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Pachama

APPLICATION FOR STRIPE 2020 NEGATIVE EMISSIONS PURCHASE

Section 1: Project Info and Core Approach

1. Project name

Pachama Forest Carbon Capture

2. Project description. ***Max 10 words***

Reforestation Projects Verified and Monitored with Satellite and Machine Learning

3. Please describe your negative emissions solution in detail, making sure to cover the following points:

a) Provide a technical explanation of the project, including demonstrations of success so far (preferably including data), and future development plans. Try to be as specific as possible: all relevant site locations (e.g. geographic regions), scale, timeline, etc. Feel free to include figures/diagrams if helpful. Be sure to discuss your key assumptions and constraints.

b) If your primary role is to enable other underlying project(s) (e.g. you are a project coordinator or monitoring service), describe both the core underlying technology/approach with project-specific details (site locations, scale, timeline, etc.), and describe the function provided by your company/organization with respect to the underlying technology/approach.

c) Please include or link to supplemental data and relevant references.

Max 1,500 words *(feel free to include figures)*

Overview:

Pachama is developing technologies to measure and monitor carbon sequestration by forests. This is a key development required for the unlocking of forests as a scalable solution to climate change. Until today, carbon credits have been issued to forest projects using field plot data collected manually, and baselines of biomass change based on hypothetical scenarios. This system results in a significant financial burden upfront for landowners, as well as baseline results that can be very suspect. Consequently, there are less than 500 forest carbon offset projects currently worldwide. Pachama's technology will democratize this system using remote sensing data and machine learning to measure the true carbon stock of the forest, bringing transparency, accountability, and affordability to the process.

Our technology addresses and verifies every facet of a forest carbon offset project. Pachama uses air-borne LiDAR and space-borne photogrammetry to derive three dimensional structural information about the forest. Custom deep-learning models are then applied to this data to produce estimates of existing forest

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carbon that are superior to traditional field inventories. Pachama examines historical satellite imagery dating back four decades, making estimates of carbon for each year in the time series. This information is used to assess a project's growth trajectory, its justification, and its performance relative to its surroundings. Finally, Pachama monitors it's projects using space-borne radar collected on a weekly basis. This data informs Pachama of real-time activity and disturbance threats to the forest.

Currently, we are using our technologies to select, evaluate and monitor existing certified forest carbon projects, aiming to ensure their integrity and keep them accountable as they progress in their work. In the near future, we hope to use our technologies to help originate new high-impact reforestation and improved forest management projects. This will effectively accelerate the removal of carbon by forest and other nature-based solutions by bringing down the cost of verification, and lowering the barrier to entry for small landowners.

In this application we are presenting the two most productive carbon offset projects (on a per-hectare basis) in Pachama's portfolio. Both projects have been validated and are being monitored by Pachama at all times.

The Guanare Plantations Project:

Our first project, "Guanare," is a large-scale **Afforestation** project (21,298 hectares) based in Treinta y Tres and Cerro Largo, Uruguay. The project started in 2006 and is expected to continue until 2066. It was verified by VCS (Verified Carbon Standard) and audited in the field by Rainforest Alliance. The project converted degraded grassland with a long history of cattle grazing into forest plantations. Forests consist of Eucalyptus and pine plantations, managed with a rotation length of 22 years. Under these circumstances, these plantations are enormously efficient carbon sinks, sequestering on average 26 tons of CO2 per hectare per year.

Pachama uses historical satellite data to estimate carbon stock on a yearly basis, dating back to 1984. Figure 1 illustrates the Guanare Plantation's average biomass over time. This data can be visualized as well (See https://www.youtube.com/watch?v=n-_Fs1M1m0U). Pachama likewise uses additional satellite and airborne remote sensing technologies to monitor on a high frequency basis for unforseen disturbances, and verify the amount of forest carbon with a higher degree of precision than field measurements.

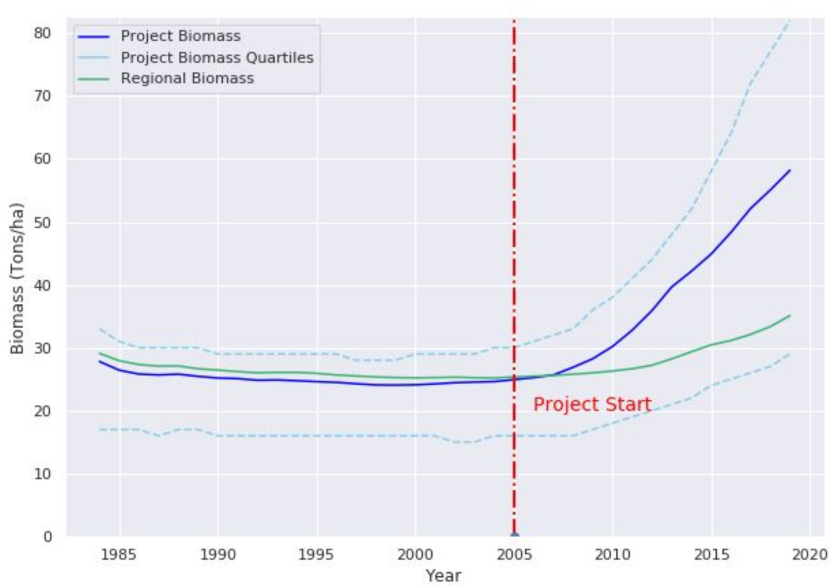

Figure 1. Pachama's estimate of the Guanare Plantation's biomass over time.

