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Process Assessment

Protection of forest and wilderness areas by Wilderness International

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using the example of the "Secret Forest" project

in Madre de Dios, Peru

Reviewed organization

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Table of contents

1. Expert

The expert opinion was prepared by Rainer Kant. Mr. Kant is a certified forester and senior consultant for the future-oriented topic of "Biodiversity and Ecosystems with a Focus on Forest Ecosystems" at BAUM e.V.

BAUM is a network for sustainable business (www.baumev.de) and the first and largest European environmental organization in the business sector, with over 800 companies and individuals/institutions from a wide range of industries and sizes. As a driver of transformation for climate and biodiversity protection in the business sector, BAUM plays a key role and uses its expertise to support companies on their path to climate-friendly and nature-positive business practices.

With 20 years of professional experience at BAUM, Mr. Kant has extensive knowledge in the areas of biodiversity and ecosystems, with a focus on forests and their relevance to the economy. Mr. Kant teaches the subject of "Ecological Sustainability" at the Hamburg School of Business Administration (HSBA).

His experience includes the preparation of forest reports, guidelines, and expert opinions on forestry; book publications such as "Permanent Forest Made Easy – A Short Guide for Practice" and "Forests, Economy, Biodiversity – Entrepreneurial Options for Nature-Based Climate Protection Measures"; in the "Wälder beraten Wirtschaft" (Forests advise business) seminars for companies and in the development of company checks for biodiversity.

2. Summary and conclusion

Wilderness International's conservation approach

Wilderness International (WI) pursues a comprehensive approach to the protection of primary rainforests, characterized by **integrativity, systems thinking, multidimensionality, interdisciplinarity, and holism**. The organization combines different perspectives, methods, and actors to achieve its goals effectively and sustainably. This methodologically complex and modern approach to nature conservation represents a forward-looking model for the protection of wilderness areas.

The **integrative approach** is evident in the fact that Wilderness International links different areas of society: environmental and climate protection are combined with educational work, technological innovations, and economic financing models. Companies, schools, scientists, and local indigenous communities are actively involved, creating synergies between civil society, business, and science.

Furthermore, Wilderness International works **systemically** by understanding ecological challenges in a broader context. The protection of a piece of rainforest is not viewed in isolation, but as part of a complex ecological network that influences the global climate, biodiversity, and water balance. This systemic thinking enables the organization to design measures that have long-term and far-reaching effects.

Wilderness International also operates **multidimensionally**, as its work unfolds on several levels simultaneously: ecologically through the preservation of species-rich habitats, economically through financing via land sponsorships and CO_2 offsets, technologically through the use of drones, satellite imagery, and eDNA, and educationally through educational projects in schools. This not only puts environmental and climate protection into practice, but also makes it tangible and understandable.

Another key aspect is the **interdisciplinary approach**. Wilderness International brings together experts from the fields of biology, geography, forestry and environmental science, education, computer science, and communication. This diversity of expertise enables informed decisions to be made,

innovative solutions to be developed, and complex interrelationships to be communicated in an understandable way.

All these approaches ultimately contribute to a **holistic understanding of nature conservation**. Wilderness International considers not only the ecological component, but also the social, cultural, and economic dimensions. The goal is to establish long-term and sustainable protection mechanisms that both preserve the natural habitat and strengthen people's awareness and responsibility.

Goal achievement and sustainability

Wilderness International specifically purchases primary forest areas with land registry entries in countries with a high level of legal certainty. A prerequisite for a purchase is a rapid assessment carried out in advance to prioritize biodiversity and endangerment. Drones are used to document the condition of the forest, which is actively supported by visitors and researchers. Protection is ensured through long-term local partnerships and regular checks by forest rangers, as well as through the Wilderness International foundation concept.

Conclusion: The strategy of achieving permanent forest protection through targeted land purchases, legally secure registration, ongoing monitoring, and (re)financing is being implemented systematically and successfully.

Calculation of living above-ground biomass

Wilderness International's statement that an average of 60 kg CO_2/m^2 is stored in its protected areas (equivalent to 600 t CO_2/ha) is fundamentally plausible. It is at the upper end of the typical values for intact primary forests in the tropics and temperate rainforests – and is particularly realistic if, as is the case with Wilderness International, 1) old, intact stands are protected, 2) deforestation or degradation is excluded, and 3) a mixed land area approach is used for Peru and Canada.

See also the chapter "Evaluation of the carbon sink."

Annual carbon storage capacity

Conclusion: Wilderness International's claim that primary rainforests continue to sequester carbon is research-based and factually accurate. An increase of 3.02 t C/ha/year (11 t CO_2/ha/year) is in line with research findings for intact primary forests. The reference to Cook-Patton et al. (2020) is correct. Wilderness International's decision not to include the increase in its calculations is consistent with a cautious and responsible modeling approach.

See also the chapter "Evaluation of annual carbon storage capacity."

Fulfilment of the criterion of additionality and leakage in Peru

Additionality is defined as follows in the context of forest conservation projects:

- Projects whose emission reductions are additional to those that would otherwise have occurred, i.e., additional to the baseline scenario (UN-REDD Program).
- Projects that must generate benefits, such as reduced emissions or increased carbon sequestration, that would not have occurred without this activity, i.e., that would not have occurred in a business-as-usual scenario. (CIFOR - Center for International Forestry Research).

The following criteria are among the requirements for additionality in forest conservation projects:

1. Reference scenario (baseline): A credible scenario must be created that shows how the forest would have developed without the project.
2. No legal obligation: Emission avoidance must not be required by law. It must therefore be voluntary and go beyond legal requirements.
3. No funding from existing programs: The emission reductions must not already be covered by other programs or government subsidies.
4. Project intervention: The project must actively take measures to ensure forest protection.

The following requirements apply to forest conservation projects in order to identify, minimize, and transparently account for leakage:

1. In addition to the actual protected area, a spatially defined influence or leakage zone must be defined. This includes those areas to which deforestation activities could realistically shift. In this zone, it must be checked whether protective measures in the project area lead to increased pressure on land use outside the area.
2. Systematic identification of the causes of deforestation (e.g., agriculture, logging, infrastructure). Assessment of who uses the forest and why, as well as an assessment of whether and where these activities could shift.
3. Measures to actively prevent leakage (involvement of local communities and land users, alternative income and use options, large-scale or networked protected areas, legal protection of land).
4. Monitoring and verification (regular monitoring (e.g., satellite data), comparison of deforestation rates inside and outside the project area, transparent reporting on identified leakage effects).

The baseline scenario is characterized by rising deforestation rates caused, for example, by mineral extraction, logging, the expansion of agriculture, urban growth, and the current forestry law.

Conclusion: Due to the complex drivers of deforestation in Madre de Dios, and especially in the immediate vicinity of WI's protected areas, the additionality of the "Secret Forest" tropical forest protection project has been proven. Without the purchase, protection, and diverse activities (concession areas, area control through regular patrols, agroforestry and school projects, etc.), it can be assumed that the protected forest areas would no longer exist at this point in time or in the coming years. WI counteracts the risk of leakage by expanding protected areas, connecting with other protected areas, cooperating with local communities, creating sustainable sources of income, establishing participatory forest management, and implementing field controls and early warning systems. In this way, WI contributes to ensuring that the protection of the Secret Forest extends beyond the boundaries of the area and that the avoided emissions and biodiversity protection are not undermined by displacement effects.

Fulfillment of the additionality criterion in Canada

British Columbia is home to the world's last large contiguous area of temperate rainforest. Timber production is a traditional and very important industry with an influential and financially powerful lobby. In contrast, the political influence of Canadian NGOs working to protect the last wilderness areas is minimal.

Conclusion: Only about 25% of the original temperate rainforest area remains in Canada. These last areas are threatened by logging companies, agricultural corporations expanding farmland, urban sprawl, construction and infrastructure, and Canada's withdrawal from the Kyoto Protocol. Although the specific threat to the WI protected areas on Porcher Island, Calvert Island, Read Island, and Toba Valley was considered to be rather low in the past, it has increased significantly over the last five years. Additionality is therefore clearly given in view of the sharp increase in logging pressure in British Columbia.

See also the chapter "Evaluation of protected areas in Canada with regard to additionality."

3. Organization and objectives assessed

3.1. Wilderness International

The Wilderness International Foundation is a German foundation based in Dresden and Berlin. It was founded in 2008 by 26 founders. The organization is committed to protecting wilderness areas in the temperate rainforest on the west coast of Canada and in the tropical rainforest in eastern Peru. To achieve its goal of legally protecting wilderness areas in a sustainable manner, Wilderness International acquires private land with land registry entries. The purchases are refinanced through donations, which are also used for the long-term protection of the areas, the implementation of environmental education projects, and research activities on CO_2storage and biodiversity recording.

The German foundation works in close partnership with its sister organizations Wilderness International (Canada), a Canadian NGO based in Stony Plain near Edmonton, Canada, and Wilderness International Peru, based in Puerto Maldonado, Peru.

3.2. Reason for and objective of the expert opinion

The reason for preparing this report is to examine whether the statements publicly communicated by the Wilderness International Foundation regarding the conservation goals achieved are factually accurate and to what extent the defined objectives are actually being achieved through the processes implemented.

This report focuses on the processes implemented by Wilderness International for rainforest conservation in Peru and Canada. Based on the foundation's objectives and the steps specified for their realization, it examines whether and by what measures the set goals are being achieved. In addition, the additionality and carbon storage of the conservation projects are examined. Furthermore, the report highlights the specific benefits of rainforest conservation for companies and the application and follow-up opportunities that arise in the context of corporate ESG responsibility. Finally, suggestions are made for process improvements and for measuring forest ecosystems.

The following objectives were set in descending order for the preparation of the report:

Priority 1: Evaluation of the core area's processes in terms of effectiveness, including additionality.

Priority 2: Identification of the added value of WI projects from a corporate perspective, including their potential uses for reporting requirements and their corporate benefits in the non-reporting area.

Priority 3: Proposals for process improvements to further develop the projects.

Priority 4: Proposals for measuring and visualizing forest ecosystem services and changes therein.

3.3. Scope of the study, procedure, and implementation period

Wilderness International's conservation concept in Peru and the measures implemented to achieve its objectives were reviewed in an on-site evaluation. In the "Secret Forest" project area, approximately 30 km southwest of the city of Puerto Maldonado on the Tambopata River, the core areas, concession areas, and deforestation activities outside the areas controlled by the organization were examined. Information and data for the expert assessments were obtained through excursions, presentations, and interviews. The assessment of Wilderness International's conservation concept in Canada was based on the documents provided, interviews, and internet research. The expert opinion was prepared between March 2025 and January 2026 and is divided into 1) preparation time (March 2025), 2) travel time to Peru (April 8-16, 2025), 3) preparation time (April-September 2025), and 4) revision time (January 2026).

The procedure for implementing this process report from the coordination phase to the final report:

4. Basis for the investigation

4.1. Documents provided

In March 2025, the expert sent Wilderness International a list of topics and questions relevant to the preparation of the report.

In the same month, the organization submitted approximately 30 relevant documents providing information on the processes and activities used by Wilderness International in Peru and Canada.

The evidence includes, for example, area maps, monitoring and activity reports, project descriptions (agroforestry and school projects), annual plans, impact reports, overviews of current projects and scientific partners, calculation evidence of CO_2storage and random sample measurements, external scientific work (bachelor's and master's theses), presentation of scientific communication, etc.

4.2. On-site evaluations, excursions, and interviews

From April 8-16, 2025, an on-site visit took place at the Secret Forest in the Tambopata province of the Madre de Dios region in Peru.

Since 2019, Wilderness International has been cooperating with the Peruvian NGO Fauna Forever, which operates the "Secret Forest" research station in the immediate vicinity of Wilderness International's protected areas. The findings of Fauna Forever's long-term research on Peruvian tropical forests, monitoring of animal populations, and the effects of human influence in the region are used by both organizations to develop concepts for long-term forest conservation.

The core and concession areas of the Secret Forest protected area were visited. This provided an opportunity to gather information and impressions about the land purchase processes, area protection strategies, individual project implementations (such as agroforestry and school projects), scientific work, and communication strategies.

Figure 1 - During the expert's inspection of the protected areas, WI explains the procedures and methods used in forest ecosystem research.

Figure 2 - During the inspection of the agroforestry project, WI presents the plans, processes, and objectives for supporting local communities.

Figure 3 - WI forest rangers describe their strategic approach to ensuring area protection with their patrols.

Specifically, WI provided the expert with the following content and evidence through excursions, interviews, and presentations:

1. Excursion and presentation with Chris Ketola (biologist, Head Field Research Coordinator Wilderness International Peru) on scientific methods for researching **bird life**
2. Excursion and presentation with Nadine Holmes (biologist, mammal research, Wilderness International Peru) on scientific methods for researching **mammals**
3. Guided tour and explanation with Gabriela Veneros (forest scientist, Botany Wilderness International Peru) on **botany and forest ecosystem research** (tree species, sampling surveys, biomass calculation)
4. Guided tour and explanation with Stefany Rado (forest ranger) and Xiomara Banegas (forest ranger) on the tasks and methods of the Forest Guardians to secure the **protected areas**
5. Tour of the Malinowski Station; guided tour and explanation of the tasks and methods of the Forest Guardians to secure the **concession areas**
6. Excursion and presentation of **the canopy tower**
7. Excursion to **clear-cut areas** (deforestation front) with explanations and discussions
8. Guided tour and explanation with Simon Hrbek (forest scientist, agroforestry project Wilderness International Peru) about the "Agroforestry" project
9. Presentation by Ana Paula (school project and forest guardian) and interview on the "school projects" project
10. Interview with Flor Ugarte (CFO WI Peru) on the tasks of "land purchase" and "human resources"
11. Interview with **Dr. Chris Kirkby** (CEO Wilderness International Peru and Chairman Fauna Forever)
12. Interview with **Kai Andersch** (CEO Wilderness International Germany, Director WI Canada, Land Strategy)

4.3. Further sources of information

In addition to the information relevant to the report obtained during the on-site visit and from the documents and evidence provided, Wilderness International subsequently provided further information and documents in response to requests. In addition, all relevant information on the protection concept was retrieved from the organization's website, and further web information, e.g., on the topics of deforestation pressure and additionality, special features of the study area in the context of carbon sequestration and biodiversity, was reviewed and used.

