# LAND FOOTPRINT CALCULATOR

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CARBON ANALYTICS

Duke UNIVERSITY | BASS CONNECTIONS

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# MOTIVATION

**Habitat destruction, biodiversity loss, climate change**

**Loss is invisible to responsible parties**

**Reconcile true cost within a free market (i.e. market externality)**

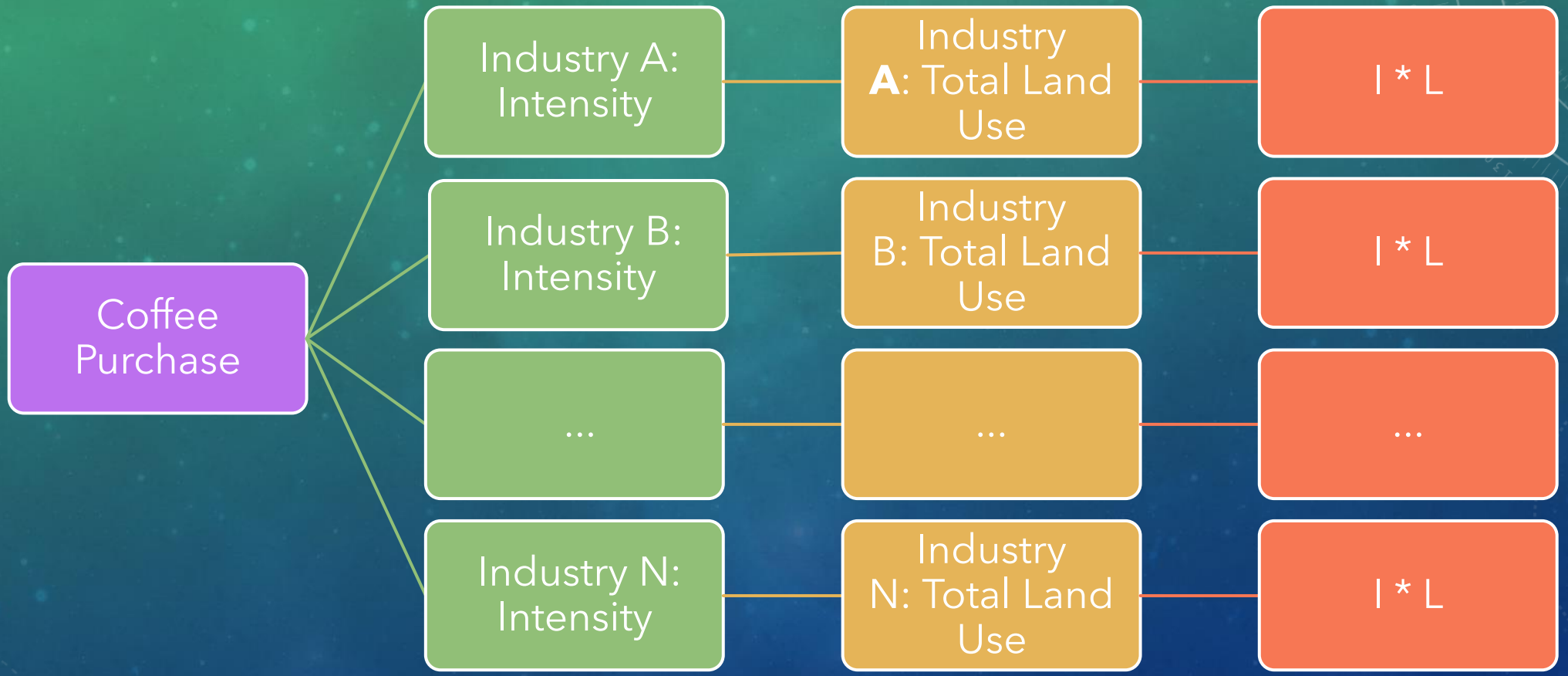
# RESULTS

- Incorporating market externality
  - Environmental awareness and accountability
    - Ecosystem conservation