Under the right conditions, Eucalyptus is the fastest growing tree on earth, with the capacity to grow up to 10 meters in height in a single year. The conditions in this region of Uruguay are ideal for this growth, and so these plantations are sequestering an enormous amount of carbon from the atmosphere. Additional uncredited carbon is stored in long-term wood products derived from these trees. These trees are a testament to nature's own capacity to rebalance the earth's atmosphere.

Figure 2. An image of the Guanare Plantation in Uruguay.

The Rip's Redwood's Project:

The second project we are presenting is "Rip's Redwoods," an **improved forest management** project based in Sonoma County, in Northern California. This is a Climate Action Reserve project that allows existing second-growth Redwood forest to regrow well above the regional average. The forest is stocked with Coastal Redwoods as well as Douglas-firs and it is the intent of the owner to restore this forest to mimic old-growth conditions. The project started in 2013 and is obligated to retain this policy for 100 years. Coastal redwood forests are some of the most productive native forests in the world, and this forest is sequestering a considerable amount of carbon from the atmosphere on a yearly basis (16 tons of CO2 per hectare per year). Simultaneously, this forest project provides mature, native forest habitat for numerous rare animal species.

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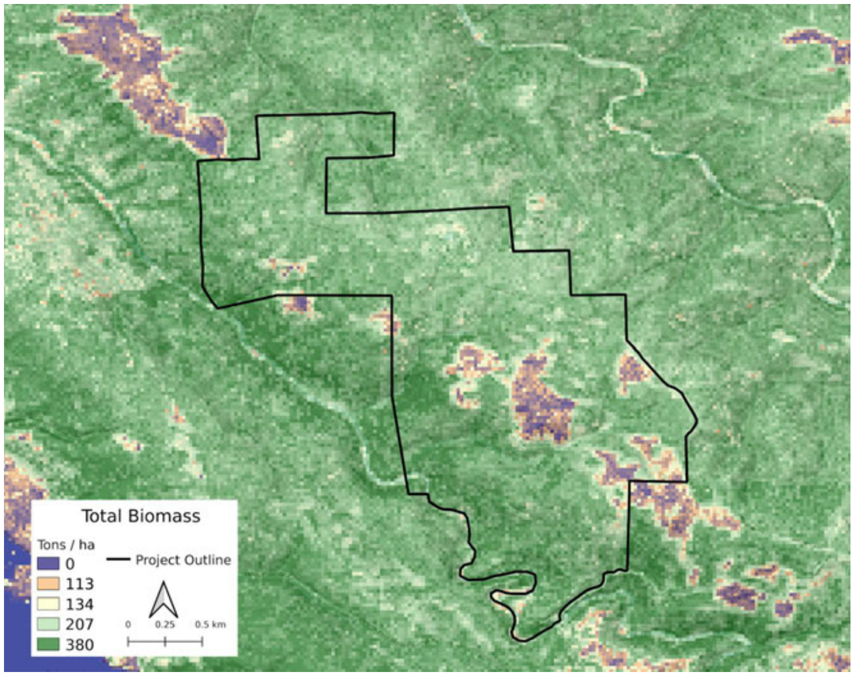

Figure 3. The Rip's Redwoods project boundary overlaid atop Pachama's estimate of biomass in the region.

Figure 3 illustrates the historical biomass of the project and its surroundings. The last major disturbance of the project area took place in 1989-90. The existence of this harvest and others within the project's boundaries several decades ago indicate to Pachama that this project is a legitimate improvement of the existing condition. Likewise, Pachama notes aggressive forest harvesting taking place in the forests surrounding the project.

Since this last major harvest, observable biomass stock has increased each year until the present. Pachama has determined that the project already exceeds the regional median carbon density, and is likely to continue to do so indefinitely. Typical of Coastal Redwood forests, this forest will be able to maintain this growth rate for perhaps centuries. Once again, historical biomass can be visualized (See https://youtu.be/gtD3yrtGScE).

