

studio  
IRIS

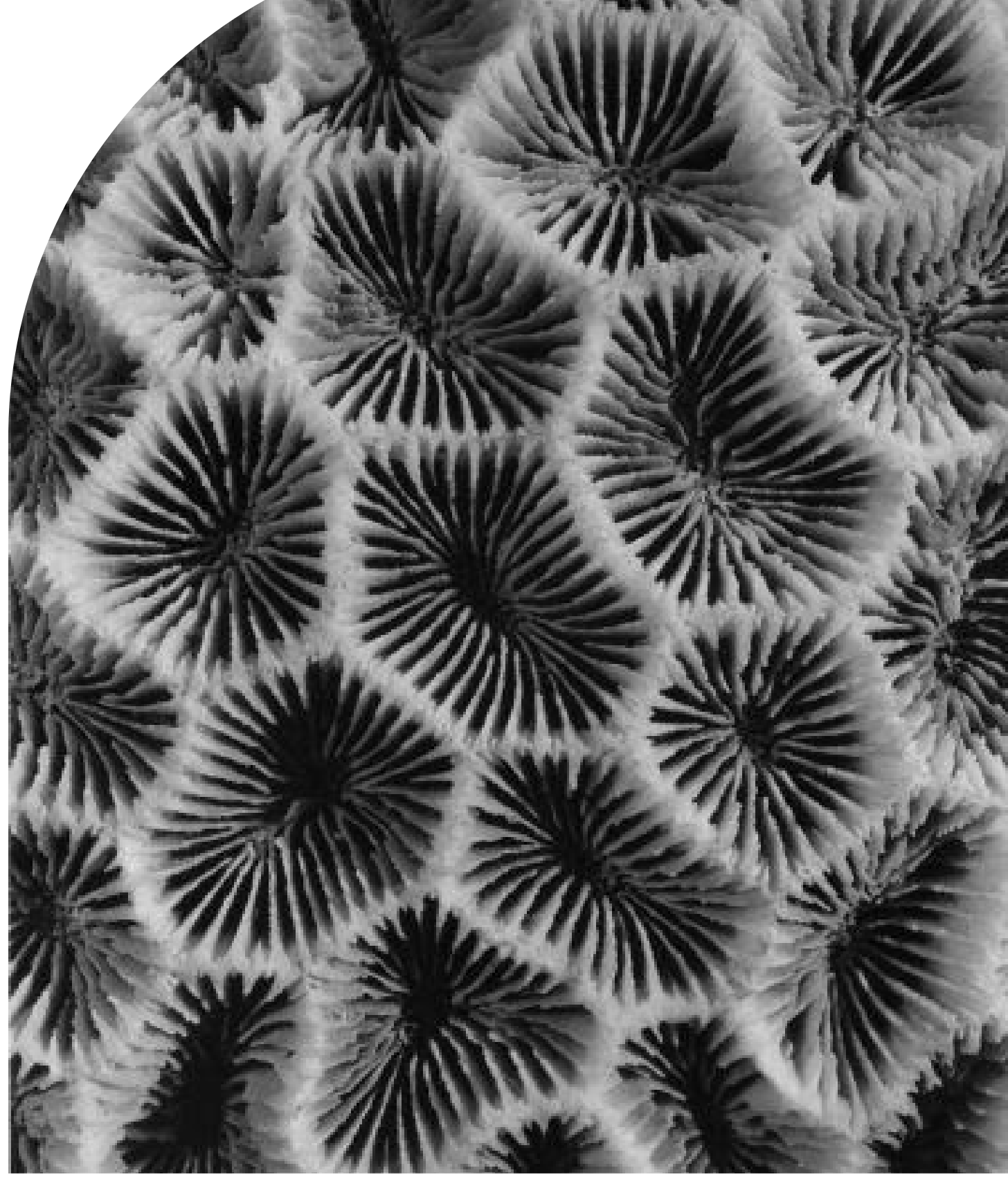
WE TAKE MEASURES TO  
MINIMIZE OUR CARBON  
FOOTPRINT AS MUCH AS  
POSSIBLE. LEARN ABOUT  
HOW STUDIO-IRIS QUANTIFIES  
AND COMPENSATES FOR ITS  
FOOTPRINT TO ULTIMATELY  
BECOME A CO<sub>2</sub>-NEUTRAL FINE  
JEWELRY BRAND.