# COFFEE AS A CASE STUDY

- Land Use Impact — #6 per kg; #3 per Calorie
- Abundance in everyday lives
- Data availability
- Generalizability of supply chain

# COFFEE: GLOBAL PRODUCERS




$\sum[I * L]$ = **Supply Chain Footprint**

COST OF COFFEE ($/KG)

LAND AREA HARVESTED (HA)

TOTAL COFFEE PRODUCED (KG)

FIRST-LAYER SUPPLY CHAIN

SPECIFIC LAND TYPE

# TECHNICAL DESIGN

# DATA ANALYSIS IN EXCEL

Land Area and Coffee Import / Export Data

1

Data grouped by **continent** and country

2

Sources for each country normalized by year (ico.org, fao.org)

3

Primary supply chain analysis

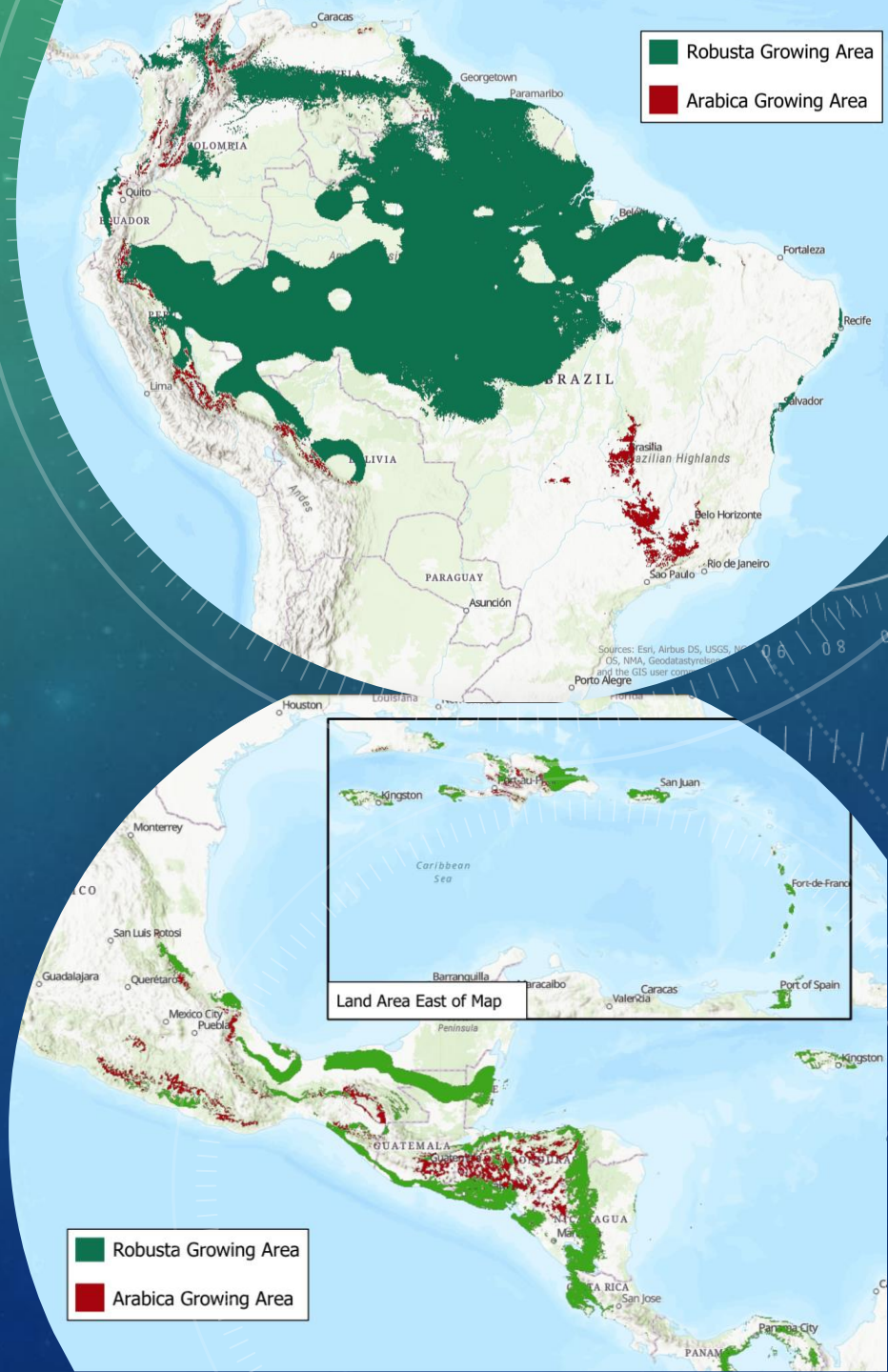
- Burlap Sacks

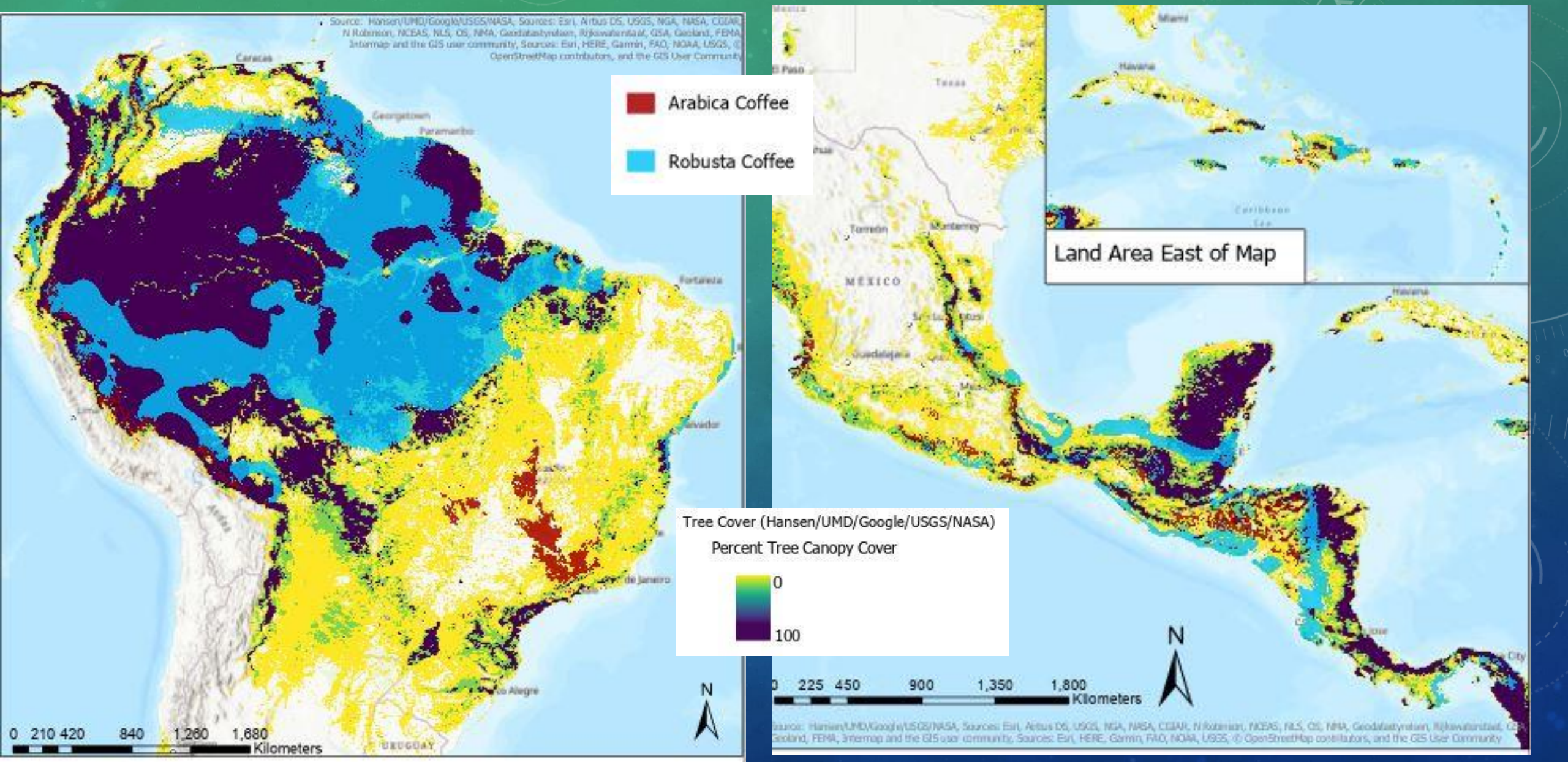
Normalize data (price, conversions), back-end and front-end development

