Intact forest landscapes

Why it is crucial to protect them from industrial exploitation

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Protecting Forests

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1) Introduction

Forests are among the most important ecosystems on the planet. Covering about one-third of the Earth's land surface, forest ecosystems account for over two-thirds of net primary production on land – ie the conversion of solar energy into biomass through photosynthesis. They store vast amounts of carbon, about half the biomass carbon on land[1] (nearly 300 Gt in their living biomass alone (excluding soil), equivalent to 40 years of fossil fuel emissions[2]); thus, preventing deforestation also helps prevent dangerous climate change. The forests also host over half of our land-based plant and animal species[3] and provide crucial ecological processes such as the cycling of freshwater and nutrients at the global scale. Beyond vital ecosystem services, forests also have an intrinsic or ethical value, which is largely unquantifiable but should not be forgotten.

Despite the vital ecosystem services that forests provide, they are still being exploited and destroyed rapidly to provide timber and more space for agriculture, roads and settlements. Forest management is still largely aiming at industrial timber production despite the myriad of other goods and services forest ecosystems provide.

It is high time for a paradigm shift in forest management from the current focus on industrial logging towards more small-scale community forest management and conservation. Nowhere is this paradigm shift needed more urgently than with the Intact Forest Landscapes (IFLs). These are the remaining large unfragmented areas of forests undisturbed by roads and settlements covering a little over one-fifth of the global forest vegetation zone[4]. These IFLs contain a disproportionally high amount of global forest carbon and biological diversity, and can continue to do so if they remain protected from fragmentation and subsequent exploitation. IFLs are also large enough to help many plant and animal species to adapt to climate change.

Protection of other primary forests (ie forests that are undisturbed but are not in an intact landscape) and secondary forests (ie forests that have been impacted by human activities) is also important, as these generally have high biodiversity and social values. Allowing secondary forests to recover from logging and disturbance, and prevention from further fragmentation, will positively impact on their ecosystem function and carbon sequestration. However, the remaining IFLs urgently require strict protection from being fragmented into segments of primary and secondary forests.

The United Nation's Convention on Biological Diversity (CBD) has realised the importance of large intact forests and other intact ecosystems (see, for example, CBD AHTEG reports on Biodiversity and Climate Change[5]), as has the German government, which concluded that 'Large, unfragmented forests...have a significant impact on climate and water cycles'[6]. The importance of preserving natural forests – of which, IFLs are the backbone – also emerges in the UN Framework Convention on Climate Change (UNFCCC) discussions on Reducing Deforestation and Degradation (REDD) in developing countries.

This report describes the importance of IFLs for climate, biodiversity and people. It is acknowledged that not all of these values can exclusively be attributed to IFLs, as some of them can also be found, often to a lesser extent, in more fragmented forest. The report also highlights the threats of IFL fragmentation by large-scale activities, using industrial selective logging and road building as prime examples. Finally, it describes how IFLs can be protected from further fragmentation through precautionary exclusion of industrial-scale activities.

2) Intact Forest Landscapes (IFLs)

Intact Forest Landscapes (IFLs)[7] are defined as those with an unfragmented area of at least 500 km^2 and which are minimally influenced by human economic activity. They are large extents of primary forest, or large landscape-level unfragmented forest ecosystems, but they may also contain non-forest ecosystem components, eg lakes, swamps or mountains.

The vast majority of IFLs are found in two biomes: humid tropical and boreal forests. Most of the world's IFL area is concentrated in a small number of countries - 13 countries contain 90% of the total IFL area, and just three of them - Canada, Russia and Brazil - contain 63.8% of the world's entire IFL area. In the tropics, the largest IFL areas can be found in the Amazon Basin of South America, the Congo Basin of Central Africa and on the large islands of the Asia Pacific region (see Fig 1). A website dedicated to the mapping and reporting of Intact Forest Landscapes – www.intactforests.org - has been developed by a collaboration of environmental non-governmental organisations (including Greenpeace) and institutes.

Intact Forest Landscapes become fragmented when, for example, the building of a road for selective logging divides the forest area. With increasing activity, the forest gets cut into increasingly smaller segments or fragments. These fragments become affected by - and eventually dominated by - edge effects (see Box 1).

Much of the knowledge on forest fragmentation comes from studies on the Amazon forest, as this is the most studied. Many of the effects of fragmentation, eg further deforestation and edge effects, are considered applicable to fragmentation of tropical forests generally, although the pressures may vary from region to region (eg tropical regions other than the Amazon are not predicted to experience severe drought related to climate change).

