stripe

# Ekovilla (via Puro.earth)

## APPLICATION FOR STRIPE 2020 NEGATIVE EMISSIONS PURCHASE

## Section 1: Project Info and Core Approach

1. Project name

*Ekovilla*

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

*Ekovilla's net-negative products - emission neutralization with carbon removal*

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)*

Ekovilla is very popular, ecological CE-marked product in building industry. It is natural insulation material - wood-based blown fiber used in private and public builidings. It is also widely used in housebuilding industry. Main market area is in Finland. Ekovilla loose fiber product is manufactured of recycled newsprint and it has been used for insulating our customers' homes for four decades.

Ekovilla cellulose fibre insulation sequesters 1,102 ton CO2 eq more than the production emits, thus rendering it's carbon footprint negative. Figure include -10% buffer elimination. Real value is -1,26 kg CO2 e/kg according to our product EPD based on standard EN15804.

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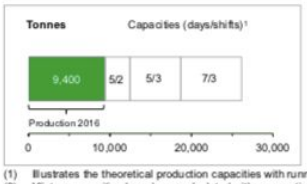
# Production facilities

Ekovilla has four production sites across Finland. All facilities have free capacity to support the growth going forward

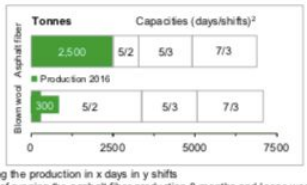
## Kiiminki

- Kiiminki loose wool production site was established in 1985 by Jukka Karhumaa and Eero Ervasti, father of the current CEO Mika Ervasti.
- The site is used for blown wool production and mainly serves the northern part of Finland
- The facilities at Kiiminki consist of 1,700m² (6,000m³) production and office facilities and 1,500m² (7,500m³) storage facilities
- Theoretical capacity at Kiiminki is 28 tonnes blown wool/8h shift



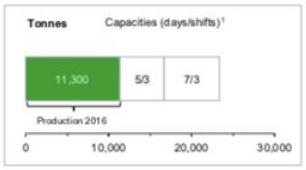

## Ylistaro

- Ylistaro production site was opened in 1985 and the production facilities are used to produce both blown wool and asphalt fiber
- Facilities at Ylistaro consist of the production facility with 1,250m² (6,900m³), a storage facility of 450m² (2,700m³) and two tarpaulin storage facilities 900m² (5,400m³) each
- Theoretical capacity of 23 tonne blown wool/8h alternatively 11 tonne asphalt fiber/8h shift

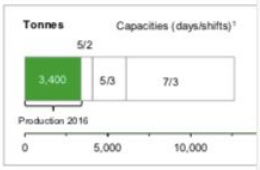



## Kuusankoski

- Kuusankoski blown wool production site was established in 1985
- It is used to manufacture blown wool for the southern part of Finland and to produce raw material for the slab production site.
- The facilities consist of a production, office and storage facility of 1,725m² (7,195m³) and some storage facilities of 1,130m² (4,758m³) and 1,484m² (11,500m³)
- The theoretical capacity for the blown wool production site is 25 tonnes of blown wool/ 8h shift




- Kuusankoski slab production facilit an automated high tech productior facility opened in 2011
- The slab production site is situated to the blown wool production site a consist of a production facility of 10000m² (60000m³)
- Out of the production facility there around 800m² of office and social s in two floors, Ekovilla headquarters situated in the this building
- Theoretical capacity of 11 tonnes slab/8h shift




(1) Illustrates the theoretical production capacities with running the production in x days in y shifts
(2) Ylistaro capacities have been calculated with assumption of running the asphalt fiber production 8 months and loose wool production 4 months

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# Overview of the production process – blown loose wool & asphalt fiber

Blown loose and asphalt fiber are manufactured with a similar process which includes three main phases as illustrated below

**Receiving and storing of raw material**

- Recycled and other paper materials are used as main the raw materials in Ekovilla blown loose wool & asphalt fiber production
  - Paper reserves are stored in intermediate depots during spring and summer due to cyclicality of the production
- The key additional production materials include fire retardants, dust-binding oil, additives, plastics for packaging and wooden pallets for storing and transportation