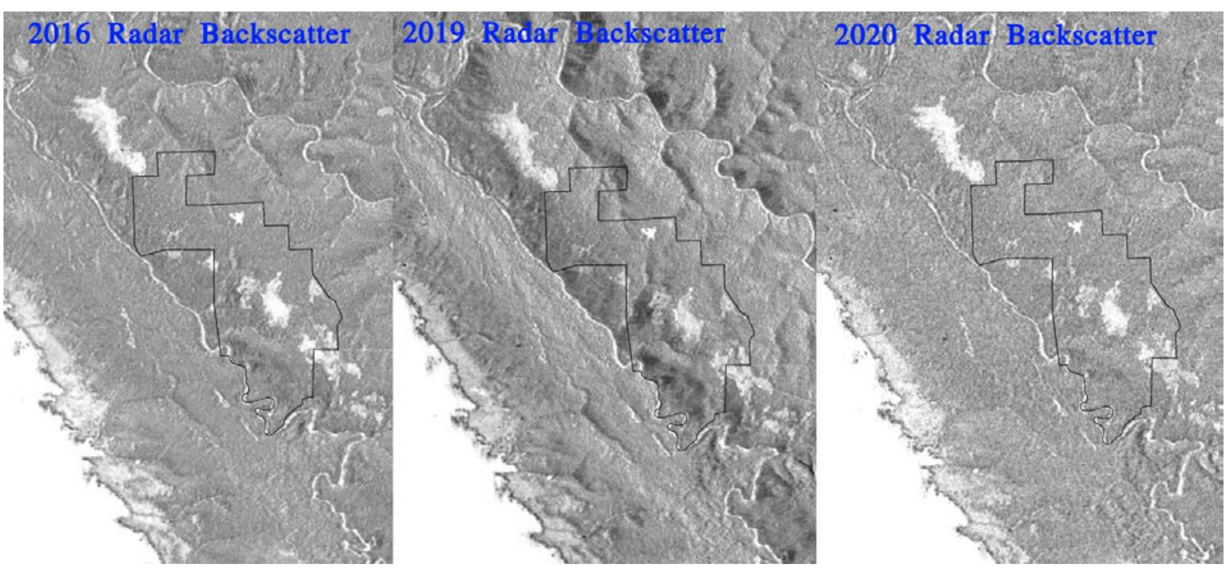

Figure 4. Normalized Sentinel-1 radar backscatter over time. Darker areas represent forest, lighter areas represent ocean and pasture. No deforestation is observed within the project (visually or by model output).

In terms of monitoring, Pachama has detected no disturbances on the project since the project's inception. Figure 6 illustrates deforestation in and around the project using satellite based radar data. Partial harvesting can be observed in many of the areas adjacent to the project.

Figure 5. An image of the Rip's Redwoods project in California. More drone imagery can be viewed at: https://youtu.be/lP_hX9rajkk

Conclusion:

Ultimately, Pachama believes that these two projects demonstrate that nature-based solutions can be a powerful tool to fight climate change. Secondary benefits such as ecosystem regeneration, wildlife habitat, and long-term wood products (which can replace petroleum products) are a highly desirable perk of these projects.

Using modern technology Pachama can monitor, verify, and justify these projects, reducing risk and increasing transparency. Ultimately this technology will be critical in unlocking forest carbon markets at scale, allowing for the mass sequestration of much of humanity's carbon footprint. We at Pachama are excited to work with Stripe to bring this technology to its fruition, and regrow the Earth's forests one tree at a time.

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Section 2: 2020 Net-Negative Sequestration Volume

See Stripe Purchase Criteria 1: The project has volume available for purchase in 2020.

4. Based on the above, please estimate the **total net-negative sequestration volume** of your project (and/or the underlying technology) in 2020, in tons of CO2. (Note: We're looking for the net negative amount sequestered here, net lifecycle emissions. In Section 3; you'll discuss your lifecycle and why this number is what it is).

The **Guanare Forest Plantations** will directly sequester 156,622 tons of CO2 in 2020. The project's five year average is 555,217 tons from 2015-2019. This is a rate of 26 tons of CO2 per hectare per year.

The **Rip's Redwoods** project will directly sequester 9,228 tons of CO2 in 2020, and has sequestered the same amount for the past five years. This is a rate of 16 tons of CO2 per hectare per year.

5. Please estimate how many of those tons are still available for purchase in 2020 (i.e. how many tons not yet committed). This may or may not be the same as the number above.

Guarane: 2,883,085 tons

Rips Redwoods: 53,000 tons

6. (Optional) Provide any other detail or explanation on the above numbers if it'd be helpful. ***Max 100 words.***

Sequestration rates are based on field inventories of the forest conducted at the start of the project, and reverified in five-year intervals. Between reverifications, forest growth and yield models developed by the National Agricultural Research Institute of Uruguay and the United States Forest Service are used to estimate annual tree growth. In the case of the Guanare project, planned forest harvesting is deducted from the 2020 estimate. Uncertainty in field measurement calculated from standard error is deducted from the estimates.

Section 3: Life Cycle Analysis

See Stripe Purchase Criteria 2: The project has a carbon negative complete lifecycle (including energy use, etc).

7. Provide a life cycle analysis of your negative emissions solution demonstrating its carbon negativity, as complete as possible given limited space, and making sure to cover the following points:

a) Include a flow sheet diagram of direct ingoing and outgoing flows (GHG, energy, materials, etc) that bear on the LCA.
b) Please be explicit about the boundary conditions of your LCA, and implications of those boundaries on your life cycle. Let us know why the conditions you've set are appropriate to analyze your project.
c) Make sure to identify assumptions, limitations, constraints, or factors that relate to ingoing and outgoing flows, citing values and sources (for example: land and resource scarcity, limitations on a required chemical, energy requirements). Also identify key sources of uncertainty in determining these values.
d) If your solution results in non-CO2 GHG emissions, please be sure to separately specify that (e.g. in units of GWP 20 or 100 years, ideally both).
e) For solutions that rely on modular components (for example: incoming energy flows or outgoing CO2 streams), feel free to cite values associated with those interfaces instead of fully explaining those components. For these values, please identify the upstream and downstream life cycle emissions of the component.
f) Explain how you would approach a more comprehensive LCA by citing references and underlying data needed for the analysis.