5. Description and special features of the protected areas

5.1. Secret Forest in Madre de Dios – Peru

Madre de Dios is one of the most biodiverse regions in the world. The territory accounts for 12% of the Peruvian Amazon and is home to the world's largest concentration of bird species, as well as healthy populations of jaguars, tapirs, and other large mammals. Madre de Dios has designated around 45% of its area as nature reserves (ANP), with at least 92% of the original forest area preserved [1].

According to the land registry, the Secret Forest reserve covers 1010.64 hectares owned by WI (tropical lowland rainforests, floodplain forests, and palm swamps along the Tambopata River, about 30 km southwest of Puerto Maldonado), spread over 32 land titles plus 1,633 hectares of nature

conservation oncessions (as of January 2026). It borders the approximately 2'746 km² Tambopata National Reserve, one of the most species-rich ecosystems in the world, with 632 bird species, 1,200 butterfly species, 169 mammal species, and over 100 reptile species, among others [2].

Figure 4 - Secret Forest © Rainer Kant

Figure 5 - Secret Forest © Rainer Kant

In addition, the areas with the highest carbon content are located in the southwestern Amazon region (in southern and central Peru) covering an area of 11 million hectares, and in the northeastern Amazon region covering an area of 16.8 million hectares (in northeastern Brazil, large parts of French Guiana, and parts of Suriname) [3].

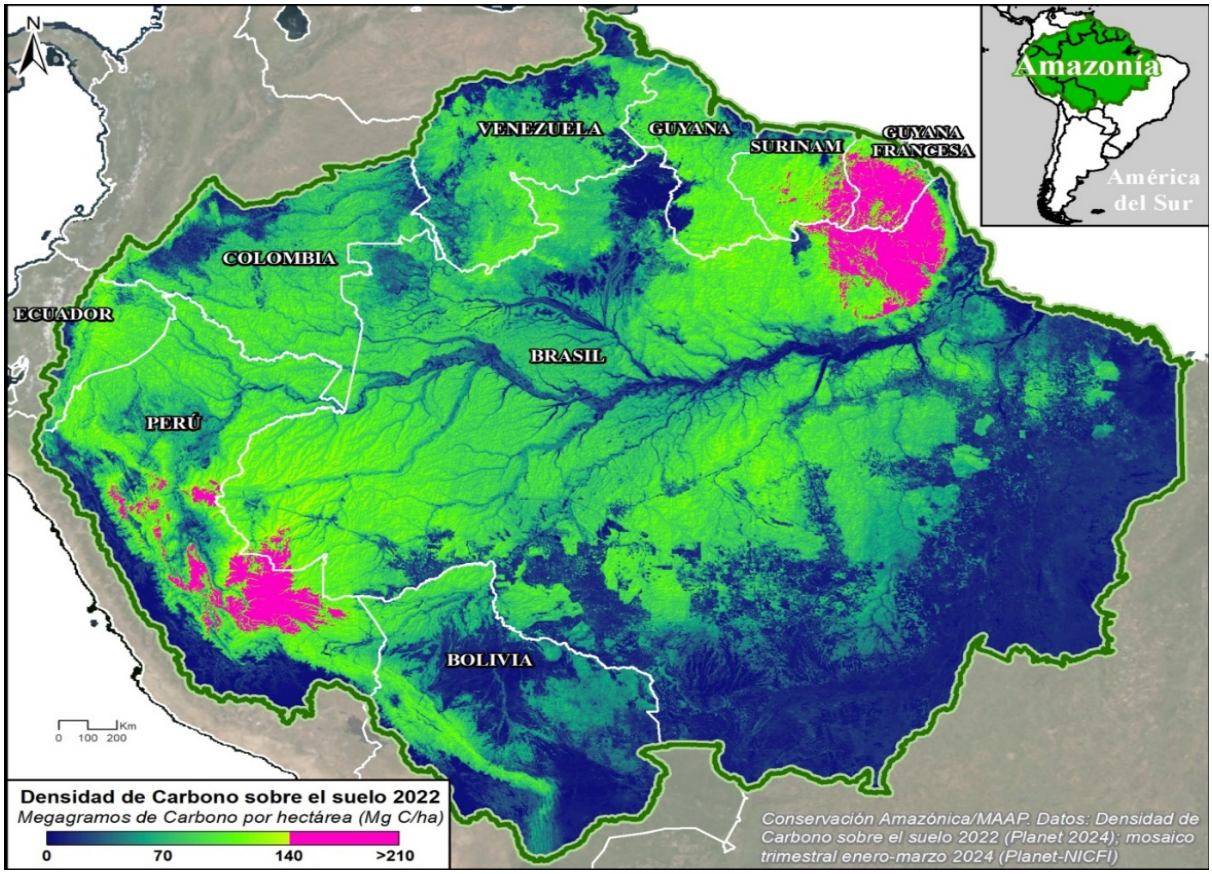

Figure 6 - Above-ground carbon density according to Planet Forest Carbon Diligence data in the Amazon biome for the year 2022; (data: Planet)

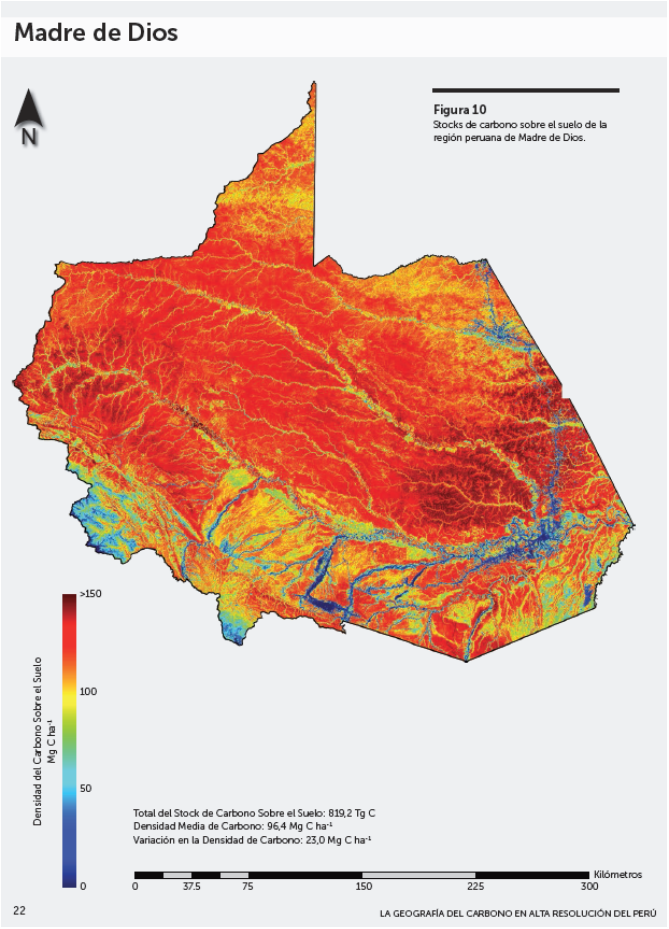

Figure 7 - Carbon storage in the Madre de Dios region in tons per hectare; (Source: "La Geografía del Carbono en Alta Resolución del Perú")

Madre de Dios is one of the regions with the highest carbon content in Peru – ranking third in total carbon stock in vegetation after the Loreto and Ucayali regions.

According to the study "La Geografía del Carbono en Alta Resolución del Perú" [4], the average carbon density in Madre de Dios is 96.4 Mg C/ha (megagrams of carbon per hectare), which corresponds to 96.4 tons C/ha. The standard deviation is 23.0 Mg C/ha. The calculations refer to aboveground carbon. The data was collected using airborne LiDAR (laser scanning from an aircraft), biomass models from field studies, and the conversion of biomass to carbon (using a standardized C factor of ~0.47–0.5).

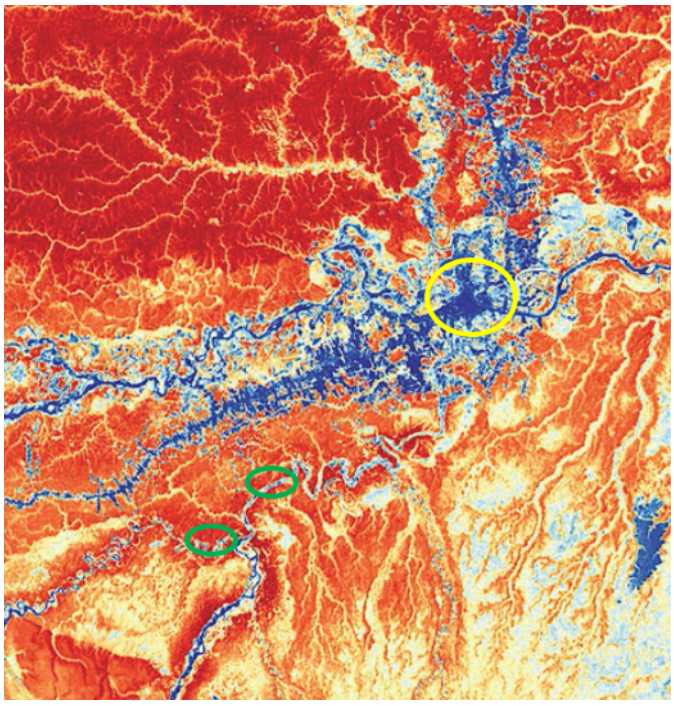

Figure 8 - Deforestation and carbon loss (BLUE) around Madre de Dios (YELLOW) and along the Oceanic Highway. WI's protected areas are located south of the highway (GREEN); (Source: "La Geografía del Carbono en Alta Resolución del Perú"; circles: own representation).

North of Puerto Maldonado is where the Madre de Dios region has the highest carbon content. Around the capital city of Puerto Maldonado and along the Interoceanic Highway, large areas have been identified that store almost no carbon. This is directly related to illegal gold mining, which is causing widespread deforestation in this region. The gold mining regions are characterized by storage values close to zero (BLUE) and are among the most significant hotspots for carbon loss in Peru (see Fig. 5).

5.2. Misty Forest, Porcher Island, and Grizzly Forest, Toba Valley - Canada

Wilderness International protects temperate rainforest areas in Canada on Porcher Island, Calvert Island, the mainland of British Columbia, including Toba Valley on Read Island.

Porcher Island combines an extraordinary mix of old-growth coastal rainforests, diverse wetland habitats, and extensive moorlands, which cover 26-50% of the area and store 100-300 kg of CO_2 per square meter [5].

Figure 9 - Misty Forest on Porcher Island © Wilderness International

As part of the Hecate Lowland Ecosection, the landscape is characterized by ancient conifers such as western red cedar, yellow cedar, mountain hemlock, and fir. With its diverse habitats, especially wetlands and bays, Porcher Island serves as an important habitat for numerous animal species and is part of the important Pacific migratory bird corridor. These ecosystems secure globally relevant carbon stores, offer outstanding biodiversity, and fulfill key functions for climate, water, and nature conservation [6].

The **Toba Valley**, with its Grizzly Forest conservation area, lies within a humid temperate inland rainforest corridor dominated by characteristic cedar-hemlock stands with dense moss and lichen undergrowth. The area is characterized by year-round humidity, a typical feature of an inland temperate rainforest (ITR). ITR is a rare temperate rainforest ecosystem that exists in drier latitudes, about 250–430 miles from the ocean, primarily in the interior mountains of British Columbia and parts of Idaho, Washington, and Montana [7].

Figure 10 - View of the Toba Valley protected area, Powell River Regional District, British Columbia © Reinhard Mink

The Grizzly Forest – Toba Valley is located in one of the most carbon-rich and ecologically sophisticated forest types in the world. Its preservation not only ensures significant climate benefits, but also protects an essential ecosystem with high biodiversity and systemic function.

6. Findings

The effective and long-term protection of primary rainforests is a challenging task in view of current and future deforestation dynamics.

The example of Wilderness International's activities in Peru (Secret Forest) clearly shows that tropical forest conservation is threatened from many sides and that the causes are multifactorial:

Poverty, road construction, lack of education, profit motives, lack of local control and law enforcement, corruption, rising international demand for agricultural commodities, lack of political will, climate change, etc. are some of the many drivers of tropical forest loss. They are often interlinked and therefore reinforce each other in their effects.

In addition, rainforests are influenced by the interaction between climate and biodiversity: climate change affects rainforests. Weakened rainforests are particularly vulnerable to the consequences of climate change. Destroyed rainforests exacerbate climate change. These positive feedback effects (self-reinforcing) influence the ecosystem services of primary rainforests, which must be prevented in order to maintain their resilience and systemic functions.

