



## Future scenarios for the world of raw materials 2050

Scenario 1:

### SUSTAINABILITY ALLIANCE

A new generation puts sustainability above everything else to keep deposits for future generations.

In 2050, the **circular economy has become the norm** in the big advanced economies. A new generation of political leaders has pushed forward a series of **reforms that focus on increasing sustainability**, not only in the raw materials industry. Almost **every product is produced in an environmentally-friendly way** with the aid of green technologies.

- Severe environmental problems have reached a tipping point, Governments agree to place sustainability above growth and profit.
- Concerted actions incentivize the shift towards more sustainable approaches (not only in the raw materials industry but also in agriculture, energy, logistics etc.)
- Recycling and substitution technologies have reached a new level of maturity. Prices for secondary (recycled) material fell over time.
- Only high-tech, low-impact mining is tolerated. Consumers reward resource-efficiency, waste reduction and durable products.
- Sophisticated environmental monitoring, prevention and mitigation technologies are being deployed.

<http://s.fhg.de/INTRAW1>



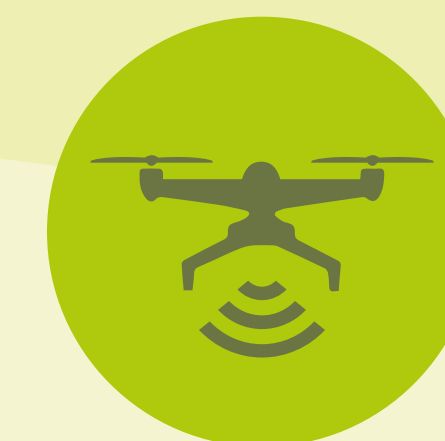
political leaders form an alliance to push reforms that focus on increasing sustainability



there is only green mining and a reduced consumption of primary raw materials



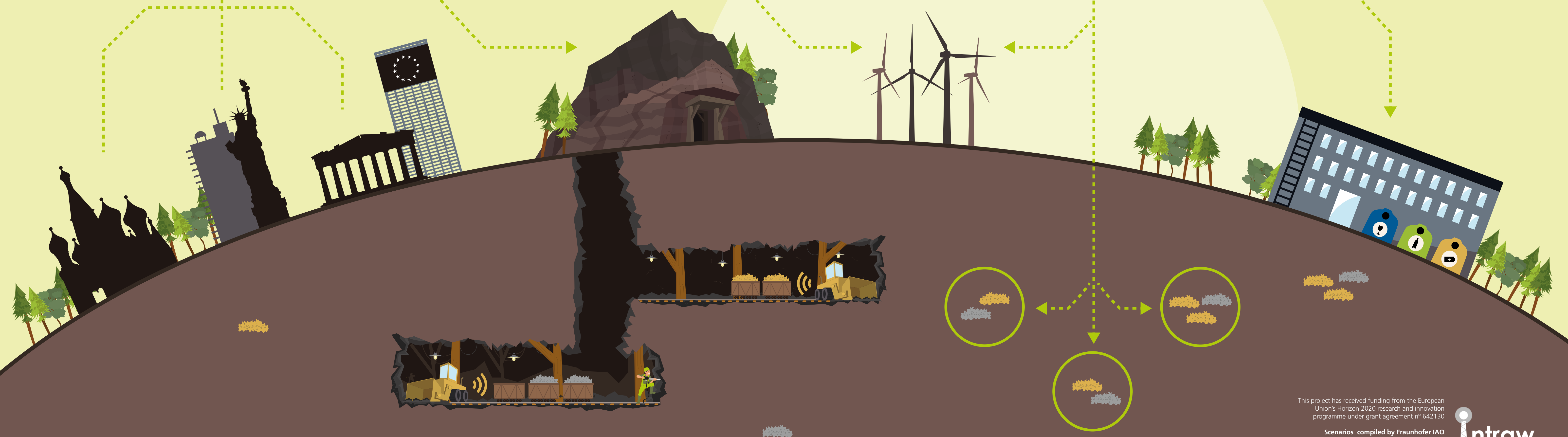
environment-friendly way of producing with the aid of green technologies



increased use of high tech for exploration and extraction



substantial progress in re-use, recycling and substitution of materials



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 642130

Scenarios compiled by Fraunhofer IAO

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## Future scenarios for the world of raw materials 2050

Scenario 2:

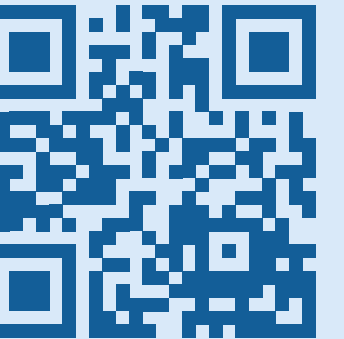
### UNLIMITED TRADE

Increased global consumption leads to raw materials growth.