Figure 1: Global map of Intact Forest Landscapes

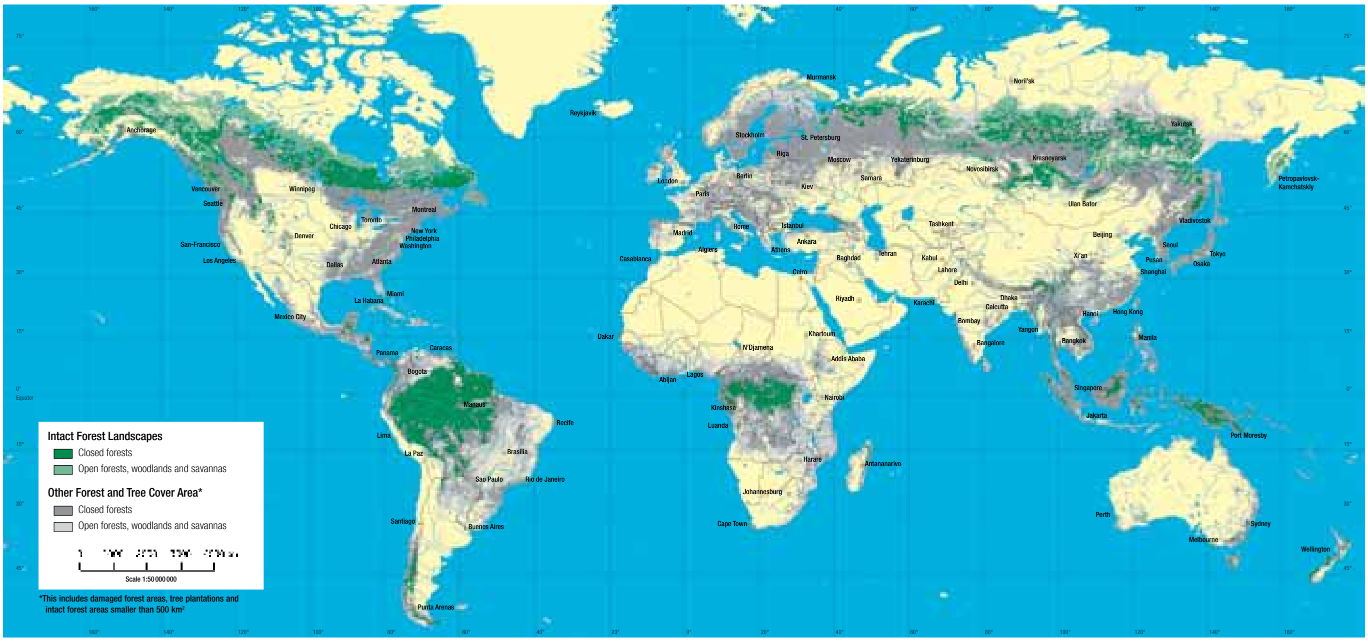
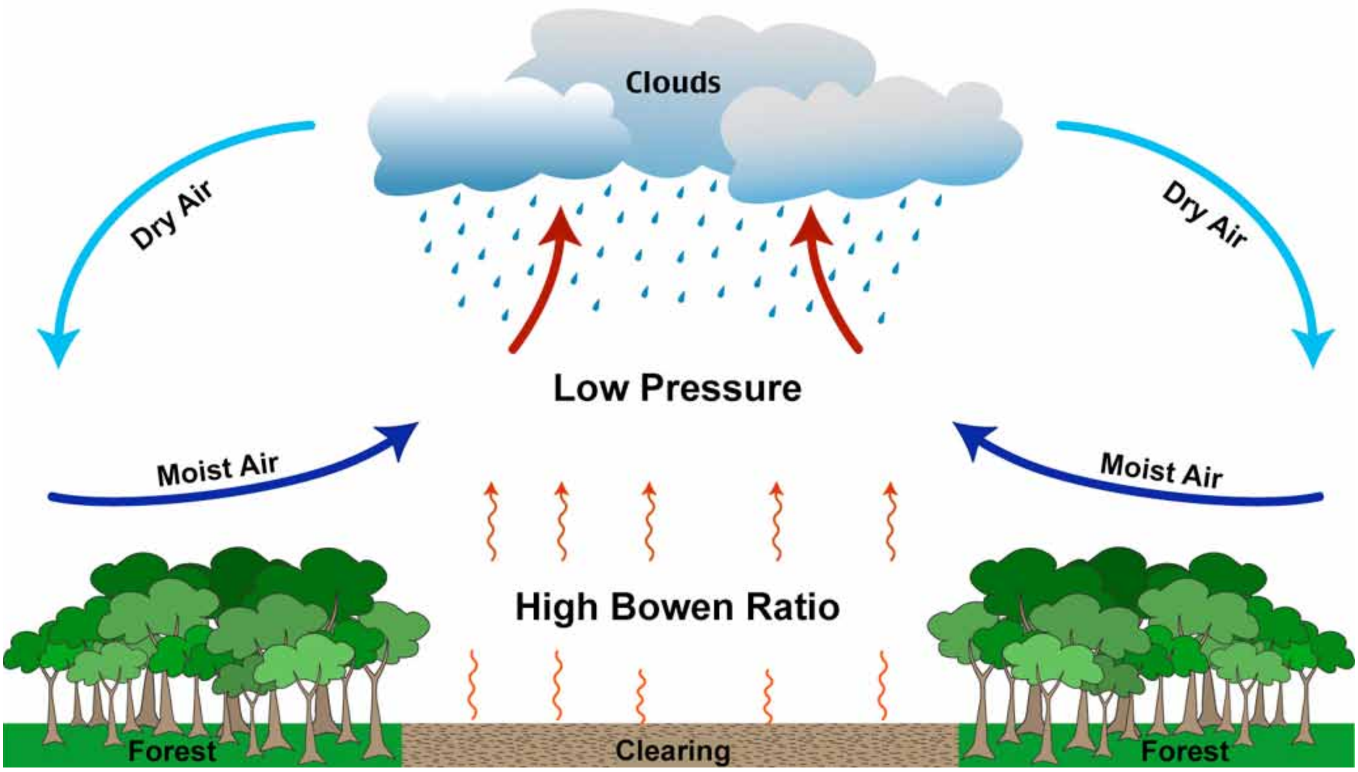


Figure 2: In a fragmented forest landscape, clearings can create localised atmospheric conditions that rob nearby forests of moisture (reprinted from Laurance et al. 2011, with permission).



Box 1: Edge effects: consequence of fragmentation

An important consequence of forest fragmentation is the increase in forest edges. Along these edges are strong microclimatic gradients, or edge effects. These are very diverse but include light, temperature, soil moisture content and wind turbulence, which impact the ecology of the fragmented forests. Even narrow clearings can be harmful[8]. Importantly, forest edges are drier than forest interiors due to a variety of factors, including local atmospheric conditions that draw moisture away from forests[9] (see Fig 2). In the Brazilian Amazon, edge effects penetrate a median distance of 100 to 200 m[10], and it has been suggested that a 500 to 1 000 m (0.5 to 1.0 km) buffer zone is needed to accommodate all edge effects[11]. However, recent research reports that desiccation extends much further than previously thought into forests, up to 2.7 km in heavily fragmented forests[12].

One important aspect of edges is that they increase dramatically with fragmentation. As fragmentation increases, the percentage of the remaining total area of ancient forest affected by fragmentation also increases, because of the geometry of edges (see Fig 3). These effects are cumulative; the severity of edge effects increases with proximity to two or more edges[13]. In the early 2000s, it is estimated that deforestation and logging generated 32 000 to 38 000 km of new forest edge a year[14] in the Amazon alone, so edges can be significant, even in large areas of forest.