Biodiversity monitoring is also challenging in highly complex ecosystems such as rainforests. There is still no uniform method for recording biodiversity. The same applies to generally applicable criteria for determining biodiversity. In addition, the market for recording biodiversity and ecosystem services, as well as their monitoring, is undergoing dynamic development with improved techniques and precision, as well as expanded areas of application.

Wilderness International strives to effectively achieve its stated goals and to scientifically substantiate its claims. To this end, this chapter validates the extent to which the organization's statutory goals are being effectively achieved. Using the examples of carbon storage and carbon storage capacity, it validates the extent to which Wilderness International's claims that one square meter of rainforest stores 60 kg CO_2 /m^2 and that rainforests are capable of an annual increase in carbon. Finally, the additionality of the projects is examined on the basis of the protected areas in Peru and Canada.

6.1. Validation of effectiveness based on statutory objectives

The following section examines the objectives of WI and the effectiveness of the measures implemented to achieve them.

To this end, the objectives and the measures used to achieve them are reviewed in terms of their effectiveness based on WI's statutes.

The statutes and their structure are reproduced faithfully. Measures (e.g., preservation of biological diversity) that are relevant to the achievement of the objectives (e.g., environmental, nature, and animal protection) are justified in italics with concrete examples and arrow symbols.

According to the WI statutes, the following objectives and measures are defined:

(1) The foundation has the following purposes:

It promotes:

- Environmental, nature, and **animal protection**
- **Education, science, and research** related to climate, environmental, and nature conservation, as well as
- **international understanding, development aid**, art, and culture for the implementation, support, and **communication** of climate, environmental, nature, and animal protection projects

(2) The foundation's purpose is realized in particular through:

- (a) **Preserving biological diversity** by protecting the habitats of animal and plant species.

  → *see also (b)*

  → *1) **Legally secure land purchase with land registry entry:** Biodiversity conservation in Peru and Canada (countries with a high level of legal certainty) is achieved through the purchase of ecologically intact natural landscapes, in this case "forest and wilderness areas" with land registry entries by Wilderness International.*

  → *2) **Statutory protection through ownership and restrictions on use**: Wilderness International's statutes stipulate that the land must be left untouched and may only be visited for research and documentation purposes. Additional security is provided by the fact that all three international foundations are entered in the land register as owners.*

  → *3) **Permanent earmarking through statutory structure:** As a non-profit foundation under civil law, Wilderness International is structured in such a way that the foundation's capital and the acquired land permanently serve the specified purpose of the foundation. This means that the protected areas may not be sold or used for other purposes, which ensures their long-term protection [8].*

- (b) **Promotion of the establishment of nature reserves**, acquisition or lease of areas with the aim of establishing a nature reserve or preserving an area as a nature reserve.

  → *See (a)*

  → *1) A total of 2,036.4 ha of protected areas have been established by WI (as of January 2026). 1,025.8 ha in Canada (Figs. 12 and 13) and 1,010.6 ha in Peru (Fig. 11).*

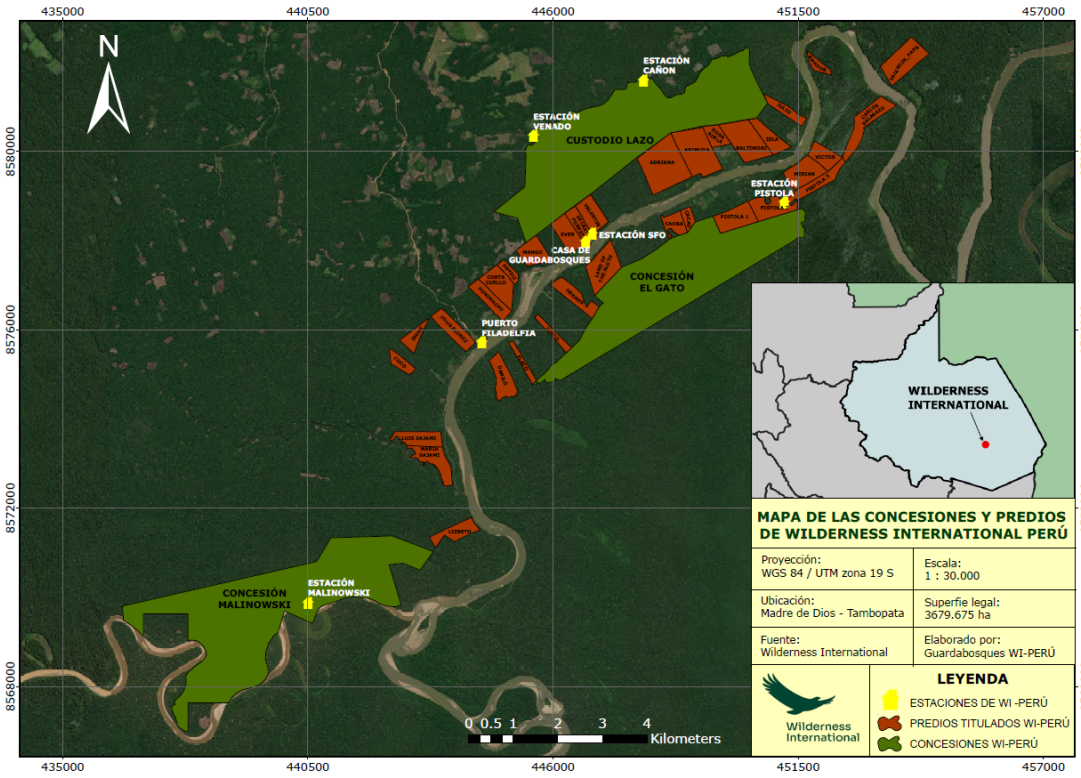

Figure 11 - Protected areas acquired through land registry entries (in RED) and leased areas (in GREEN) on the Tambopata River in the Madre de Dios region of Peru (as of April 2025).

→ *2) In order to ensure the long-term preservation of the acquired protected areas (red), Wilderness International has additionally leased state-owned forest areas for 40 years in Peru (see Fig. 8 in GREEN). The concession areas provide an additional buffer between protected areas and deforestation activities. This prevents edge effects in the protected areas and maintains their ecological functionality.*

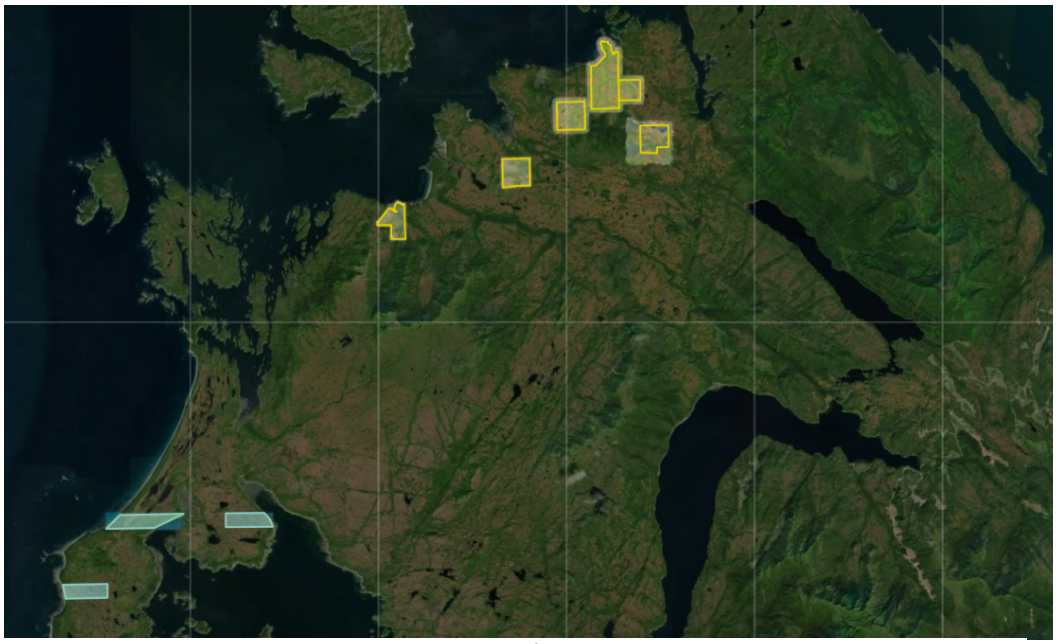

Figure 12 - Protected wilderness areas (Porcher Island/British Columbia) in Canada with the project name "Misty Forest" – Blue: Protected areas already refinanced; Yellow: Protected areas still to be refinanced through donations

→ 3) *The Misty Forest is located on Porcher Island, an island covering approximately 2,300 km² on the northern Pacific coast of British Columbia (Canada). The temperate*

coastal rainforest is home to Douglas firs up to 70 meters tall and some of the most massive giant sequoias currently living. The landscape also consists of raised bogs, lakes, and an extensive coastal landscape with coastal wolves, bald eagles, otters, minks, and black-tailed deer.

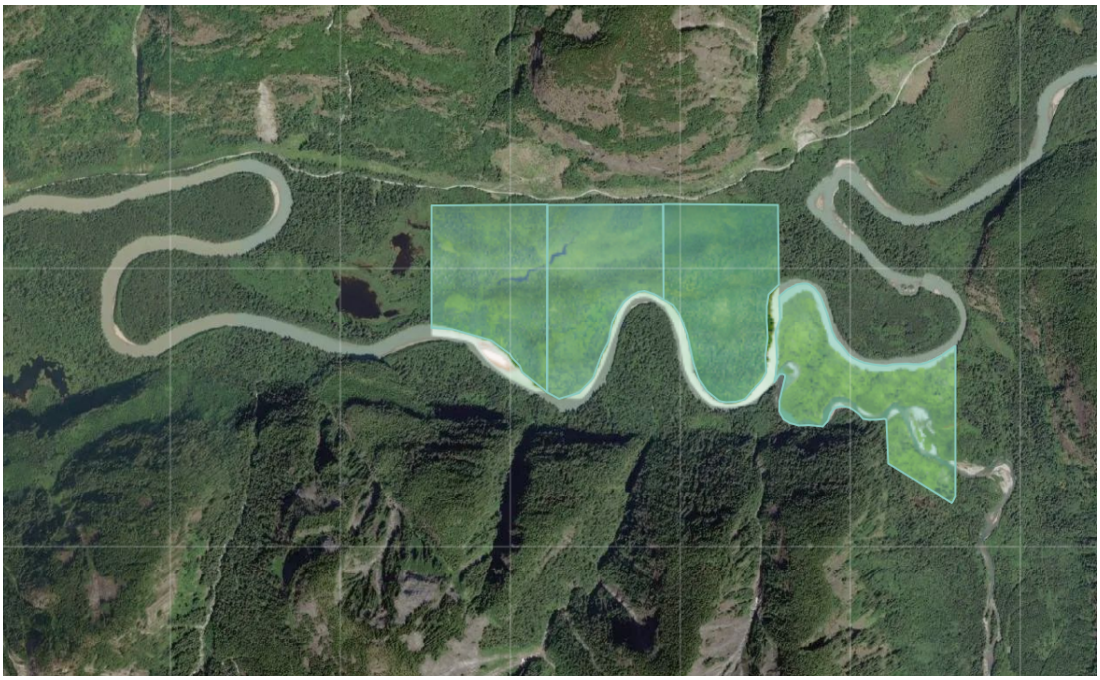

Figure 13 - Protected wilderness areas in Canada with the project name "Grizzly Forest – Toba Valley"

→ *4) The "Grizzly Forest" is located in the Toba Valley, about 160 kilometers north of Vancouver in the Canadian province of British Columbia. Since 2012, Wilderness International has been acquiring land there to create a protected corridor for grizzly bears to genetically exchange a healthy population. The Toba Valley is home to a healthy grizzly population that depends on the undisturbed wilderness and rich food sources of the region.*

(c) **Promotion of inter- and intracultural exchange** between bearers of cultural knowledge to raise awareness of the need to preserve nature.

Examples of promoting intercultural and intracultural exchange:

→ *1) As part of **the "Protect the Peel" project,** Wilderness International organized exchange programs in 2007 and 2008 between the Teetl'it Gwich'in, an indigenous community in Canada's Yukon Territory, and German youth. These programs included reciprocal visits during which participants learned about the importance of the Peel River area to the culture and identity of the Gwich'in and worked together on environmental issues. In Germany, the Gwich'in visited an open-cast coal mine and the Saxon Switzerland National Park, among other places, to understand the effects of human intervention on nature. These intercultural encounters promoted mutual understanding and awareness of nature conservation.*

The exchange programs raised awareness of the conflict between First Nations land use plans and the numerous mining claims in the region. Between 2004 and 2008, there was a significant increase in the amount of land used for mining in the Canadian Peel Watershed region, particularly in the areas around the Wind, Snake, and Bonnet Plume rivers. In 2004, approximately 530 quartz claims and 525 iron mica leases were registered. By 2008, the number of active claims had risen to a total of

8,431, of which 6,773 were staked after the land use planning process began in 2004. However, the increase in registered claims of over 1,000% did not lead to significant extraction of mineral resources in the Peel Watershed region, but was limited to exploration activities without any large-scale mining projects. The rapid increase in claims led to concerns among indigenous communities and environmental organizations [10]. Following the announcement in 2015 that the case would be brought before the Supreme Court of Canada, Wilderness International launched a new expedition to the Peel River area in 2017 to strengthen global support. In 2017, the Canadian legal system ruled to permanently protect 80% of the Peel River watershed [11].