**Production**

- Production starts with opening the stored paper piles and inserting the paper into a pre-crusher to get a uniform material flow
  - Debris, including staples, are removed using a magnetic separator
- The material flow is led through a grinder where fire retardants, magnesium sulfate, boric acid, and oil used for dust-binding are added to the mass
  - The production quality and quantity can be altered by adjusting the grinder
- Dust is extracted and the mass is forwarded to a feed hopper to insure an even flow for packaging

**Finishing and shipping**


- Blown loose wool is packaged into desired bag sizes
  - Time, date and production site identification is printed on the bags
- In Kuusankoski, part of the blown loose woo is stored or transported for Ekovilla slab production
- Packed blown loose wool is transported to customers on pallets

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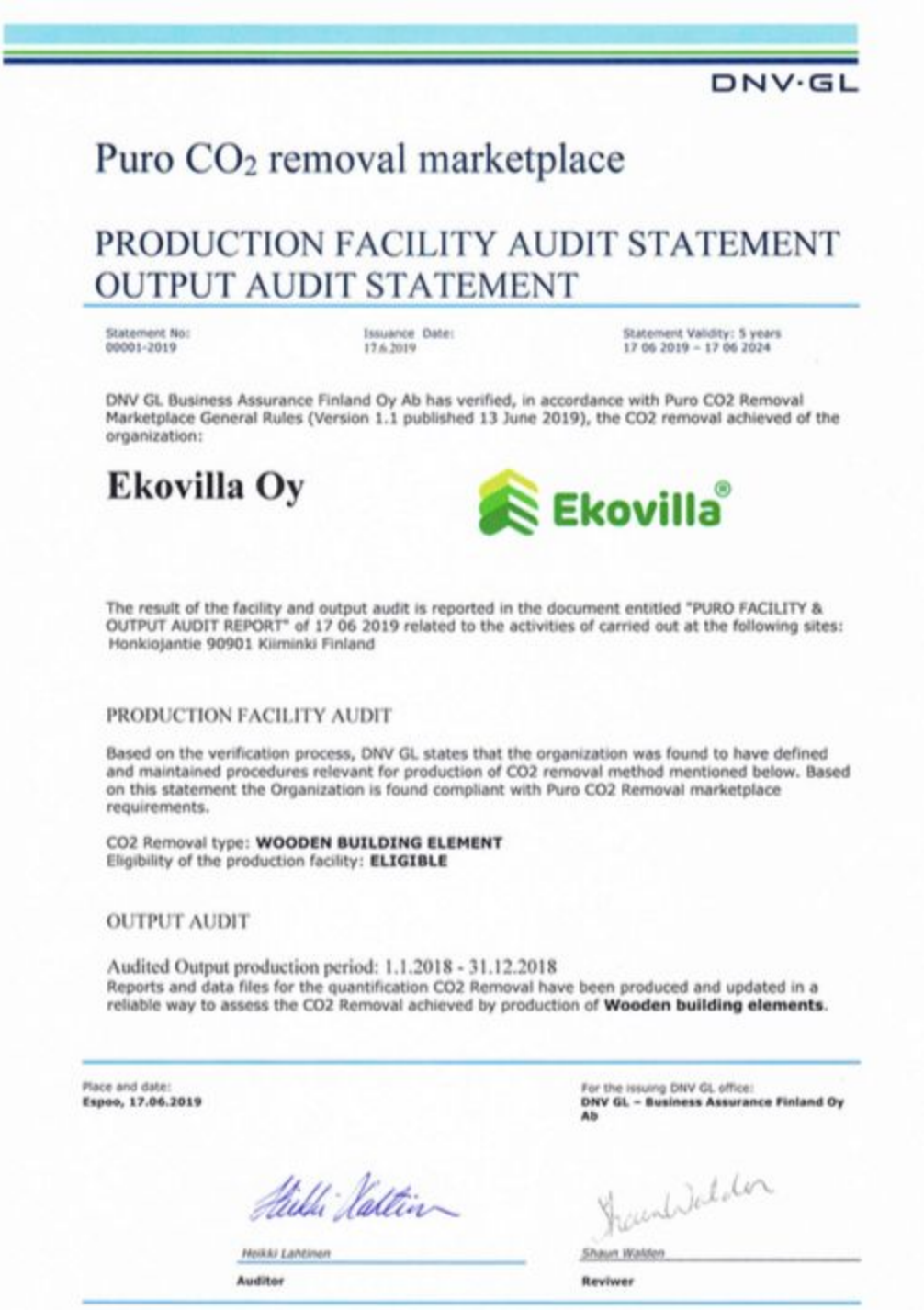