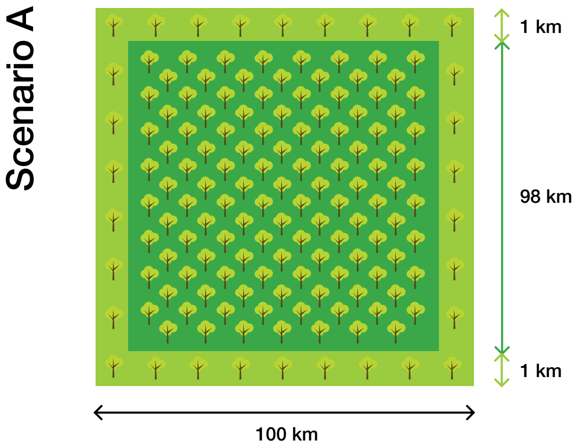
Edge effects influence the trees that comprise the ancient forest. It has been estimated that fragments of forests up to 10 km^2 will be composed almost entirely of edge-affected habitat[15]. Not only do more trees die near ancient forest edges, but a higher proportion of these trees are large[16]. Large, mature trees are important for animal shelter and reproduction.

Microclimates along edges are hostile to regeneration. Seed germination in rainforest fragments has been shown to be impaired, with seeds in ancient forest fragments suffering from edge effects including hotter, drier conditions and increased light penetration[17]. Edge microclimates also affect forest structure, leaf fall and turnover in the plant community[18]. There are abrupt shifts in the composition of trees and other plants within 100 m of the fragment margin[19]. Large-seeded, slow growing, and old growth species tend to decline, or even become extinct locally, while those that are adapted to disturbed forests and do not depend on animals to disperse their seeds increase. There is also an increase in tree structural parasites such as vines, which block out light, further preventing forest regeneration[20]. However, such vines may also protect from microclimatic changes by 'sealing' the edges[21]. Together, these diverse changes are likely to a high impact on the ecological dynamics of the fragmented forest.

"Edge phenomena are remarkably diverse. They include increased desiccation stress, windshear, and wind turbulence that sharply elevate rates of tree mortality and damage. These in turn cause wide-ranging alterations in the community composition of trees and lianas. Such stresses may also reduce germination and establishment of shade-tolerant plant species in fragments, leading to dramatic changes in the composition and abundance of tree seedlings."

- (Laurance et al. 2011)[22]

Figure 3: Forest fragmentation increases the proportion of forest affected by edges



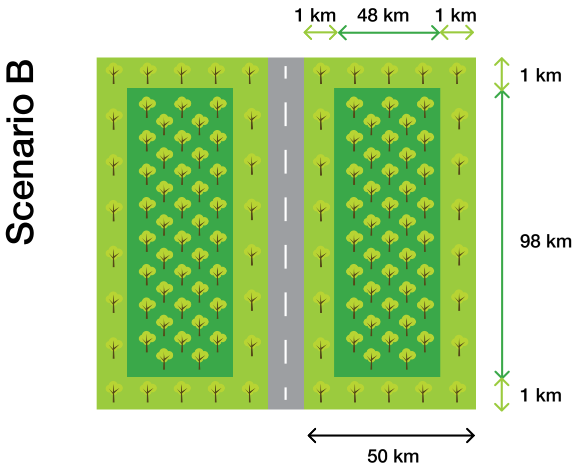
Consider a hypothetical block of forest 100 km x 100 km with edge effects extending for 1 km (shown as the lighter green). This is shown in Scenario A. In Scenario B a feature - eg a road - is built through the forest block, separating it into two. In Scenario C a second feature crosses the forest block, further dissecting the block. The total area of the forest is considered constant.

Scenario A: Forest in a single block

Total area = 100 km x 100 km = 10 000 km^2

Area affected by edge zone = (2 x 100 km x 1 km) + (2 x 98 km x 1 km) = 396 km^2

% of forest area affected by edge zones = 396/10 000 x 100% = **4.0%**

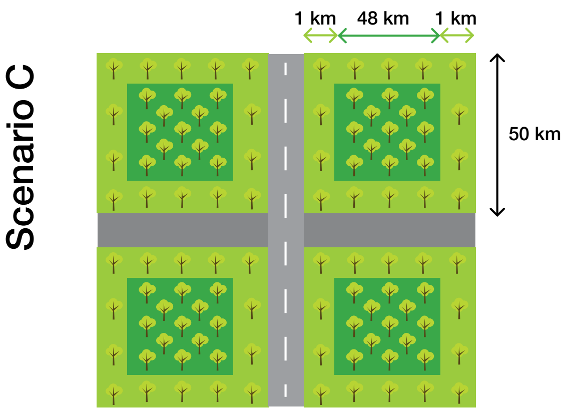


Scenario B: The forest is cut in half by, for example, a road

Total area = 2 x (100 km x 50 km) = 10 000 km^2

Total area affected by edge zone = 2 x [(2 x 100 km x 1 km) + (2 x 48 km x 1 km)] = 592 km^2

% of forest area affected by edge zones = 592/10 000 x 100% = **5.9%**



Scenario C: The forest is now cut into four blocks

Total area = 4 x (50 km x 50 km) = 10,000 km^2

Total area affected by edge zone = 4 x [(2 x 50 km x 1 km) + (2 x 48 km x 1 km)] = 784 km^2

% of forest affected by edge zones = 784/10,000 X 100% = **7.8%**

3) The importance of intact forest landscapes

IFLs are essential both to biodiversity and to people in a variety of ways. IFLs affect many natural processes at many levels, from local through regional to global.

3.1 Carbon and climate change

IFLs play an important role in regulating the Earth's atmosphere and climate. They interact with the climate in many ways, including:

- aiding mitigation of climate change by taking up carbon from the atmosphere and storing vast carbon stocks more securely than other forests or plantations;
- allowing migration of plant and animal species, enabling adaptation of biodiversity to climate change; and
- enabling human adaptation to climate change by lessening the impacts of extreme weather and maintaining ecosystems services.

a) IFLs are vital for carbon storage and uptake

There has been considerable scientific debate regarding the question of whether intact forests sequester carbon dioxide from the atmosphere or are simply vast carbon stores. Recent reviews[23] and studies[24] conclude that at least some intact forests (boreal, temperate and tropical) do indeed take up carbon.

"In largely intact forest landscapes where there is currently little deforestation and degradation occurring, the conservation of existing forests, especially primary forests, is critical both for preventing future greenhouse gas emissions through loss of carbon stocks and ensuring continued sequestration, and for conserving biodiversity."

- (CBD 2009)[25]

"Because old-growth forests steadily accumulate carbon for centuries, they contain vast quantities of it. They will lose much of this carbon to the atmosphere if they are disturbed, so carbon-accounting rules for forests should give credit for leaving old-growth forest intact."

