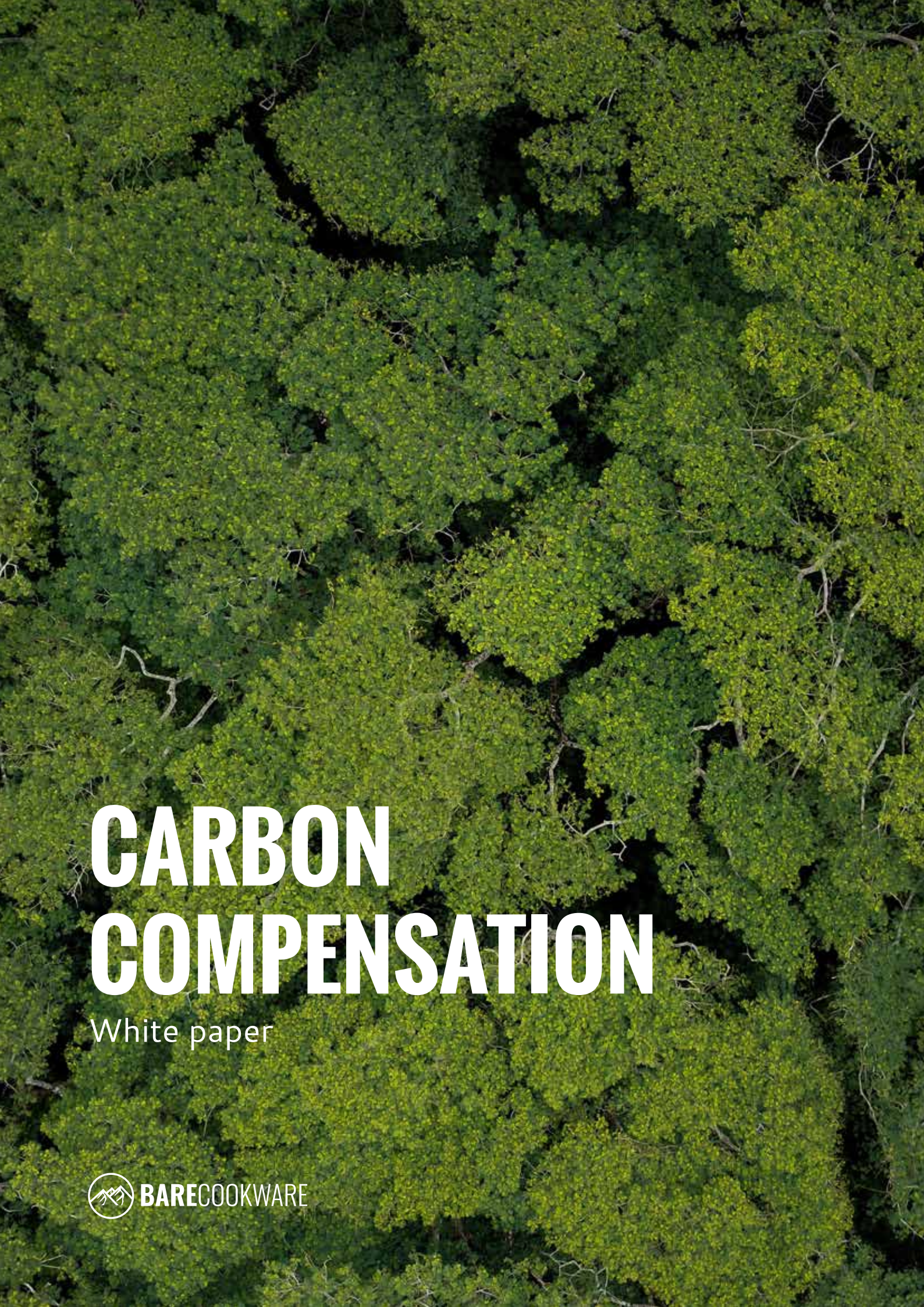


# CARBON COMPENSATION

White paper

BARECOOKWARE

What if all products you bought had their carbon footprint compensated 10x?

What if all companies cleaned up after themselves?

We believe the planet would be a lot healthier.

# ABOUT BARE COOKWARE

We believe our tools define us, and every tool should be as beautiful as it is practical. The beauty of our tools is not just skin deep.

We want to leave a lasting impression. We make culinary tools that are gorgeous, razor sharp, and carbon negative.

Our signature line of mountain pattern knives bring the beauty of nature into your home and reduce carbon emission. We stand for honest tools made from honest materials at an honest price.