***Max 1,000 words** (feel free to include figures or link to an external PDF)*

Trees are natural carbon sinks, and so little to no external greenhouse gas emissions are required for them to sequester carbon. Once grown, primary carbon sinks include living and dead aboveground and belowground biomass reservoirs, as well as soil organic carbon, and litter. The Guanare project only quantifies the living above and belowground stocks, while the Rip's Redwoods project also includes dead carbon stock and carbon captured by long-term wood products (timber).

Additional GHG emissions:
Initiating the Guanare project resulted in the emission of some GHG in the tillage, pruning, and harvesting of the plantations. In addition, fertilizer is used to ensure seedling growth on degraded land, and this required additional resources to produce. Unlike other reforestation projects, a preliminary inventory of the land revealed no pre-existing carbon sinks (such as existing trees or shrubs), and so additional steps were not taken to quantify the GHG emissions needed to start the project.

Rip's Redwoods has almost no additional GHG footprint, as this is a pre-existing forest and forest harvests are very light and infrequent (note that the carbon removed from the site during these harvests is accounted for, but the GHG emissions involved in operating the harvest equipment is not). Also accounted for in Rip's Redwoods is the natural decomposition of decaying organic matter.

The harvested products of these projects is a traditionally difficult pool to account for. All numbers reported in section 2 refer to carbon on the site. However, as noted, Rip's Redwoods also receives credits for harvested wood products stored in long-term timber. This is estimated by calculating the amount of saw logs to be removed from the site, along with mill efficiency. Other biomass removed (for paper and fuel products) is assumed to be returned to the atmosphere.

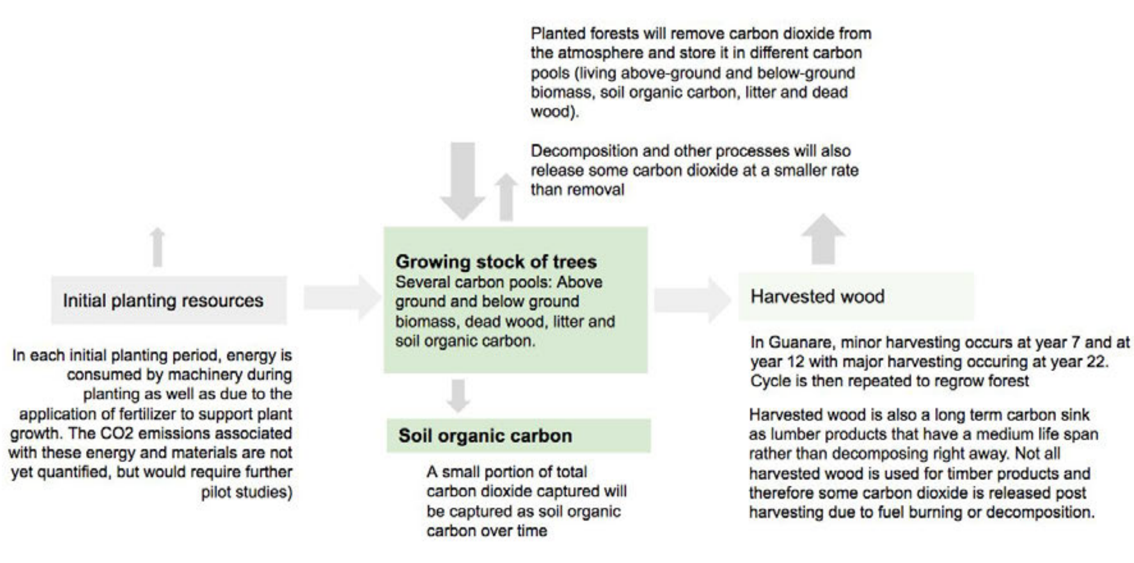

Figure 1. A flowchart illustrating sinks and sources of a forest plantation.

At Guanare, post planting of trees requires some emissions due to fertilizer and the planting process, carbon is sequestered by trees until they are harvested. Two minor harvests are scheduled to occur during each cycle as well as a major harvests every 22 years. During these major harvests the carbon stock of the project decreases dramatically (as seen in graph below). However, unharvested and replanted trees that remain will continue to grow and will capture additional carbon, increasing the project's overall CO_2 sequestration over time.

