

# Gold and climate change: Current and future impacts

The World Gold Council and its members recognise that climate change imposes very substantial risks to the global economy and socio-economic development. Policy makers, industry stakeholders, asset owners, investors and wider society, are now eager for a greater understanding of these risks and their potential consequences, and how these might be mitigated or managed in future. To contribute to a clearer, more consistent appreciation of how climate-related risks (and opportunities) might impact the future prospects of the gold industry, we have undertaken new research, building on our initial work of 2018. We believe this new analysis offers a comprehensive overview of the current status of gold's climate impacts and how the sector might adapt in the face of climate change in order to transition to a net zero carbon future. We have also examined how gold's role as an investment asset might be affected by climate-related physical and transition risks in comparison to the other mainstream investments.

## Key findings

- This analysis, using more granular data covering the whole supply chain, has produced more accurate estimates of gold's greenhouse gas (GHG) intensity and carbon footprint, while broadly validating our 2018 work.
- Gold's downstream uses – gold in bullion, jewellery, and electronic products – have little material impact on either gold's overall carbon footprint or GHG emissions.
- The current primary source of GHG emissions in the gold supply chain – energy and fuel use in gold mine production – can transition towards a net zero pathway in a practical and cost-effective manner.
- Gold's risk-return profile is likely to be relatively robust in the context of climate-related physical and transition risks, particularly in comparison to the vulnerability of many other mainstream assets.
- Heightened market volatility and uncertainty from climate-related risks are likely to be supportive of further investment demand for gold, as gold's roles as a risk hedge, portfolio diversifier and market insurance asset are well established.
- Taken together, these findings suggest gold may have an additional role to play as a climate risk mitigation asset in long-term investment strategies.

## Gold's carbon footprint

Expanding on our previous work, with more granular data and coverage of the whole gold supply chain, we have produced revised estimates of the emissions associated with both the production and consumption of gold. These broadly validate our 2018 work, while indicating a slightly lower emissions intensity and smaller carbon footprint for gold than was previously calculated.

Significantly, we have also confirmed that emissions from gold's downstream uses are relatively small.

## GHG emissions from downstream gold products

### Jewellery



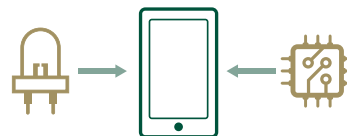
828,000 CO<sub>2</sub>e, tonnes (1% of total)

### Investment



4,500 CO<sub>2</sub>e, tonnes (<0.01%)

