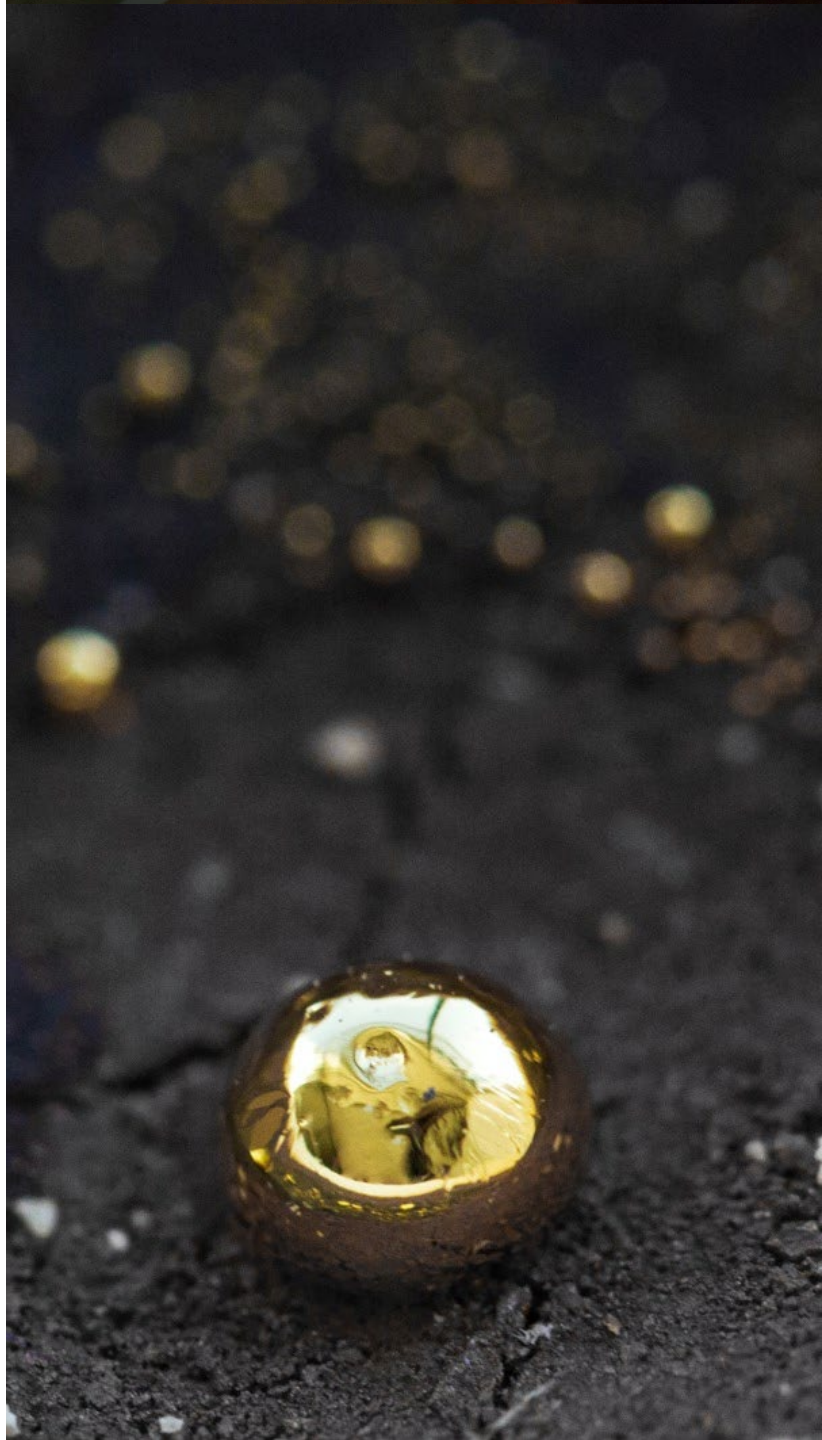
Towards Sustainable Recovery: Collaborative models for Gold and Copper valorization from Urban Waste

"Join us on a journey towards sustainable metal recovery. We'll explore innovative circular approaches to extract valuable resources from urban waste streams"