# GEOSPATIAL ANALYSIS

| Environmental Factor | Arabica | Robusta |
|---|---|---|
| Elevation | 914-2800 m | 0-1200 m |
| Average Air Temperature | 20 °C | 24-26 °C |
| Rainfall | 1200-1800 mm / year | 1600mm+, withstands 2000mm+ which arabica does not |
| Mean Annual Temperature | 18-21 °C, quality degradation after 23 °C, dead around 30 °C; degradation below 17 °C | 22-26 °C, or 24-30°C depending on source |

Incorporate data on tree canopy cover in North/Central/South America




Arabica Coffee
Robusta Coffee
Land Area East of Map
Tree Cover (Hansen/UMD/Google/USGS/NASA)
Percent Tree Canopy Cover
0
100
0 210 420 840 1,260 1,680
Kilometers
0 225 450 900 1,350 1,800
Kilometers
N
Caracas
Georgetown
Paramaribo
Fortaleza
Salvador
Rio de Janeiro
Porto Alegre
URUGUAY
Miami
Havana
Caribbean Sea
Torreón
Monterrey
MÉXICO
Guadalajara
Mexico City

# ENVIRONMENTAL BENEFIT ANALYSIS

## LAND USE

**Shade Grown** vs. **Sun-Tolerant**

Physical land area use (intensity, yield, resources used)

## BIODIVERSITY TRACKING

Increasing conversion of intact forest to agriculture

***Deforestation*** → biodiversity loss

Dependent on cropland location and type

## EMISSIONS

***Deforestation*** → loss of carbon stocks in biomass and soil

***Croplands*** → reduction in carbon-storing potential

Synergies with Carbon Analytics

# SOCIAL BENEFIT ANALYSIS

## CONSUMER AWARENESS

Connect consumers with coffee producing countries

Lead to more ethical consumption

## HUMAN HEALTH

Working forests are essential for cleaning water + air

Better farming practices and technology in coffee bean production will reduce child labor