**Summary**
This whitepaper covers the calculation of our carbon footprint and subsequently the amount of CO2 in kg we compensate. We predict emission generated with a life cycle analysis per component.

**Mission statement**
BARE Cookware aims to make affordable, amazing looking, Michelin grade quality kitchenware. We believe in responsible production that minimizes environmental impact. The production and shipping of our knives unavoidably generates CO2 emissions. We compensate for this CO2 ten times over. Every knife we sell essentially decreases our overall carbon footprint.

**Life cycle analysis**
We identify five phases in our life cycle analysis. The material, manufacturing, transport, use, and end-of-life phases.

### *1. Material phase*
The material phase covers the carbon footprint of the primary production of the material.

| Component | Mass(kg) | Material | Manufacturing Process | Co2 (g Co2 per kg material) | Total Co2 (kg) |
|---|---|---|---|---|---|
| Blade | 0.18 | X50CrMoV15 Stainless steel | Forging | 6.150[1] | 1.107 |
| Handle | 0.04 | Wenge hardwood | included in material value | 0.600[1] | 0.024 |
| Packaging | 0.10 | Cardboard | included in material value | 1.200[1] | 0.120 |

*Table 1 Material phase carbon analysis per knife*

### *2. Manufacturing phase*
The manufacturing phase covers the CO2 produced during the transformation of the raw material into a product.

| Manufacturing steps | Mass(kg) | Material | Co2 (kg Co2 per kg material) | Total Co2 (kg) |
|---|---|---|---|---|
| Forging | 0.18 | X50CrMoV15 Stainless steel | 0.383[2] | 0.0690 |

*Table 2 Manufacturing phase carbon analysis per knife*

### *3. Transport phase*
The transport phase covers the carbon footprint of transporting the product to its end user.

| Transport | Mass(kg) | Type of transport | Average distance (km) | Co2 (g Co2 per kg material per km) | Total Co2 (kg) |
|---|---|---|---|---|---|
| Ocean freight to Netherlands | 0.32 | Ocean freight | 20000 | 0.008[3] | 0.051 |
| Air freight to USA | 0.32 | Air freight | 8000 | 0.600[3] | 1.536 |
| Last leg truck | 0.32 | 40 tonne truck | 500 | 0.062[3] | 0.010 |

*Table 3 Transport phase carbon analysis per knife*

### *4. Use phase*
The use phase covers Co2 produced by the product in its use. A car for example has a high carbon footprint during use, due to the burning of fuel. A roof box would also have a significant carbon footprint in the use phase as it decreases the fuel efficiency of the car it is mounted to. Our kitchenware is stationary and does not consume any power or fuel. Therefore we neglect the Co2 footprint of the product during use.

### 5. *End-of-life phase*

The end-of-life phase covers the Co2 produced in the disposal of the product but also any Co2 that might be recovered by recycling the product. Our kitchenware is built to last. A Chef's knife will last a lifetime when taken care of. Therefore end of life emissions for our products are hard to estimate.
Please note: recycling the steel in our knives or using the packaging to generate electricity in a Waste-to-energy plant will both decrease the footprint of our products. It is therefore unlikely the end-of-life phase of our products will significantly increase their carbon footprint. Therefore we neglect the Co2 footprint of the end-of-life phase.

**Results**

Table 4 shows the life cycle analysis results of one of our knives summed. Please note that data regarding emissions is generally difficult to measure. Between different sources, differences in for instance CO2 footprint per kg of material can vary up to 20%. By adding the emission from every phase, we find that the total carbon footprint of one of our knives is approximately 3 kilograms.

| **Life cycle phase** | **CO2 (kg)** |
|---|---|
| Material | 1.251 |
| Manufacturing | 0.069 |
| Transport | 1.597 |
| Use | 0 |
| End-of-life | 0 |
| **Total Co2 per knife (kg)** | **2.917** |

*Table 4 Life cycle analysis summary per knife*

**Conclusion**

In engineering, variability in material properties is to be expected. By employing a safety factor one can ensure that critical components of a system will meet specification despite variability in input. The amount of CO2 in our atmosphere is a critical component of our ecosystem. We chose to use a safety factor of 10 for our carbon compensation. This ensures our knives will be carbon negative despite any sources of CO2 emissions we might have overlooked. We will, for every knife sold offset 30kg of carbon dioxide by contributing to CO2 reducing practices.