- (Luyssaert et al 2008)[26]

Fragmented forests can suffer from die back along their edges, leading to losses of forest carbon (both from soil and woody biomass), and losses of uptake of carbon. It has been estimated that these edge effects related to fragmentation may cause up to 150 Mt C yr^{-1} to be lost to the atmosphere, above and beyond that from tropical deforestation[27].

"Habitat fragmentation affects far more than biodiversity and interactions among species; many ecosystem functions, including hydrology and biochemical cycling, are also being altered. Among the most important of these are fundamental changes in forest biomass and carbon storage"

- (Laurance et al. 2011)[28]

b) IFLs are more resilient to climate change impacts than fragmented forests

Climate change is predicted to increase drought in tropical forests. IFLs are less vulnerable to drying, wind and fire than fragmented forest because they are less affected by edge effects. This effect is expected to be especially pronounced for the Amazon, where die-back could cause the forest to reach a tipping point whereby it is no longer a forest, but becomes savannah.

"Evidence suggests that intact forests, particularly primary forests, will be more resistant to climate change than second-growth forests and degraded forests."

- (CBD 2009)[29]

It is predicted that this could occur in as little as 50 years[30]. If the dry season increases in length and precipitation falls to a critical value of 1,100 mm yr^{-1}, we could see the terminal degradation of the Amazon, which would lead to a huge loss of biodiversity[31]. Indeed, some studies predict this may be happening already[32]. While not all forest regions are predicted to experience drought in the same way as the Amazon, variability in weather patterns caused by climate change will add additional stresses to forests. The key to increasing the strength of forests to withstand drought and other climate impacts is to maintain and protect intact areas of forest[33].

"There is good evidence that tropical forest intactness will aid resilience of its carbon stocks to climate change"

- (UNREDD 2010)[34]

Fragmentation reduces the resilience of intact forests to climate change.

"Deliberate limitation of deforestation and fire may be an effective intervention to maintain Amazonian forest resilience in the face of imposed 21st-century climate change. Such intervention may be enough to navigate E. Amazonia away from a possible 'tipping point', beyond which extensive rainforest would become unsustainable."

- (Malhi et al. 2009)[35]

c) Fragmentation leaves forests vulnerable to climate change impacts

Fragmentation of forests reduces the amount of carbon a forest holds because of losses of biomass in clearings and affected edges of the fragments.[36] However, fragmentation also increases the vulnerability of the remaining forest to climate change.

Climate change is predicted to cause higher variability in tropical rainfall, resulting in periods of drought[37], in particular the Amazon region[38]. Fragmentation magnifies climate change impacts in tropical forests by fragmenting the remaining forest, making it drier along its edges and more vulnerable to drought-induced fire; due to this, a positive feedback between forest fire and drought results. Drought and fire then further fragment the forest, increasing its vulnerability, in a vicious cycle that weakens the forest's ability to withstand the impacts of climate change.[39]

The more vulnerable a forest is to climate change, the more vulnerable the carbon stocks are to being lost to the atmosphere, increasing greenhouse gas concentrations in the atmosphere. In addition, degradation of forest ecosystems will result in a decreased ability to take up human carbon emissions from the atmosphere. This is important, as it is estimated that land-based ecosystems have already taken up approximately 30% of human carbon emissions, proving a vital buffer for atmospheric carbon concentrations[40]. The loss of this service, together with the loss of carbon stocks, increases the risk of runaway climate change and even more disastrous losses of ecosystem services. Therefore, it is important to maximise the resistance of forests to climate change by preserving intact primary forest landscapes[41], rather than subjecting them to logging regimes, however 'sustainable'.

"Habitat fragmentation affects far more than biodiversity and interactions among species; many ecosystem functions, including hydrology and biochemical cycling, are also being altered. Among the most important of these are fundamental changes in forest biomass and carbon storage"

- (Laurance et al. 2011)[42]

3.2 IFL biodiversity underpins ecosystem services

The large extent of an IFL enables large mammals, such as primates, to exist in viable numbers. For example, the gorilla depends on intact forest in Central Africa for its survival[43]. Because of their long-standing and relatively lower levels of disturbance, IFLs are typically richer in biodiversity (including within species and genetic diversity) than other types of forest, with a high degree of specialised and co-evolved flora and fauna. A patchwork of forested areas differs markedly from continuous forest in composition and ecology[44].

Fragmentation of IFLs particularly affects large mammals and can induce far-reaching changes in the ecology of the forest. Species with a wide home range are vulnerable to fragmentation[45], not because they become genetically isolated, but because fragmentation also restricts their ability to roam in search of food. Large mammals require blocks of habitat that are thousands, if not tens of thousands, of square kilometres in size[46]. Many large mammals that depend on forests are endangered, including some of the great apes (gorillas and orangutans), species of tigers, elephants and bears. Fragmentation of forests in the DRC and wider Congo Basin through logging, mining and burning have been identified as a key threat to the region's gorillas, which according to a UN report may disappear from most of their present range in less than 10 to 15 years from now[47]. Ultimately, fragmentation results in losses of large mammal species locally, regionally or even globally.

Large mammal species have important influences on forest ecosystems. Their disappearance, from forest ecosystems - especially the disappearance of predators - can lead to elevated abundances (hyperabundance) of smaller species in fragments, thereby upsetting the ecological balance of the ancient forest. This effect is not only restricted to the disappearance of predators. The survival of certain tree species is considered at risk in the Brazilian Atlantic forest either from local extinctions of fruit-eating vertebrates (mostly birds and mammals), which are key to seed dispersal, or from their restricted range caused by fragmentation[48]. Smaller animals and plants are also affected. Numerous studies have shown that birds, butterflies, ants, beetles and termites respond negatively to fragmentation and edge effects[49]. The losses of these species can be important because of the high degree of endemism (species that occur only in one region) and co-dependency of species in IFLs. This means that ecological impacts may occur if specialised pollinators or seed dispersers are lost upon fragmentation because this will prevent effective reproduction of the plant or tree[50]. For example, habitat fragmentation was found to seriously impact the reproductive cycle of an endemic tree species in the Eastern Arc Mountains of Tanzania. In this example, due to the fragmentation of the forest, the fruit-eating bird that the tree depended on for seed dispersal was either rare or absent[51].

"The decline or hyperabundance of numerous animal species in fragmented landscapes can distort key ecological processes such as pollination, seed dispersal, herbivory and nutrient cycling, with additional impacts on rainforest tree communities. In the long term, such wide-ranging disruptions could pose an important threat to tropical biodiversity, given the myriad ecological linkages among rainforest trees and their many dependent animal, plant, and fungal species."

