

# Sustainability in Mining

# Past, Present, Future

06 November 2025

# Avhurengwi Nengovhela



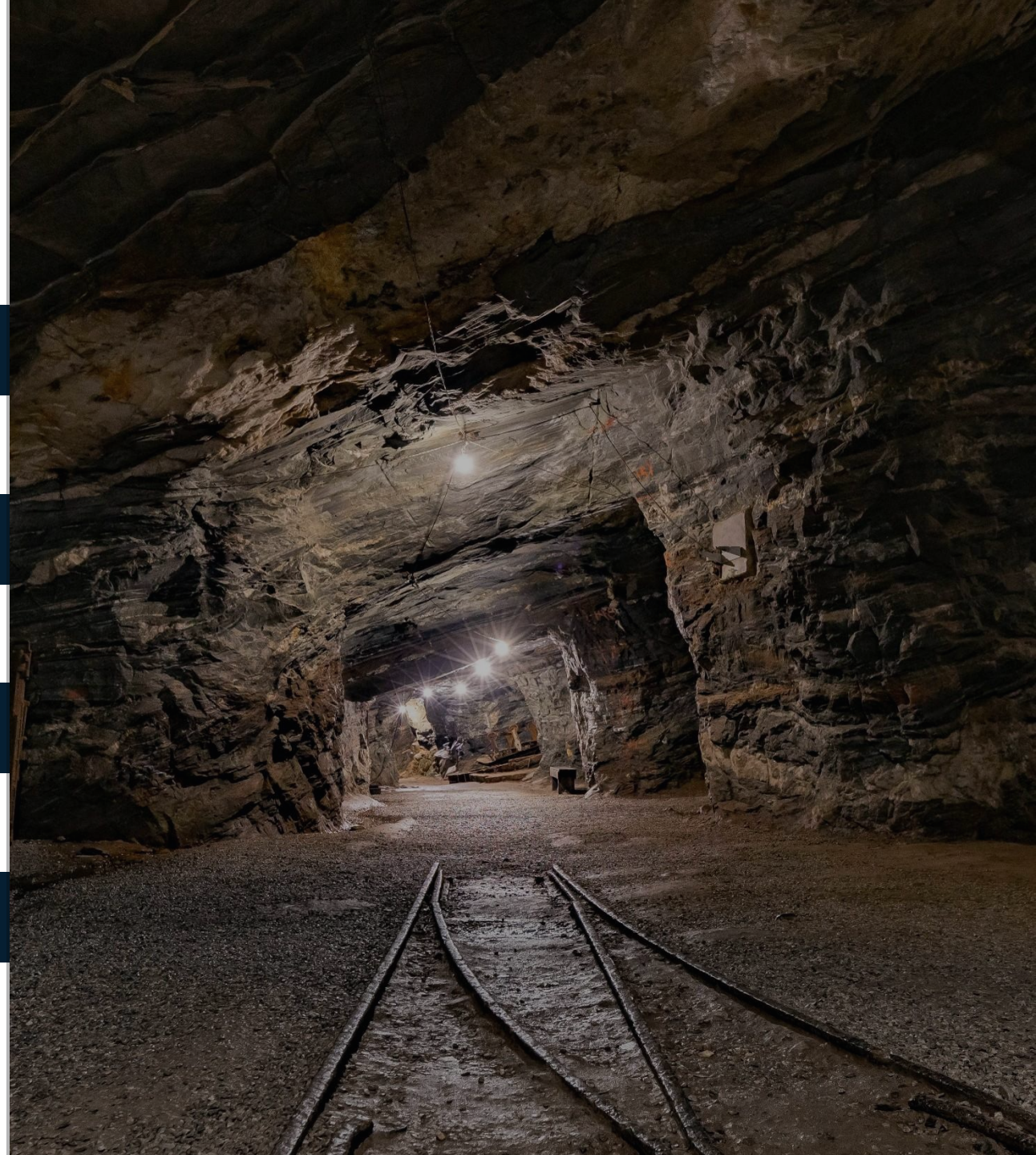