DNV·GL

# Puro $CO_2$ removal marketplace

## PRODUCTION FACILITY AUDIT STATEMENT
## OUTPUT AUDIT STATEMENT

| Statement No: | Issuance Date: | Statement Validity: 5 years |
|---|---|---|
| 00001-2019 | 17.6.2019 | 17 06 2019 – 17 06 2024 |

DNV GL Business Assurance Finland Oy Ab has verified, in accordance with Puro CO2 Removal Marketplace General Rules (Version 1.1 published 13 June 2019), the CO2 removal achieved of the organization:

**Ekovilla Oy**

The result of the facility and output audit is reported in the document entitled "PURO FACILITY & OUTPUT AUDIT REPORT" of 17 06 2019 related to the activities of carried out at the following sites:
Honkiojantie 90901 Kiiminki Finland

### PRODUCTION FACILITY AUDIT

Based on the verification process, DNV GL states that the organization was found to have defined and maintained procedures relevant for production of CO2 removal method mentioned below. Based on this statement the Organization is found compliant with Puro CO2 Removal marketplace requirements.

CO2 Removal type: **WOODEN BUILDING ELEMENT**
Eligibility of the production facility: **ELIGIBLE**

### OUTPUT AUDIT

Audited Output production period: 1.1.2018 - 31.12.2018
Reports and data files for the quantification CO2 Removal have been produced and updated in a reliable way to assess the CO2 Removal achieved by production of **Wooden building elements**.

| Place and date: | For the issuing DNV GL office: |
|---|---|
| **Espoo, 17.06.2019** | **DNV GL – Business Assurance Finland Oy Ab** |
| Heikki Lahtinen | Shaun Walden |
| **Auditor** | **Reviwer** |

Website ekovilla.com

Our system can be scaled upto 2 times its current site regarding on demand of our product.

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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).

21847 tons

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.

19031 tons

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

Figures are based on our current situation on puro.earth marketplace. Changes may occur when with other customers buying our CORC-certificates.

# 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)*

At the moment we do not have english version of our EPD (LCA). Here are some facts from our EPD, which is made according to EN 15804 standard, updated Jan 2020.

The A1 GWP for the production of raw materials is 0.065 kg CO2e / kg and the biogenic carbon content of the raw materials calculated as CO2 is -1.34 kg CO2 / kg. Negative emissions are the biogenic carbon content (calculated as carbon dioxide) that is transferred from the previous product system (recycled paper) to this system.

VTT

ASIAKASRAPORTTI VTT-CR-00123-20
LIITE 1
5 (12)

**Tulokset**

Taulukko 2.a Ympäristövaikutukset (elinkaarivaiheet A1-5)

| Parametrit ja yksikkö | A1 | A2 | A3 | Yhteensä A1-3 | A4 | A5 | Yhteensä A1-A5 |
|---|---|---|---|---|---|---|---|
| GWP, kg $CO_2$ e/kg* | 0,065 +(-1,34) =-1,28* | 0,016 | 0,006 | -1,26 | 0,011 | 0,76e-03 | -1,24 |
| ADP-alkuaineet, kg Sb e/kg | 5,8e-04 | 6,8e-10 | 3,8e-05 | 6,2e-04 | 4,9e-10 | 1,5e-06 | 6,2e-04 |
| ADP-fossiiliset, MJ /kg | 1,1 | 0,24 | 0,072 | 1,4 | 0,17 | 8,4e-03 | 1,6 |
| AP, kg $SO_2$ e/kg | 8,8e-04 | 7,0e-05 | 1,7e-05 | 9,6e-04 | 3,6e-05 | 2,7e-06 | 1,0e-03 |
| ODP, kg CFC 11 e/kg | 1,3e-08 | 3,4e-11 | 7,7e-10 | 1,4e-08 | 2,5e-11 | 4,6e-10 | 1,4e-08 |
| EP, kg$(PO_4)^{-3}$ e/kg | 1,7e-04 | 1,5e-05 | 8,8e-06 | 1,9e-04 | 7,9e-06 | 5,3e-07 | 2,0e-04 |
| POCP, kg $C_2H_4$ e/kg | 3,9e-05 | 4,7e-06 | 2,2e-06 | 4,6e-06 | 2,5e-06 | 1,2e-07 | 4,9e-05 |