## RECREATION

Reducing deforested land gives communities valuable space to enjoy

Increase wildlife related tourism

# MARKET ANALYSIS AND BASIC BUSINESS PLAN

80 prominent Coffee Chains Worldwide

Marketing + retaining business

Existing coffee company has expressed interest to Carbon Analytics already

Existing pricing options set by Carbon Analytics for software development

# Current Carbon Analytics Calculator + offset option

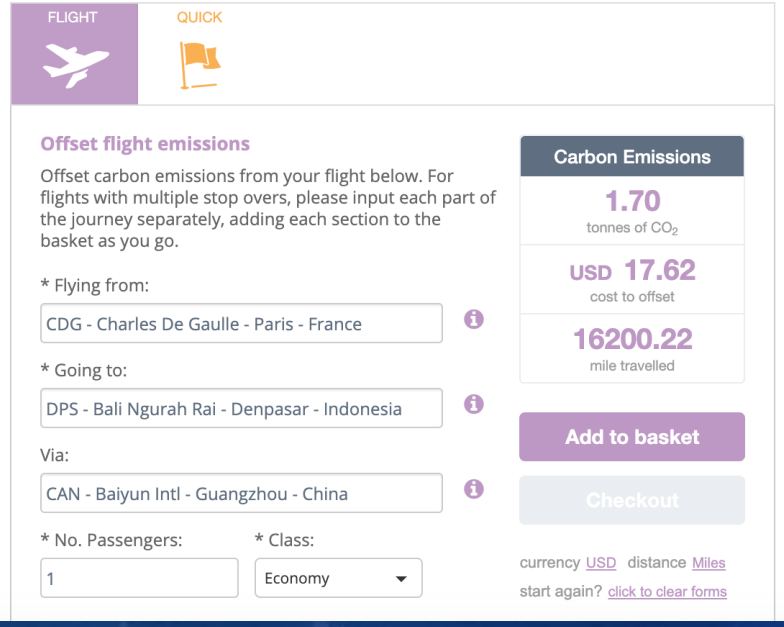
EVA AIR
A STAR ALLIANCE MEMBER

climatecare
CLIMATE + DEVELOPMENT

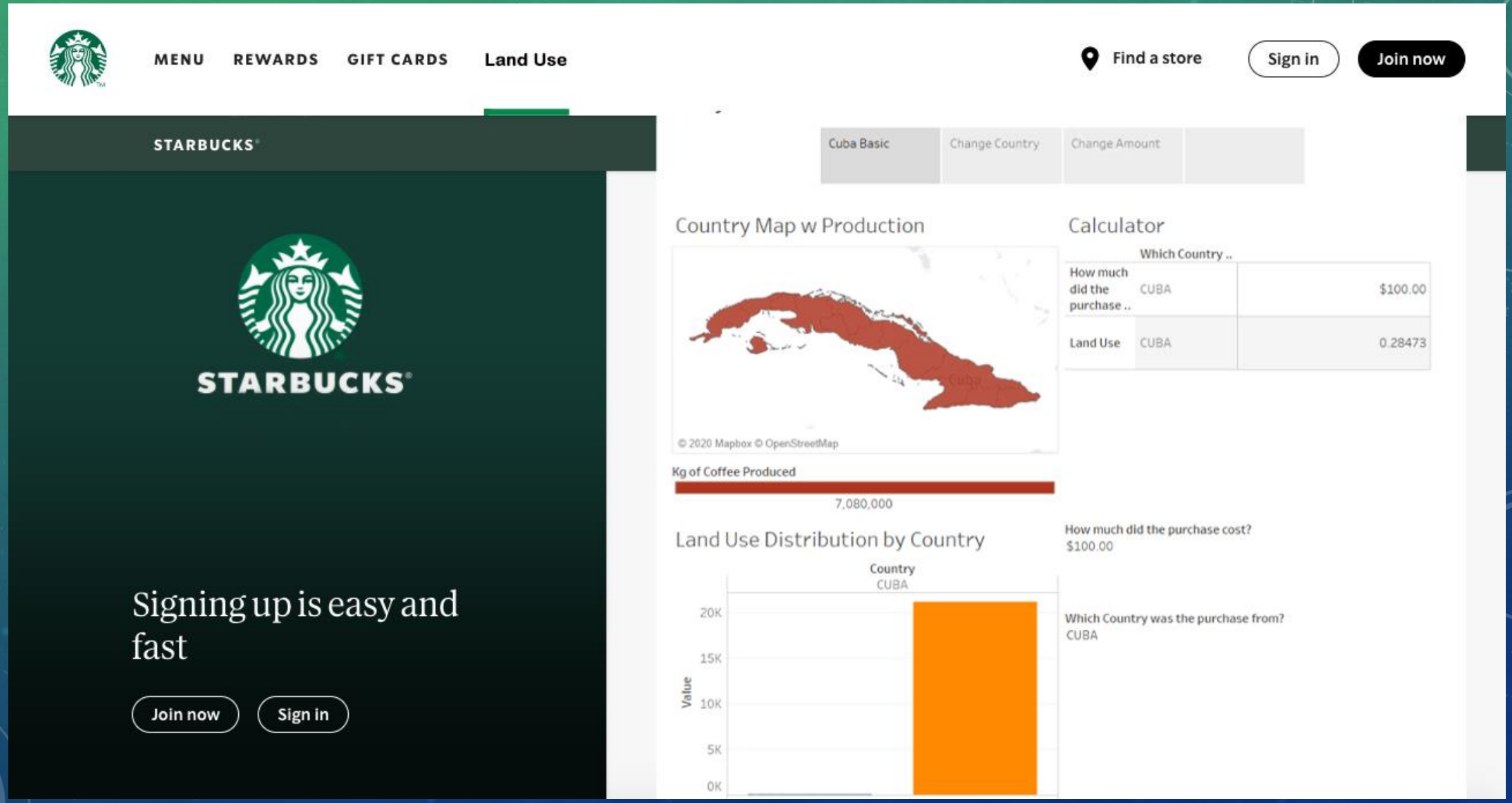
## ClimateCare Calculator

中文