### Electronics

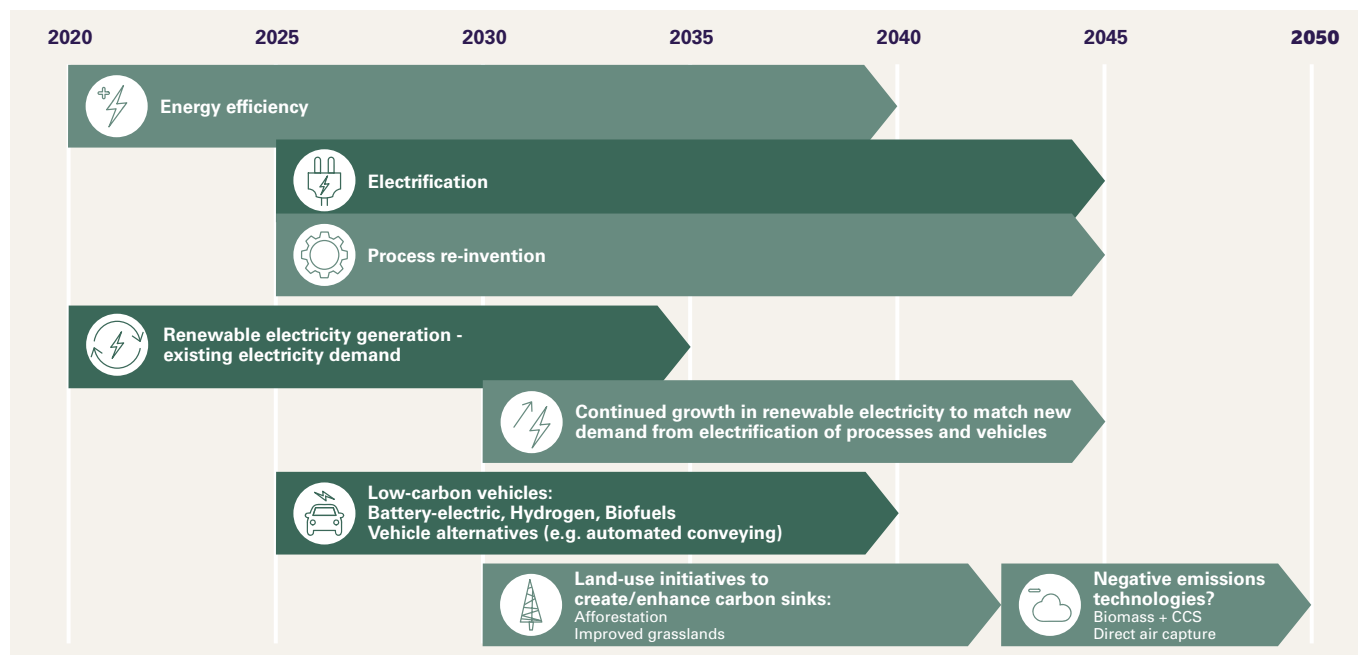


168 CO<sub>2</sub>e, tonnes (<0.01%)

## Net zero carbon transition pathways for the gold supply chain

Looking more closely at GHG emissions within the gold supply chain, our analysis suggests there are substantial opportunities for the gold supply chain, and particularly gold mining, to adapt to a net zero carbon future. We outline a range of possible steps and pathways to decarbonisation that we calculate to be both practical and, over time, cost-effective for the industry.

## Potential emissions reduction and transition pathways for gold



As previously stated, the vast majority of annual GHG emissions are associated with gold mine production and, specifically, purchased electricity (~40-45%), diesel/fuel combustion used in vehicles and machines or to generate electricity (~30-35%), and the production and transportation of fossil fuels used by the gold industry (~20%). Only ~5% of emissions are directly related to chemical processes. Our analysis provides evidence to indicate that there are now a range of practical and cost-effective options allowing the sector to minimise its emissions, in alignment with Paris Agreement targets. The following steps offer a relatively accessible and affordable path for gold mining to move towards net-zero emissions by 2050, due largely to rapid reductions in the recent and projected costs of renewable electricity generation and electricity storage:

- Process enhancement and energy efficiency
- Decarbonisation of electricity
- Decarbonisation of transport
- Self-sufficient energy sources and mini-grids
- Off-set of emissions from hard-to-eliminate chemical processes.

## Gold as an investment and climate-related risks

Our analysis examines the exposure of different investment assets, including gold, to four IPCC climate-related scenarios: 1.5°C; 2°C; 3°C; and 4°C, and the potential impact on returns to year 2030, 2050, and 2100, in comparison to the current base year of 2019.

Our key finding relating to gold is that it is likely to exhibit a relatively robust performance across all climate scenarios. Gold’s resilience is, at least in part, likely a reflection of some of the structural factors regarding gold market dynamics and the diverse drivers of demand which underpin the wider investment case for gold. It also reflects the relative vulnerability of other assets classes and gold’s negative correlation to them when they are under duress.

### Asset sensitivity and return expectations in the context of climate-related risks and global warming scenarios

Sensitivity of annual returns	2030				2050				2100			
	1.5 °C	2 °C	3 °C	4 °C	1.5 °C	2 °C	3 °C	4 °C	1.5 °C	2 °C	3 °C	4 °C
US Bond Aggregate	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	↓	↓
US Stocks	↓	↓	↓	↑	↓	↓	↓	↓	↓	↓	↓	↓
EAFE Stocks	↓	↓	→	↑	↓	↓	↓	↓	↓	↓	↓	↓
Emerging Market Stocks	↓	↓	↑	↑	↓	↓	↓	↓	↓	↓	↓	↓
Commodities	↓	↓	→	↑	↓	↓	↓	↓	↓	↓	↓	↓
Gold	↑	→	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑
Real Estate	↑	↑	↑	↑	↓	↓	↓	↓	↓	↓	↓	↓

- Assets that are relatively neutral in the context of a particular scenario, and may be expected to deliver similar annual average returns to those expected under current/historical market conditions.
- Assets that may be more robust and benefit from specific factors or opportunities associated with a scenario, potentially delivering increased returns.
- Assets that are more vulnerable to scenario ‘downside’ risks, less likely to be able deliver expected returns (and more likely to be loss-making).

Source: Anthesis; World Gold Council