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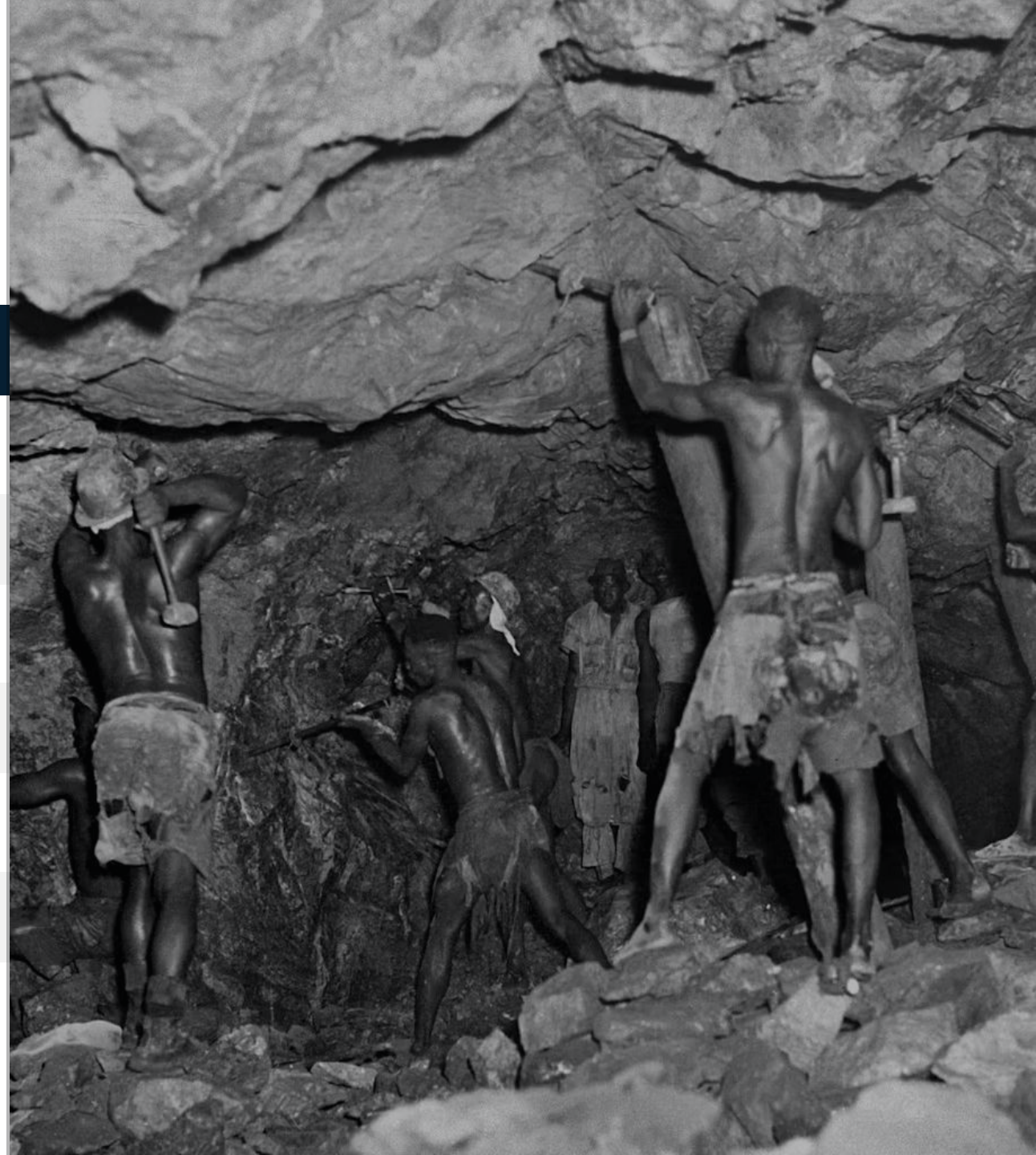
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# SA's 800-Year Mining Journey