→ *2) A key project is the **international scholarship and environmental ambassador program "Wisdom Seekers – Knowledge Keepers,"** which is aimed at committed students in grades 9 to 11 who have previously participated in wilderness runs to protect rainforest areas. The selected participants take part in expeditions lasting several weeks to areas in Canada protected by Wilderness International. There they experience the wilderness up close, carry out their own research projects, and learn about the culture of the First Nations. After their return, they share their experiences through lectures and exhibitions to raise awareness of nature conservation in their home countries [12].*

→ *3) The **Forest Guardians program** in Peru ensures local involvement and intracultural exchange with the local population for the protection of the rainforest. The Forest Guardians program trains local residents to become guardians of the protected areas. They monitor the areas, report illegal activities, and raise awareness of environmental protection in their communities. This intracultural cooperation strengthens awareness of the importance of the rainforest within local cultures [source: on-site research through excursions and interviews between April 8 and 16, 2025], [13].*

- (d) Organization and implementation of **educational projects** within the scope of the foundation's purpose.

→ *See also (c)*

→ *1) The **WIPerú Educa environmental education program,** which launched in Peru in August 2024, addresses two target groups: local young people and the communities surrounding the protected area. This project aims to impart more knowledge about and enthusiasm for the rainforest and its inhabitants and provide arguments as to why it is important to actively protect this sensitive ecosystem. This includes themed events in cities and communities, various projects in schools, and visits by schoolchildren to the WI research station in the Secret Forest. In 2025, WIPerú Educa reached 613 people in the region and produced numerous educational materials to scale up the program in the coming years.*

→ *2) With the **Wilderness Run,** a Germany-wide educational project, schoolchildren raise funds for the protection of rainforest areas through a charity run. Before the run, participants attend lectures on ecosystems and the value of wilderness areas. Schools can use 20% of the donations raised for their own environmental projects, such as greening schoolyards or tree planting campaigns [14].*

→ *3) Wilderness International is involved in local **education and planting campaigns** in Germany, for example through the "My Tree – My Dresden" initiative. In order to green the city and raise awareness of climate change adaptation and climate and*

environmental protection, citizens have planted over 110,000 trees and shrubs by the end of 2022 [15].

→ *4) **Exhibitions** by Wilderness International, e.g., on the topic of "The importance of rainforests and ways to protect them" in cooperation with the exhibition "ASISI's Amazonia" at the Panometer Dresden on September 14, 2024 (source: own on-site visit), [16].*

- (e) **Promotion of nature experiences** as part of international excursions and exchange projects.

→ *see also (c) 2*

→ *Wilderness International **regularly** organizes **expeditions** to existing and newly acquired protected areas, particularly in Canada and Peru. These trips serve the purposes of scientific research, environmental education, and media documentation. Participants collect data on biodiversity, create photo and video material for educational purposes, and experience nature in its original form [18].*

- (f) Promotion of **science and research**

→ *See also (i) 1 and (i) 2*

→ *1) Wilderness International records **ecosystem services and biodiversity** in its protected areas for vegetation (woodlands), soils, herbaceous layer, birds, insects, mammals, and amphibians/reptiles. Together with experts, WI is developing a **standardized monitoring method**. The results are shared transparently (with links) in external communications with the public.*

→ *2) Wilderness International uses a **multi-proxy approach** for its research. The multi-proxy approach is a modern and scientifically recommended method of biodiversity monitoring that enables a precise, robust, and multidimensional assessment of biological diversity through the combined use of various data sources – especially in complex ecosystems such as tropical forests. This approach is increasingly being used by research institutions, NGOs, and initiatives. In order to obtain a holistic picture of the biodiversity status of the protected areas, the organization uses satellite imaging, drone flights, acoustic monitoring (audio sensors), camera traps, environmental DNA analysis (eDNA), soil measuring instruments (temperature and humidity measurement), and biodiversity surveys on the ground through regular inspections (scientists, forest rangers, external research partners).*

- (g) Implementation of projects to **preserve traditional knowledge**.

→ *See (j) 1) and 2)*

- (h) **Documentation** of wilderness areas and natural spaces and **establishment of research stations.**

→ *See (f) 1) and 2)*

- (i) **Research on the preservation of traditional knowledge of indigenous peoples**

→ *See (j) 1) and 2)*

- (j) Introduction and promotion of sustainable, **nature-oriented management concepts** incorporating **traditional forms of land use.**

→ 1) *Since December 2023, WI has been training farmers in **agroforestry and sustainable farming practices**. The use of a wide variety of local crops and soil improvements, e.g., through the use of Terra Petra, lays the foundation for sustainable land use that reduces deforestation pressure. The project is currently being implemented with 15 families in Monte Grande.*

→ 2) *Another example of the integration of traditional land use practices is the planned **beekeeping project within the agroforestry project**. By observing the behavior of honey bees and wild bees, local families will be provided with bee colonies in the future, which will represent an additional source of income and at the same time promote traditional beekeeping practices.*

- (k) **Education and public relations**

→ *see (c), (d), and (m)*

- (l) **Transfer of environmental technologies for climate, water, and soil protection.**

→ *1) **Environmental DNA (eDNA) project using drone technology**: With the support of the Audi Environmental Foundation, WI has been conducting a pilot project in collaboration with ETH Zurich since March 2024, using drones to collect environmental DNA (eDNA) from hard-to-reach tree canopies. This method enables precise and cost-effective recording of biodiversity in protected areas. The data obtained helps to monitor the state of ecosystems and develop targeted conservation measures [19).*

→ *2) **Use of drones to map protected areas:** Wilderness International uses drones to map protected areas. Drone technology is used to create high-resolution, georeferenced aerial images of the acquired forest areas. These maps serve as transparent documentation of the protected areas and enable accurate monitoring of the condition of the ecosystems. Donors receive certificates with the exact geocoordinates of the areas they have supported [20].*

→ *3) **Installation of a solar power system in Peru:** As part of the eDNA project, Wilderness International has installed a solar power system at the research and forest ranger station in the Peruvian protected areas. This system replaces the gasoline generators previously used, saves around 3,500 liters of fuel annually, and improves the quality of life for those working on site. 's sustainable energy supply also supports the ongoing implementation of research and conservation projects [21].*

Both Agenda 21 and the Kyoto Protocol assign a key role to the transfer of environmental technology in tackling global environmental problems. With its environmental technology transfer, Wilderness International not only supports the transfer of technical processes, goods, and services, but also includes the transfer of knowledge about technical and organizational solutions for wilderness conservation.

- (m) The **promotion of educational and environmental projects in schools** within the framework of financial or material support to the school support association of the respective school, provided that it is recognised as tax-privileged.

→ *see also (c) 2) and (d) 1)*

→ 1) In collaboration with local partners such as **Wasai Lodge & Expeditions**, Wilderness International Peru enables **schoolchildren and students** from the nearby town of Puerto Maldonado to experience the rainforest firsthand and learn more about its importance. These excursions promote environmental awareness and strengthen young people's connection to their natural surroundings.

→ *2)* An outstanding example is the **Environmental Ambassadors** program, which offers particularly committed students in grades 9 through 11 the opportunity to get to know the areas they protect during the Wilderness Run in Canada. As part of this program, participants take part in expeditions lasting several weeks, experience the wilderness up close, learn about First Nations culture, and carry out their own scientific projects. After their return, they share their experiences through lectures and traveling exhibitions to inspire others to protect the environment [22].

Interim conclusion: Wilderness International is largely achieving its statutory goals. The foundation successfully implements the protection of ecologically valuable wilderness areas through legally secure land acquisition and long-term earmarking. In addition, it promotes education, research, intercultural exchange, and the transfer of environmental technologies with innovative projects in Canada, Peru, and Germany. The measures are broadly based, well documented, and demonstrate an effective link between nature conservation, scientific work, and social engagement.

6.2. Evaluation of the carbon sink

Wilderness International makes the following statement in its external communications:

"A donation of €1 protects 1m² of rainforest and thus permanently binds 60 kg of CO_2 in living biomass."

The derivation of the statement that each square meter binds 60 kg of CO_2 is based on Wilderness International's own measurements in its protected areas and additional comparison with literature values.

Calculation of living above-ground biomass in Peru

Data was collected in 10 x 50 meter plots in six different areas by measuring the circumference of trees at breast height from 31.4 cm, followed by calculation of the diameter of the trees. Tree height and wood density were also determined. Dead trees were also recorded by determining their circumference without calculating wood density and tree height. However, due to a lack of data on changes in wood density during the decomposition process, the dead trees were not included in the evaluation.

In the tropical zone, the ratio of carbon stocks in the soil to vegetation is 1:1 on average. Although underground carbon storage can achieve a similarly high storage capacity as above-ground storage, it is neglected in WI's external presentation. The reasons for this lie, on the one hand, in the uncertain data basis identified by the literature review, which is determined by the difficulty of data collection and the different measurement methods used for soil sampling.

Taking underground carbon storage into account, Broichhagen estimates the potential for carbon sequestration at 149.40 kg CO_2/m^2 [35].

WI's own measurements of above-ground biomass yielded 296.2 t biomass/ha or **54.35 kg CO_2/m^2**. This value is within the range of 39 and 71 kg CO_2/m^2 measured in similar regions using analogous measurement methods.

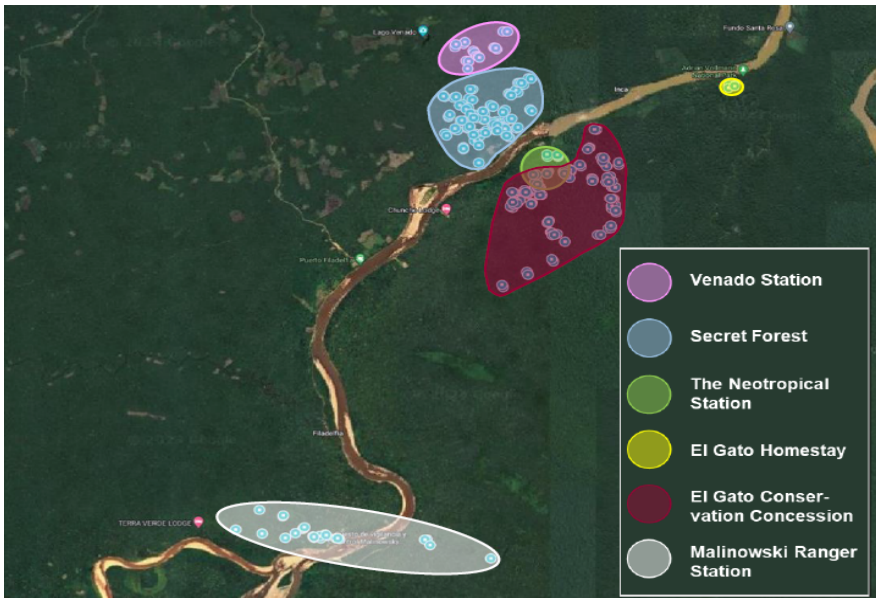

Figure 14 – Measurement points for recording above-ground biomass, divided into areas; (Source: Mirja Sophie Broichhagen)

The calculations were based on the recording of living above-ground biomass by Wilderness International in Canada:

In 2011 and 2012, the diameters of all trees > 10 cm at breast height were recorded on seven test fields (25 m x 25 m) in the Pocher Island protected area. In addition, the crown diameter was calculated and the tree species determined.
The results of the seven test fields varied between 31 and 397 t biomass/ha, depending on the location.
Taking into account the weighting of the field sizes, the average value was determined to be 330 t biomass/ha, which corresponds to 165 t C/ha of living above-ground biomass. 165 t C/ha translates to 606.79 t CO_2/ ha, which corresponds to **60.68 kg CO_2/m²**.

The scientific findings on carbon storage in Peru (Madre de Dios) and Canada (British Columbia) can be summarized as follows:

For Peru (Madre de Dios), values of above-ground CO_2 of **337-353 t CO_2 /ha** or **33.7-35.3 kg CO_2/m²** are reported (Asner et al. (2014) – La Geografía del Carbono en Alta Resolución del Perú and Csillik & Asner (2020) – Remote Sensing of Environment)

For Canada (British Columbia), figures ranging from an average of **500-800 t CO_2/ha** to >2000 t/ha are given for old stands. This corresponds to **50-80 kg CO_2/m²** to >200 kg CO_2/m² (Smithwick et al. (2002); Kurz et al. (2013); BC Forest Carbon Report (2022)).

Interim conclusion: Wilderness International's statement that an average of 60 kg CO_2/m² is stored in its protected areas (equivalent to 600 t CO_2/ha) is fundamentally plausible. It is at the upper end of the typical values for intact primary forests in the tropics and temperate rainforests – and is particularly realistic if, as is the case with WI, 1) old, intact stands are protected, 2) deforestation or degradation is excluded, and 3) a mixed area approach is used for Peru and Canada.

6.3. Evaluation of annual carbon storage capacity

Wilderness International had the living biomass in Canada (protected area on Porcher Island) examined in two consecutive years with the following result: "Based on a comparative biomass determination in 2011 and 2012 at exactly the same locations using the same measurement method and calculation method, an increase of 3.02 t C/ha and thus 1.1% carbon was determined." The calculation is based on Holtermann's thesis (2013) and was presented in Wilderness International's internal paper "Quantification of CO_2sequestration performance in our protected areas." This proves that, contrary to the assumption that primary forests have a balanced carbon balance, the forest under investigation is still growing and continues to absorb and store carbon.