- **Alexandra Levesque,** Innovation & Development Manager – Refining Division, PX Precinox SA, Switzerland
- **Kamlesh Melana**, Vice President - Global Sales and Applications, emew Clean Technologies, Ireland



PX PRECINOX
a company of PX GROUP

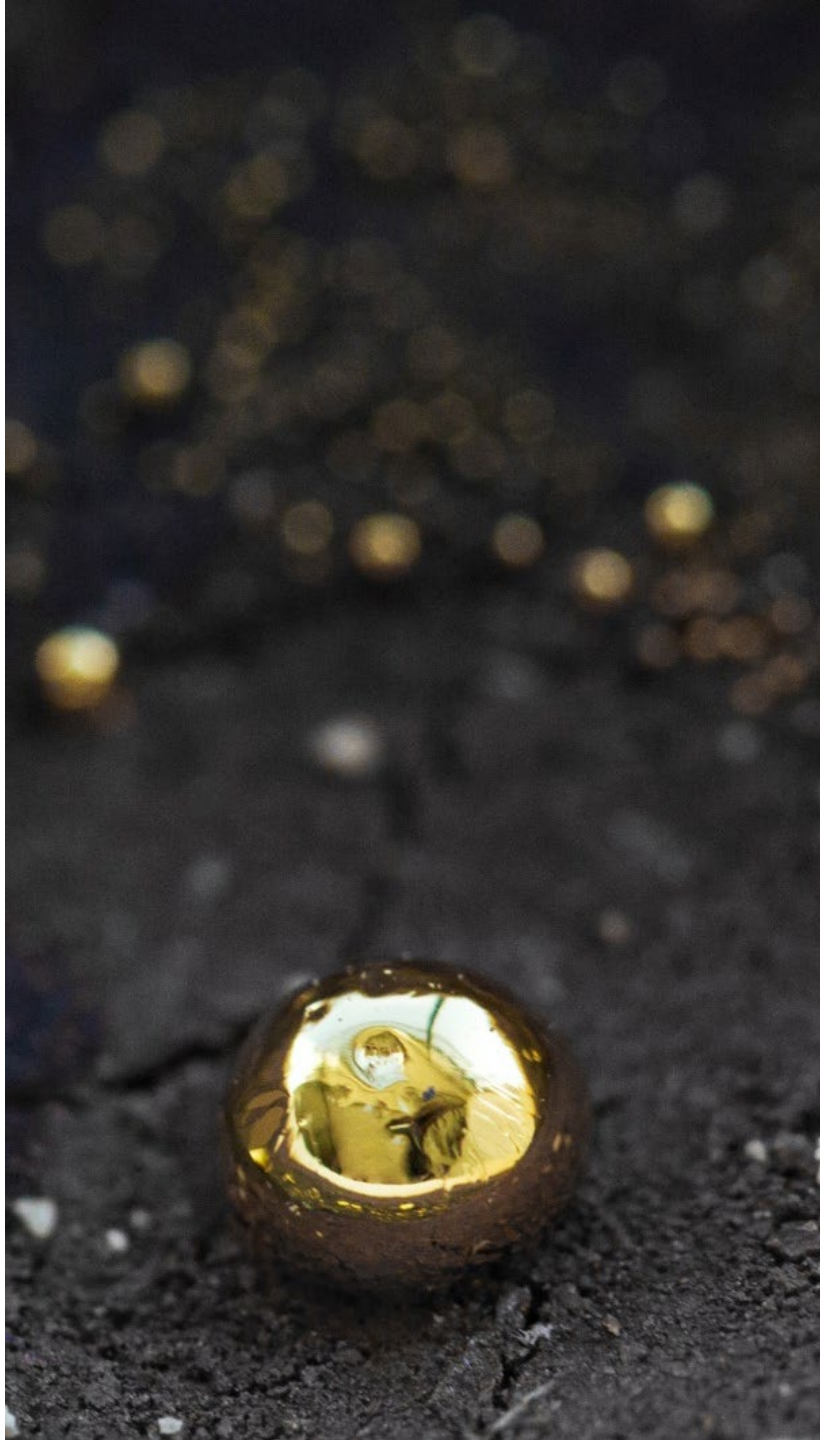
- **PX Group**:
  - Swiss family business, created in La Chaux-de-Fonds in 1976
  - A reference partner for over 40 years of the biggest players in the Swiss watch industry

