of such choices and try where possible, to source local food that has been responsibly and ethically produced. In this issue, I talk about how timber-based agriculture, gold mining and oil are also demolishing the Amazon.

# **Disease Buffer**

Not only does the Amazon store a stupendously large amount of carbon, it (as well as forests in general), helps to prevent the outbreak and spread of diseases. Vittor *et al*<sup>1</sup> found that in the Peruvian Amazon region of Iquitos (which lost over 42 km<sup>2</sup> of forest per year between 1983 and 1995; in total, an area close to the size of Singapore), the risk of contracting malaria was 278 times higher in areas disturbed by deforestation compared to forested areas. This is because the mosquitoes prefer to breed in secondary habitat that has been converted into grass/crop land with ponds and in areas converted for the purpose of farming fish. Studies have found that in forested areas, fewer adults<sup>1</sup> and larvae<sup>2</sup> of parasite-transmitting species

are found, in comparison to deforested areas, suggesting that forested areas support populations of mosquito species that do not carry malarial parasites. Moreover, deforestation as a result of land clearance for illegal gold mining, also increases infection rates of malaria<sup>3</sup>. In areas of intense illegal gold mining, malaria cases were found to be 30 times higher than areas of mild illegal gold mining<sup>4</sup>. And in the protected forest of Tambopata, Peru, malaria cases are pretty much non-heard of; so, if visiting, although there are lots of mosquitoes, malaria it is not something to be concerned about. Whereas in Iquitos, Peru, one would need to consider some form of malarial prevention tablets, as the risk is higher. As such, it is claimed that biodiversity issues and malarial control are connected, and in order to achieve low levels of malaria cases, protection of forests is key<sup>5</sup>. As land is cleared for human uses, a border is created between the forest, and cleared land. And it is at this forest edge, where disease risk is the highest. So, to reduce this risk of coming into contact with infected insects (a *disease burden*), more land is cleared to increase the distance between humans and the forest edge<sup>5</sup>. And based on this, it is claimed that conservation efforts can increase the risk of malarial infections<sup>5</sup>. However, the whole point of conservation of the Amazon, is to protect as much forest as possible, and to stop it being destroyed for human use. Thus, if none of that land in their study had been destroyed by humans, and it remained intact forest, malaria might be less of an issue.

A study using data from almost 300,000 children found that in rural areas, as well as other factors including education, an increase in forest cover can help reduce diarrhoeal disease<sup>6</sup>.

#### **Gold Mining**

"For in the true nature of things, if we rightly consider, every green tree is far more glorious than if it were made of gold and silver".

- Martin Luther King Jr.

Between 2010 and 2019, demand for gold has seen fluctuations, but has increased from 4,100 tonnes to 4,300 tonnes<sup>7</sup>. Nearly 50% of this demand is for jewellery, nearly 30% by investment and just under 10% for tech products such as mobile phones, laptops, televisions, etc.<sup>8</sup>. Gold is mined in all nine Amazon nations, and over the past decade, gold mining in the Amazon has rocketed, so much so, that in the Northern part of the Amazon, gold mining has been responsible for almost 90% of deforestation<sup>9</sup>. Between 2001 and 2013, over 1,600 km<sup>2</sup> of lowland S. American forest was cleared for gold mining, with a larger increase in loss, occurring between 2007 to 2013, in comparison to 2001 to 2006<sup>10</sup>. Guyana boasts some of the largest areas of pristine, untouched rainforest in the world, with around 80% of the country being forested<sup>11</sup>. However, between 2001 and 2017, over 1,040 km<sup>2</sup> of forest was lost to gold mining, an area equivalent to 146,000 English football pitches<sup>9,10</sup>.