Scientific statements on this:

International studies show that intact primary rainforests still absorb carbon every year, albeit at a decreasing rate:

According to Cook-Patton et al. (2020), primary rainforests can continue to sequester carbon, especially in less disturbed areas. Brienen et al. (2015) come to similar conclusions, but also emphasize that in the Amazon basin, net growth in primary forests has been declining slightly since around 2005, due in part to climate stress and extreme events. Nevertheless, positive net uptake remains in intact areas. According to Cook-Patton et al. (2020) and Brienen et al. (2015, Nature), the average carbon growth in tropical primary forests is

1.0–3.0 t C/ha/year, corresponding to 3.7–11 t CO_2/ha/year (depending on location, degree of disturbance, and climate); [23].

The observed increase at Wilderness International of +3.02 t C/ha/year (= 11.06 t CO_2/ha/year) is within the range of values published by scientists. The value is based on repeated measurements on the same sample areas (2011–2012) and validated calculation methods, which represents a high standard of verification.

Interim conclusion: WI's claim that primary rainforests continue to sequester carbon is research-based and factually accurate. An increase of 3.02 t C/ha/year (11 t CO_2/ha/year) is consistent with research findings for intact primary forests. The reference to Cook-Patton et al. (2020) is correct. WI's decision not to include the increase in its calculations is consistent with a cautious and responsible modeling approach.

6.4. Evaluation of protected areas in Peru in terms of additionality

The following section examines the deforestation risks for WI's protected areas in Madre de Dios, Peru, and assesses their additionality.

The deforestation rate rose nationwide in Peru from 150,279 hectares in 2013 to 203,272 hectares in 2020, and in the province of Madre de Dios from approximately 12,500 hectares in 2013 to approximately 23,000 hectares in 2020. This represents a significant increase in the deforestation rate both nationwide and in Madre de Dios (see Fig. 16).

The causes of deforestation are, in descending order: 1) illegal mining of mineral resources; 2) illegal logging; 3) expansion of agriculture; and 4) urban growth.

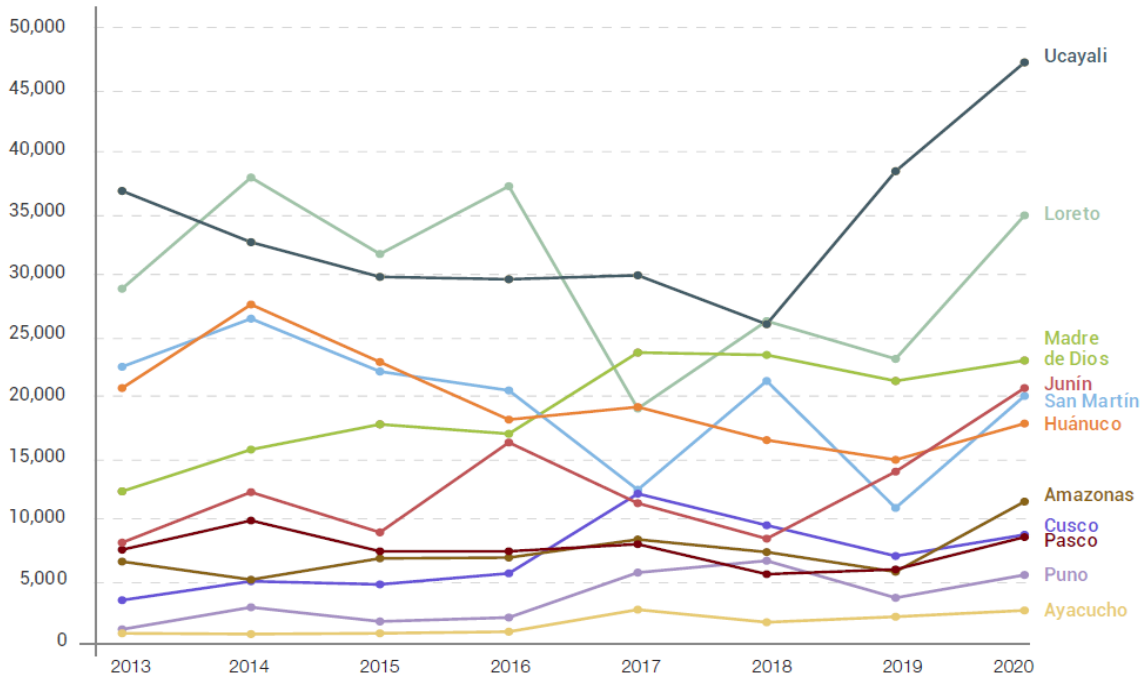

Figure 15 – Development of the deforestation rate in Peru (2013-2020); (Source: "The roots of environmental crime in the Peruvian Amazon")

The rate of deforestation is accelerated by the construction of the Interoceanic Highway, a transcontinental highway completed in 2017 that connects Peru and Brazil. It runs through Madre de Dios and is located approximately 12 km north of WI's protected areas.

From the Interoceanic Highway, the deforested areas extend into the tropical forest in a herringbone pattern (see Fig. 12). According to estimates by forest scientist Kai Andersch (CEO Wilderness International Germany, Director Wilderness International Canada, Land Management), without the purchase of rainforest areas and active protection measures, half of the forest areas protected by Wilderness International would now be deforested.

Figure 16 - Interoceanic highway (top left of the image) and the herringbone-like deforestation. In gray in the middle and below: WI's protected areas in April 2025.

The zone with the highest carbon content, covering a total of 7.9 million hectares, is located in southern Peru (Madre de Dios, Cusco, Ucayali) and southwestern Brazil (Acre). The high carbon storage combined with the highest biodiversity represents an ecological key area of global importance (see Fig. 18).

The Secret Forest area is located not far southeast of the zone with the highest carbon content in Madre de Dios, which is significant for several reasons: Firstly, as an ecological buffer for the core zone with maximum carbon content. Protecting the adjacent area prevents deforestation, fragmentation, or other disturbances from encroaching directly on the highly sensitive core zone. The spatial proximity enables species migration, genetic exchange, and functioning ecosystem processes across area boundaries. This increases the resilience of both the core zone and the Secret Forest to climate change and human intervention.

Even though Secret Forest itself is not located directly in the area of maximum carbon content, its location helps to secure the entire regional carbon store in the long term. The protection of adjacent forest areas reduces the risk of "emissions" from peripheral zones (e.g., through deforestation or degradation).

For Wilderness International, the proximity to an internationally significant carbon and biodiversity zone increases the conservation value and priority of Secret Forest. The area is not isolated, but part of a larger, contiguous conservation complex in the southwestern Amazon region.

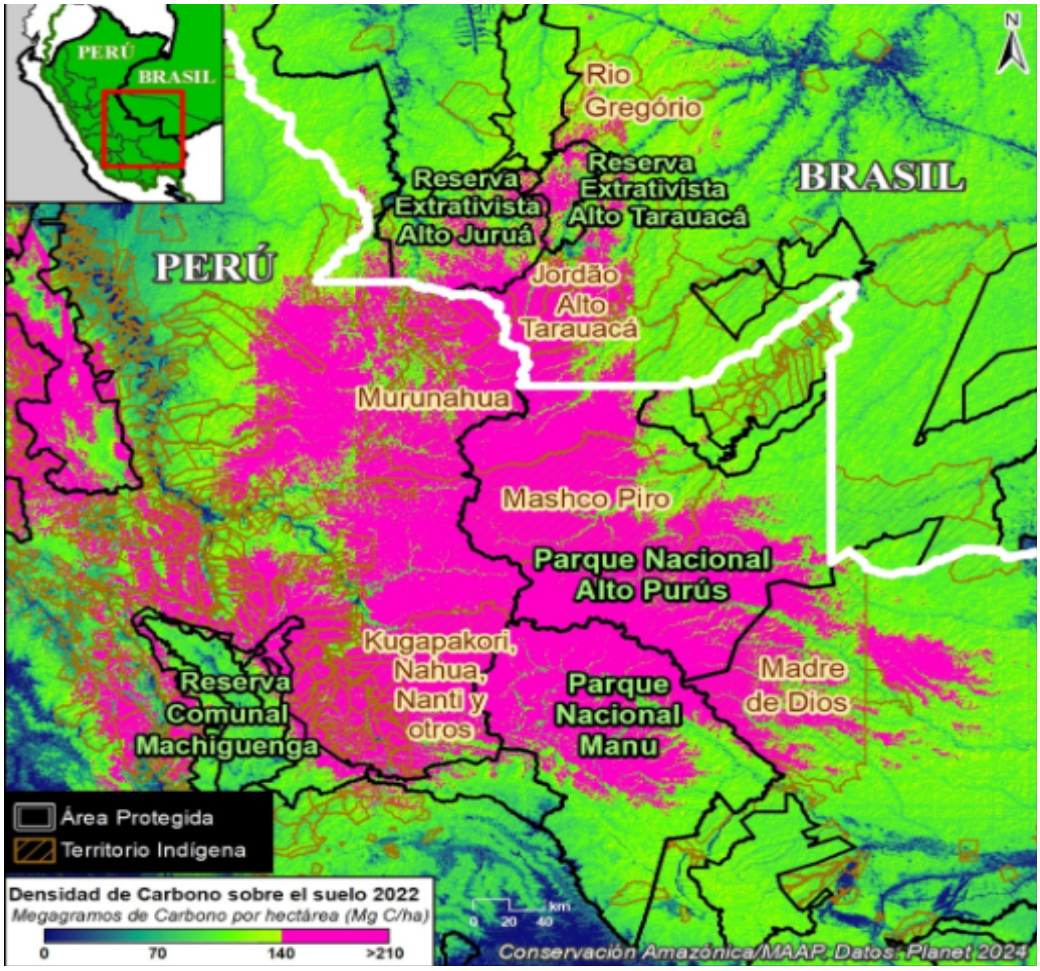

Figure 17 - Zone with the highest carbon content in the southern Peruvian Amazon region; (Source: Planet, SERNANP, RAISG)

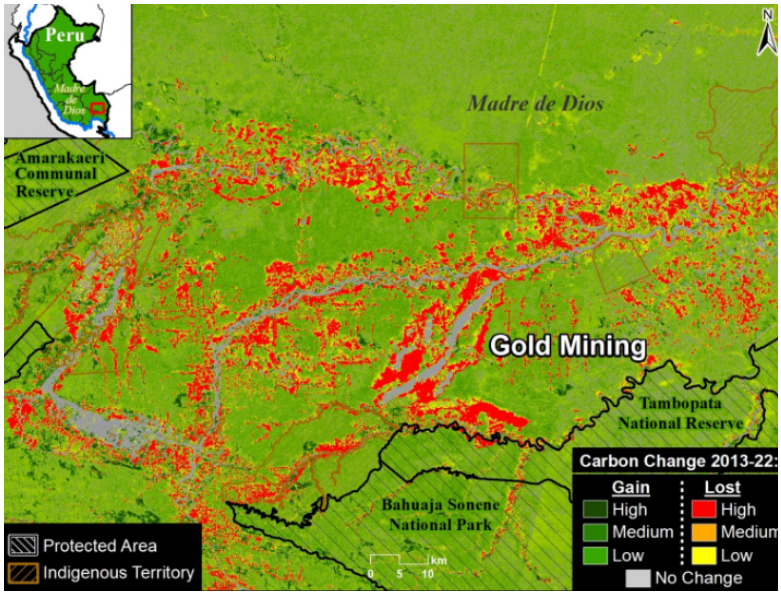

Figure 18 - Carbon loss associated with deforestation due to gold mining in the southern Peruvian Amazon region; (Source: ACA/MAAP, Planet)

Gold mining plays a prominent role in deforestation, destroying not only entire habitats and their biodiversity, but also their carbon stores, thus generating enormous carbon emissions.

The figure shows the large amounts of carbon emissions (more than 7 million tons) associated with deforestation due to gold mining in the southern Peruvian Amazon. Most of the carbon loss in protected areas (and their buffer zones) is likely due to illegal logging.

The study entitled "El aumento de la deforestación en la cuenca del río Madre de Dios, Amazonía peruana, incrementaría la escorrentía superficial y la concentración de sedimentos" (The increase in deforestation in the Madre de Dios river basin, Peruvian Amazon, would increase surface runoff and sediment concentration) from March 2023 examined the hydrological consequences of deforestation caused by gold mining in the Madre de Dios region. The study provides scientifically sound evidence of the extent to which gold mining-related deforestation affects hydrological processes in tropical rainforest regions. Of particular note is the significant increase in erosion, sediment transport, and surface runoff, which threatens the ecological integrity of rivers and adversely affects water quality and biodiversity in the long term [24].

New Peruvian forestry law promotes deforestation and threatens indigenous peoples

On January 11, 2024, the Peruvian Congress passed a new forestry and wildlife law. The law facilitates the conversion of forest areas into agricultural land and retroactively legalizes illegal logging. This poses a significant threat to the Amazon rainforest, the rights of indigenous communities, and global climate goals. International organizations and human rights groups are therefore calling for a review and repeal of the law. Past crimes committed by small farmers, industrial agribusinesses growing palm oil and cocoa, illegal loggers, miners, and drug traffickers who grow coca can be pardoned under the forestry law, and their illegal logging prior to January 2024 will be legalized.

José Francisco Calí Tzay, the UN Special Rapporteur on the Rights of Indigenous Peoples, issued a statement on January 31, 2024, arguing that these changes could also "legalize and promote the expropriation of indigenous peoples from their lands" [25].

Officially, the goal of Law 31973 was to allow the conversion of forest areas for agricultural use in order to create "stability" in the agricultural sector and security for farmers. Small farmers would be among those who would benefit, proponents said.

Proponents say the legislative changes are necessary to protect Peruvian producers and circumvent a new European Union deforestation regulation (EUDR) set to take effect in December 2024 that bans imports of raw materials resulting from illegal logging (as well as legal deforestation after 2020).