In 2050, the world of raw materials has experienced **steady growth**, mainly due to ever-growing consumption. International cooperation and dialogue have created **new opportunities to produce and trade** raw materials. Access to capital has led to **industry integration, technology development and productivity improvements** alike.

- The growth of the BRICS states has been amplified by other fast-growing economies (Mexico, Indonesia etc.).
- The world's economic giants (the U.S., China and India) have opted to intensify dialogue and to cooperate.
- Despite the wide existence of backup strategies related to interrupted supply, raw material prices remain stable.
- As capital is available, the extraction of raw materials goes on and new mines are opened.
- Open data repositories enable collaborative research, innovation and planning.
- Secondary raw materials play an increasingly important role, but cannot satisfy total demand.
- Positive public image of mining – it is regarded as a diverse and high-tech industry.
- Technological progress has many effects (better exploration, higher automation, reduced need for energy & water, mining of previously sub-economic mines).

<http://s.fhg.de/INTRAW2>



increased demand for raw materials due to growing consumption



vertical integration of processing industry



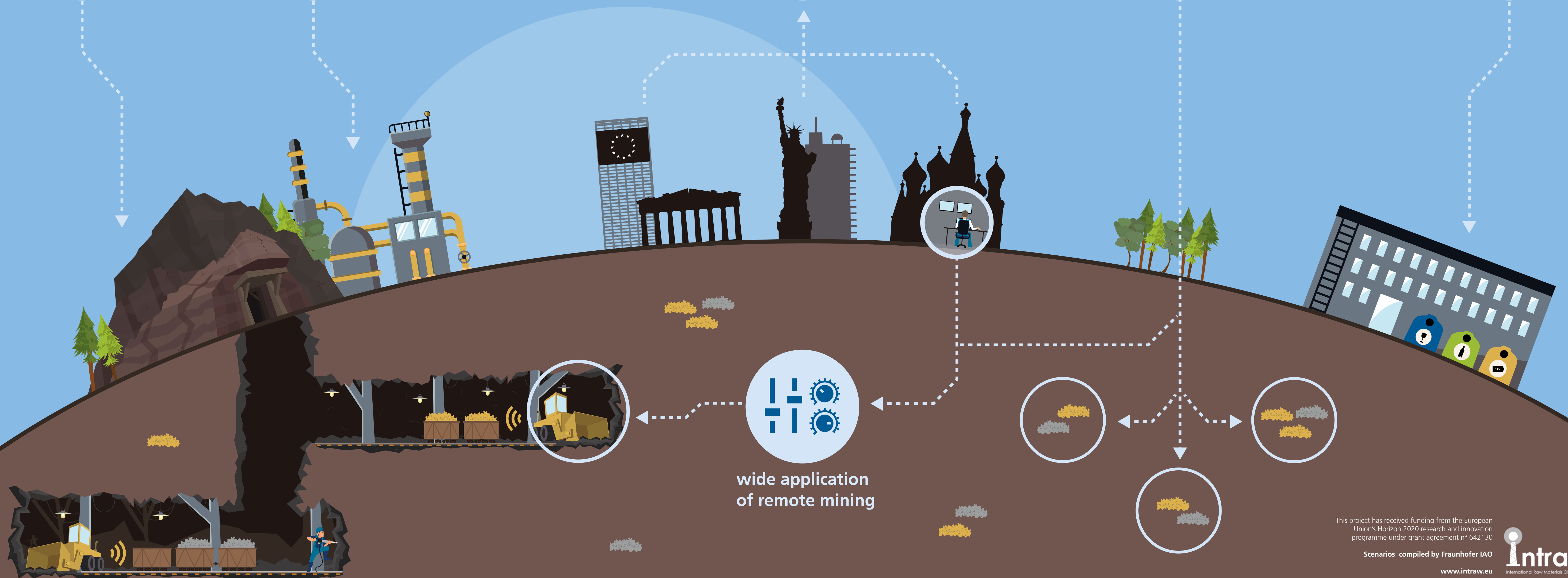
international cooperation and elimination of trade barriers



increased use of high tech for exploration and extraction



recycling gains importance



wide application of remote mining

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Scenario 3:

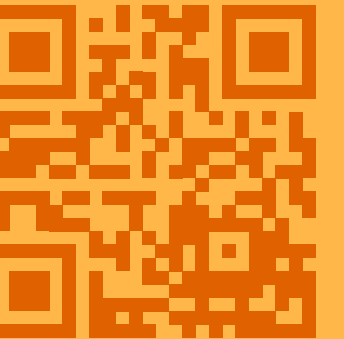
### NATIONAL WALLS

Economic standstill gives rise to nationalist politicians and protectionist measures.