# SUSTAINABILITY

## OUR CHALLENGE

PRODUCING CO<sub>2</sub>-NEUTRAL JEWELRY IS DIFFICULT BECAUSE THE ENTIRE PROCESS, FROM MINING TO MANUFACTURING AND DISTRIBUTION, INVOLVES SIGNIFICANT CARBON EMISSIONS.

Extracting precious metals and gemstones often relies on energy-intensive methods, transportation adds further emissions, and many production techniques require substantial energy. Additionally, achieving full transparency and sustainability in the supply chain is complex, making it challenging to eliminate or offset all CO<sub>2</sub>eq emissions involved.



## RESPONSIBLE MATERIALS

THERE IS MUCH TO BE IMPROVED IN THE SUPPLY CHAIN OF METAL AND GEMSTONE MINING. WHILE WE WANT TO BE TRANSPARENT, THE PRECISE IMPACT CAUSED BY MINING IS OFTEN UNCLEAR. FOR THIS REASON, WE PARTICIPATE IN COMPENSATION PROGRAMS.

Our journey toward sustainability begins at the source. We strive to ethically sourced materials and opt for recycled or responsibly mined metals whenever possible. By recycling 'unused' gold jewelry and avoiding virgin materials as much as possible, we limit our impact. Also, Studio-IRIS prioritizes conflict-free gemstones in all our designs. Although it's currently impossible to guarantee.

## CALCULATING OUR FOOTPRINT

MANUFACTURING JEWELRY INEVITABLY RELEASES GREENHOUSE GASES (CO<sub>2</sub>EQ). FROM SOLDERING TO POLISHING, MAKING JEWELRY HAS AN ENVIRONMENTAL IMPACT. HOWEVER, THE AMOUNT OF GASES EMITTED—VARIES PER ITEM. TO QUANTIFY THE GREENHOUSE GAS EMISSIONS ASSOCIATED WITH OUR OPERATIONS, WE FOLLOW THE GUIDELINES OF THE GREENHOUSE GAS (GHG) PROTOCOL. THIS IS THE MOST WIDELY USED INTERNATIONAL SYSTEM FOR ACCOUNTING AND REPORTING GREENHOUSE GAS EMISSIONS.

**Scope 1** emissions include the emissions directly produced by a company, such as the combustion of fossil fuels by our own sources. For Studio-IRIS, this includes transportation and our gas-usage for soldering and melting components.  
- The amount of gas used for melting and soldering is calculated based on our tank's capacity and the frequency of annual refills.  
**Scope 2** emissions refer to indirect emissions from the consumption of purchased energy, such as electricity, heat, or cooling. These emissions occur during the generation of the electricity, not its consumption.  
- Currently Studio-IRIS rents a space in a shared building, which makes it challenging to accurately track our gas- and electricity usage for heating. Therefore, we make our best educated estimates based on the consumption per unit of time for each electronic device we use.  
**Scope 3** emissions report the Scope 1 and 2 emissions of suppliers. For instance, if gold is mined, emissions are generated there.  
- To determine the emissions for the metals we use in our jewelry, we use key figures. The source on which we base these figures is IdematLightLCA, a method developed by TU-Delft. Except for diamonds, there is unfortunately no such data available for other gemstones.

## COMPENSATION PROGRAMS

EACH YEAR, STUDIO-IRIS WILL DONATE 5% OF ITS PROFITS TO NON-PROFIT ORGANIZATIONS DEDICATED TO PRESERVING AND RESTORING THE HEALTH OF OUR PLANET. ADDITIONALLY, WE OFFSET OUR EMISSIONS BY PARTNERING WITH CLIMEWORKS.

- Once we have calculated the CO<sub>2</sub> equivalent emissions of a piece of jewelry, we include a reserved amount in the sale price for CO<sub>2</sub>eq compensation. This ensures that the customer covers the environmental cost of their purchase.
- Climeworks can precisely measure the amount of CO<sub>2</sub>eq they capture with their technology, enabling us to accurately offset the calculated CO<sub>2</sub>eq emissions for each piece of jewelry. The cost to offset one kilogram of CO<sub>2</sub>eq through Climeworks is €1.30.