José Luis Capella, director of the forestry program and ecosystem services at the Peruvian Society for Environmental Law, says: "Deforestation has not alleviated poverty. This change will not benefit small farmers (who already have no access to international markets) and will endanger the lives of indigenous peoples" [26].

Sigma Earth, a sustainability platform promoting environmental awareness and action, summarized the potential impacts of the law on the environment, indigenous communities, and the climate on April 18, 2025, as follows:

Environmental risks

- **Increase in deforestation:** Without supervision, land grabbing and forest clearing could skyrocket. The public prosecutor's office warns that over 3,000 cases of forest crime could be affected, involving the illegal clearing of 4,000 hectares.
- **Expansion of agricultural land:** The area of palm oil plantations, which are known to be responsible for deforestation, has exploded from 15,000 hectares in 2000 to 108,000 hectares in 2019. The change in the law could further boost this growth and favor the agricultural industry over the forests.
- **Illegal deforestation:** Up to 80 percent of Peruvian timber is harvested illegally. The law could encourage loggers, miners, and coca farmers to fear little punishment.

Threats to indigenous communities

- **Indigenous land at risk:** Indigenous territories have already lost 276,000 hectares of forest in the last ten years. Communities such as Unipacuyacu (23 percent of their land) and Catoteni are facing increased threats.
- **Lives in danger:** Environmentalists are being targeted. In 2023, indigenous leaders Quinto I-numa and Benjamín Ríos were killed for opposing deforestation linked to coca and logging.
- **Rights violated:** The Interethnic Association for the Development of the Peruvian Rainforest (AIDESEP) strongly criticized the law, stating that it poses a "serious threat to indigenous peoples and will encourage large-scale deforestation." The UN Special Rapporteur on Indigenous Peoples, José Francisco Calí Tzay, warned that it could ***"legitimize and promote**" **land grabbing***.

Impact on the climate

- **Carbon losses:** In 2019, land use changes, mainly deforestation, accounted for 48% of Peru's greenhouse gas emissions (210,404 gigagrams of CO_2 equivalent). More clearing means more carbon is released and less is absorbed.
- **Global implications:** The Amazon's role as a climate regulator is irreplaceable. A loss of this role could exacerbate droughts, heat waves, and floods worldwide and undermine Peru's commitments under the Paris Climate Agreement and agreements with countries such as Norway and Germany [27].

Interim conclusion: The Tambopata region, where Wilderness International is active, is characterized by proven high deforestation pressure. Within seven years, there has been a significant increase in deforestation both nationwide (from 150,279 hectares in 2013 to 203,272 hectares in 2020) and in Madre de Dios (from 12,500 hectares in 2013 to approximately 23,000 hectares in 2020). The causes of deforestation are, in descending order: 1) illegal mining of mineral resources; 2) illegal logging; 3) expansion of agriculture, and 4) urban growth. The Interoceanic Highway near the protected areas and the deforestation of the surrounding rainforests by farmers pose a direct threat to Wilderness International's protected areas. In addition, the nationwide pressure for deforestation is intensified by the Peruvian Forestry Law of January 1, 2024.

Gold mining takes place in close proximity to WI's protected areas along the Tambopata River and, to a particularly large extent, along the Malinowski, Madre de Dios, and Huaypetue rivers. The Río Huaypetue mine on the Huaypetue River is a large open-pit mine in southeastern Peru for gold extraction in the Cusco region and near the border with the Madre de Dios and Puno regions. It has been estimated that at the peak of production in 1998, approximately 2% of the world's annual gold production came from Huaypetue [28). Wilderness International's protected areas are ecologically and geographically part of the same larger Amazonian landscape as the areas threatened by gold mining. Impacts on protected areas from gold mining may include the fragmentation of forest areas, rivers, and animal migration routes (e.g., through restricted genetic exchange among flora and fauna) or the release of mercury and sediments from mining sites downstream into rivers and tributaries, polluting waters that are also habitats for species in the protected area.

Due to the political involvement in gold mining in Madre de Dios and the high global price of gold, a decline in gold mining is not expected in the foreseeable future.

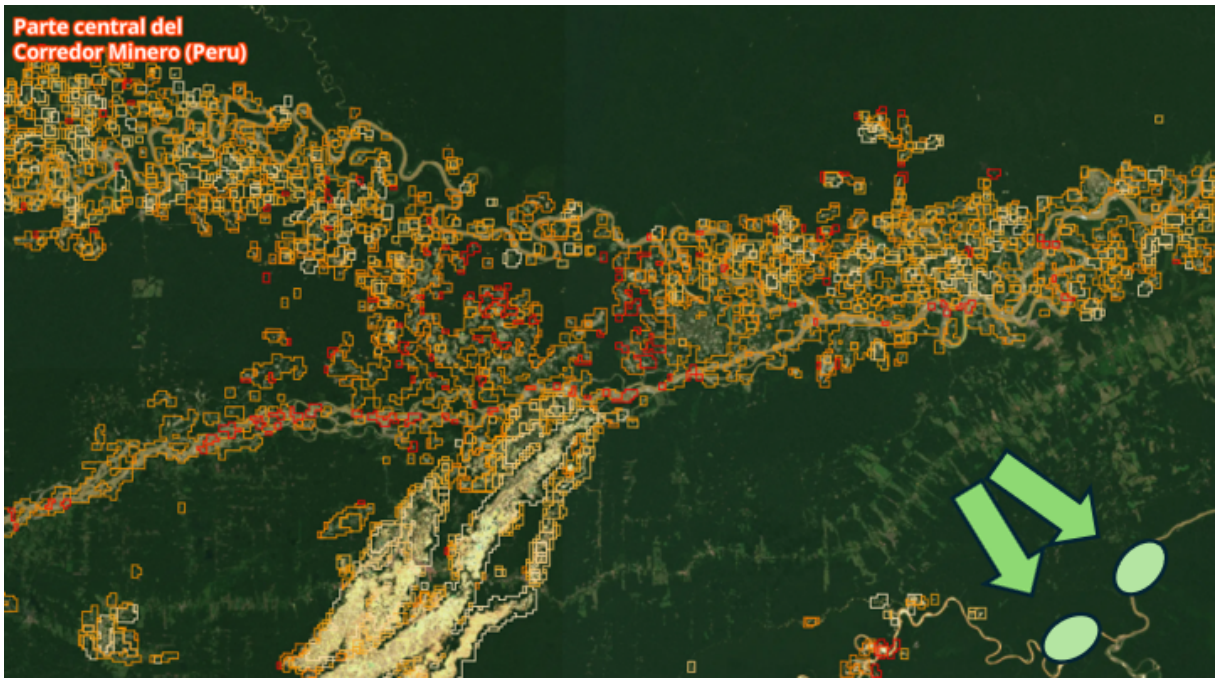

Figure 19 - The central part of the Peruvian mining corridor: intensive mining activities since 2018 on a total of 47,000 hectares. Gold mining activities in 2023 and 2024 in dark orange and in 2025 in red. WI protected areas at bottom right in light green; (Source: Amazon Minig Watch https://amazonminingwatch.org)

North of the WI protected areas, starting from **the Interoceanic Highway,** the tropical forest is threatened by **deforestation** and **expanding agriculture** as farmers encroach on the primary forest.

In addition, the Amazon rainforest is threatened by the new **forestry and wildlife law** passed by the Peruvian Congress on **January 11, 2024**. The law facilitates the conversion of forest areas into agricultural land and retroactively legalizes illegal deforestation. This new political legislation poses a **significant threat to the Amazon rainforest**, the rights of indigenous communities, and global climate goals.

Interim conclusion: Due to the complex drivers of deforestation in Madre de Dios, and especially in the immediate vicinity of WI's protected areas, the additionality of the tropical forest protection project has been demonstrably proven. Without the purchase, protection, and diverse activities (concession areas, area control through regular patrols, agroforestry and school projects, etc.), it can be assumed that the protected forest areas would no longer exist at this point in time or in the coming years.

6.5. Evaluation of protected areas in Canada with regard to additionality

Deforestation threats to Wilderness International's protected areas on Porcher Island and in the Toba Valley, British Columbia, and consideration of additionality

Deforestation

British Columbia (B.C.) is one of the world's largest exporters of wood products – from wood pellets and pulp to biofuels.

Tens of thousands of hectares of ancient forests are cleared every year in B.C., resulting in an enormous climate and environmental footprint. Over the past 150 years, 75% of the original productive old-growth forests on the south coast of British Columbia – Vancouver Island and the southwestern mainland – have already been cleared, including over 90% of the valley floors where the largest trees grow [29].

From 2021 to 2024, 96% of the tree population in natural forests was lost in British Columbia. The total loss within the natural forest was 3.20 million hectares, equivalent to 1.27 Gt CO_2e emissions [30].

The latest satellite-based studies from BC show that, despite announced protection mechanisms, massive amounts of old-growth forests have been cleared since 2020 – about 31,800 ha in just three and a half years, around 50% more than the province reported [31].

Carbon storage capacity

Until 2002, British Columbia's forests acted as a carbon sink. Within 10 years (2003-2012), the forests have gone from being a carbon sink to a carbon source. The causes of this result are logging, forest fires, slash-and-burn practices, and the reduced carbon storage capacity of B.C.'s forests.

In contrast, in the previous 10 years, from 1993 to 2002, B.C.'s forests were still a net carbon sink, absorbing 441 million tons of carbon dioxide. During this period, British Columbia's forests absorbed the equivalent of 70 percent of the province's cumulative official emissions (629 million tons of carbon dioxide) [32].

Between 2012 and 2021, negative trends continued: a sharp increase in fires, insect infestations, and deforestation led to a significant increase in carbon emissions – since 2010, B.C. has dominated as a source of CO_2 [33].

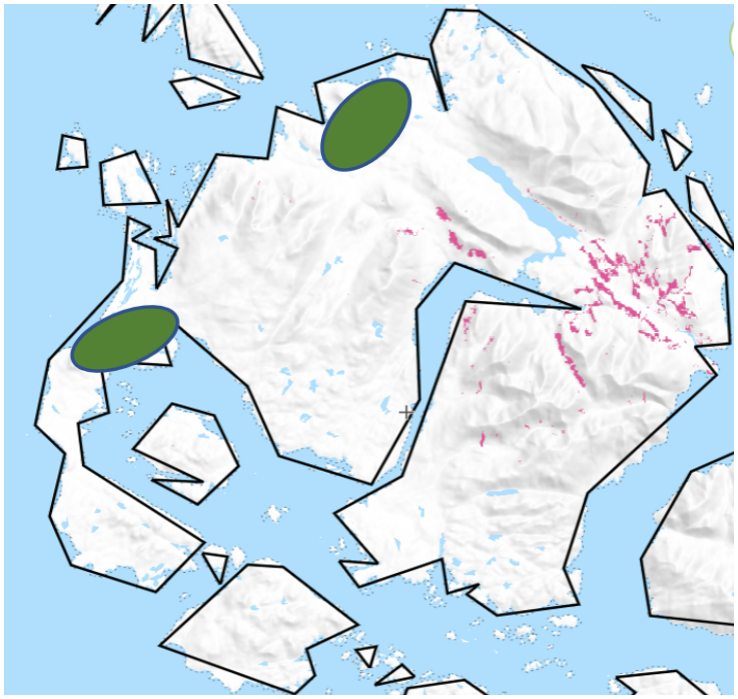

Figure 20 – Porcher Island: Regions in GREEN (own representation) where WI's protected areas are located. Deforestation in PINK; (Source: Forest Watch, 2025)

Porcher Island

Porcher Island is located about 40 km south of Prince Rupert in the Pacific rainforest of British Columbia. The island is home to large areas of old-growth coastal rainforest, including hemlock, western red cedar, and yellow cedar, as well as nutrient-rich wetlands.

Porcher Island was historically **very sparsely populated**, with small settlements around Oona River, Humpback Bay, and others.

Industrial logging is **not extensively documented** there. There is evidence of early sawmill use in Oona River, but no large-scale clear-cutting as on the mainland.

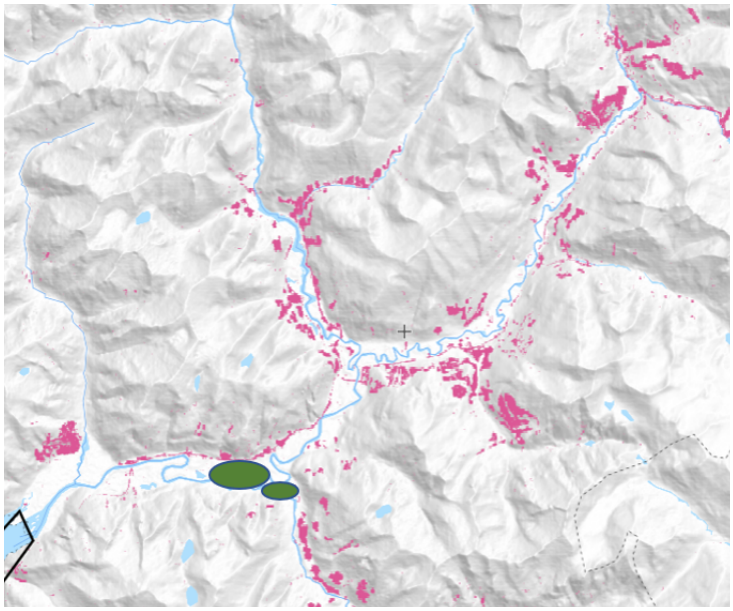

Figure 21 – WI protected areas in Toba Valley (GREEN) in the Powell River Regional District in British Columbia. Forest loss (in PINK) surrounding the rivers; (Source: Global Forest Watch, 2025) Protected areas: Own re-

Toba Valley

Since 2012, Wilderness International has been purchasing land in the Toba Valley, a coastal mountain range in western Canada, 160 kilometers north of Vancouver City. The purchased land will be used to create a **protected grizzly bear corridor**.