13th  
Century

Africans mine **gold** and **iron ore** in regions like the Witwatersrand.

1850

First industrial mining project – **copper** in Springbok (Northern Cape).

1867

First **diamond** discovered at Hopetown → diamond rush, rise of De Beers, by 1880s producing 95% of the world's diamonds.

1870s-  
1880s

Alluvial **gold** discovered (Pilgrim's Rest); 1886 Main Reef gold discovery in Witwatersrand → Johannesburg founded.

1895

**Coal** found in Witwatersrand Basin, powering industrial mining.

1924

**Platinum** discovered in Bushveld Igneous Complex → South Africa becomes world's largest platinum producer.

# Wealth Above, Scars Below

## Gold Sparked Prosperity, But At A Human Cost



- ❑ **1886:** Gold discovered in Witwatersrand
- ❑ Hostels built for mineworkers from across southern Africa

## Coal Fueled Progress, But Left Lasting Wounds



- ❑ **1960s–1980s:** Coal powers economic growth, lighting homes across South Africa
- ❑ Miners' health: **silicosis, dust**
- ❑ Water and land: lasting impacts

## From Extraction to Inequality, A Shared Challenge



- ❑ Rapid development ± growing **inequality**
- ❑ Migrant labour systems segmented families
- ❑ Communities bear the scars

## Wealth Above Ground, Cost Below



- ❑ Wealth enabled industry and mobility
- ❑ Many miners faced hardship; long hours, dangerous dust, family separation
- ❑ Rivers still run orange from early mine drainage



# 1970-1987: When Everything Changed



## Global Environmental Wake-up

- 1970: 20 million people flood U.S. streets for the first Earth Day.
- Demands: Clean air. Clean water. An end to destruction for profit.
- Spark: ***Birth of a global environmental movement.***



## South African Struggle

- 1976: Soweto: thousands of students march for freedom, dignity, and justice.
- Repression: Police bullets meet peaceful protest.
- Impact: ***The world finally sees the cost of injustice at home.***

In 1970, millions around the globe marched for **clean air and water**. Six years later, in Soweto, young South Africans marched for the right to **learn, live, and be free**.

United Nations



Report of the World Commission on Environment and Development

## Our Common Future



United Nations  
1987

**“Meeting the needs of the present... without compromising the ability of future generations to meet their own needs.”**

### Defining Our Common Future

- Harlem Brundtland, the former Prime Minister of Norway, chaired the World Commission on Environment and Development (WCED)



# From Rio to Joburg: Building the Global Framework (1992-2002 Summits)



**Rio Summit (1992)**

Agreement on the concept of **sustainable development** and the establishment of key frameworks and agreements to achieve it



**Mandela Inauguration (1994)**

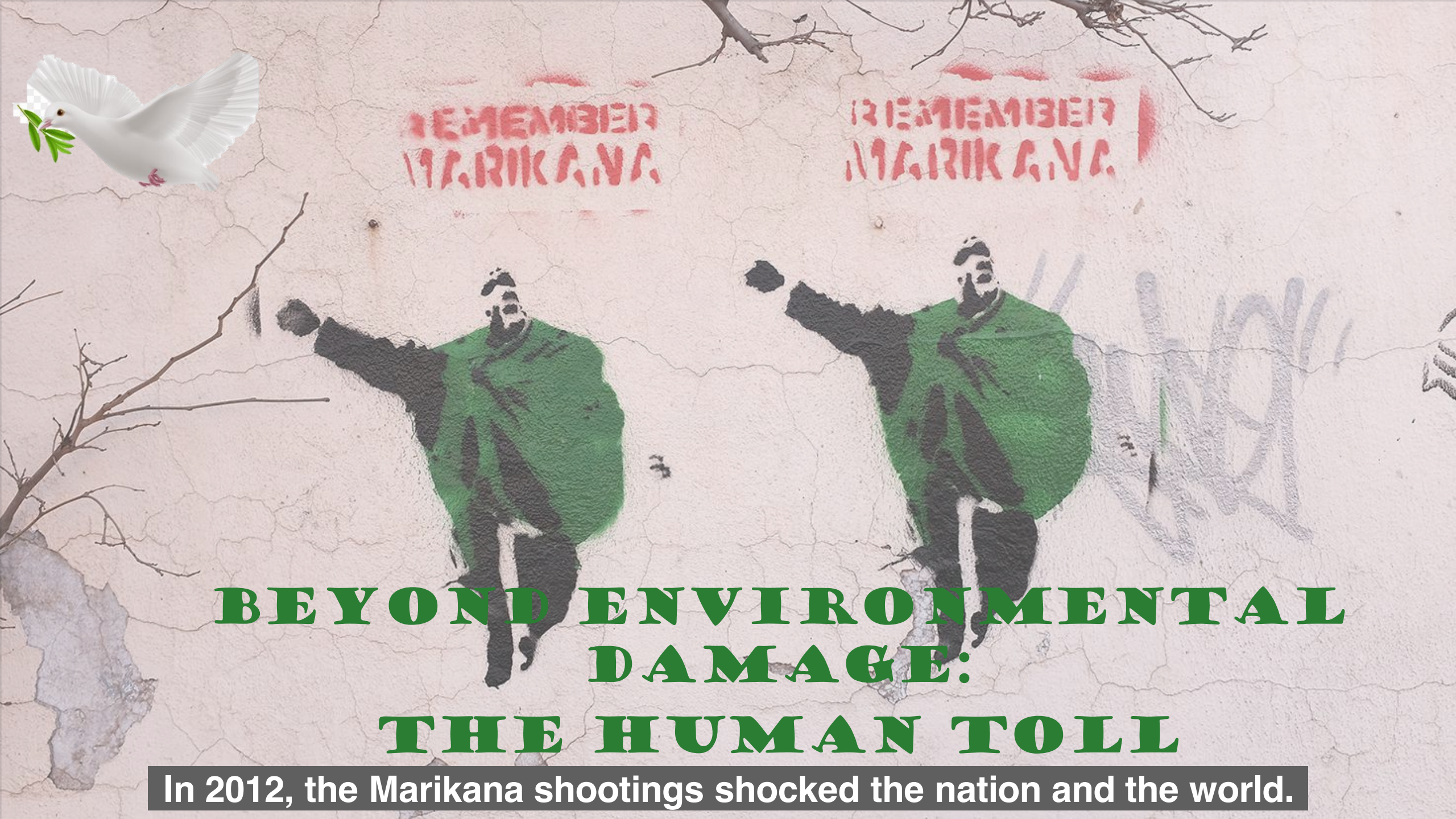
South Africa's post-apartheid constitution includes explicit rights to a **healthy environment**, **social justice**, and **sustainable resource use**