- (Laurance et al. 2006)[52]

Therefore, fragmentation has serious consequences for wildlife and the ecology of previously intact forests. Ultimately, loss or restriction of a required habitat for a species can eventually lead to its extinction. If this species happens to be a 'keystone species' (ie it performs a key linkage in the food web or acts as a seed dispersal agent), then its extinction may cause a cascade of linked extinctions, substantially altering the ecosystem and potentially causing its collapse[53].

Often considered 'nice to have', biodiversity is actually essential for mankind's continued existence on this planet. Biodiversity forms ecosystems and ecosystems provide services (such as clean air and water supply), both locally and globally. Without biodiversity, or with severely degraded biodiversity, many of the forest ecosystems and their services that we rely upon would probably collapse[54]. Without these ecosystem services, the planet would be uninhabitable for humans and many other species. This is described in sub-section 3.3.

In the context of climate change, IFLs are important as they allow species migration by providing contiguous forest cover, and thus aid adaptation to climate change. However, the resilience of IFLs to climate change means that they will also be more likely to retain these vital ecosystem goods and services in the face of climate change than fragmented forest. As the following sub-section shows, this is highly important for us all.

3.3 People need IFL ecosystem services

IFLs are of value to people in many ways, both directly and indirectly. Aside from intrinsic value, the economic value of an IFL to people is mostly derived from ecosystem services. While IFLs only make up a quarter (23.5%) of global forests[55], their intactness would suggest they would have the highest level of ecosystem services provision, including vital services that underpin agriculture.

A comprehensive international assessment of the economics of ecosystems and biodiversity (TEEB) gave an estimated average value of ecosystem services from tropical forests at $6,120 (US dollars) ha^{-1} yr^{-1}, of which only 7% is raw material extraction such as timber[56]. No estimates are available for the proportion of the economic value of forests that is attributable to IFLs. However, on a simple area basis, this would imply that the economic value of ecosystem services from the tropical IFLs alone (approximately 5.9 million km^2 [57]) would be in the region of well over $3,000bn a year.

a) IFLs provide ecosystem services that many millions of people directly depend on, including indigenous peoples and local communities

The value of forests in terms of timber or other extractive products is well known. The fact that indigenous peoples and traditional forest dwellers depend on forests for their livelihoods and their culture is also well known. What is not well known is how much people depend, in particular, on IFLs directly. The best way to estimate this is in terms of the use of ecosystem services, as these are at risk from fragmentation. The Millennium Ecosystem Assessment[58] estimated that 300 million people, most of them very poor, depend substantially on forest ecosystems for their subsistence and survival, with the 60 million indigenous peoples who live in forest areas being especially dependent on forest resources and the health of forest ecosystems. They concluded that, while forest resources alone were generally insufficient to promote poverty alleviation, degradation (which would include fragmentation) has significant negative consequences on human well being.

b) Global weather patterns – ecosystem service from IFLs

The regulation of weather patterns is an important ecosystem service of IFLs, especially for people. It is well known that IFLs can affect rainfall locally and regionally[59]. For example, the intactness of the Amazon forest is vital for regional rainfall[60]. There is also growing evidence that this can happen at larger scales and even globally:

- Modelling suggests that forests in Amazonia and Central Africa regulate rainfall in the US midwest, at times when water is crucial for agricultural productivity in these regions[61].
- Forests are also important for transferring moisture from the ocean to the continents. They create a pump that causes ocean-fed rain to fall many hundreds, and even thousands, of kilometres inland[62].
- Deforestation can, according to models, dramatically reduce rainfall in inland areas, and that historical deforestation in Australia has contributed to the Australian drought[63].

Fragmentation can lead to forest losses that could affect local, regional and even global weather patterns. Rainfall is essential for agriculture, and it is likely that a large portion of the world's people are indirectly reliant on the IFLs for their food crops. Forests are providing vital ecosystem services we are often simply unaware of.

"Deforestation [in the Amazon] may directly affect local climate by reducing local recycling of soil water through deep roots into forest transpiration and consequently into precipitation, although this seems to depend on the scale and location of deforestation…
In addition, lost forest transpiration results in decreased surface cooling and thereby an increase regional air temperatures, evaporative demand, and water stress in remaining forests. Land use change and fire also affect the rainfall regime by greatly increasing the aerosol content of the atmosphere through smoke and dust. High aerosol content favours less frequent but more intensive convective rain and possible suppression of rain in the dry season. A retreat of Amazonian forest (whether caused by deforestation or severe drying) would therefore further exacerbate regional climate change by altering local water recycling and other biophysical properties."

- (Mahli et al. 2009)[64]

c) IFLs are important for human adaptation to climate change

Forests can contribute to adaptation to climate change in many ways:

- A structural defence providing protection against wind and soil erosion.
- Regulation of local water supply and quality - especially with increasing erratic rainfall. This is of particular importance as, by 2030, 47% of the world's population could be living in areas of high water stress[65].
- Provision of timber and non-timber forest products that support forest dwelling populations - often the poorest members of society with the lowest adaptive capacity[66].
- Protection against extreme events. Increased rainfall can lead to landslides in areas of land degradation, eg in Pakistan, 56% of landslides are due to land degradation from deforestation and over-grazing[67].

Fragmentation of IFLs will reduce the resilience of forests to climate change impacts (eg increased periods of drought). Hence, fragmentation increases the vulnerability of the capacity of forests to provide these ecosystem services that aid human adaptation to climate change.

4) Selective logging and fragmentation

The fragmentation of ancient forests is possibly the most important factor initiating the chain of forest degradation that leads to deforestation and the eventual loss of the forest ecosystem.

There are several agents of fragmentation and most involve the building of roads or otherwise generating access to previously inaccessible and intact areas of forest. Examples include selective logging, logging practices, highways and mining. **Selective logging** is one of the most important factors, and is therefore the focus of this report.

Selective logging in the Amazon

The importance of selective logging as an agent of fragmentation is clearly illustrated in the Amazon by the case of mahogany, a valuable timber species. It is well documented that the selective logging of forests for mahogany was a prime cause in the initiation of the fragmentation process until trade was strictly controlled by a CITES listing in 2003[68].