- **PX Precinox SA**
  - Precious metal refining and recycling
  - Tailor-made semi-finished products
  - Responsible gold sourcing, refining and dedicated lines

LBMA GOOD DELIVERY REFINER

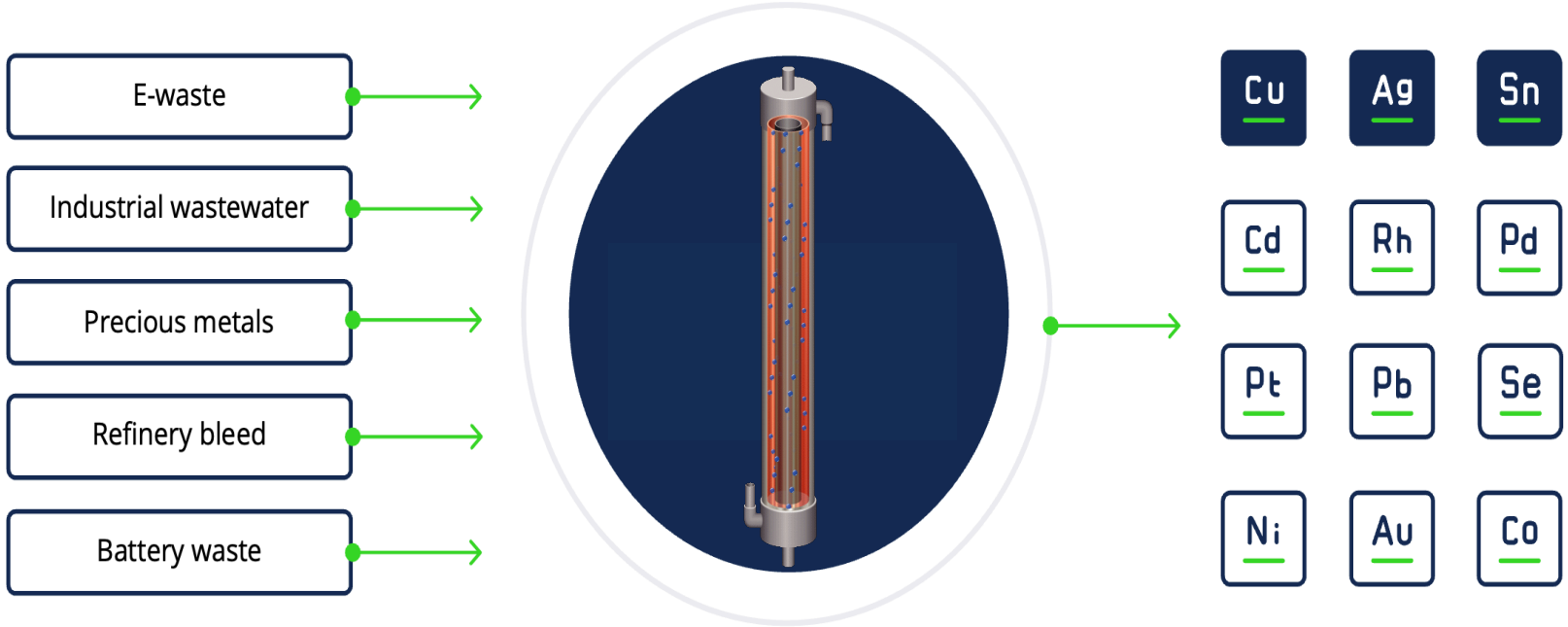
FAIRMINED

PX IMPACT®



emew
clean technologies

- Global metal recovery technology provider for sustainable recovery of high purity metals; Established in 1995
- Inventor of vortex electrowinning, providing higher selectivity, recovery, and current efficiency



Freeport McMoRan Copper & Gold · adani · BOSCH · vedanta transforming for good · RAND REFINERY · sircel