**JHB Summit (2002)**

Reaffirmed the global commitment to sustainable development, emphasizing **poverty eradication**, **social equity**, and **environmental protection**.





# **BEYOND ENVIRONMENTAL DAMAGE: THE HUMAN TOLL**

**In 2012, the Marikana shootings shocked the nation and the world.**



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So, What's Next?

PERSON *of the* YEAR  
TIME

GRETA  
THUNBERG

THE POWER  
OF YOUTH

2019







## Where Did ESG Begin? Let's Rewind to 2004.

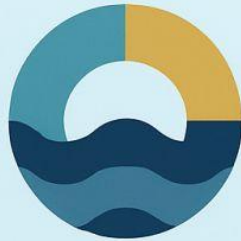
Before ESG became a boardroom buzzword, the United Nations was already connecting finance, ethics, and sustainability.

### UN GLOBAL COMPACT



### WHO CARES WINS

CONNECTING FINANCIAL MARKETS  
TO A CHANGING WORLD



In 2004, the UN Global Compact released the landmark report 'Who Cares Wins – Connecting Financial Markets to a Changing World.' It was here that the concept of **Environmental**,

**Social**,  
**Governance (ESG)** was formally introduced to global markets.

 **Environmental**

 **Social**

 **Governance (ESG)**

In 2004, the United Nations Global Compact released the landmark report "**Who Cares Wins**, Connecting Financial Markets to a Changing World.

## The Birth of ESG - Connecting Money to Meaning

- Better consideration of environmental, social, and governance factors will lead to more sustainable markets and better outcomes



# IPCC 1.5°C Report (October 2018) – Scientific Urgency

# Climate Strikes (2018-2019) – Youth Activism

# Fees Must Fall (October 2015) – Social Justice

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Climate crisis

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Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

Overwhelmed by climate change? Here's what you can do

Jonathan Watts Global environment editor  
Mon 8 Oct 2018 07:23 BST

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A firefighter battles a fire in California. The world is currently 1C warmer than preindustrial levels. Photograph: Ringo HW Chiu/AP

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# Paris + SDGs: The World's Biggest Promise

The Sustainable Development Goals (SDGs) officially came into force on January 1, 2016, as part of the 2030 Agenda for Sustainable Development.