ADP-alkuaineet - Uusiutumattomien mineraalivarojen ehtyminen, ADP-fossiiliset polttoaineet- Uusiutumattomien energiavarojen ehtyminen, AP - Maaperää ja vesistöjä happamoittavat päästöt, ODP - Yläilmakehän otsonia tuhoavien aineiden päästöt, GWP - Kasvihuonekaasupäästöt, EP - Rehevöitymistä aiheuttavat päästöt, POCP - Valokemiallista otsonia alailmakehässä muodostavien aineiden päästöt

*A1 vaiheen GWP raaka-aineiden valmistuksen osalta on 0,065 kg $CO_2$e/kg ja raaka-aineiden biogeenisen hiilen sisältö, laskettuna $CO_2$:na on -1,34 kg $CO_2$/kg. Negatiivinen päästö on se biogeeninen hiilisisältö (hiilidioksidiksi laskettuna), joka siirtyy edellisestä tuotessysteemistä (keräys-paperi) tähän systeemiin.

| Taulukko 2b. Ympäristövaikutukset (elinkaarivaiheet B1-D) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parametrit ja yksikkö | Yhteensä B1-7 | C1 | C2 | C3 | C4 | Yhteensä C1 -4 | D |
| GWP, kg $CO_2$ e/kg* | 0 | 4,4e-09 | 3,1e-03 | 0,017 | 1,9e-03 | 0,022 | -0,086 |
| GWP, kg $CO_2$/kg (biogeeninen hiili laskettu $CO_2$:na) joka siirtyy seuraavaan tuotesysteemiin * | 0 | 0 | 0 | 1,34 | | 1,34 | 0 |
| ADP-alkuaineet, kg Sb e/kg | 0 | 2,8e-11 | 1,4e-10 | 9,6e-07 | 4,3e-07 | 1,4e-06 | -6,2e-04 |
| ADP-fossiiliset, MJ /kg (LHV) | 0 | 5,8e-08 | 0,048 | 2,0e-03 | 8,4e-04 | 0,051 | -1,4 |
| AP, kg $SO_2$ e/kg | 0 | 6,0e-12 | 1,0e-05 | 2,2e-06 | 3,9e-07 | 1,3e-05 | -9,6e-04 |
| ODP, kg CFC 11 e/kg | 0 | 7,8e-16 | 7,0e-12 | 1,8e-11 | 1,2e-11 | 3,7e-11 | -1,4e-08 |
| EP, kg$(PO_4)^{-3}$ e/kg | 0 | 4,6e-12 | 2,3e-06 | 8,9e-07 | 2,4e-06 | 5,5e-06 | -1,9e-04 |
| POCP, kg $C_2H_4$ e/kg | 0 | 1,7e-12 | 7,2e-07 | 3,5e-08 | 5,0e-07 | 1,3e-06 | -4,6e-05 |

* seuraavaan tuotesysteemiin kierrätyksestä siirtyvä biogeeninen hiilisisältö $CO_2$:ksi laskettuna on 1,34 (oletuksena on että valmistaja ottaa kerran käytetyn tuotteen 100% takaisiin uuden tuotteen valmistukseen. EN16485:2014 mukaan biogeenisen $CO_2$:n vaikutus GWP:en tuotteen elinkaaressa on 0)

I am able to send you the whole report as a pdf-version.

b) The system boundary is as required by Puro.earth Cradle-to-gate i.e. from sourcing the feedstock to putting the product in our warehouse. Boundary conditions: we do not include the transportation from our production site to the customer, as those emissions are covered by the carbon accounting of the customer.

c) Allocation of CO2 emissions to various output products from the same production line is based on the energy content (in MJ). This is in line with the ISO 14044 recommendation that the inputs and outputs of the system shall be allocated between the different products by reflecting the underlying physical relationships between the products. All the energy we use is emission-free wind power, for which we have certificate from our energy provider..