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Guanare Project Expected CO2e Sequestered Over TIme

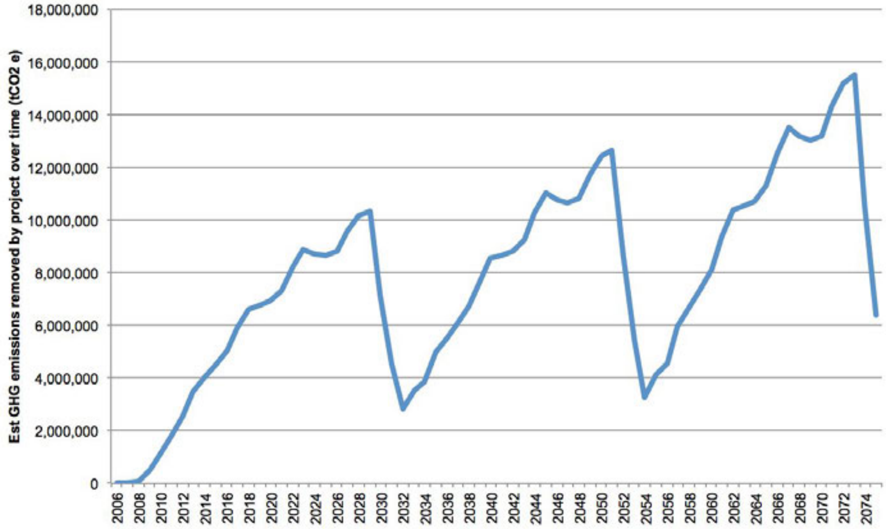

Figure2. Net carbon sequestration annually of the Guanare Plantation project.

At Rips Redwood, less harvesting is expected to occur over the lifetime of the project. Harvesting is expected to occur in 25 year intervals over the project's 100 year life cycle. During each harvest, up to 20% of standing trees may be harvested in such a way as to favor native species and lead to the restoration of healthy old growth forests. Also visible in the figure below, but not included in the total numbers presented here, is the project's baseline. This represents a harvest scenario which is designed to replicate the landscape's harvest practices. The project was initially credited with the amount of carbon it contained above this baseline. Pachama verified this baseline and found it plausible, regardless though, credits being issued now and in the future represent active tree growth.

Rips Redwood Expected CO2e Sequestered Over TIme

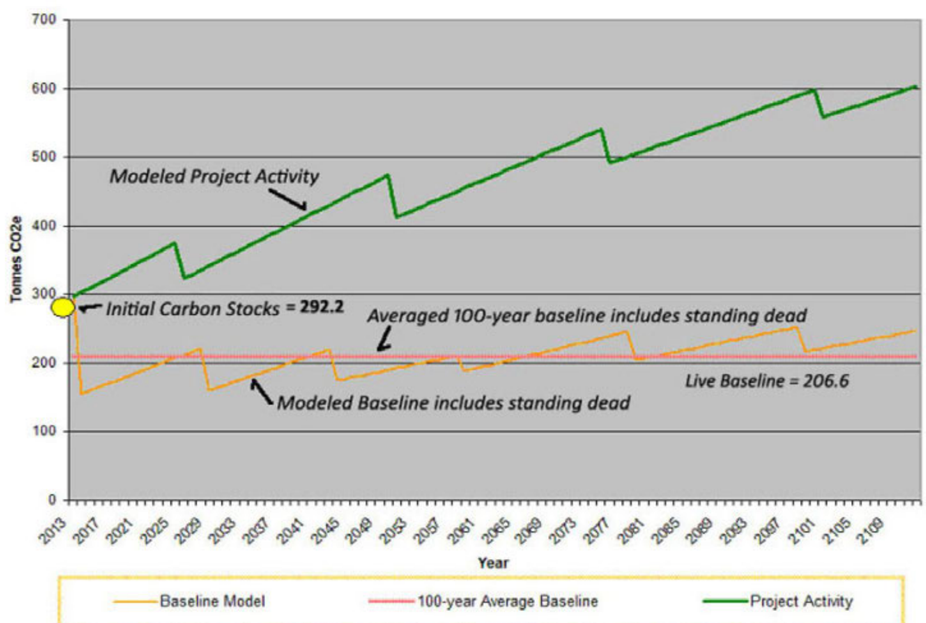

Figure3. Average carbon stock over time on the Rip's Redwoods project.

8. Based on the above, for your project, what is the ratio of emissions produced as any part of your project life cycle to CO2 removal from the atmosphere? For true negative emissions solutions, we'd expect this ratio to be less than 1.

Guanare*: 0.81*
Rip's Redwoods*: 0.41*

Section 4: Permanence and Durability

See Stripe Purchase Criteria 3: The project provides durable, long-term storage of carbon.

9. Provide an upper and lower bound on the likely durability / permanence of sequestered carbon provided by your project, in years:

Guanare: 60 years from 2006
Rip's Redwoods: 100 years from 2013

10. Please provide a justification for your estimates, and describe sources of uncertainty related to: the form of storage, effects of environmental or climatic variability, difficulty in monitoring or quantification, etc. Specifically, discuss the risks to permanence for your project, the estimated severity/frequency of those risks (e.g. 10% of the acres of forest in this forest type are burned by fire over a 100 year period), and the time-horizon of permanence given those risks.
Max 500 words

To ensure the permanence of the GHG emission reductions from these projects, buffer credits from each of the projects are put on hold in a pool. When a loss event occurs (fire, diseases, pests, etc) buffer credits would be used to compensate for any unforeseen carbon losses, in the absence of any reversal.