Peru is the sixth top miner of gold in the world (and the largest in Latin America), producing over 143 tonnes in 2019<sup>12</sup>. The region most devasted by gold mining, is the La Pampa region in the southeaster department, Madre de Díos, which is where Peru's illegal gold is predominantly mined. Madre de Dios is considered the capital of Biodiversity of Peru. In 2013, it was estimated that 28% of Peru's exported gold was illegal, amounting to over \$2.6 billion<sup>13</sup>. Here, the construction of the Interoceanic Highway in 2006 (which connects the Atlantic coast of Brazil with the Pacific coast of Peru) resulted in a 760 km<sup>2</sup> loss of forest<sup>14</sup>. And it was this highway that paved the way for an increase in gold mining, with mining increasing by over 50% between 2012 and 2017. In a 34-year period between 1985-2017, almost 1,000 km<sup>2</sup> of

Peruvian Amazon was destroyed for gold mining (an area just smaller than the size of Hong Kong), with destruction as a result of gold mining more than doubling between 2010 and 2017<sup>14</sup>. And whilst the Peruvian Amazon is facing several threats, gold mining was the primary cause of forest loss between 2010 and 2015. In 2019, the top importers of Peruvian gold were Switzerland (>50 tonnes), Canada (>44 tonnes), India (over 40 tonnes) and the United Arab Emirates (over 25 tonnes)<sup>15</sup> (average price of gold per ounce in 2020 was \$1,770)<sup>16</sup>.

The Brazilian Amazon is also suffering to mining of this metal. Between 2005 and 2015, almost 5,000 km<sup>2</sup> of deforestation is attributable to gold mining, with over 30,000 km<sup>2</sup> more due to mining for other commodities<sup>17</sup>.

There is however, some good news, in February 2019, the Peruvian military took control, and expelled over 5,000 miners from the La Pampa<sup>18</sup>. Scientists are now attempting to plan restoration efforts, to reforest the region, however miners have rendered the soils devoid of nutrients, and altered the natural flow of water, making restoration efforts difficult. Additionally, gold prices are high, at around £43 per gram (~ \$1,900 per ounce, May 2021)<sup>16</sup>. This is concerning, as it could entice miners to return, which could cause conflict with people trying to restore the region. And it is the demand for gold, that is one of the factors that can cause prices to increase, with the highest demands being by India, China and USA<sup>19</sup>.

If this once lush forested region could have its forest restored, it would take hundreds and thousands of years, but a recent study in Guyana<sup>9</sup>, has found that mining has grave implications for forest regeneration. Research from two recently abandoned gold mining pits in Guyana, found that there were no signs of tree recovery 3-4 years after abandonment. And it is thought that the intense extraction of soil nutrients, is what prohibits vegetation from growing. And of further concern, is that stripping the land bare, results in a reduced potential for carbon sequestration, with their estimates showing an accumulation of around 21,000 tonnes less carbon sequestered, than had the land been used for agricultural purposes (which is just as destructive to forests).

Why place so much value in something lifeless, that gives naught but a little glamour for a limited time, when there is a living world with endless glamour, teaming with life?

Thus, a simple solution to this would be to stop buying, in particular, jewellery made from gold, but for those that cannot resist the temptation to own this shiny metal, one should question jewellers of the origin of the gold, and ask for proof that it was legally mined. And if they cannot tell you, simply walk away, and look elsewhere, or if they say it has originated from South America, realise the amount of forest that was decimated to produce that small pendant or necklace, and again, simply turn away and look elsewhere.



Some photos to show the devastating impacts of gold mining activity – Top left: Suriname<sup>20</sup>, middle left: La Pampa, Peru<sup>21</sup>, bottom left: Colombian troops blow up an illegal mine<sup>22</sup>, top right: Brazil<sup>23</sup>, middle right: Venezuela<sup>24</sup>, bottom right: Ecuador<sup>25</sup>.