Urban Waste Examples

E-waste

Industrial effluent

Sweep & Trash

Copper Smelting

Urban Waste Challenge

1 **Mixed metal waste**

Material complexity

Base metals mixed with precious

Valuable resource

2 **Opportunities**

Circular Economy Emphasis

Regulatory Drivers

Technological Innovation

3 **Local Solutions Needed**

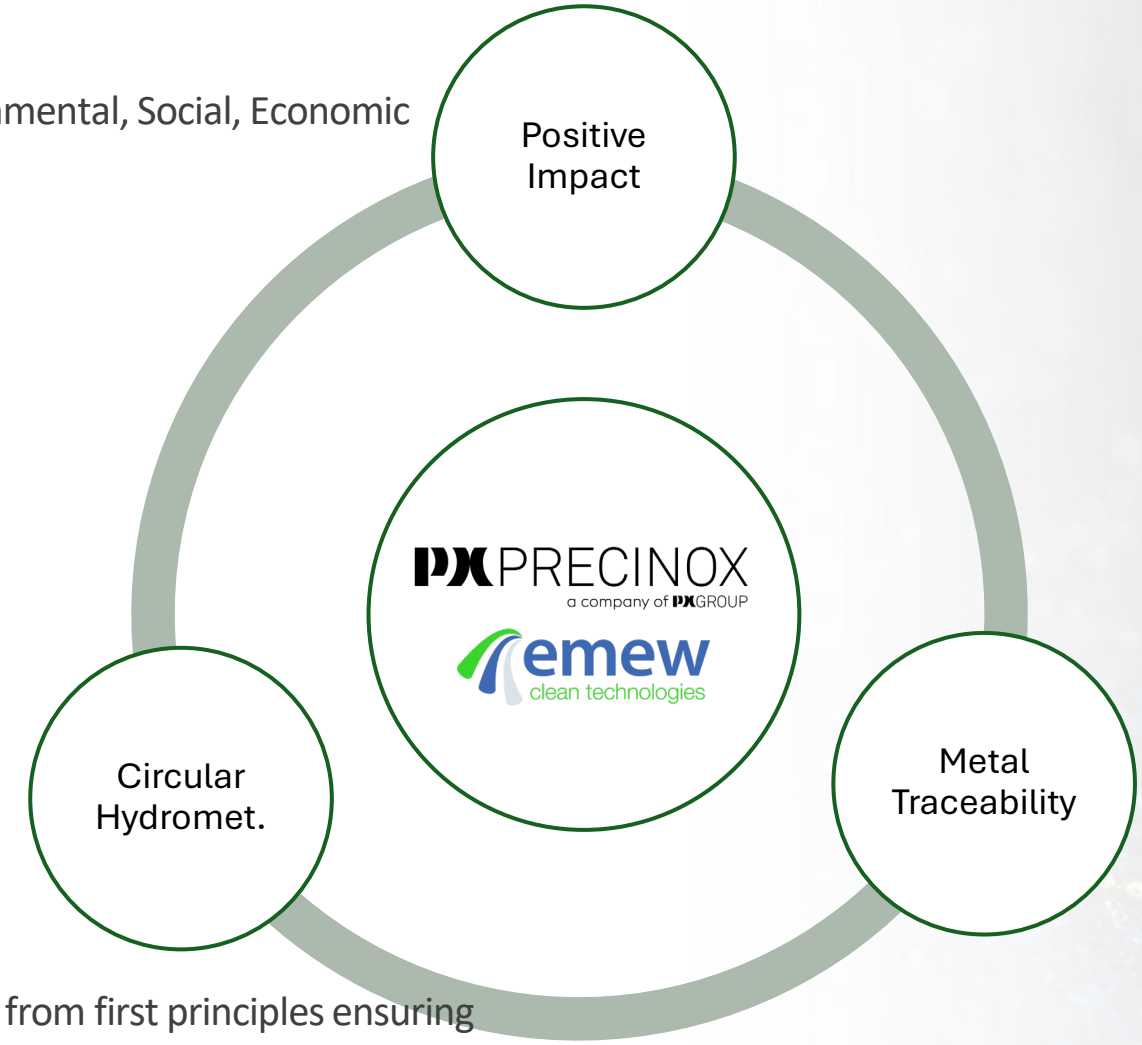
Economically viable localized recovery methods are required.