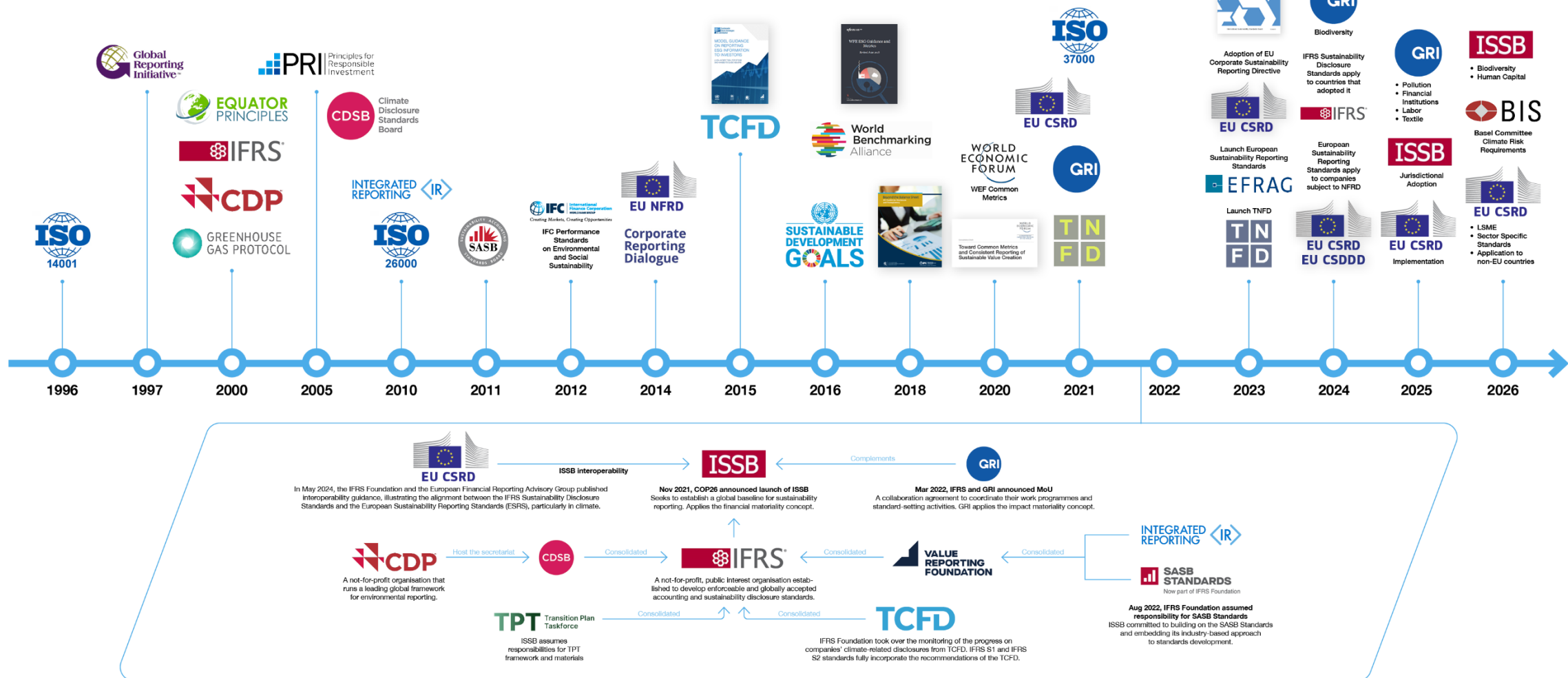


UNITED NATIONS  
**PARIS CLIMATE  
AGREEMENT**  
SIGNING CEREMONY  
— 22 APRIL 2016 —



The Paris Agreement is a **legally binding international treaty on climate change**. It was adopted by 195 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016.

# Which Standard Or Framework Should I Use?





A photograph of a wind farm at sunset. In the foreground, two workers wearing yellow hard hats and high-visibility vests are seen from behind, looking towards the turbines. A small drone is flying in the sky between them. The background is filled with several large wind turbines against a dramatic, orange-hued sky. The overall scene conveys a sense of sustainable energy and modern technology.

An international survey of company practices in 2020 revealed that, among the 250 largest companies in the world, **96% produced a corporate sustainability** or social responsibility report

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So, what's next?





# When Sustainability Became Political

The Economist

Weekly edition The world in brief War in the Middle East War in Ukraine United States The world economy Business Artificial intelligence