Mahogany logging was the first step in a colonisation process that involved slash-and-burn agriculture. Colonists advanced along the logging roads built by mahogany companies, deforesting areas opened up by the loggers and converting them to crops and ranching[69]. Agricultural settlement along roads ultimately leads to fragmentation, and ultimately the disappearance of the remaining forest.

"Mahogany loggers play a key role in building roads that give squatters and loggers taking less-valuable species access to new areas. The process that this initial step sets in motion eventually leads to destruction of the entire ecosystem."

- (Fearnside 1997)[70]

A survey of logged forests in the Brazilian Amazon showed high levels of canopy damage in at least 76% of the harvesting, leaving the forest susceptible to drought and fire and with a probability of deforestation up to four times greater than for unlogged forests[71].

Satellite images of the Amazon and other places typically reveal roads, possibly for logging, built into IFLs. Along these roads are a mosaic of agricultural fields – in the familiar 'herringbone pattern' frequently seen on satellite images[72]. These agricultural fields are beginning to enclose smaller blocks of forests, producing a fragmented forest. While selective logging for mahogany is no longer an agent of fragmentation in the Amazon, many other threats remain and fragmentation continues.

Selective logging in Central Africa

Selective logging is also becoming an important agent of fragmentation in Central Africa. Patterns of deforestation, similar to those in the Amazon, are now following selective logging in IFLs of the Congo[73].

To facilitate industrial logging, wide roads are built to accommodate the large logging trucks. In addition, many trees are inadvertently damaged, even during selective logging, leading to edge effects[74]. It has been estimated that about 35% of tropical forest carbon emissions can be attributed to legal selective logging, 0.51 Gt C a year[75]. This makes selective logging a hidden killer of the forest as it goes largely unnoticed by most monitoring programmes, which are focussing on deforestation.

"Traditionally, selective logging alone has not been considered as a source of forest fragments, as it does not generally result in a dramatic loss of vegetation cover. However, depending on harvest intensity, losses of 10–60% of canopy cover from logging operations are typical and logging activities cause marked disruption and small-scale fragmentation of the forest understory, mainly by roads, skidder tracks, and patios. In addition, the results of our fine-scale analyses of fragmentation indicated that canopy damage in logged areas is intense and spatially distributed throughout the logged area. This combination indicates that logged areas could, for the reasons previously highlighted, result in extensive forest fragmentation and edge-effects."

- (Broadbent et al. 2008)[76]

5) Conserving and protecting intact forest landscapes

5.1 How much of our IFLs should be protected to maintain biodiversity?

"To keep every cog and wheel is the first precaution of intelligent tinkering."

- (Aldo Leopold, 1953)[77]

Visionary conservationist Aldo Leopold captured the principle of conserving representative samples of flora and fauna, and the ecosystems they make up. Reviews by conservation scientists estimate that between 25% and 75% of natural ecosystems would need be under some form of protection to maintain biodiversity, noting that this would vary with biomes and degrees of endemism and heterogeneity, and not all would need to be in strict reserves but at a minimum managed with the objective of protecting ecological integrity and species diversity[78].

At its 10th Conference of the Parties (CBD-COP10) in Nagoya in 2010, the UN CBD adopted a plan to increase the formally protected land areas from the current 12.9% to 17% in 2020[79]. This is a short-term minimum target and discussions at CBD-COP10 showed that, after 2020, this figure would need to continue rising significantly. For instance, Conservation International presented a detailed analysis showing that "an additional minimum 4.4% of Earth's land...would be a minimum requirement to halt the loss of biodiversity" and "11% of additional unprotected land with high storage of biomass carbon is needed to protect 90% of global biomass carbon in natural habitats"[80].

Adding these additional amounts to the existing 12.9% of protected land would result in the mid-term need to more than double existing protected lands to over 28%, and a large part of this expansion would need to be bio-diverse and/or carbon rich forests. This translates into a mid-term need to expand forest protected areas to well over 30% of global forest cover, inevitably including most - if not all - IFLs. In addition, the protection of IFLs should be a priority because of their value to biodiversity and humans (see Section 3).

However, there is still a long way to go to achieve the target percentage. For the mid-term conservation of IFLs, the expansion of their industrial exploitation would need to stop immediately in order to allow for adequate conservation and land-use planning with the full participation and free and prior informed consent of forest dwelling communities. Otherwise the world will loose significant IFL areas in the coming two to three decades before their values can be assessed and, if necessary, their designation as protected areas can be completed, thereby undermining the mid-term global conservation targets.

5.2 Participatory land-use and conservation planning

Essential to the long-term protection and conservation of IFLs is a land-use and conservation planning process that is inclusive of key stakeholders, in particular those who are affected the most by land use decisions and are often marginalised, such as indigenous peoples. To be successful in terms of maintenance of biodiversity and carbon, beneficial and equitable to all parties, and enduring, there are several key principles and process requirements.

a) Key principles

- Indigenous peoples and forest-dependent communities' rights are respected
- Participatory approaches are used to ensure indigenous peoples and forest-dependent communities need to participate throughout the process, being involved in analysis, decision-making and the implementation, monitoring and evaluation of plans for the use of their traditional lands and resources.
- Should not be constrained by existing land use, previous unplanned land allocation or top-down spatial planning.
- Planning should be carried out at all levels from eco-regional or macro level through to community level, and top down macro spatial planning or zoning does not have precedence over local or community level land use planning.
- 'Zero deforestation' is a goal along with the restoration of secondary forest areas, and any conversion should be focused on deforested areas or other degraded areas with low conservation and carbon values.
- Infrastructure and transport planning is guided by comprehensive social, economic and environmental assessments that consider indirect impacts such as from forest fragmentation, energy self-sufficiency and least emissions transport options.
- Decisions about forest use - zoning - do not override forest ownership or control. Zoning may impose certain restrictions on land use decisions or forest management but it should not be interpreted as changing local ownership or decision-making regimes unless that has been explicitly discussed and free, prior and informed consent has been granted by the communities or indigenous people concerned.