## CALCULATION COMPARISON

LET'S WALK THROUGH A CARBON EMISSIONS CALCULATION FOR ONE OF OUR RINGS. WE CALCULATE AND COMPARE THE CO<sub>2</sub> EQUIVALENT EMISSIONS OF THE HEX\_R3 IN 14 KT GOLD WITH A 0.25 CT DIAMOND, MADE WITH EITHER RECYCLED GOLD OR WITH MARKET-MIX GOLD. THIS CALCULATION IS BASED UPON THE PREVIOUSLY MENTIONED GHG-PRINCIPLE.

### Scope 1: direct emissions

#### 1.1 Transport

For the production of this product we do not have to travel.

#### 1.2 Gas-usage

The energy required to heat gold from 20°C to 1,064°C can be calculated using the formula:

$$Q_{\text{heating}} = m \cdot c \cdot \Delta T$$

Where:

- Weight ring (14 kt gold): 7.80 g
- Melting temperature of gold: 1,064°C
- Latent heat of fusion (melting) of gold: 64.5 J/g
- Assumed starting temperature: Room temperature, ~20°C
- Q = Energy required [joules]
- m = Mass of gold [g]
- c = Specific heat capacity of gold [0.129 J/g°C]
- ΔT = Change in temperature [1,064°C - 20°C = 1,044°C]

$$Q = 7.8 \text{ g} \times 0.129 \text{ J/g°C} \times 1,044 \text{°C} \approx 1,050.47 \text{ J}$$

- Energy to melt the gold

$$Q_{\text{fusion}} = m \cdot L_f$$

$$= 7.8 \text{ g} \times 64.5 \text{ J/g} = 503.1 \text{ J}$$

Total energy required:

$$Q_{\text{total}} = Q_{\text{heating}} + Q_{\text{fusion}} = 1,045.53 \text{ J} + 503.1 \text{ J} = 1,553.57 \text{ J}$$

- Amount of butane needed
- Heat of combustion of butane: ~49,100 W s/g (49,100 J/g)
- Efficiency of butane burner: About 50% (0.5 factor).

$$\text{Mass}_{\text{butane}} = \frac{Q_{\text{total}}}{\text{Energy provided by butane/g} \times \text{efficiency}} = 1,553.57 \text{ W} / 49,100 \text{ W s/g} \times 0.5 \approx 0.00633 \text{ g}$$

- Emissions combustion of Butane (C<sub>4</sub>H<sub>10</sub>)
- The chemical equation for the combustion of butane is: 2 C<sub>4</sub>H<sub>10</sub> + 13 O<sub>2</sub> → 8 CO<sub>2</sub> + 10 H<sub>2</sub>O
- This means that 2 moles of butane produce 8 moles of CO<sub>2</sub>.
- Molar mass of butane (C<sub>4</sub>H<sub>10</sub>): 58.12 g/mol
- Molar mass of CO<sub>2</sub>: 44.01 g/mol

For every 2 moles (116.24 grams) of butane burned, 8 moles (352.08 grams) of CO<sub>2</sub> are produced. This gives us the ratio: 352.08 g CO<sub>2</sub> / 116.24 g butane = 3.03 g CO<sub>2</sub>/g butane

- CO<sub>2</sub> from 0.063 grams of Butane
- Now, multiply the amount of butane by the CO<sub>2</sub> emission factor: 0.063 g butane × 3.03 g CO<sub>2</sub>/g butane ≈ 0.191 g CO<sub>2</sub>

Melting 7.8 grams of gold with Butane produces approximately 0.191 grams of CO<sub>2</sub>

### Scope 2: indirect emissions

#### 2.1 Electronic devices

Assumed power rating for each device:

- Polishing machine: 1.5 kW (1500 watts) duration: 30 min
- Ultrasonic cleaning device: 0.5 kW (500 watts) duration: 15 min
- Emission factor (NL, 2022) = 0.38 kg CO<sub>2</sub>eq/kWh (source: RVO, EEA, CBS)

$$\text{Energy consumption [kWh]} = \text{Power [kW]} \times \text{Time [h]}$$

$$\text{Energy}_{\text{polishing}} = 1.5 \text{ kW} \times 0.5 \text{ h} = 0.75 \text{ kWh}$$

$$\text{Energy}_{\text{ultrasonic cleaner}} = 0.5 \text{ kW} \times 0.25 \text{ h} = 0.125 \text{ kWh}$$

$$\text{Emission} = \text{Energy}_{\text{total}} \times \text{Emission factor}_{\text{NL}}$$

$$(0.75 \text{ kWh} + 0.125 \text{ kWh}) \times 0.38 = 0.333 \text{ CO}_2\text{eq}$$

#### 2.2 Heating and cooling

Unfortunately, we are currently unable to make a well-founded calculation of the amount of heating and cooling we use.

### Scope 3: emissions of suppliers

To determine the emissions for the metals we use in our jewelry, we use key figures. The source on which we base these figures is IdematLightLCA, a method developed by TU-Delft. Except for diamonds, there is unfortunately no such data available for other gemstones.

#### 3.1 Embodied emissions gold

Here both market mix gold and recycled gold are compared to each other. The emissions can be calculated using the formula:

$$\text{Emission} = m_{\text{gold}} \times \text{Emission factor}$$

Where:

- Emission factor gold (marketmix) = 13786.49 kg CO<sub>2</sub>eq/kg
- Emission factor (recycled) = 750.62 kg CO<sub>2</sub>eq/kg

$$\text{Emission}_{\text{marketmix}} = 7.8 \times 13,79 = 107.56 \text{ kg CO}_2\text{eq}$$

$$\text{Emission factor}_{\text{recycled}} = 7.8 \times 0.75 = 5.85 \text{ kg CO}_2\text{eq}$$

#### 3.2 Embodied emissions gemstones

According to our source, synthetic diamonds have a much higher emission factor than natural ones. Therefore we only use natural ones in this calculation (source: trucost.com).

Emission factor diamond = 32 kg CO<sub>2</sub>eq/gram

Emission factor synth. diamond = 102.2 kg CO<sub>2</sub>eq/gram

Diamond used: 0.25 ct (1ct = 0.2 gram)

$$0.25 \times 0.2 = 0.05 \text{ gram}$$

$$0.05 \times 32 \text{ kg} = 1.6 \text{ kg CO}_2\text{eq}$$

The emissions for gold and the diamond are:

$$E_{\text{total}} = E_{\text{gold, marketmix}} + E_{\text{diamond}} = 107.56 \text{ kg CO}_2\text{eq} + 1.6 \text{ kg CO}_2\text{eq} = 109.16 \text{ kg CO}_2\text{eq}$$

$$E_{\text{total}} = E_{\text{gold, recycled}} + E_{\text{diamond}} = 5.85 \text{ kg CO}_2\text{eq} + 1.6 \text{ kg CO}_2\text{eq} = 7.45 \text{ kg CO}_2\text{eq}$$

### Conclusion

When comparing the ecological footprint of recycled to market-mix gold, several things can be concluded:

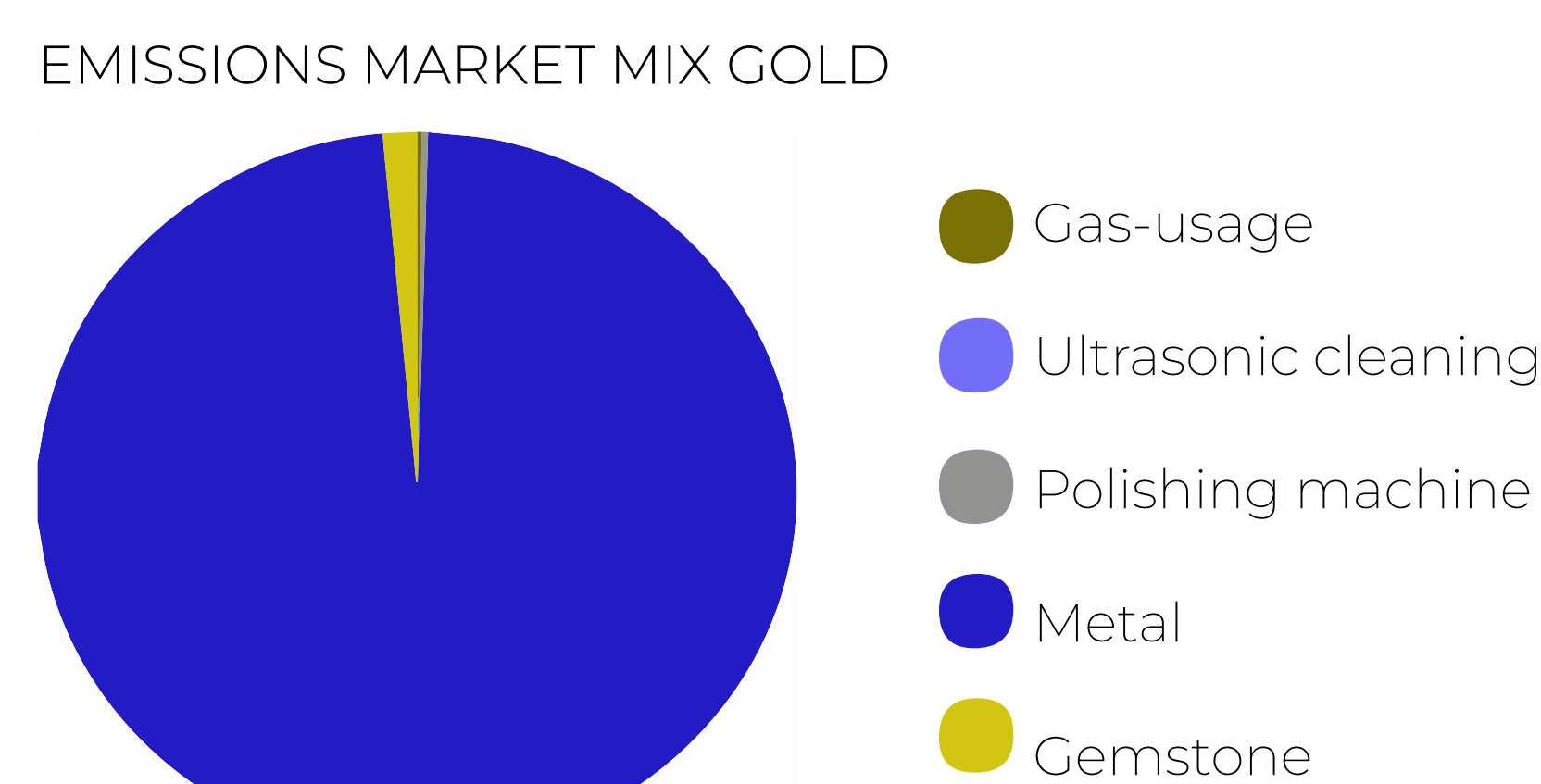
- In both cases, the largest amount of emissions are caused by the metal.
- The emissions of recycled gold is approx. 70% less than the market-mix gold.

$$E_{\text{total, market mix}} = E_{\text{scope1}} + E_{\text{scope2}} + E_{\text{scope3}}$$