ENGLISH

You can measure and offset carbon emissions from your flight using our carbon calculator. Select your start point and destination, the number of passengers, and the class you're traveling. The calculator will work out your climate impact, which you can then offset.



# INTEGRATE WITH MAJOR COFFEE COMPANIES



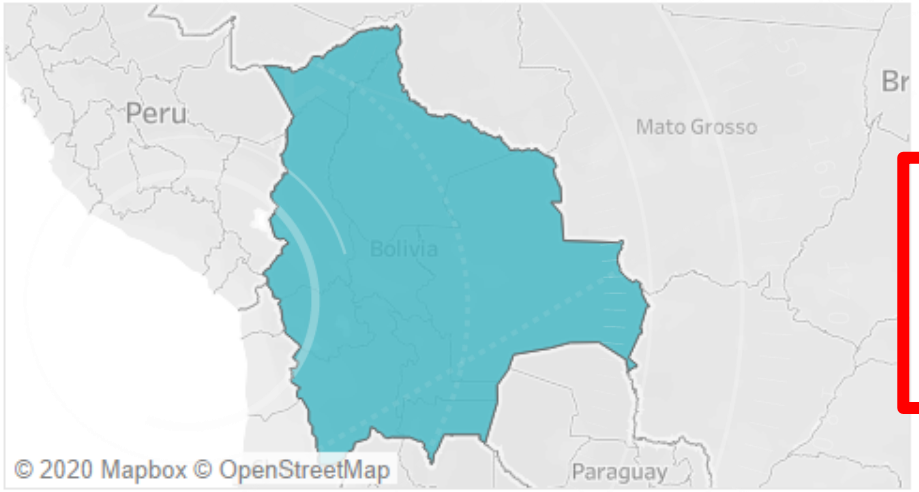
# WHAT IS SUCCESS FOR OUR TEAM?

**Case study with deliverables**

| | | |
|---|---|---|
| Assessing land impact of supply chain within Coffee industry | Georeferenced ArcGIS or Tableau Map of land use | Relative Score assessment to encourage offset |