Guanaré buffer pool: **10% of the credits** (minimum required by VCS AFOLU Non-Permanence Risk Tool) **-** [Financial Failure 1%, Project Management -4%, Internal Risk 2%, Natural risks 2%, Community engagement 0%, Political risk 0%]

Rip's Redwood buffer pool: **16.7% of the credits** - [Financial Failure 4.75%, Conversion 1.96%, Over harvesting 1.96%, Social 1.96%, Wildfire (calculated over 30 years) 0.99%, Disease or Insect Outbreak 2.91%, Other Catastrophic Events 2.91%]. The Rips Redwood project is recorded in Sonoma County deeds and records as 100+ year duration in accordance with Climate Action Reserve requirements.

In addition to these contingencies, Pachama monitors these sites on a regular basis using satellite-based radar to ensure continued compliance. More detail can be found in section 5.

Section 5: Verification and Accounting

See Stripe Purchase Criteria 4: The project uses scientifically rigorous and transparent methods to verify that they're storing the carbon that they claim, over the period of time they claim to.

11. Provide detailed plans for how you will measure, report, and verify the negative emissions you are offering. Describe key sources of uncertainty associated with your monitoring, and how you plan to overcome them.
Max 500 words

Projects are verified in the field through field inventories conducted every five years. These measurements involve a set of randomly placed plots throughout the project, on which each tree's species, diameter, and height are recorded. This information is used to predict the carbon stock of each tree using a set of prescribed equations. This is summed to the plot and project level, and project-level uncertainty is assessed by calculating standard error. This error is then deducted from the project's carbon stock.

Pachama performs an additional level of verification via remote sensing. Pachama makes use of airborne LiDAR, a three dimensional imaging technique, to predict current carbon stock using deep learning models that are capable of scanning this data with 3D convolutions. Pachama's models are developed using a variety of public and private field plots and LiDAR in the region. Model uncertainty is assessed by withholding training data and assessing model error and bias. These models are used to verify the claims made by the project's field inventory, with a project being verified if Pachama's model falls within the 95 % confidence window of the project's estimate. Currently these models have been applied to the Rip's Redwoods project, while the Guanare Plantations project is still awaiting Pachama's verification. Existing scientific literature describes Pachama's verification methodology [1][2], and how this technology can match the quality of a field inventory [3].

Pachama verifies these project's justification through a set of historical models developed using historical satellite imagery dating back to 1984. Yearly imagery is mosaiced and spectral data as well as disturbance history is used to predict annual carbon stock [4]. Pachama then verifies a project's justification by comparing it to its historical values and its surroundings. In the case of the Guanare project, Pachama confirms that the land use history was pasture for the entire time series prior to the project's initiation. In the case of the Rip's Redwoods project, Pachama concludes that the project has a history of aggressive forest harvest, and was not conserved prior to the project's start.

Finally, Pachama monitors these projects using satellite radar data on a quarterly basis [5]. Radar images are aggregated over the period in question, and changes in structure inform Pachama of whole or partial harvesting within the project's boundaries. These models are derived and validated using a set of hand-labeled disturbance data (derived from high-resolution satellite imagery), and once again make use of deep learning. Disturbances beyond those anticipated by the project (note, these projects do allow some forest harvests), are reported to the consumer and the project developer. In cases of severe unanticipated harvesting, pachama will delist projects from it's platform.

[1] Ayrey, E., & Hayes, D. J. (2018). The use of three-dimensional convolutional neural networks to interpret LiDAR for forest inventory. *Remote Sensing*, *10*(4), 649.
[2] Ayrey, E., Hayes, D. J., Kilbride, J. B., & Weiskittel, A. R. (2019). Synthesizing Disparate LiDAR and Satellite Datasets through Deep Learning to Generate Wall-to-Wall Regional Forest Inventories. *BioRxiv*, 580514.
[3] Zolkos, S. G., Goetz, S. J., & Dubayah, R. (2013). A meta-analysis of terrestrial aboveground biomass estimation using lidar remote sensing. *Remote Sensing of Environment*, *128*, 289-298.
[4] Hooper, S., & Kennedy, R. E. (2018). A spatial ensemble approach for broad-area mapping of land surface properties. Remote Sensing of Environment, 210, 473-489.
[5] Antropov, O., Rauste, Y., Väänänen, A., Mutanen, T., & Häme, T. (2016, July). Mapping forest disturbance using long time series of Sentinel-1 data: Case studies over boreal and tropical forests. In *2016 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)* (pp. 3906-3909). IEEE.

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12. Explain your precise claim to ownership of the negative emissions that you are offering. In particular, explain your ownership claim: 1) in cases in which your solution indirectly enables the direct negative emissions technology and 2) when, based on the LCA above, your solution relies on an additional upstream or downstream activity before resulting in negative emissions. Please address the notion of "double counting" if applicable to your project, and how you'll prevent it.
Max 200 words

Each of these projects's CO2 sequestration is demonstrated through field and remote verification. The values reported in this document represent the direct growth of the trees on an annual basis, thus they represent direct negative emissions from the atmosphere. Additional credits have been issued to the Rip's Redwood project based on it's carbon stock above a baseline harvest rate observed in the region.

Both project's ownerships have been verified and vetted for additional forest carbon offset programs. The nation of Uruguay has no international forest carbon offset agreements. Most of such agreements are based on avoiding deforestation and are highly to be applicable to Uruguay, or these plantations.