$$E_{\text{total}} = 0.191 + 0.333 + 108.64 = 109.16 \text{ kg CO}_2\text{eq}$$

$$= 109.16 \text{ kg CO}_2\text{eq}$$

#### EMISSIONS MARKET MIX GOLD

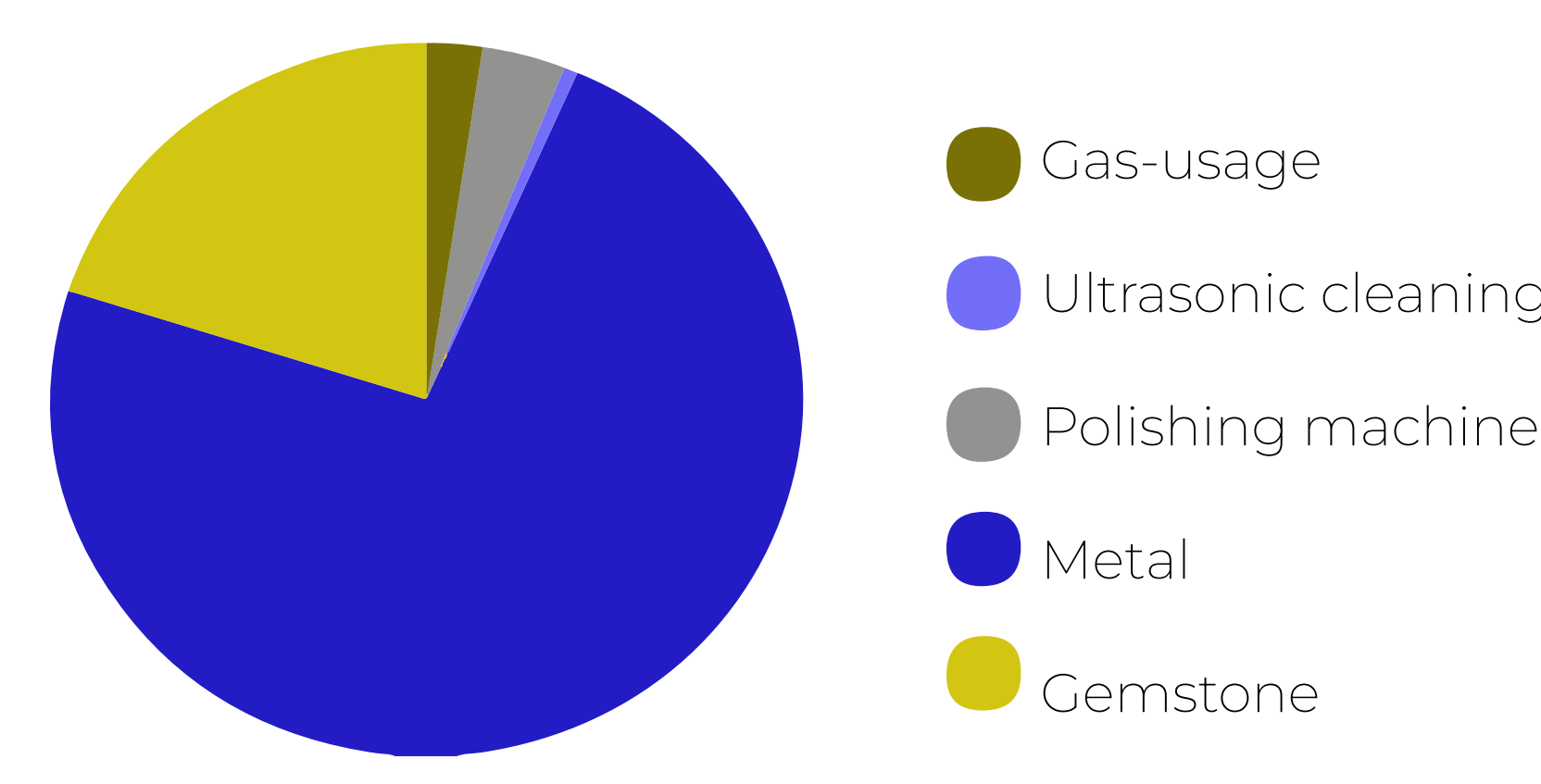


$$E_{\text{total, recycled gold}} = E_{\text{scope1}} + E_{\text{scope2}} + E_{\text{scope3}}$$