b) Key process requirements

- Identification of indigenous peoples and forest-dependent communities, and establish key rights and use holders, and other stakeholders who hold an interest in the process. Care must be taken to ensure correct and comprehensive identification using many different information sources to cross reference. Determine the most appropriate process and tools to facilitate their participation. Ensure equality in awareness of process, levels of information and participation, particularly of the commonly marginalised groups.
- Data and Information; gather all necessary data for the process. Determine what minimum data levels are required to proceed. For community: community needs assessments, participatory appraisals, community mapping and genealogy mapping, and use of participatory GIS processes. Other broader biophysical information, feasibility studies, and social and environmental impact assessments.
- Identify the different levels of spatial planning: national, regional, local and village/community. Determine the tools and methodology for each level. Determine the mechanism for the integration of the different levels to achieve the optimal outcome for all levels that includes the resolution of any conflict between the outputs of different planning levels, with an emphasis on ensuring customary rights are not overridden, and consideration of compensatory options. The planning process should combine macro or 'coarse' level zoning based on eco-regional, ecosystem or landscape-level bio-geographical data that uses conservation science principles to determine configuration of protected and conservation zones, with micro or finer local level assessments and participatory planning approaches with local communities.
- Land-use options, alternatives and 'solutions' are to be sought and considered with information from feasibility studies, community needs assessments, and environmental and social impact assessments. Appropriate social, environmental and economic criteria/screens/layers used to delineate areas and zones.
- Ensure participation and transparency especially for decisions and to achieve shared ownership of outputs.
- Need a clear understanding of timelines, clear communication, and security of data, information and intellectual property.
- Outputs: need integration of different planning levels including maps, reports and descriptive narrative. A delineation and boundary demarcation process on the ground with community must be carried out. A verification and confirmation process extends the participatory and collaborative ownership of outputs with clear land-use responsibilities and rights, with the participatory approach continuing into implementation and monitoring.

Figure 4: Before participatory land use and conservation planning

- Protected Area
- Intact Forest Landscapes (IFL)
- Logging Concession
- Logging Concession/IFL
- Secondary Forest

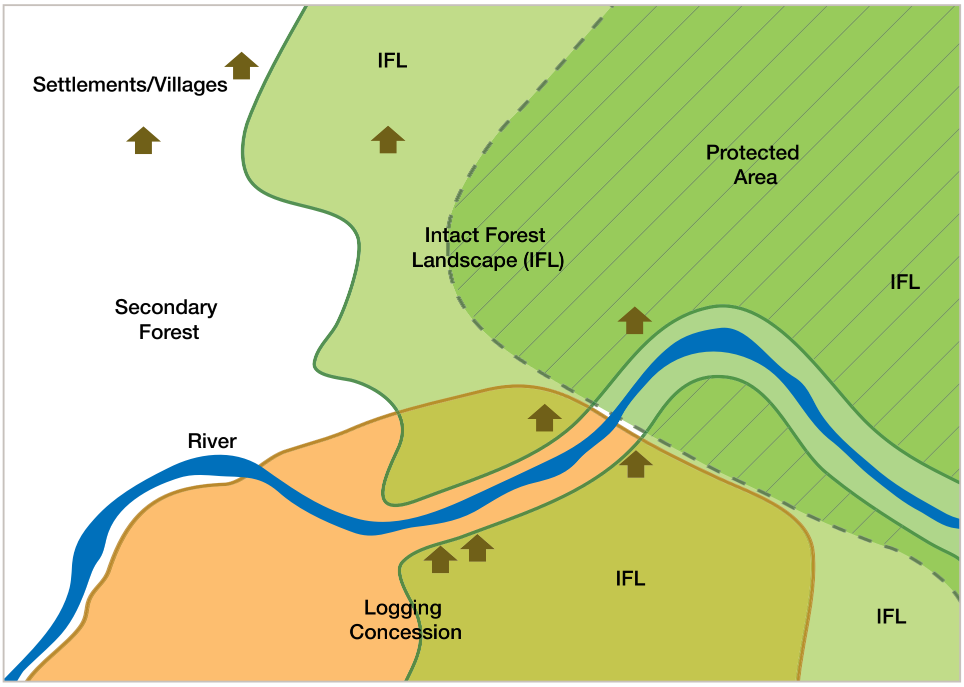
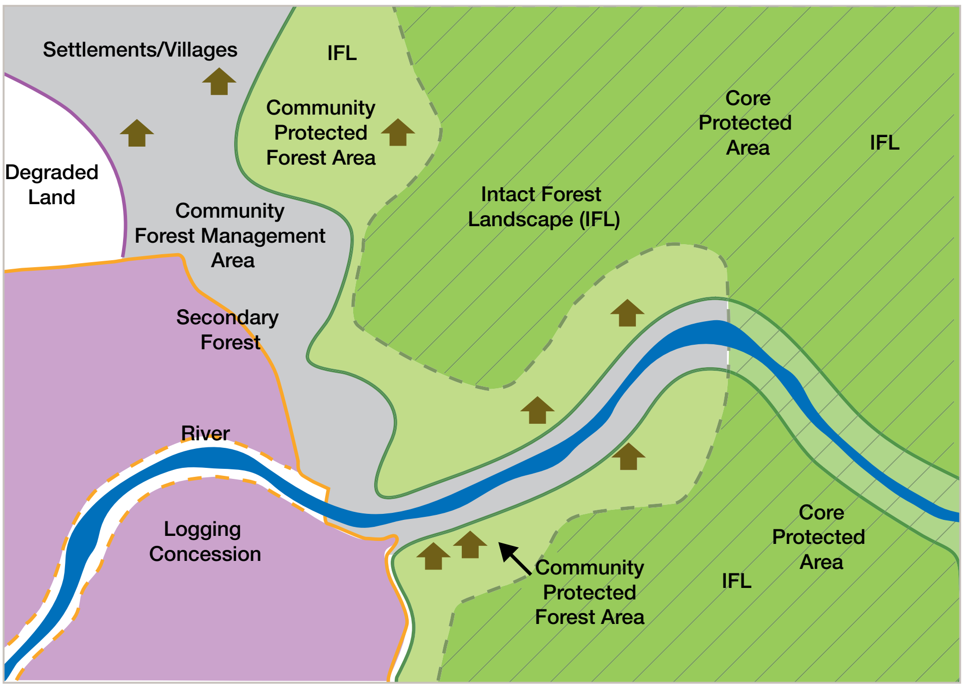


Figure 5: After participatory land use and conservation planning

- Core Protected area
- Intact Forest Landscapes (IFL)
- Logging Concession
- Community Forest Development Area
- Degraded Land