**Pass to Carbon Analytics**

## Country Map w Production



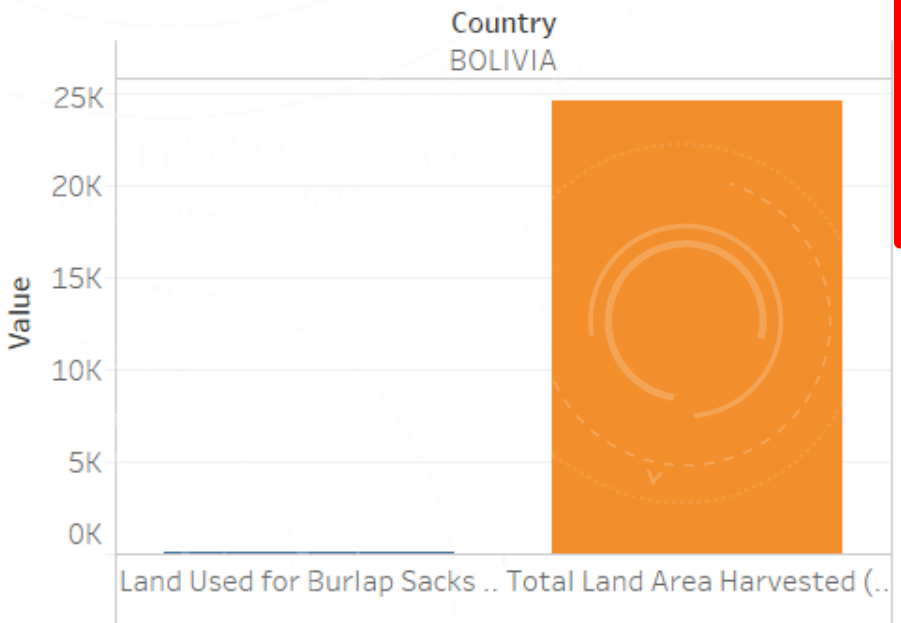

Score

0.0 100.0

## Calculator

| | Which Country was the purchase from? BOLIVIA |
|---|---|
| How much did the purchase cost? | $100.00 |
| Land Use | 0.26182 |
| Score | 81.50 |

## Land Use Distribution by Country




How much did the purchase cost?

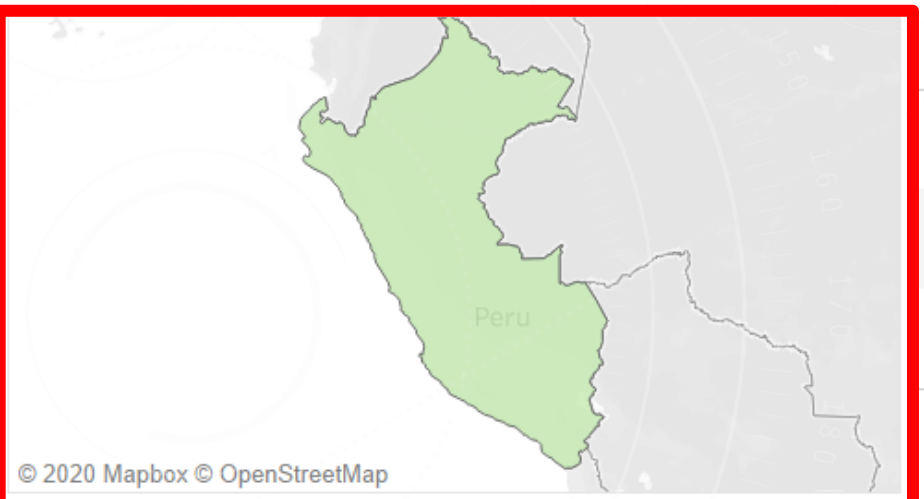
$100.00

Which Country was the purchase from?