While the Vancouver Island region is often the focus of attention due to its ancient rainforest, the **mainland side** of rivers such as the Brem River also shows **intense remnants of historical logging structures** (see below in ROSA). The ecological consequences, especially for fish and riparian ecosystems, can be significant when deforestation occurs along riparian zones.

Critics and Indigenous groups are calling for significantly stricter protection buffers and the enforcement of existing regulations. In the 1960s–1980s, intensive logging along the Brem River led to serious ecological damage, including significant erosion changes and sharp fluctuations in river levels. By 1984, large sections of the riverbank had been severely damaged, and there were regular losses of spawning grounds due to the unstable river course [34].

The risk of deforestation in the Brem River area is mainly influenced by historical activity and is currently relatively low compared to the rest of British Columbia – however, there is a latent threat of instability due to past interventions. In the larger context of British Columbia, logging pressure, flooding, landslides, and storm damage have increased significantly. The Brem River currently benefits from being a less acutely endangered area, but could be indirectly affected by adjacent activities.

Overall, it can be said that there are no public, detailed annual forest loss statistics available for smaller areas such as Porcher Island, Calvert Island, Read Island, and Toba Valley. WI reports that deforestation activities have expanded in recent years to the immediate vicinity of their protected areas (see Figs. 22 and 23).

Figure 22 – Industrial logging near Porcher Island in June 2024.

Figure 23 – Logging activities on Calvert Island in July 2023

Interim conclusion: British Columbia is home to the world's last large contiguous area of temperate rainforest. Timber production is a traditional and very important industry with an influential and financially powerful lobby. In contrast, the political influence of Canadian NGOs working to protect the last wilderness areas is minimal. Only about 25% of the original temperate rainforest area remains in Canada. These last areas are threatened by logging companies, agricultural corporations expanding farmland, urban sprawl, construction and infrastructure, and Canada's withdrawal from the Kyoto Protocol. As the threat to the Wilderness International protected areas of Porcher Island, Calvert Island, and Toba Valley on Read Island has intensified in recent years, the additionality is clear in view of the sharp increase in logging pressure in British Columbia.

7. Corporate commitment to rainforest conservation – benefits and added value

From a purely economic perspective, investing in rainforest conservation serves companies' long-term resilience and economic viability.

The following added value for the economy can be attributed to rainforest conservation:

1. Rainforest conservation promotes **climate stability**. This is the basis for **economic planning**, as climate stability is crucial for long-term investment security and raw material supply.

2. Rainforest conservation **minimizes risk in global supply chains,** as deforestation leads to regulatory, reputational, and operational risks (e.g., supply chain laws, boycotts).
   The creation of deforestation-free supply chains reduces risks for companies (e.g., through ESG ratings, investor requirements, etc.).

3. Rainforest conservation **safeguards ecosystem services**, as rainforests regulate water and nutrient cycles, stabilize soils, and ensure the functioning of regional agriculture. Without these services, there is a risk of production losses in agriculture, energy, and water sectors.

4. Rainforest conservation **avoids economic follow-up costs**, as the economic damage caused by climate change, drought, erosion, and species loss costs billions. Protecting rainforests is therefore more cost-effective than repairing this damage.

5. Rainforest conservation enables **sustainable resource security**, as many medical, chemical, and agricultural innovations are based on biological diversity – especially in tropical forests. Conservation ensures long-term access to genetic resources and bio-based innovations.

6. Rainforest protection creates **competitive advantages through sustainability,** as companies with credible rainforest protection measures strengthen their brand and market position. Consumers and investors are aware of these activities by companies and increasingly prefer companies that operate responsibly.

7. **Compliance with national and international regulations** is facilitated or made possible by rainforest protection. Laws such as the EU Deforestation Regulation (EUDR) or the German Supply Chain Due Diligence Act require deforestation-free products. The protection of rainforests thus becomes a legal obligation for companies with a global procurement strategy.

8. Rainforest protection **strengthens global partnerships and stability**. Cooperation on forest protection (e.g., through conservation projects, technology transfer, renaturation projects, etc.) generally improves international relations. Furthermore, protecting rainforests provides a common goal for states, organizations, and civil society, which companies can support through cooperation. This cooperation in turn contributes to stabilizing political conditions, securing economic relations, conserving global resources, promoting social justice, and ensuring global supply capabilities.

9. Rainforest conservation enables **access to climate finance and subsidies**. Projects to protect rainforests are eligible for public and private climate finance (e.g., through REDD+, Green Climate

Fund). Companies can also benefit from funds from the Green Climate Fund (GCF), the world's largest multilateral climate fund, as well as from bilateral initiatives such as the German government's International Climate Initiative (IKI). These funds particularly support projects that have both ecological and social impacts. International development banks such as the World Bank, the Inter-American Development Bank (IDB), and KfW Development Bank finance numerous projects in tropical forest regions, for example, to protect biodiversity, promote sustainable land use, or strengthen indigenous communities.

The following section takes a closer look at how companies can use and communicate their activities for tropical forest protection both in the context of **legal reporting requirements** and for numerous **voluntary reporting** and disclosure options. There are several ways for companies to strategically position their biodiversity management, depending on whether it is to be used for legal reporting, for investors, or in public communications.

The following areas are relevant for reporting on tropical forest conservation or can be used for this purpose:

The **CSRD (Corporate Sustainability Reporting Directive)** and the **ESRS standards**, in particular **ESRS E4 "Biodiversity and Ecosystems**," form the central basis for **mandatory reporting in the EU.** In specific cases, e.g., when tropical forest conservation is related to economically relevant activities, the **EU taxonomy** may also play a role, particularly for classifying taxonomy-eligible activities under the environmental objective "biodiversity."

If a company wants **to report on biodiversity in its own supply chain**, established sustainability standards such as the new **GRI 101: Biodiversity**, the **CDP framework** (especially on forests and biodiversity), the **TNFD framework** (for nature-related risks and opportunities), and **ISO 14001** as a basis for environmental management systems that integrate supply chain aspects.

For **conservation projects outside the supply chain**, such as financing tropical forest conservation through partnerships or voluntary contributions, there are also several options: The GRI standard allows reporting on so-called "positive impacts," even outside of a company's own activities. CDP and TNFD also recognize such contributions. In addition, they can be credited as part of **B Corp certification** or thematically located and communicated under **SDG 15 "Life on Land**."

There are two established instruments in particular that are suitable **for certifying environmental responsibility**: the international environmental management standard **ISO 14001**, which systematically maps voluntary environmental goals and measures, and **B Corp certification**, which recognizes environmental performance as part of a holistic assessment of socio-ecological corporate management.

, companies can use tropical forest conservation on several levels—regardless of whether the conservation takes place within or outside the supply chain. The key is to embed it in a structured reporting system, credible communication, and, if necessary, a partnership with verifiable, impact-oriented projects.

The following questions provide initial guidance on **the areas** in which corporate activities can be used to protect tropical forests:

Does tropical forest protection fall **within the scope of your own production or procurement**?

→ Applicable to CSRD/ESRS, EU taxonomy or CDP, if applicable

Is there **no direct connection to the supply chain**, but a clear impact?

→ Applicable to contribution claims + voluntary reporting formats (GRI, TNFD, B Corp.)

Are there **strategic goals** (e.g., CO_2 sequestration, reputation, ESG)?

→ Applicable as a combination of reporting, claims, and communication strategies

Is there already an **environmental or sustainability management system in place**?

→ Applicable as direct integration of the project (ISO, EMAS, environmental program)

Examples of applications for tropical forest protection **outside the supply chain** can be found by companies

→ according to **GRI 101** (Disclosure 101-1 and 101-6) as a positive effect outside the value chain

→ be specified in **the CDP questionnaire** as a biodiversity measure (F6.12a: Offsetting)

→ Included in **the B Corp Assessment** as an environmental contribution in the "Environmental Stewardship" category

→ be positioned as a strategic commitment to nature via **TNFD** or **SDG reporting**

The following is a brief overview of the instruments, frameworks, and reporting relevant to the protection of biodiversity and tropical forests:

CSRD / ESRS (in particular ESRS E4 – Biodiversity)

The Corporate Sustainability Reporting Directive (CSRD) requires large and capital market-oriented companies in the EU to report on sustainability in accordance with the European Sustainability Reporting Standards (ESRS) from 2024 onwards. **ESRS E4 (biodiversity and ecosystems)** is particularly relevant to tropical forest conservation. Companies must disclose both direct and indirect impacts on biodiversity and may also report voluntary contributions – such as conservation projects in tropical forests outside the supply chain – provided these are embedded in the overall strategy.

EU taxonomy

The EU taxonomy classifies economic activities according to their environmental impact and thus represents a tool for promoting sustainable investment. The protection of tropical forests does not fall directly under a specific activity, but can be considered under **environmental objective 6**, **"Protecting and restoring biodiversity and ecosystems."** This means that companies can report on tropical forest protection if they 1) themselves carry out or finance an activity that is considered taxonomy-eligible (e.g., forestry, biodiversity projects); 2) this activity demonstrably makes a significant contribution to environmental goal 6; 3) at the same time, it does not cause "significant harm" to other environmental goals (DNSH criteria) and 4) minimum social protection standards are complied with (e.g., ILO core labor standards).

Contribution Claim Approach

The contribution claim is a voluntary communication approach that allows companies to disclose their contributions to environmental or climate protection without having to claim that they have fully offset their emissions. Tropical forest conservation measures can be credibly presented here as **a** "**contribution to the preservation of biodiversity and carbon** sinks" – e.g., by **financing forest conservation projects with documented impact.** This approach is particularly suitable for companies that want to expand their responsibility without getting caught up in compensation debates. It is reputation-safe and compatible with international reporting formats such as GRI or SDGs.

GRI 101: Biodiversity

The Global Reporting Initiative (GRI) enables companies to systematically report on their impact on biodiversity. The new **GRI 101: Biodiversity (2024)** standard, which will become mandatory for CSRD users from 2026, also explicitly provides for reporting on "**positive contributions outside the organization's own supply chain**." GRI 101: Biodiversity 2024, Draft Disclosure 101-1 states the following relevant passage: "The reporting organization may also report on positive impacts on biodiversity and the actions it takes to prevent or reverse biodiversity loss, even if these occur outside the organization's value chain." Companies can thus make **land purchases for tropical forest protection, partnerships with NGOs, or educational work in protected areas** transparent as "positive impacts." The GRI standards are among the most internationally recognized frameworks for sustainability reporting.

CDP (Climate Disclosure Project)

The CDP offers companies a structured framework for reporting on biodiversity risks, natural capital, and voluntary contributions. Tropical forest conservation can be specified in the CDP questionnaire as a *biodiversity-related project* or *offsetting measure*, particularly in sections F6.12a (Project Type: **Biodiversity Offsetting**) or as "**Engagement outside of the value chain**." CDP reports are particularly relevant in the capital market and for ESG ratings and are increasingly being used by investors as a basis for evaluation.

TNFD (Taskforce on Nature-related Financial Disclosures)

TNFD is a voluntary framework for disclosing nature-related risks, opportunities, and dependencies. Companies can use it to present tropical forest protection as part of their **approach to environmental risks** (e.g., biodiversity loss) or as a strategic opportunity (**"Nature Positive** Opportunity"). Although TNFD is currently voluntary, the framework is expected to become relevant for regulatory purposes in the medium term, particularly in the context of EU reporting requirements and financial market transparency.

B Corp certification

B Corp certification assesses companies holistically in the areas of environment, social, employees, public welfare, and governance. Tropical forest protection can be credited here in the area **of "Environmental Stewardship & Circularity**," even if the measure takes place outside the operational supply chain. This option is particularly attractive for impact-oriented companies, as it allows them to credibly certify their impact and responsibility—also with regard to partnerships with conservation projects or environmental organizations.

SDG reporting (Sustainable Development Goals)

Reporting on contributions to the UN Sustainable Development Goals (SDGs), in particular **SDG 15: Life on Land**, allows companies to position their tropical forest protection in a global context. Contributions such as protected area financing, educational projects, monitoring of forest ecosystems, or partnerships with indigenous groups can thus be made visible. This is often done through SDG mapping in sustainability reports, websites, or stakeholder dialogues.

ISO 14001 (environmental management systems)

Within an ISO 14001-certified environmental management system, companies can document voluntary environmental performance, provided it is integrated into their environmental goals and programs. Tropical forest protection—for example, through **the financing of conservation projects or**

partnerships—can be listed here as **a supplementary contribution to environmental improvement**, even if there is no direct supply chain connection. Integration increases the credibility of the commitment in the context of a structured management system.

NGO partnerships

Companies can document their tropical forest protection activities through project-based partnerships with recognized environmental organizations. These measures can be incorporated into **sustainability reports** as well as **CSR communications** or **compliance documentation**. Particularly in conjunction with impact measurement (e.g., protected area, CO_2 sequestration, species monitoring), such partnerships offer high credibility and stakeholder acceptance.