In 2050, the world of raw materials got stuck as **social and demographic pressures** triggered a long period of economic standstill, which lead to a rise of **protectionist measures**. The absence of leadership and insufficient political will didn't help to improve the situation. **Each country fights for its own agenda**. There is **little progress in mining practices** as reforms have stalled and private investments are low.

- Conflicts related to the access to raw materials arise. International institutions are weak, they can barely settle disputes.
- Big countries dominate the raw material value chain
- Disparities between countries got worse, there is little economic growth.
- Securing access to raw materials is a major challenge, especially for the resource-poor countries. Old alliances are re-established.
- Nations focus on solving their own problems. They run national economic development programmes.
- Resource-poor countries re-start mining and invest into recycling, reuse & substitution.
- Resource-rich countries favour technologies that are readily available.

<http://s.fhg.de/INTRAW3>



countries that abandoned mining, have re-started



no collaboration across national borders



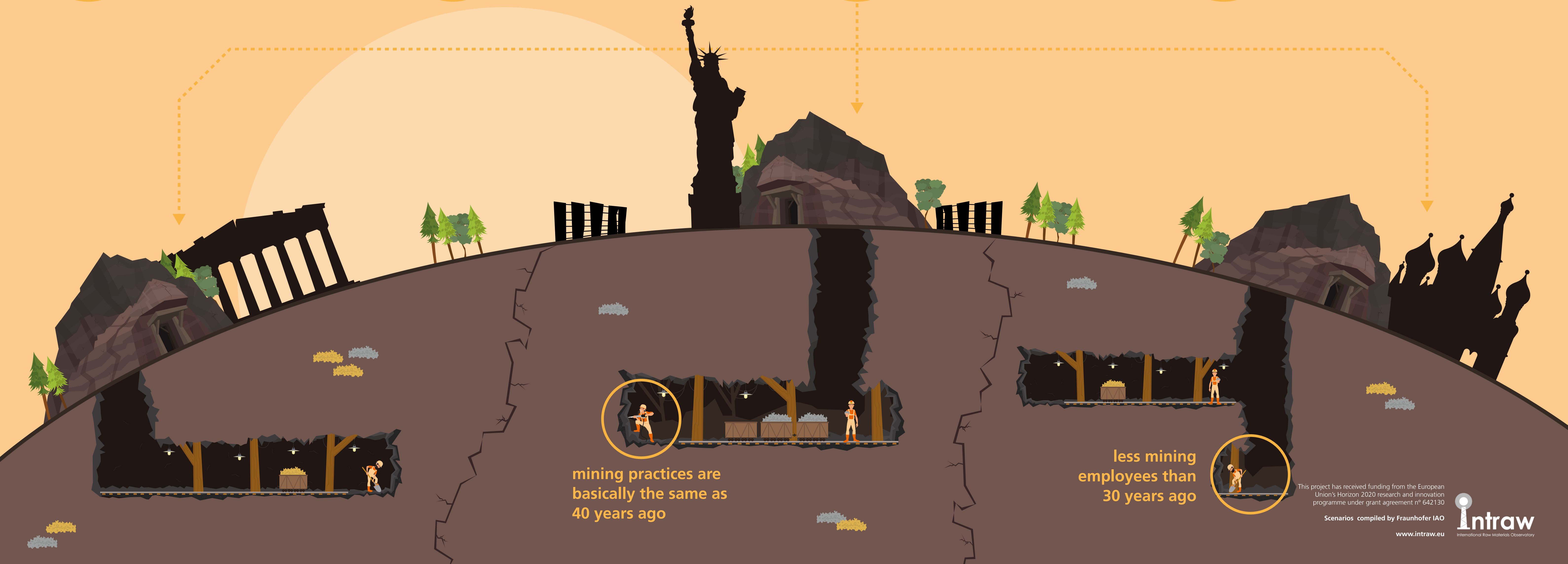
mining technology development is at a standstill, but some countries have to catch up



little economic growth, mostly boosted by national government



acceptance of mining (it is a necessity)



mining practices are basically the same as 40 years ago

less mining employees than 30 years ago

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