# Platinum Group Metals Life Cycle Assessment

## LCA 3, Reference Year 2022

# FAQs

### 1. What is a life cycle?

A life cycle describes the consecutive and interlinked stages of a product or service system, from the extraction of natural resources to the final disposal.

### 2. What is a life-cycle assessment (LCA)?

As defined by ISO in their Principles and Guidelines for Life Cycle Assessment (ISO 14040.2), an LCA is a systematic set of procedures for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to the functioning of a product or service system throughout its life cycle. It shows where the greatest environmental impacts occur and where improvements would deliver the most benefits.

### 3. What are life cycle data used for and who is the target group?

Life cycle data are used by e.g., end users to assess the environmental performance of a product. Existing tools are, e.g., ISO standardized life cycle assessments. The inputs and outputs of two products fulfilling the same function can be compared.

The IPA LCA data are intended for use by the IPA and its members, for communications to LCA practitioners, LCA database providers, end-user of PGMs (customers), and legislators. Against the background of the growing public debate about energy and climate change, it has also become of increasing interest to financial stakeholders such as investors, the broad media landscape, and the public.

### 4. What does the IPA LCA 3 cover?

The IPA LCA 3 (reference year 2022) is a cradle-to-gate study that quantifies the environmental impacts of primary and secondary production (recycling) of platinum group metals (PGMs). It represents an update to the second industry wide LCA that was based on fiscal year 2017 production data and finalized in 2020.

The IPA LCA 3 is highly representative of the industry, covering 95% of primary PGM production and around 60% of secondary PGM production.

On the input side, the LCA includes, inter alia, the volume of ore mined and processed, electric energy, fuel, water, explosives, and process chemicals. On the output side, it covers e.g., the emissions to air and water, as well as waste. These data are shown in the relation to the primary production of 1 kg of each platinum, palladium, rhodium, iridium and ruthenium;

for secondary production, the study offers results based on the production of 1 kg of each platinum, palladium, and rhodium.

The cradle-to-gate life cycle inventory (LCI) also includes the production of fuel and ancillary materials and represents all resource use and emissions related to PGM production.

**5. What are the main differences of LCA 3 (2022 production) compared to LCA 2 (2017 production) in terms of reporting quality?**

LCA 3 improved compared to LCA 2 (2017) in several aspects:

- *Representativeness and geographical coverage*

  For primary production, we could maintain the same high industry coverage, with 95% of global production covered. For recycling, the coverage is still high, with an estimated 60% of global production, whereas LCA 2 covered nearly 70%.

- *Data Quality*

  The quality of the data was enhanced for water as well as for electricity supply, e.g., detailed information about supplier-specific power supplies could be used. Data quality was also improved through the higher granularity of process steps.
  Additionally, all end-of-life pre-treatment (outside of secondary producers' system boundaries) was estimated based on available pre-treatment data from two member companies and a more accurate modelling of toll refining activities was performed.
  Like the previous study, LCA 3 has been reviewed by an independent technical expert in accordance with ISO 14044 section 6.2 and ISO 14071.

- *Impact categories*

  LCA 3 reports the results according to the widely adopted Environmental Footprint EF 3.1 impact categories, whereas our previous study relied on the CML impact assessment methodology framework. CML is however used to compare 2022 to 2017 results.

**6. Who performed the IPA LCA, and what are their qualifications?**

The IPA LCA was carried out by Sphera, a recognized leader in providing life cycle assessment and developing sustainable solutions for corporate operations and products.

**7. Why has IPA conducted this update?**

As processes and technologies used in production change and improve over time, it is recommended to update LCA data every 3-5 years. The IPA LCA 3 update also reflects changes in background data (e.g., on energy use) and data category requirements, i.e., data required by regulators and other stakeholders to assess environmental impacts.
LCA 3 is predominantly based on the Environmental Footprint EF 3.1 impact assessment methodology, which is more widely adopted than CML.

## 8. Which PGM products were covered by the IPA LCA 3?

The IPA LCA 3 covers the primary production of platinum, palladium, rhodium, iridium, and ruthenium, as well as the secondary production (recycling) of platinum, palladium, and rhodium. The functional unit is 1 kg of the respective metal.

## 9. Why is there no data on recycled iridium and ruthenium?

Data on the recycling of iridium and ruthenium could not be provided due to not reaching the minimum amount of at least three reporting producers.

## 10. Is the data representative of PGM production?

All relevant production technologies are covered. The data provided for the primary production route covers around 95% of global production; for the secondary production route, the data collected covers roughly 60% of global recycling. Data on mining covers the major producers in South Africa, Zimbabwe, Russia and the USA, whereas data on PGM recycling covers operations in China, Germany, Japan, South Africa, the UK, and the USA.
In summary, the data are considered as highly representative for both production routes and have probably the greatest representation of any industry LCA performed in the metals' sector.

## 11. What processes were included in the study?

The LCA covers all main production processes to produce PGMs from "cradle to gate", which means from ore extraction, the production of other raw materials, energy supply and the production of the PGMs themselves. The cradle-to-gate life cycle inventory also includes the production of fuel and ancillary materials and represents all resource use and emissions associated to PGM production.