Nature-based solutions (NbS)

Investments in nature-based solutions such as reforestation, renaturation, or **protection of primary forests** can be presented as **strategic biodiversity measures in sustainability strategies**. These solutions are considered highly effective in combating climate change and species extinction at the same time. Companies can report on these contributions via **SDGs, CDP**, or **TNFD**, supplemented where necessary by monitoring and verification approaches such as satellite-based monitoring, reporting, and verification systems (MRV systems).

Compliance with the EU taxonomy

As a classification system for "green" investments, the EU taxonomy is an important instrument of the "Sustainable Finance" action plan adopted within the European Green Deal. The aim of the taxonomy is to steer future investments toward sustainable economic activities and thus make an important contribution to achieving climate neutrality by 2050.

Since January 1, 2022, the EU taxonomy has been mandatory for public-interest entities with more than 500 employees that fall under the Non-Financial Reporting Directive (NFRD), financial market participants, and companies that offer financial products. The sustainability of each company's entire business activities must be reported annually, usually as part of the sustainability report or annual report. The reporting requirements are intended to create transparency and help investors make informed decisions about sustainable investments.

Under the EU Taxonomy Regulation, tropical forest protection is considered a potentially environmentally sustainable economic activity, particularly under **environmental objective No. 6: protecting and restoring biodiversity and ecosystems.**

Tropical forest conservation contributes to environmental goal 6 with the following criteria:

1. Prevention of further deforestation and fragmentation
Securing and managing existing tropical forests protects the habitats of endangered species and preserves functional ecosystem services such as water regulation, carbon sequestration, and erosion control.

2. Preserving ecosystem-based resilience
Tropical forest conservation increases resilience to climate risks and natural disasters (e.g., through flood prevention, temperature regulation, climate stabilization).

3. Restoration of damaged forest ecosystems

Measures such as reforestation with native species, renaturation of degraded areas, or rewetting can be considered restoration measures. In this way, tropical forest conservation directly supports biodiversity and ecological balance.

8. Proposals for process improvements to further develop the projects

Wilderness International already has a strong foundation of effective projects and innovative processes. The continuous development of processes and projects is part of the organization's strategic planning, such as the integration of moorland research into biodiversity monitoring; the expansion of the community agroforestry project with continuous monitoring of the comparison areas; the development of tree canopy research; and the expansion of monitoring activities, e.g., to include the topic of water (source: PDF document "Research and Science Communication," internal WI document).

Many ideas that could improve certain processes and thus the desired effects already exist, but there are limited resources available to implement them effectively. It should be emphasized that although Wilderness International consists of a highly motivated team, some of its members are working at full capacity and are under increasing pressure due to the foundation's strong growth.

Based on the experiences gained and interviews conducted on site in Peru, as well as the documents provided, a number of potential approaches for the further development of Wilderness International's existing processes and projects are proposed below. Some recommendations may already be known or in the process of being implemented, while others may serve as new impetus for further optimization.

Centralized GIS data platform & web GIS structures

The structured collection, management, and communication of spatial data is a central basis for effective nature and climate protection. Wilderness International has already taken the first steps in this direction: protected rainforest areas in Peru and Canada can be viewed on an interactive online map via the website. Users of can gain a clear and comprehensible insight into the location and size of the permanently protected areas via geocoordinates, aerial photographs, and digitally generated certificates.

This publicly accessible map service primarily serves to **ensure transparency for donors and sponsors**, thus fulfilling an important communicative function. The visualization is based on real geodata, but its functionality and integration are currently limited to purely static information purposes. It is not yet a fully-fledged **web GIS platform**, as would be required for operational planning, environmental analyses, or scientific evaluations. Likewise, **expandable GIS structures** such as layer management, temporal change analyses, user profiles, or interfaces to other data systems (e.g., universities, AI platforms, or public authorities) are currently lacking.

For strategic further development, it is recommended to set up a **centralized, modularly expandable GIS data platform** with a browser-based user interface. This should make it possible to provide internal and external actors—e.g., scientific partners, local stakeholders, or project staff—with up-to-date, differentiated geodata in a structured form. The platform could bundle data from various sources, e.g., GPS-based protected area boundaries, drone images, eDNA measurement points, vegetation indices, CO_2 sequestration models, or monitoring data from forest rangers. The integration of such information offers added value not only for operational management, but also for research, education, reporting, and impact communication.

Recommended technical measures:

- Establishment of a scalable web GIS infrastructure based on open-source solutions such as **GeoServer**, **QGIS Server,** or commercial tools such as **ArcGIS Online**
- Implementation of **layer-based map management** with interactive analysis tools
- Integration of **time-dynamic data**, e.g., for visualizing changes due to protective measures or climatic factors
- Definition of **access rights and user roles** for different partner groups
- Integration of **OGC-compliant interfaces** (e.g., WMS, WFS) for long-term interoperability with external data sources

In the long term, this platform can also form the basis for **open APIs** (see next chapter), through which universities, for example, can automatically access biodiversity or remote sensing data. Models such as the **Forest Atlases** of the World Resources Institute show how such systems can contribute to improving forest protection, monitoring, and governance at the international level.

The further development into a comprehensive GIS platform is therefore a **logical and effective next step** in order to make targeted use of Wilderness International's existing data resources, increase operational efficiency, and ensure connectivity to scientific and technological developments in the environmental sector.

Open APIs (application programming interfaces) to promote research and cooperation

A key approach to the further development of Wilderness International's projects is the creation **of** open, standardized **application programming interfaces (APIs)** that allow authorized external partners such as universities, research institutions, and technology service providers to automatically access project-related data without having to manually request or download it. Open APIs not only enable efficient data exchange, but also deeper integration into scientific networks and digital analysis tools.

Existing collaborations with universities – such as with ETH Zurich in the field of drone-based eDNA collection – show that scientific partners have a strong interest in comprehensive, structured, and interoperable data sets. APIs can replace the manual transfer of data or ad hoc requests in the long term with a transparent, reusable system.

International best practice examples demonstrate the added value of such interfaces in the context of the environment and biodiversity. The **Global Biodiversity Information Facility (GBIF)** platform provides globally standardized biodiversity data via a publicly documented API (now with over 2 billion data sets from over 100 countries). These are actively used by researchers, policymakers, and conservation organizations (GBIF, 2025). Another example is the **Global Forest Watch** platform, which offers interfaces that can be used to automatically query and analyze data on forest loss, biomass, and land use (GFW, 2024).

An API system from Wilderness International could, for example, make the following data accessible:

- Geographic information on protected areas (polygon and metadata)
- Time series on carbon sequestration, species occurrence, or soil moisture
- Results from drone and sensor data analyses (e.g., eDNA, multispectral images)
- Education and impact data from the school and agroforestry initiative

In addition, a well-documented API also opens up the possibility of establishing partnerships with data-driven environmental platforms, citizen science projects, or AI startups that rely on such interfaces. Technical openness and standardization of environmental data is also becoming increasingly important in the context of **open science** and EU-wide research funding programs (e.g., Horizon Europe).

The development and publication of open APIs can significantly increase the **impact, visibility, and connectivity** of Wilderness International's projects, with a comparatively manageable implementation effort.

Strategic project planning and prioritization

Many projects arise from specific local needs, new partnerships, or innovative impulses. The focus is often on operational implementation.

The introduction of a standardized project evaluation and prioritization system, e.g., based on impact potential, resource efficiency, and strategic relevance, can achieve better resource allocation, avoid redundancies, and enable clearer external communication.

In addition, the development of a multi-year project portfolio can promote a balance between innovation and stability.

Project expansion and resource development

Many projects, such as environmental education and agroforestry projects, are effective and achieve their goals, but are difficult to scale up with the current staffing levels. In particular, the changing requirements of WI's increased growth mean that resources lack adaptability.

WI's goal of expanding the agroforestry project to other families and communities shows that increased and continuous communication and presence are necessary. The expansion of school projects to new regions also requires a significantly higher level of work, which necessitates an increase in personnel capacity.

Monitoring the success of the agroforestry project

Although projects are being implemented with commitment, the performance monitoring of some projects could be improved. Taking the agroforestry project as an example, information about the processes and their effects is essential for both WI's project management and the farmers. Farmers should be given the opportunity to enter relevant data for project controlling, such as planting time, frequency and amount of irrigation and fertilization, themselves. Data on production volume, financial support, and sales revenue are also essential for managing and improving the agroforestry project.

Enlargement and consolidation of protected areas

The protected areas in Peru and Canada consist of several separate areas. It is important that the ecosystem services of these areas are secured in the long term by integrating them into the largest possible protected forest region. This would also fundamentally improve the influence and control over larger forest areas and the achievement of WI's goals. The purchase of neighboring forest areas or the creation of additional leased areas, which enable previously fragmented areas to be consolidated into larger, contiguous units, is a measure that contributes to the scaling of climate and biodiversity protection.

Building trust and presentation skills in the "WIPerú Educa" school project

Cooperation with local institutions or the local population is only possible if there is mutual trust on both sides.

For the successful implementation of school projects, it is essential to build a sustainable relationship of trust with decision-makers at the schools. A confident manner and the ability to appropriately identify and take into account the individual circumstances, challenges, and needs of the school partners are key to this. Younger or less experienced project staff in particular need targeted support in this

regard. It is recommended that experienced representatives—for example, from the board of Wilderness International or Fauna Forever—brief these staff members in advance and accompany them on site several times during the initial discussions with schools. Such structured support can significantly improve the quality of project acquisition and contribute to the development of lasting trust.

9. Proposals for measuring and visualizing forest ecosystem services and changes therein

1. Integration of satellite-based remote sensing and LiDAR for area-wide forest structure and degradation analysis

It should be noted that Wilderness International has already carried out LiDAR flights and that further LiDAR missions are planned in principle. However, the possibilities are limited by financial, human, and technical resources, particularly in the area of data evaluation. The fundamental advantages of an integrative multi-sensor approach are highlighted below. The combination of optical and radar-based satellite data with LiDAR measurements and the resulting possibility of using complementary data sets leads to a more robust assessment of ecological parameters, which can represent added value for Wilderness International.

To expand existing drone-based remote sensing, it is recommended to integrate high-resolution satellite image data (e.g. Sentinel-2, Landsat 8/9) and airborne LiDAR (Light Detection and Ranging) data to be integrated in order to detect changes in vegetation cover, forest structure, biomass, and potential degradation across large protected areas. While drones provide selective and short-term insights, multispectral satellite data with a high temporal repeat rate (e.g., every 5–10 days for Sentinel-2) enable long-term, continuous monitoring at high spatial resolution (up to 10 m). LiDAR supplements this data with vertical structural information, allowing for a more accurate estimate of above-ground carbon storage, which is particularly relevant for assessing climate protection services. Studies show that the combination of satellite data and LiDAR can make a decisive contribution to the detection of forest loss, fragmentation, and illegal use, especially in tropical and boreal ecosystems (Asner et al., 2009; Pflugmacher et al., 2021). In addition, freely accessible data platforms such as Google Earth Engine support the analysis of large-scale time series and integration with local monitoring data from Wilderness International.

Sources:

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Expansion of the indicator set to capture multiple ecosystem services

In order to be able to assess the overall condition and benefits of protected areas more comprehensively, it is recommended that Wilderness International's existing indicator system be expanded to include additional dimensions of key ecosystem services. While the focus has so far been strongly on carbon sequestration and biodiversity, in future regulatory services (e.g., water purification, erosion control), supporting services (e.g., soil formation, nutrient cycles), and cultural services (e.g., educational value, spiritual significance) should also be systematically recorded. The MAES concept of the European Environment Agency and the international Biodiversity Indicators Partnership (BIP), which provides concrete indicators on habitat change, fragmentation, water quality, and socioeconomic impacts, offer guidance frameworks (EU MAES, 2014; UNEP-WCMC, 2022). The methodological implementation can take the form of an expanded assessment grid for monitoring sites that integrates qualitative and quantitative data. For example, water

quality could be recorded through regular sampling, fragmentation levels could be analyzed using GIS, and cultural services could be assessed through local surveys. The establishment of a modular, adaptable set of indicators allows Wilderness International to present the impact of its conservation measures in an evidence-based, transparent, and comparable manner to donors.

Sources:

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5. Establishment of long-term monitoring plots and repeat inventories

To establish a long-term monitoring system, it is advisable to set up permanently marked monitoring plots that are surveyed regularly (e.g., every 3–5 years). These so-called "permanent sample plots" (PSPs) enable the structured long-term observation of key ecosystem parameters such as tree growth, species composition, carbon stocks, soil moisture, and disease infestation. The methodology can be based on internationally established forest inventory systems, such as the US Forest Service's Forest Inventory and Analysis (FIA) program or the tropical forest monitoring network ForestPlots.net.

Side note on ForestPlots.net: ForestPlots.net is a global monitoring network for tropical forests that uses permanently marked monitoring plots (PSPs) to collect standardized data on topics such as tree growth and biomass, species composition, and the effects of climate change. The data is collected regularly (every 3–5 years) in the same plots. The benefit for Wilderness International would be that by connecting to ForestPlots.net, WI could establish its own long-term plots in Peru according to global standards, with international comparability and support for data management. This creates scientific credibility and connectivity to existing research networks.

In general, it can be said that, especially in regions rich in biodiversity, repeated inventories provide valid data on the dynamics of flora and fauna and on resilience to climate change. The combination of long-term field measurements with other monitoring data (e.g., eDNA, satellite images) allows for the calibration and validation of large-scale analyses. Long-term data is also a crucial factor in communicating scientifically sound successes to the public, donors, and funding institutions. By specifically selecting representative plots within different biotope types, Wilderness International could create a robust monitoring framework that can be gradually expanded.

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