Link to Puro.earth audit statement
https://puro.earth/methodologies/

f) The LCA is made by a 3rd party, who is experienced in reporting carbon footprints according to GHG Protocol. The LCA is verified by Puro.earth and its auditing partner DNV GL

Puro.earth methodologies for quantification of carbon sequestered in Biochar, carbonated or bio-mass based building elements https://puro.earth/supplier-verification/

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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.

**Carbon sequestered i.e. Negative emissions NETS calculation (CO2-stored (minus) emissions, from LCA]:**
1,34 (Y) tons CO2eq embodied per tonne product – 0,087 (X) tons CO2eq emitted in manufacturing = 1,253 (z) tonnes CO2eq sequestered per tonne product.

from the equation above: Y/X < 1

# 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:

*100 years (minimum 50 years, maximum 400 years)*

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***

According to a scientific article in Nature vol. 575 the storage duration and permanence of long-lived wood products is decades to centuries.
https://www.nature.com/articles/s41586-019-1681-6

In the building site, our product lasts as long as the building. Homes and buildings are under surveillance, protected and maintained in addition to their long life cycle, by default. After that there are still many ways to reuse and recycle Ekovilla. If the building is demolished and removed, the product can be reused as thermal insulation.

Nearly 4 tonnes of CO2 emissions may be avoided for each tonne of dry wood used that displaces concrete-based materials.
https://www.rogersathre.com/Sathre&OConnor_2010_wood_substitution_meta-analysis.pdf

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## 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***

We are using the PURO.earth methodology for verification and accounting. The audit will be done by global DNV GL as suggested by PURO.earth.

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***

Double counting is prevented by Puro.earth rules. When the carbon removal attribute is attached from the physical biochar product, the physical product is then accounted for as carbon neutral. The verification process checks that the packages or web-page do not present biochar as carbon net-negative.

## 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***

I don't see big social or political risks for our production or application in this country. There are huge

amount of positive trends both local and global supporting our business.

# 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 $) | 21.50 | 25 | 25 |
| Est. Net-negative volume (in tons of CO2) | 19031 | 35000 annually | 50000 annually |

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***

We have the conditions for normal industrial operations. According to my experience and over 40 years history, cost factors are fairly stable and responsive to overall cost levels.

# 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***

Our production sites are located as follows:

Ekovilla Oy Kiiminki, Honkiojantie 14, 90900 Kiiminki, Finland
Ekovilla Oy Kuusankoski, Katajaharjunkatu 8, 45720 Kuusankoski, Finland.
Ekovilla Oy Ylistaro, Pajatie 1, 61410 Ylistaro, Finland.
Locations are visible at google maps.

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***

N/A

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***

We are not the land owner. We purchase biomass from certified FSC-PEFC forests and that is a requirement in the Puro.earth methodology as well.

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***

LCA system boundary as required by Puro.earth covers cradle-to-gate GHG impact. In addition to the removed and stored CO2, our production has the following climate impacts:

1) Replacement of materials and their emissions: Use of  our product can displace use of other materials that would have caused emissions.

2) Together the Puro.earth ecosystem companies create jobs in the new carbon net-negative economy and enable recycling business.

3) avoided decomposing of feedstock biomass to GHG: The biomass we use would otherwise decompose naturally or be used for energy. Those emissions are avoided by stabilizing the GHG into our product.

4) Harvesting and managing forests sustainably decreases risk of forest fires, insects and diseases.

5) Our products improve the indoor air quality and provide healthier living conditions.

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# 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 for carbon removal credits (Puro CORCs). This would enable investing in rapid capacity increase.* |

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

***Max 500 words***

| |
|---|
| |

# 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] |
| [redacted] |
| [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.