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### Polluting the Arteries

The impacts of gold mining do not end with directly destroying rainforest, another issue is the irresponsible discharging of mercury waste in to rivers. Mercury is used as an inexpensive metal to extract gold, and is used by more than 50 countries<sup>26</sup>. A 2017 report by the Peruvian Ministry of Environment<sup>27</sup>, found that in the past 20 years, over 3,000 tonnes of mercury were dumped into Amazon rivers, contaminating aquatic life and all life that depends on the rivers for food and water, which includes human populations. Furthermore, a 2013 study<sup>28</sup> found that in the city of Puerto Maldonado, in Peru's Tambopata region, over 60% of fish species that are most commonly consumed by people, were found to have average levels of mercury, higher than safety levels. With mercury levels increasing in 90% of species between 2009 and 2012. Indicating that the scale of mercury poisoning was much greater than previously thought. It was also found that 78% of adults in the city, had on average 3 times higher concentrations of mercury, than was deemed safe, with some having concentrations almost 30 times higher. However, a study in the Tambopata-Malinowski rivers, flowing through the Tambopata National Reserve, did not detect high levels of mercury accumulation. But a study in Brazil's Tapajós River basin, found that even low levels of mercury poisoning can lead to neurological disorders<sup>29</sup>, and people in communities downstream of gold mining sites, who rely on fish as a staple protein source, have been found to have chronic exposure to mercury<sup>30</sup>. In the Brazilian Amazon state of Amapá, bordering French Guiana and Suriname, mercury contamination was found in nearly 30% of fish samples<sup>31</sup>. And the more contaminated fish people consume, the greater the chances of risk there will be over time.

But much of this is needless, and in some sense, is indirectly as a consequence of the gold trade. By facilitating this trade, peoples' lives are being put at risk of poisoning. But not just the people, more critically, wildlife that drink river water, and whose diet comprise fish are at great risk. A WWF report<sup>32</sup> found that Bolivia has one of the highest rates of mercury release into rivers, and this has been found to threaten the Bolivian pink river dolphin<sup>33</sup>, as well as pink river dolphins in other parts of the Amazon<sup>34</sup>. A study in the Brazilian Pantanal (a wetland ecosystem), found high levels of mercury in the fur of jaguars, which would be as a result of consuming contaminated fish<sup>35</sup>. Caimans<sup>36</sup> and otters<sup>37</sup> have also been found to have mercury poisoning in the Brazilian Pantanal, with the former, also being prey for jaguars, and both being reliant on fish as their food source.

# **Selective Logging**

Logging is a trade that generates furniture products, flooring, packaging material, paper, loo roll, books, and more. However, selective logging results in the rampant loss of large, old trees, which subsequently induces collateral damage to surrounding trees, sub-canopy vegetation and soils<sup>38</sup>. This impacts hydrological processes, exacerbates erosion and fire, hinders the ability for carbon storage, and impacts directly, the animals that require such trees for foraging and/or nesting. Approximately 20% (~108 million ha) of the Amazon Rainforest is under threat from logging, and can generate somewhere between 2-15 billion USD per year<sup>39,40,41</sup>. And logging is a significant driver of colonisation, which in turn encourages migration into areas that were once harder to access; and in particular, facilitates farmers to enter and clear more land for agriculture<sup>40</sup>. Some of the trees that are targeted are Mahogany, Cedar, iron wood trees, purpleheart and Ceibas<sup>42</sup>. These trees are regarded

as 'high value' as they will fetch for a higher price in the timber market<sup>43</sup>. And as these trees are often huge in height and girth, as they fall, they often take out several trees on the way down, and in doing so severely damages the forest, which, with time, has been found to lead to more trees dying. Between 1999 and 2002, logging in the Brazilian Amazon has been found to degrade an area of over 46,000 km<sup>2</sup>, almost doubling the area of impacted land, when deforestation for crop and pastureland is taken into consideration<sup>38</sup>.

Trees such as the iron woods, are important for macaws and large raptors for nesting<sup>44,45</sup>. It is the older trees that are more likely to have suitable cavities for the macaws which they are dependent upon; and these larger trees are likely to have larger canopy layers which can support the large nests raptors make. A single iron wood tree has the potential to live for over 1,000 years, thus in its lifetime, can support thousands of macaw chicks, and as macaws will use the same cavity for as long as possible, the macaws have a commensal relationship with these trees<sup>46</sup>.

One way to ensure that the products you are looking to purchase, have not contributed to illegal deforestation, is to look for a certification by the Forest Stewardship Council (FSC). The FSC is analogous to the RSPO that certifies sustainability of palm oil, in that to gain FSC certification, logging companies must meet the FSC standards including the maintenance, conservation and/or restoration of ecosystem services, coupled with the endeavour to avoid negative environmental impact, or have measures to mitigate for any harm. As well as contributing to the social and economic wellbeing of local communities and workers, and additional criteria<sup>47</sup>. If a product is certified, it will display one of the FSC logos.