Leaders | Sustainable investing

## ESG should be boiled down to one simple measure: emissions

Three letters that won't save the planet

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Jul 21st 2022 | 5 min read

Mark Harris



Business And Society

## ESG Is Under Attack. How Should Your Company Respond?

by Andrew Winston

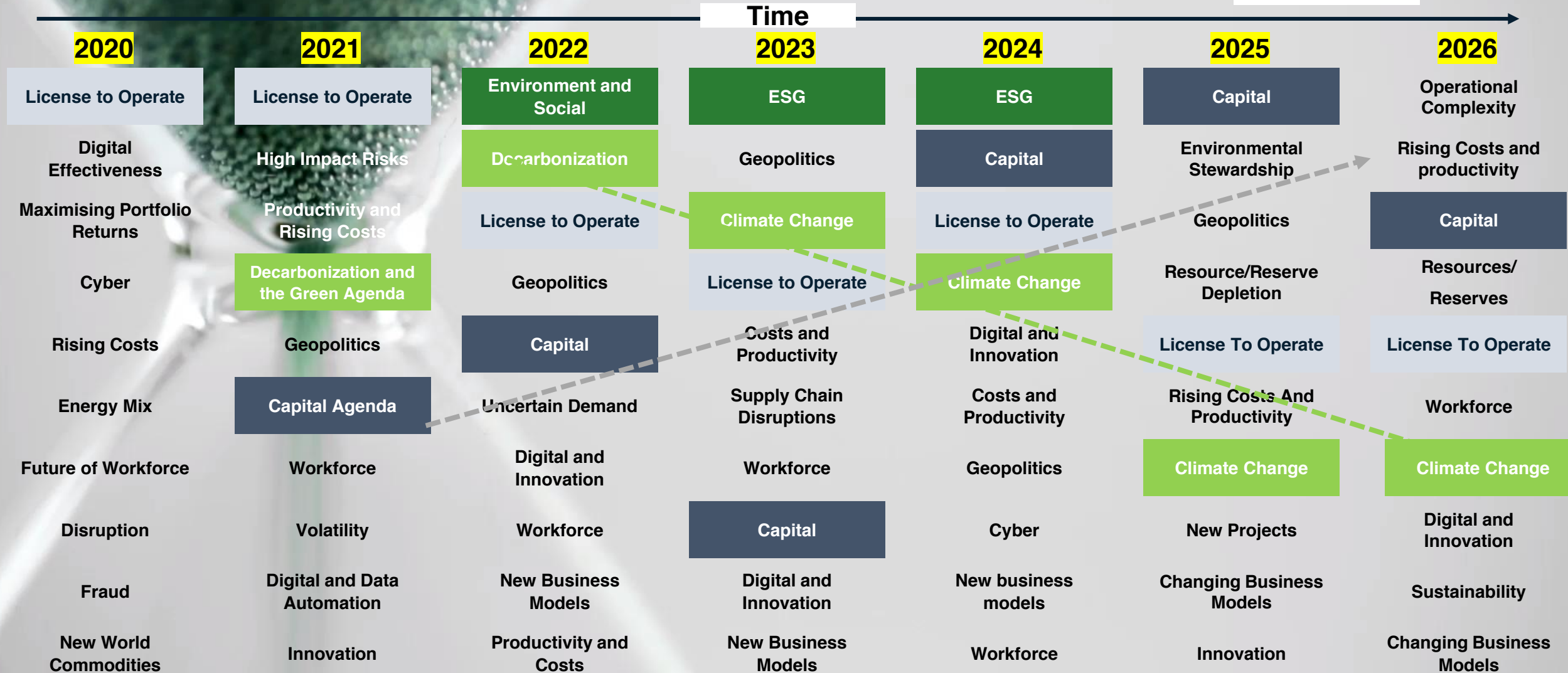
December 22, 2023, Updated December 22, 2023

## Trump will pull U.S. out of Paris climate agreement

The agreement was meant to ensure global cooperation in reducing the amount of carbon dioxide released into the atmosphere.