BOLIVIA

# BASIC INTERFACE

## Country Map w Production



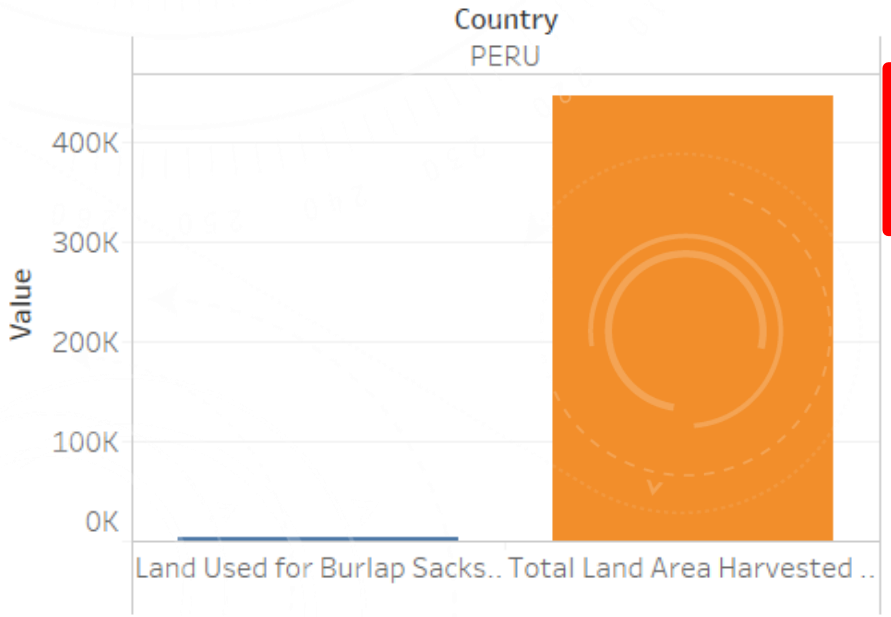

Score

0.0 100.0

## Calculator

| | Which Country was the purchase from? PERU |
|---|---|
| How much did the purchase cost? | $100.00 |
| Land Use | 0.06744 |
| Score | 48.69 |

## Land Use Distribution by Country




How much did the purchase cost?

$100.00

Which Country was the purchase from?

PERU

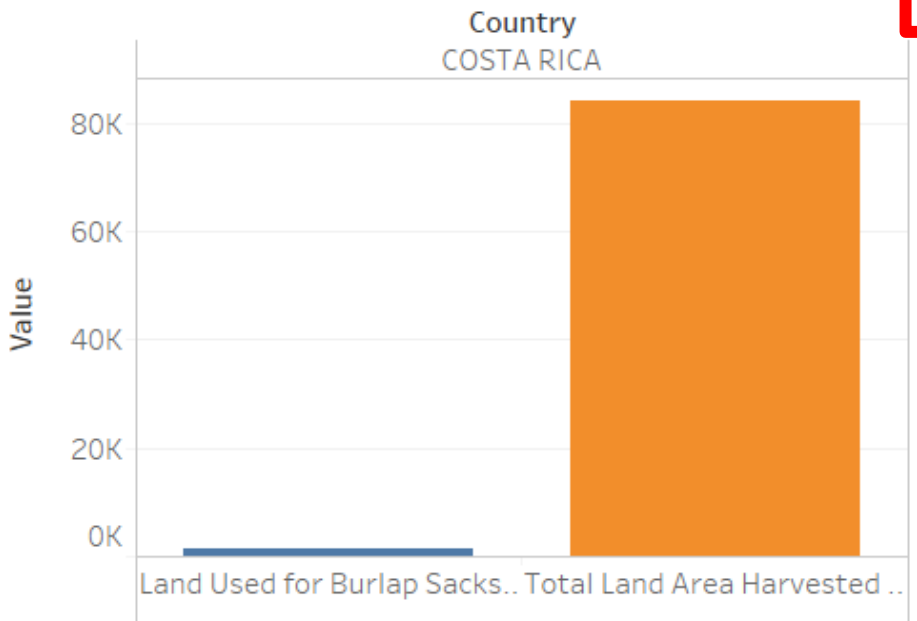
CHANGE COUNTRY

## Country Map w Production

Score

0.0 100.0

## Land Use Distribution by Country




## Calculator

Which Country was the purchase from?
COSTA RICA

| | |
|---|---|
| How much did the purchase cost? | $21.76 |
| Land Use | 0.00585 |
| Score | 17.70 |

How much did the purchase cost?

$21.76

Which Country was the purchase from?

COSTA RICA

# CHANGE AMOUNT

# PROPOSED SOLUTION

Breakdown of supply chain

Assess global land use of coffee purchase

Suggest offsets for land use footprint w/ restoration or reduction

# THANK YOU!

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CARBON ANALYTICS

- **Check out: https://www.co2analytics.com**