Bamboo products including loo roll and kitchen towel are also good alternatives, and the kitchen towels can also be reused and composted, thus can reduce waste.

# **Deforestation Oil**

Ecuador's Yasuni National Park is one of the most biodiverse regions in the world, however, beneath the park, lies fields of oil<sup>48</sup>. The park is also home to indigenous tribes, who before the 1950s/60s remained completely uncontacted. These tribes would fiercely defend their territory, but after attempts by missionaries to contact them, nothing but chaos has ensued. The missionaries brought with them outside diseases, and inadvertently, paved the way for oil companies to industrialise the forest. In the 1960s, oil giant, Texaco, began drilling for oil, and in the years to follow, triggered rampant deforestation, and the deaths of countless animals and tribesman. The companies have altered the landscape of Yasuni with a series of

wells and refineries which branch out 100s of km of pipelines. Between 1994 and 2001, 29,000 barrels of crude oil were spilt into the Amazon, over 20% of barrels were not recovered from the environment<sup>49</sup>. These oil spills turn once pristine, clean forest into a toxic wasteland, that have resulted in health problems in local populations, degradation of habitats and loss of wildlife. Contents of the spills have been found to contain anti-corrosives, bactericides and fungicides<sup>48</sup>. And a positive correlation has been found with oil extraction and deforestation; to increase access to extraction sites, oil access roads are constructed, which displace large areas of forest; moreover, the roads facilitate colonisation into forests, which facilitate further industrialisation of the forest<sup>48</sup>. There are also plans to connect roads, and another issue that has arisen as a result of these roads, is rampant poaching of wildlife for the bushmeat trade, which is largely unregulated, and also sees mammals captured live for the pet trade<sup>48</sup>. Additionally, logging has become a major issue, to the extent that the large trees that were along the oil access roads, have all gone, with large trees now just found deep inside the forest. Unfortunately, all the destruction, has forced indigenous communities into smaller and smaller corners, and subsequently conflict amongst tribes, with two of the tribes choosing to remain completely isolated and attack all outsiders. Almost 70,000 km<sup>2</sup> (68%) of Ecuadorean Amazon is now covered by oil fields<sup>49</sup>. Resulting in a reduction in wildlife diversity, abundance and density in proximity to roads<sup>50</sup>.

People who live in close proximity to oil fields have acquired many health issues which have been directly linked to the oil spills. With conditions including skin irritation, respiratory and digestive issues and with some pollutants known to be human carcinogens, there has been a direct link to childhood leukaemia, as well as cancers in adults<sup>49</sup>. And alarmingly, there is a link to the pollutants causing DNA to mutate, leading to different types of cancers, and as well as effecting embryos in children, leading to more abortions. These are conditions not found in communities that live far away from drilling sites<sup>51</sup>.

Most recently, in April 2020, an eroded pipeline ruptured and leaked over 15,800 barrels (over 2,500 m<sup>3</sup>/664,000 gallons) of oil into Amazon rivers<sup>52</sup>. Six months down the line, and still protective actions have been delayed, affecting over 120,000 people and an unknown amount of wildlife<sup>53</sup>. And with the rivers flowing to Peru and Brazil, the issue extends internationally, thus to reiterate, borders are meaningless in nature.

The plight of the Ecuadorean Amazon and its inhabitants is well portrayed in the movie *Yasuni Man*<sup>48</sup>.

Individually, some of the areas of forest loss, may not seem much, but when added up, is a huge amount. The maps below, taken from the Global Forest Watch, show forest cover in 2001 (top), followed by forest loss of greater than 30% (indicated in purple) between 2001 and 2019 (bottom).



Source: Global Forest Watch<sup>54</sup>.