Section 6: Potential Risks

This section aims to capture Stripe Purchase Criteria 5: The project is globally responsible, considering possible risks and negative externalities.

13. Describe any risks or externalities, any uncertainties associated with them, and how you plan to mitigate them. Consider economic externalities, regulatory constraints, environmental risk, social and political risk. For example: does your project rely on a banned or regulated chemical/process/product? What's the social attitude towards your project in the region(s) it's deployed, and what's the risk of negative public opinion or regulatory reaction?
Max 300 words

In both projects, fire is the primary risk for reversals. The Guanare project has the greater risk of fire due to the selected species. However, the project makes use of several mitigation strategies. (1) The plantations are distributed on the landscape, making it impossible for a single fire to consume a large percentage of the project. Individual forest blocks are no larger than 50 ha. (2) The project constructed a network of firebreaks throughout the plantations. (3) There is permanent on the ground surveillance of the project. (4) Unauthorized camping is forbidden, and the sites are posted with fire warnings. (5) Staff have been trained to respond and manage small fires. (6) The understory is kept clear by allowing cattle grazing, and fuel load is at a minimum. The project also offers up to 10 times the amount of job opportunities per hectare as cattle grazing, and offers job training to local impoverished communities. Agrochemicals (glyphosate, insecticide, and fertilizer) are applied at the start of the project, and again after 22 years. These chemicals are applied in minimal quantities in spot treatments.

The Rip's Redwood project is at a smaller risk of fire due to its location very near the coast of California, as fog keeps the forest floor moist throughout the year. The project did a historical analysis, and found no cases of fires in the project's area. The project is also located less than 10 kilometers away from a fire protection facility. Rip's Redwoods also has an outstanding relationship with the community. The project is currently constructing a set of public trails, and it regularly hosts educational retreats.

Insect damage is often a risk factor for forest carbon offset projects, however neither project is in a region known to be affected by widespread insect outbreaks. We also note in section 4 that a portion of the issued carbon credits are set aside in a buffer to be retired in the event of a reversal.

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Section 7: Potential to Scale

This section aims to capture Stripe Purchase Criteria 6: The project has the potential to scale to high net-negative volume and low cost (subject to the other criteria).

14. Help us understand how the cost and net-negative volume of your solution will change over time. Note that we aren't looking for perfect estimates. Instead, we're trying to understand what the long-term potential is and what the general cost curve to get there looks like. (Note: by "cost" here we mean the amount Stripe or any other customer would pay for your solution):

	Today	In ~5 years	In ~20 years
Est. Cost per net-negative ton (in $)	$1 to $15	$1 to $15	$1 to $15
Est. Net-negative volume (in tons of CO2)	2,135,020 tons of CO2	2,809,485 tons of CO2	4,832,880 tons of CO2

15. What are the drivers of cost? Which aspects of your costs could come down over the next 5 years, and by how much? Do you think your eventual scale potential is limited by cost or by volume? Why? Refer to any relevant constraints from question #7, like land or materials scarcity, and specify the boundary conditions for which you consider those constraints.

Max 300 words

The main driver of cost for new forest carbon projects today is MVR (Monitoring, Verification and Reporting) cost required as part of the certification processes required by all established protocols. The technologies that Pachama is developing, harnessing Remote Sensing and Machine Learning, could dramatically reduce MRV costs for new projects. Today, MRV costs range between $200,000 and $600,000. This high cost makes it impossible for small landowners and farmers to participate in carbon markets and get financing to start reforestation and forest conservation efforts. Our technologies can bring theses costs down to cents per hectare, as we achieve scale of data collection and processing.

Additional drivers of costs are nurseries for seedling production and planting labour. New robotic solutions are being developed which we plan to harness to help our partners reduce their costs on those fronts too. All in all, reforestation and improved forest management is the most economically efficient way to capture carbon from the atmosphere. Our technologies have the potential to unlock this solution at scale by democratizing access to carbon markets to all types of landowners, increasing the integrity of the projects and monitoring their progress keeping a science-based rigor on accountability.

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Section 8: Only for projects with significant land usage

See Stripe's Purchase Criteria 2: The project has a net cooling effect on the climate (e.g. carbon negative complete life cycle, albedo impact, etc.) ***This section is only for projects with significant land usage requirements: Forest, Soil, and BECCS/Biochar/Biomass sequestration projects.***

16. Location: Please provide baseline information about the geographic location(s) of your project; and link shapefile(s) of project area(s).

Max 100 words

The Guanare Plantation project consists of approximately 144 plantations in Eastern Uruguay. A shapefile of these plantations can be found here: https://drive.google.com/file/d/1Gnekma2_On9xfwlmjsOxY_pylMxuCzId/view?usp=sharing

The Rip's Redwoods project is a relatively small property located on the Northern California coast. A shapefile of the product boundary can be found here: https://drive.google.com/file/d/15KRR37mqg3Ba34e9F4xI4BDmO1eMHwZe/view?usp=sharing

17. Land ownership: Please describe the current (and historical as relevant) land ownership and management for the area(s) provided in (16). If your project is not the landowner, describe your relationship to the landowner.