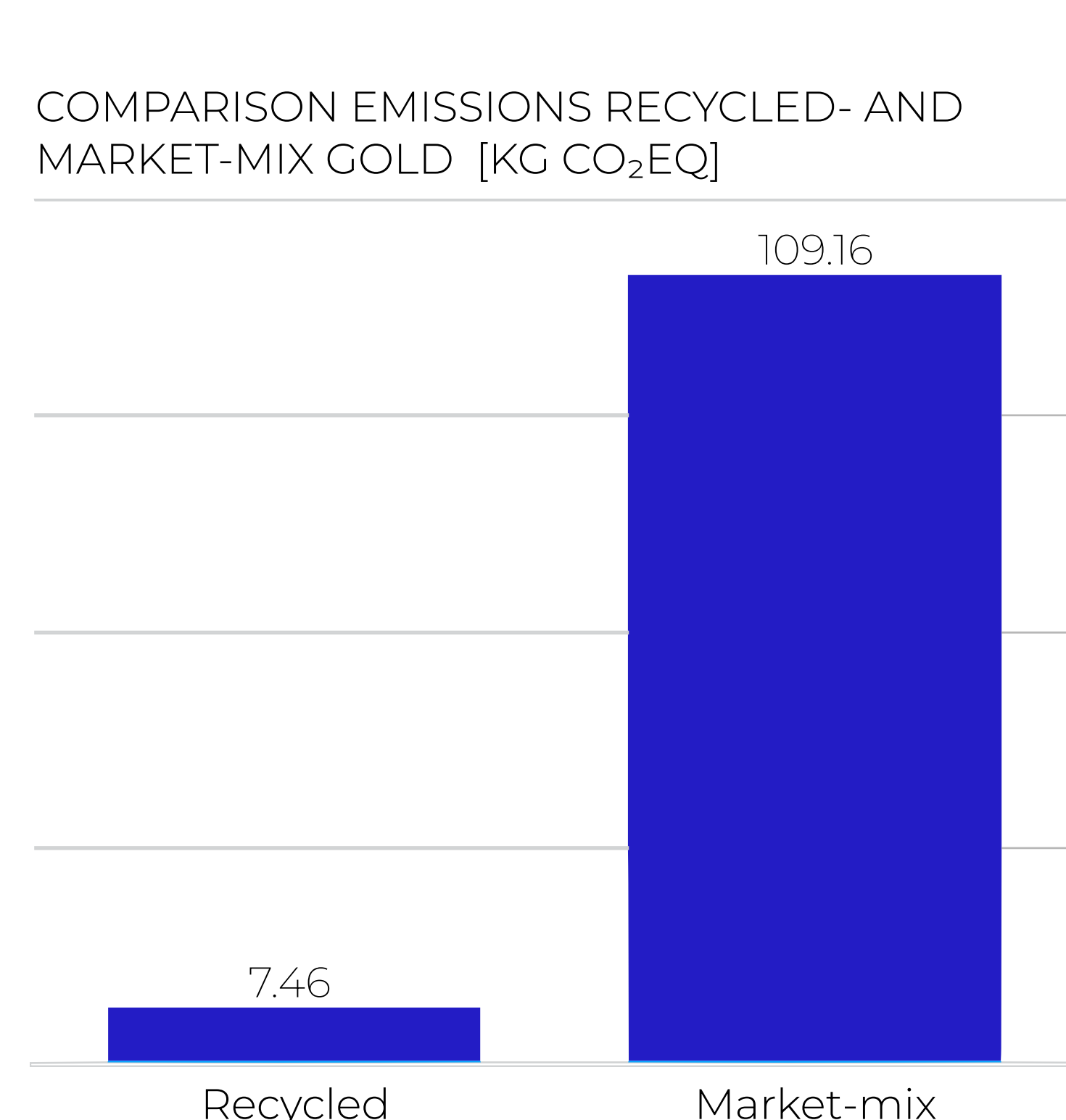
$$E_{\text{total}} = 0.191 + 0.333 + 6.93 = 7.454 \text{ CO}_2\text{eq}$$

$$= 7.454 \text{ CO}_2\text{eq}$$

#### EMISSIONS RECYCLED GOLD



#### COMPARISON EMISSIONS RECYCLED- AND MARKET-MIX GOLD [KG CO<sub>2</sub>EQ]



We acknowledge that our current calculation is not factor in human health, eco-toxicity, water usage, or resource depletion. However, starting somewhere is better than not starting at all. While our calculations aren't perfect, they provide valuable insights that are already shaping the way we run our business.

- The price of our products includes CO<sub>2</sub>eq compensation. When recycled gold is used, we offer a discount to our clients as an incentive. This encourages our clients to join us in our efforts to become more sustainable.

Behind the scenes, we're continually pushing ourselves to improve their accuracy. If you have any tips or ideas, we'd love to hear them! Help us become the first true regenerative goldsmith :)