5.3 Land use options to protect and conserve IFLs

a) Protected and conservation areas

Following the participatory land-use and conservation planning and mapping, zones for different categories of protected and conservation areas will be identified including IFL areas (see Fig. 4 and Fig. 5) These will include core strict protected areas that have a primary focus on maintaining biological values in the landscape. The rights of indigenous peoples will be respected in the process of establishing these areas through free prior and informed consent, although human activities in these areas will need to be very low impact and compatible with maintaining biodiversity, and will accommodate subsistence-based forest-dependent peoples. Beyond the core would be buffer zones and other categories of protected and conservation areas that have maintenance of key biological and ecological attributes as a goal including intactness, but allow for local community use and extraction of forest products such as hunting and fishing, ecotourism and non-timber forest products. The focus for these areas will be on IUCN category 4 and 6 protected areas and may involve co-management between the local community and government.

b) Community low-impact small-scale use

Outside the protected and conservation zones will be zones for community use and management (see Fig. 5). These may include, for example, the 'protected forests' category in the Democratic Republic of Congo. The community land-use planning process would identify key areas for food collection, hunting and production/harvesting, village areas and sacred sites, etc. that would be delineated. Many of the low-impact and small-scale community uses do not fragment and degrade the forests and are therefore compatible with protection of IFLs. These include non-timber forest product extraction, eco-tourism, and possibly low-impact single-tree portable sawmilling and extraction of timber. Within the forest landscape matrix it will be possible for a range of community management and use options that are compatible with maintaining intact areas, whereas higher impact activities will be focused on secondary or already logged forests.

There is evidence that larger forest size and greater rule-making autonomy at the local level (community control) are associated with both high carbon storage and livelihood benefits, compared with state control of forest 'commons' that produces lower carbon storage[81]. The combination of forest size and high carbon storage indicate likely high levels of intactness and lower fragmentation through community management and use rather than industrial.

c) Ecosystem services

Payments for ecosystem services (PES) and their maintenance or restoration will play a much bigger role in the future. This includes financial incentives provided for REDD under a future UNFCCC climate agreement for the maintenance or restoration of forest carbon storage together with biodiversity, water and other crucial ecosystem services including those coming from protected areas. Protected area categories include both strict protected areas as well as protected areas with small-scale and low-impact use for community benefits.

The key characteristic of PES is that the focus is on maintaining a flow of a specified ecosystem 'service' in exchange for something of economic value[82]. PES schemes may be public or private and markets either voluntary or regulated. Examples include the purchasing and protection of water catchments to ensure water quality and quantity, or private investment in protected areas for the conservation of biodiversity.

5.4 Process, actors and responsibilities

There is a long way to go to achieve an adequate conservation status for all remaining IFLs globally. It will only lead to ultimate success if many different actors from the local to the global level work responsibly together towards this common goal and refrain from undermining it along the way.

Some important actors on the national and international level include:

a) National governments of IFL and donor countries

It is ultimately the sovereign decision of nations and their national governments to determine their land use including the conservation status of their IFLs. Sixty-eight nations lying within the global forest vegetation zone still have IFLs and many of them have very limited means and cannot protect their IFLs alone. Donor country governments need to act and support IFL countries bilaterally and through multilateral processes (see below) and need to stop contributing to destructive activities in IFLs.

b)Intergovernmental processes and conventions such as CBD and UNFCCC

The most important intergovernmental processes to achieve adequate conservation of IFLs are the CBD and UNFCCC. The CBD has agreed to a protected area target on land of 17% by 2020, which needs to be significantly expanded in the longer term. UNFCCC is negotiating a new climate agreement including reducing forest emissions (REDD), which must cover IFLs in order to be comprehensive and to tackle the reduction and prevention of emissions from forest degradation as well.

c) FSC, RSPO and other voluntary actors in the international marketplace

The voluntary certification of forest management such as by the Forest Stewardship Council (FSC) and the voluntary regulation of commodity crops driving deforestation such as palm oil (RSPO) are important actors in this context as well. While they cannot formally designate protected areas in IFLs they can set aside areas for protection and conservation, and it is important that they do not undermine their future protection in this long process by contributing to their fragmentation through industrial logging or conversion projects.

6) Preventing the loss of intact forest landscapes

IFLs are vital for stabilising the Earth's climate, maintaining biodiversity and associated ecosystem services upon which we depend. IFLs store vast amounts of carbon and also uptake of carbon from the atmosphere. IFLs are vital for biodiversity, not only for large mammals, but also for many specialist, endemic or co-evolved species. IFLs are of value to society, both directly and indirectly. They are of direct value to the people who live in or near them, and of indirect value via the local, regional and global ecosystem services they provide, such as regulating rainfall, which can even be at the intercontinental scale.

Fragmentation of forests creates edges, and these edges are highly damaging to forests. They increase forests' vulnerability to climate change and substantially alter their ecology. Loss of biodiversity in fragmented forests risks collapse of those ecosystem services upon which humans depend.

Fragmentation is, at least over a few decades, irreversible. It is therefore essential that the precautionary principle be applied in all and any consideration of IFLs, leading to their conservation as intact contiguous forest becoming a priority.

One of the key agents of IFL loss is selective logging, no matter how sustainable the actual logging process is. Selective logging causes fragmentation. Fragmentation not only often means the forest is no longer an IFL, it is also the first step in opening up a forest to further degradation, and eventual complete loss of forest cover or deforestation. Therefore, conservation of IFLs is a priority to reduce the rate of forest loss.

The amount of forest protected areas necessary has been estimated in this report at over 30% of global forest cover, which would encompass most, if not all, IFLs. While this protection cannot be achieved immediately, it has to be a medium-term goal of international conventions. Therefore, industrial logging in IFLs needs to stop immediately, or significant areas of forest will no longer be in IFLs before they can be protected.

Participatory land-use and conservation planning processes that are inclusive of key stakeholders are essential to the long-term conservation of IFLs. In particular, those affected the most by land use decisions, but often marginalised - such as indigenous peoples - must be actively included. In addition to biodiversity protection, land-use options for IFLs include small-scale, low-impact community use and payments for ecosystem services (PES).

Conservation of remaining IFLs will only be successful if the many actors, from the local to the global level, play their parts well. Actors include national governments of IFL and donor countries; intergovernmental processes and conventions such as CBD, UNFCCC and REDD and marketplace actors eg FSC, RSPO. Only when each of these actors actively promotes conservation, rather than industrial logging, will IFLs be saved. IFLs are essential for the Earth's climate, biodiversity and people: their conservation is paramount.

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