Max 150 words

Guanaré: The land is owned by Bosques del Uruguay IV, previously owned by Guarané SA until December 2018. The management is under AgroEmpresa Forestal. Pachama's connection with the owner is a commercial relationship based on the acquisition of carbon credits.

Rip's Redwoods: The land is owned by Rips Redwoods LLC, main owner of the LLC being Richard Goelet. Rip's Redwood is committed to retain this long-term working landscape so that it will sequester and store carbon for the 100+ year life of this Forest Carbon Project. A conservation easement has been placed on the forests of the entire property. Pachama's connection with the owner is a commercial relationship based on the acquisition of carbon credits.

18. Land use: For forest projects, please provide details on forest composition as well as forest age and basal crop area/density. For soil projects, please provide details on land use and crop type (if agricultural), soil organic carbon baselines, and regenerative methodology. For BECCS, biochar, or wooden building materials projects, please provide details on biomass crop type and methodology as applicable.

Max 500 words

The forest composition of the Guanare Plantation consists of Eucalyptus grandis, Eucalyptus dunnii, Eucalyptus maidenii and Pinus taeda. Planting began at the project start date in 2006, and took five years to complete. Thus, the plantations are 9-14 years old. Seedlings are planted at a density of 1,100 per acre, with rows placed every four meters. Thinnings are conducted at the 7th and 12th years of age. 100-150 grams of P-rich fertilizer is applied directly to each seedling. Soil carbon is not formally quantified in this project, however Pachama notes an apparent history of soil degradation of the pasture land prior to the existence of the project. The project primarily harvests these trees for long-term wood products. Under other forest offset protocols, these products could be credited as net negative emissions. However, under this protocol, these products are subtracted from the standing carbon value. Therefore it can be said that these plantations are sequestering more carbon than they are directly credited for.

The forest composition of the Rip's Redwoods project can be characterized as Coastal Californian Redwood. By basal area, second growth redwood consists of 51 % of basal area, douglas fir consists of 22 %, tan oak consists of 16 %, and old growth redwood consists of 6 %, with the remainder being made of other deciduous species. By annual growth, second growth redwood consists of 42 %, douglas fir consists of 38 %, and tan oak consists of 17 %. Soil carbon is not quantified by this product. The project consists of second-growth forests with old-growth remnants, and the average forest age is 68 years, with the oldest portion being 144 years.

19. Net effect on climate: Please discuss the non-CO2 impacts of your project that may not be covered in your LCA, such as your impact on albedo.
Max 150 words

As noted above, the Guanare Plantations project sequesters large amounts of additional carbon into long-term wood products Satellite imagery of the project indicates a three-decade long history of soil degradation prior to the project's implementation. The project will help keep existing top soil in place, and accumulate new topsoil through detritus. Eucalyptus are noted to have only a slightly lower albedo than the pasture they're replacing. However, the pine species being planted will reduce the area's albedo. Pachama does not believe that the increase in radiative absorption is likely to offset the large carbon gains of the project. Studies have noted that forests at these middle-latitudes have a net cooling effect on the region by enhancing evapotranspiration.

The Rip's Redwood project has a number of additional ecological benefits owing to its location and forest type. The project is home to northern spotted owls, and both coho and steelhead salmon spawn on the property.

Section 9: Other

20. What one thing would allow you to supercharge your project's progress? This could be anything (offtakes/guaranteed annual demand, policy, press, etc.).
Max 100 words

Guaranteed annual demand, press, support of new protocols development, and willingness to support origination of new reforestation/afforestation projects via ex-ante credits.

21. (Optional) Is there anything else we should know about your project?
Max 500 words

These projects are among the best available certified forest carbon projects in the Americas. Our hope is to transfer the learnings of applying our technologies used validating these projects to the origination of new large-scale reforestation and afforestation projects around the world.

Section 10: Submission details

*This section **will not** be made public.*

22. Please insert below the name and title of the person submitting this application on behalf of your company (or, if you are submitting this application on your own behalf, your own details). By submitting this application, you confirm that you have read and accept the Project Overview (available HERE), as well as the further conditions set out below. As a reminder, all submitted applications will be made public upon Stripe's announcement. *Once you've read and completed this section, submit your application by March 20th by clicking the blue "Share" button in the upper right, and share the document with **nets-review-2020@stripe.com**.*

Name of company or person submitting this application

[redacted]

Name and title of person submitting this application (may be same as above)

[redacted]

Date on which application is submitted

[redacted]

We intend to make the selection process as informal as possible. However, we do expect that (a) the content of your application is, to the best of your knowledge, complete and correct; (b) you do not include any content in your application that breaches any third party's rights, or discloses any third party's confidential information; (c) you understand that we will publicly publish your application, in full, at the conclusion of the selection process. You also understand that Stripe is not obliged to explain how it decided to fund the projects that are ultimately funded, and - although extremely unlikely - it is possible that Stripe may decide to not proceed, or only partially proceed, with the negative emissions purchase project. Finally, if you are selected as a recipient for funding, Stripe will not be under any obligation to provide you with funding until such time as you and Stripe sign a formal written agreement containing the funding commitment.