# A SnapShot of Shifting Priorities -





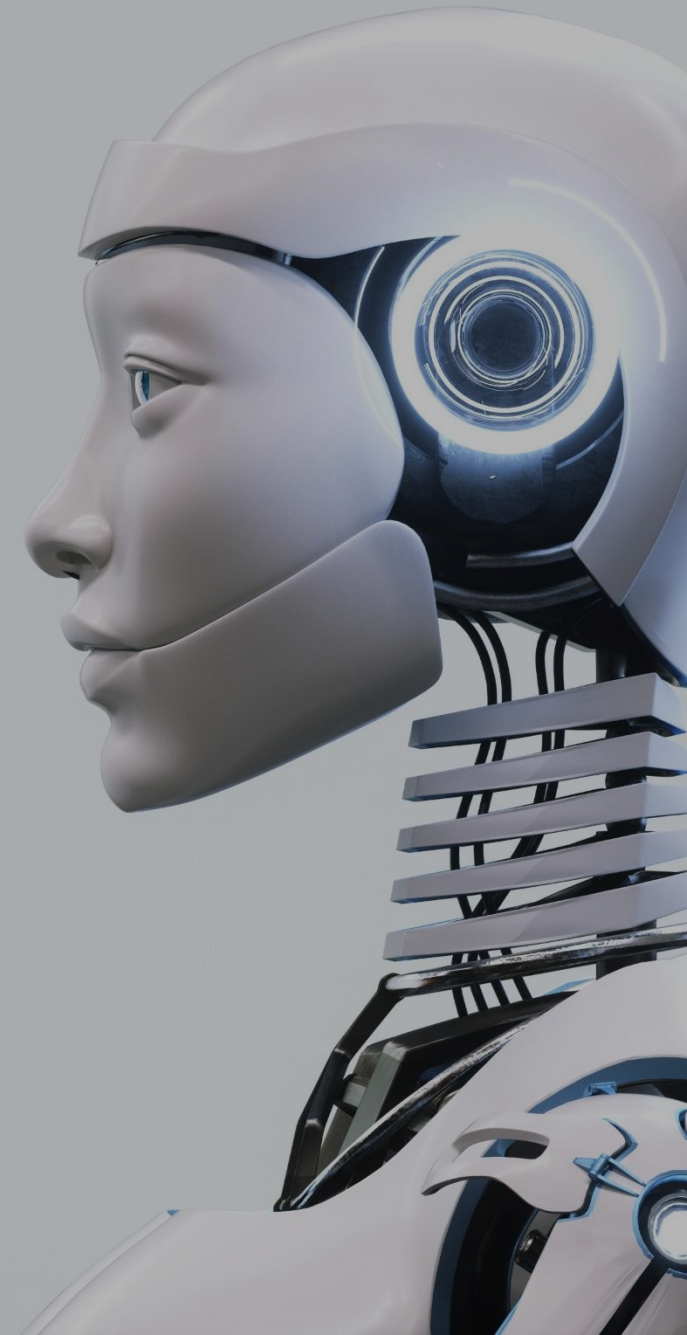
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**It's tough to  
make  
predictions,  
especially about  
the future.  
N. Bohr**



# Trends That Will Define Sustainability's Next 10 Years

Reuse, recycling, and **eliminating waste**.

**Biodiversity credits** will emerge as new financial instruments to fund habitat restoration and species reintroduction, requiring like-for-like local restoration



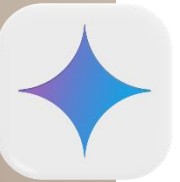
Digital transformation will directly support sustainability goals through **IoT monitoring**, digital twins for resource optimization, and blockchain for supply chain transparency

Artificial intelligence will optimize energy grids, **predict extreme weather**, monitor deforestation in real-time, and enable **precision agriculture** with reduced water and fertilizer use


Climate finance needs to reach \$5-9 trillion annually by 2030, requiring massive scaling of **green bonds**, **transition finance**, and **adaptation funding**

# 2040 Scenarios (AI's View)


*'Based on historical data, current industry practices, and credible fact-based projections, analyze and synthesize the most probable scenario for sustainability practices in mining by 2040, considering the specific context of South Africa'*




Sustainability in mining will be defined by a bifurcated model where **highly regulated, digitally-integrated**, and capital-intensive critical mineral operations will coexist with a vast, **under-resourced**, and **socially contested legacy sector**, which will **struggle** to **address historical liabilities** and manage a just transition.



Mining will achieve **incremental emissions reductions of 25-40%** from 2020 baselines through renewable energy adoption and efficiency gains, but **will fall short of net-zero targets** while struggling with **legacy environmental issues, community tensions**, and the challenge of scaling critical mineral production for the energy transition without proportional sustainability improvements



Mining operations will be fully-integrated, **circular ecosystems** mandated by stringent global ESG frameworks, where zero-carbon, automated extraction processes are symbiotically linked to local energy grids and water systems, with **social license** entirely contingent on **delivering** tangible, audited **benefits to host communities**



South African mining will operate through **AI-optimized**, semi-automated systems under **mandatory carbon-neutral** ESG frameworks, maximizing **critical mineral** extraction for global clean energy infrastructure while meeting standardized **social license** requirements.



“Sustainability entails matters of  
economic equity, financial  
security, human dignity and social  
justice, all with a weight equal to  
any environmental concerns”



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