In the book, *The Song of the Dodo*, author David Quammen presents the analogy, that an ecosystem is like a Persian carpet. Whereby, if you cut the carpet into smaller pieces, you do not end up with many carpets, but rather many useless pieces. In other words, when you cut through forests, you end up with many fragments of forests that struggle to function as they did when connected.



To illustrate the impact of all this deforestation at a global level, the image below shows regions of the world that will see changes in rainfall as a result of tropical forest deforestation.

Source: Lawrence and Vandecar<sup>55</sup>.

Thus, it can be seen that over time, many regions will face either more droughts, or more floods. The natural world is connected in such an intricate way, as if to say, *if you screw me over in one place, I'm going to screw you over in many different places*. And this schematic only shows loss of tropical forests, and does not take into account loss of other ecosystems... The west coast of the United States for example has been facing severe forest fires, with fire outbreaks worsening year after year, and with more Amazon deforestation causing climatic shifts that are unintended by nature; reducing the amount of rainfall, the severity of fires will only continue to worsen. This reduced rainfall will not only impact those directly at the epicentre of the outbreaks. Reduced rainfall places severe pressure on the agricultural system. If plants cannot grow, where will food come from? Where will food come from to feed livestock, would we sacrifice meat so that we no longer 'waste' water to give livestock to drink, so that humans may salvage what water is available? *Why must technologies be built to purify unpotable water, when nature can give us clean water at absolutely no cost*?

#### We are Burning Away Nature's Pharmacy

As mentioned earlier, deforestation has increased exposure risk to malarial-infected mosquitos. Ironically, with all this destruction, the source for today's anti-malarial drug, is also being destroyed. There lives a tree species in the Amazon called Cinchona, and it is this, that is the source of the quinine, used in malarial treatment drugs, and has saved countless lives. Found in the bark of the tree, it is a medicine where the use of which dates back to the 17<sup>th</sup> century, being used to treat fevers, now known to be caused by malarial parasites<sup>56</sup>. Amazon trees are also known to have properties that heal common colds, conjunctivitis, tuberculosis and who knows, probably even the novel COVID-19 coronavirus! Leaves from a tree endemic to Brazil, have been found to be effective in treating the parasitic infection leishmaniasis, and whilst medication for this infection is widely available, the chemicals are very strong on the organs, and joints, so can be quite debilitating. Thus, the natural chemicals found in native plants can offer a less debilitating, but effective option for treatment<sup>57</sup>. Ayahuasca is a vine, and rituals are very common amongst tourists to experience its psychedelic effects, however it can also be a treatment for depression and anxiety. In the Brazilian Amazon, locals have been documented using various natural plants to treat conditions associated with the central nervous system.

Future medicines could even come from the most uncanniest of creatures. The three-toed sloth is a species that 'cultivates' unique fungi on its body; gross? Well, these fungi have been found to have strong anti-parasitic, anti-bacterial and anti-cancer properties<sup>58</sup>, and could be a novel source for future treatments, where we'll have sloths to thank. Poison dart frogs are some of the most toxic creatures in the animal kingdom, and analysis of their toxins has found a potential pain killer, that is much stronger than morphine; and even a potential addiction inhibitor. Thus, could offer future treatments for those that suffer long-term pain, or those that are trying to end their nicotine addiction<sup>59</sup>. Even venom from venomous snakes have the potential to help treat high blood pressure<sup>60</sup>. Snake venoms have even been found to have anti-viral, anti-bacterial and anti-protozoal properties<sup>61</sup>.

Of course, more research needs to be conducted, but as there is promising science to back the claims, it is superior compared to the half-baked claims of traditional Chinese medicine, and does not require the animals or plants to be killed. But we need the Amazon and its inhabitants alive, and who knows what else there is to discover. Indigenous people are vitally important as they are the ones with the best knowledge of which plants can treat which conditions. Thus, it is important that we protect their home so that we do not lose that knowledge which they have acquired over several millennia.



With great loss of forest, comes even greater loss of forest! This is the viscous cycle of degradation that ensues land clearance. *Source: WWF International*<sup>62</sup>.