## 12. Which companies participated in this exercise?

In total, ten out of then*[1] twelve IPA members participated in the study: Anglo American, Implats, Sibanye-Stillwater, Royal Bafokeng Platinum, Northam, Nornickel, BASF, Johnson Matthey, Heraeus, and Tanaka.

## 13. How does the 2022 data set compare to the previous (2017) data? Could the PGM industry improve its environmental performance?

For the *primary production* of PGMs, an increase of the GWP could be noted in 2022 compared to 2017. The increase can predominantly be attributed to temporary external factors such as:

- Higher $CO_2$ emissions from the South African electricity grid mix due to a decreased efficiency of the South African hard coal power plants.

[1] In the reporting year 2022, Royal Bafokeng Platinum was still a separate member of IPA. Meanwhile, the company belongs to Implats.

- The influence of the increased market price (10-year average) for PGMs.
- Shifts in ore grades.

While direct comparisons of environmental performance for the *secondary production route* are challenging due to changes in the mix of companies represented, it is important to note that the data collected in 2022 is more representative and comprehensive than the data from 2017.

Looking ahead, the identified hotspot related to the electricity source has already driven rapid progress. From 2019 to 2023, South Africa's reliance on coal-powered electricity significantly declined—from 87.4% (IEA 2019 data used in the study) to 76%. Ongoing investments in renewable energy by both producers and the South African Government are expected to further reduce this dependency.

### 14. How can I get access to the results of the LCA?

The full IPA LCA 3 report is an internal document and not intended for publication. However, the main results for the most requested impact categories and conclusions are summarized in an extended LCA Fact Sheet (April 2025).

The LCA data set can be requested by filling out the LCA data questionnaire on the IPA Website. By filling out the questionnaire, enquirers accept the Data Policy quoted on the website. The data is then released to the interested party in ILCD or excel format.

The IPA LCA data on PGMs will be integrated into the summer update 2025 of Sphera's LCA for Experts (formerly GaBi) commercial database. Inclusion of the data in further databases, such as the EU's PEF EF4.0 database, is currently being reviewed.

### 15. What data sets are available from IPA? Can I get company-specific or site-specific data?

The IPA can provide industry-average data sets for the primary production of platinum, palladium, rhodium, ruthenium, and iridium. Recycling data sets are available for platinum, palladium, and rhodium.
Company specific or site-specific data sets have been collected as part of the LCA, and participating companies have received their company specific report. However, these data are confidential and the IP of the respective companies. IPA had no access to these data at any time, since the collection was performed by a third party.
The LCA 3 Report encompasses only aggregated life cycle data from all participants. Only those aggregated data sets are then also entered into life cycle data bases.

### 16. How does the industry intend to further reduce the carbon footprint of PGM production and its impact on climate change?

IPA Members work in various environments with different power sources. In South Africa, primary production is still largely reliant on hard coal-fired electricity from Eskom, which

contributes significantly to $CO_2$ emissions. However, the implementation of South Africa's proposed Integrated Resource Plan 2023 is expected to lower the carbon intensity of the national power grid.

Both South African producers and the government are making major investments in renewable energy, which is accelerating the decarbonization of the electricity supply. For example, coal-powered electricity's share has decreased from 87.4% in 2019 (based on IEA data referenced in LCA 3 for the 2022 base year) to 76% in 2023, demonstrating the country's shift towards cleaner energy.

Reflecting these developments, IPA has integrated a $CO_2$ scenario in its LCA 3, projecting the Global Warming Potential (GWP) for the primary production of PGMs in 2030. This scenario highlights the industry's efforts to reduce its carbon footprint and minimize its impact on climate change.

**17. What is the basis for the $CO_2$ scenario for 2030? Is it a pure mathematical exercise or will it likely happen?**

The $CO_2$ 2030 projection is derived from direct data collected from South African mines and reflects their planned investments in renewable energy. The modelling incorporates both a best-case and a conservative scenario. These scenarios address the impact of purchased raw materials (PGM concentrates) from third-party suppliers. In the best-case scenario, it is assumed that these raw materials will benefit from the same improvements in renewable energy uptake as the mines' own materials; in contrast, the conservative scenario assumes that no such improvements occur. Consequently, the GWP in 2030 for primary PGMs is expected to fall between these two scenarios.

The second component of the modelling considers the planned investments in renewable energy and the improvements at Eskom, as outlined in the South African Government's draft Integrated Resource Plan 2023 (January 2024).

**18. Why do the reductions in GWP vary for the different PGMs?**

The variability in GWP reductions among different PGMs can be attributed to two main factors:

*Variation in Investment:*
Different PGM producers invest in renewable electricity to varying degrees. Higher investments in renewable energy result in more significant GWP reductions.

*Differences in Production Volumes:*
Producers contribute different volumes of production for specific PGMs. For example, a high-volume platinum producer that makes substantial renewable energy investments will drive a greater reduction in the global GWP for platinum compared to producers of other metals with lower volumes or lesser investments.

Together, these factors explain why the reductions in GWP vary across the different PGMs.