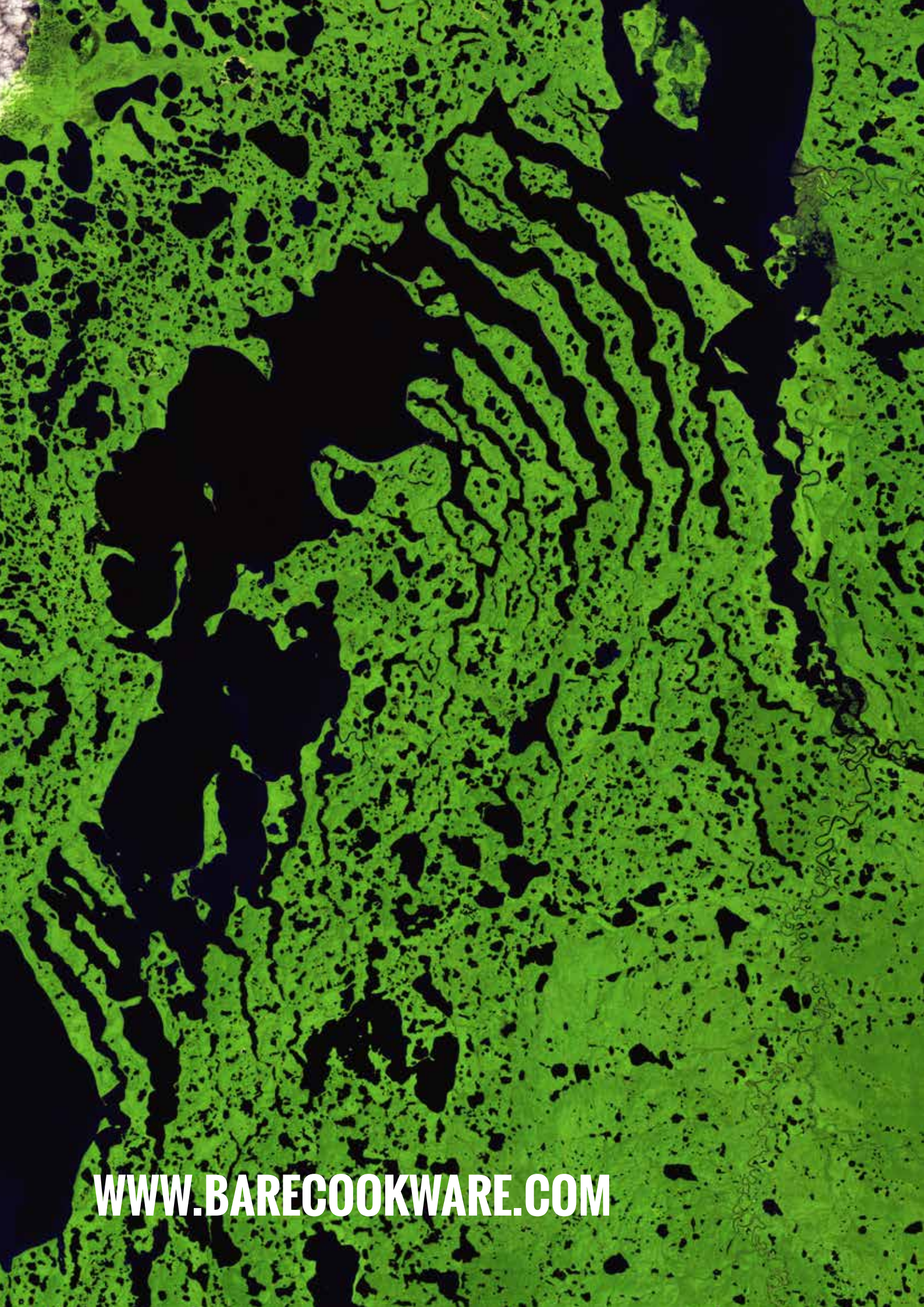
Our calculated CO2 emissions will be checked for accuracy after production and shipment to ensure we reach our 10x compensation goal. If necessary we will offset additional CO2.

We hope to lead by example in contributing to a more sustainable future.


[1] C. I. J. G.P.Hammond. Embodied energy and carbon footprint database [Online] Available: http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.html#.XjRJv2hKiUk

[2] G. T. a. G. M. Ciceri N.D., "A Tool to Estimate Materials and Manufacturing Energy for a Product," presented at the IEEE/International Symposium on Sustainable Systems and Technology, Washington D.C, May, 2010.

[3] ECTA, "Guidelines for Measuring and Managing CO2 Emission from Freight Transport Operations," ECTA, European Chemical Transport Association, 2011. Accessed: 31-01-2020. [Online]. Available: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