This is why human-induced climate change is such a real threat, and a threat that trumps any other issue people may consider important. Put simply, life cannot function without the [free] services that the natural world carries out, and every day, forests effortlessly give the world so much. You might think, well humans could just perform those functions themselves, this is absurd; according to a report by The Economics of Ecosystems and Biodiversity, the services that tropical forests (alone) perform, amount to \$3.4 trillion<sup>63</sup>. Yet ironically, aid given to developing countries in an effort to help them progress in their development, through sustainable technologies, amounts to over \$100 billion, yet the root cause of many of the issues such as access to clean water and food security, could be prevented if forests were conserved. There's nothing quite like drinking pure, clean water that flows through a forest (I have not once become sick from drinking water flowing through creeks or rivers in rainforests – obviously the water must be clear and flowing!).

Whilst conservation and forest management are integral to the existence of the Amazon Rainforest (and all ecosystems for that matter), there are many ways in which we as consumers can help drive away some of these threats, and make a stand to show that those threats will not be tolerated. The global corporate affairs vice president for Bunge (one of the companies destroying Brazilian Cerrado and Bolivian Amazon), states that one company cannot alone solve the issue of deforestation, and states that other companies should adopt zero-deforestation commitments<sup>64</sup>; however, this clearly demonstrates that such companies are not bold enough to set an example and pave the way for zero-deforestation production of commodities. It seems like as much land clearance as possible is being sought after, so by the time that commitments are officially set-in place, so much land has already been converted, to the extent that it is deemed that there is a 'sufficient' amount of land available on which to cultivate. But the wildlands left are so depleted that wildlife will struggle to sustain itself, which could lead to human-wildlife conflict, stronger, more frequent natural disasters and even more disease outbreaks and pandemics. Industries and governments are

great at talking and proposing future plans to mitigate environmental damage, but track records suggest that they are all talk, and no walk.

As the COVID-19 pandemic put almost all countries to economic standstill, many jobs at risk, many redundancies, over a million deaths, and millions facing long-term repercussions, can we really afford to allow another viral pandemic, this time from South America, to plague the world?

The Amazon Region has global importance, with much of life on Earth being inherently dependent on it, albeit in different ways. It just takes one person to take the steps to change. Start avoiding companies that source meat that is linked to deforestation, and source local and from regenerative farms. If purchasing gold, ask for proof of where the gold was mined, responsible and reliable sellers should be able to tell you. Take a quick look at the ingredients of products, have a look out for palm oil, and have a look for the RSPO logo, or if unsure, have a look to see if alternative choices are available. Similarly with chocolate, purchase from brands that source chocolate responsibly. With furniture or paper-based products, look out for FSC certification. Incorporating some of these into your choices will ensure that you are not helping to finance deforestation. But most significantly, spread these messages to people around you, and increase your impact. Together we can encourage companies that are more responsible, with better environmental standards. Together, we can save the Amazon.

"There are some things in the world we can't change - gravity, entropy, the speed of light, and our biological nature that requires clean air, clean water, clean soil, clean energy and biodiversity for our health and wellbeing. Protecting the biosphere should be our highest priority or else we sicken and die. Other things, like capitalism, free enterprise, the economy, currency, the market, are not forces of nature, we invented them. They are not immutable and we can change them. It makes no sense to elevate economics above the biosphere."

David Suzuki

My career in conservation began when I started my Bachelor of Science degree in International Wildlife Biology at the University of South Wales, UK. On my BSc, I got my first experience of forests on a field trip to Honduras, where we spent a week in a cloud forest, and I fell in love with the ecosystem. After I graduated, I went on a conservation field course to Guyana, spending a month in an ecosystem called the Guyana Shield. I then progressed on to my Master of Science degree at the University of Leeds, UK, where I took a year out and volunteered on a conservation project on bluethroated macaws in Bolivia, and then embarked on my first experience with The Macaw Society as a field volunteer assistant. This was my first time in true Amazon Rainforest, and it was a spell-binding experience for me. Here, I spent half a year and worked alongside amazing people, and learnt so much about macaw conservation in the Amazon. As such, I was very fortunate to be able to return as the field leader, to oversee all the field work for what was our 20<sup>th</sup> year of macaw research in Tambopata.





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