Scaling innovative technologies remains challenging.

Solving whole problem usually require multiple technologies.

Collaborative approach is critical

Environmental, Social, Economic



Inspiration from first principles ensuring sustainable metal recovery processes

Transparent supply chains

First conversation

- Introduced in 2021
- Discussed copper recovery from hydroxide sludge

Bench scale testing

- Onsite testing in 2022
- Discussed e-waste recycling for copper electrowinning
- PX team continued bench scale trials

Pilot testing

- emew Pilot skid arrived in 2023
- Multiple onsite visits of emew team to improve the results
- PX team continued pilot trials in 2024

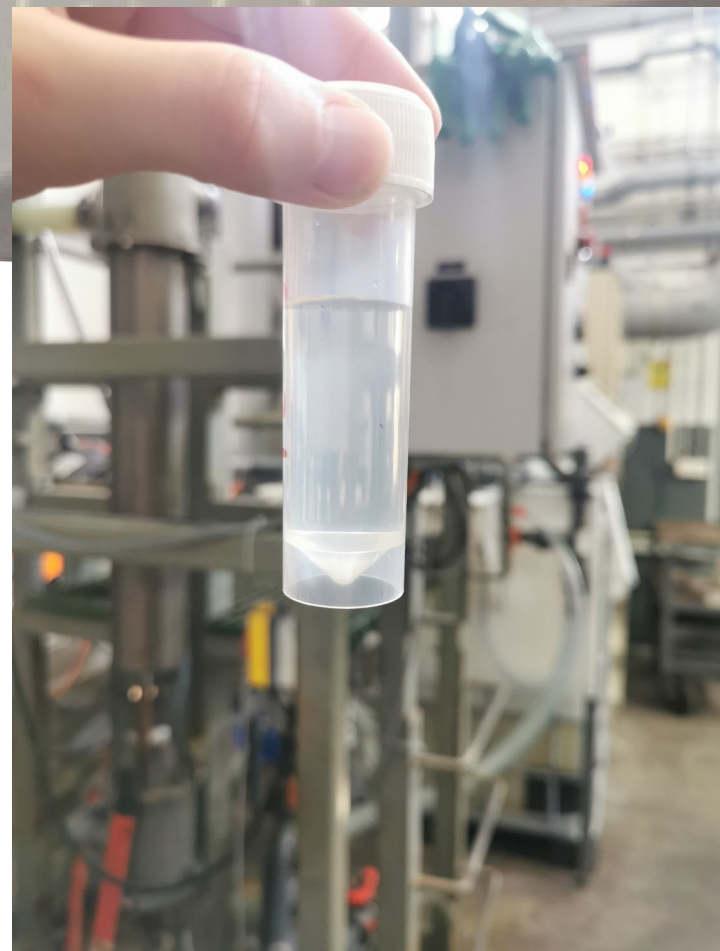
Flowsheet finalization

- Optimized flowsheet in 2025

Towards sustainable metal recovery : Case studies

Case study 1: Copper recovery from aqua regia effluent by EW

- Process developed by PX Precinox and Emew Clean Technologies



Case study 2: Copper recovery from e-waste copper fraction by EW

1

Collection & Sorting

PCBs contain up to 15-20% copper by weight

2

Mechanical or Pyrometallurgical processing

Separation technique and size reduction (50-90% Cu)

3

Digestion

Selective digestion of base metals to liberate PM concentrate

4

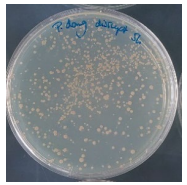
Electrowinning

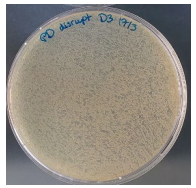
99.9+% pure copper cathodes via emew electrowinning

Case study 3 : Biomining, inspiration from Nature

Bacteria miners

Bacteria naturally extract metals from minerals. We harness their capabilities for urban waste processing.





“Can microbes power the clean energy transition?

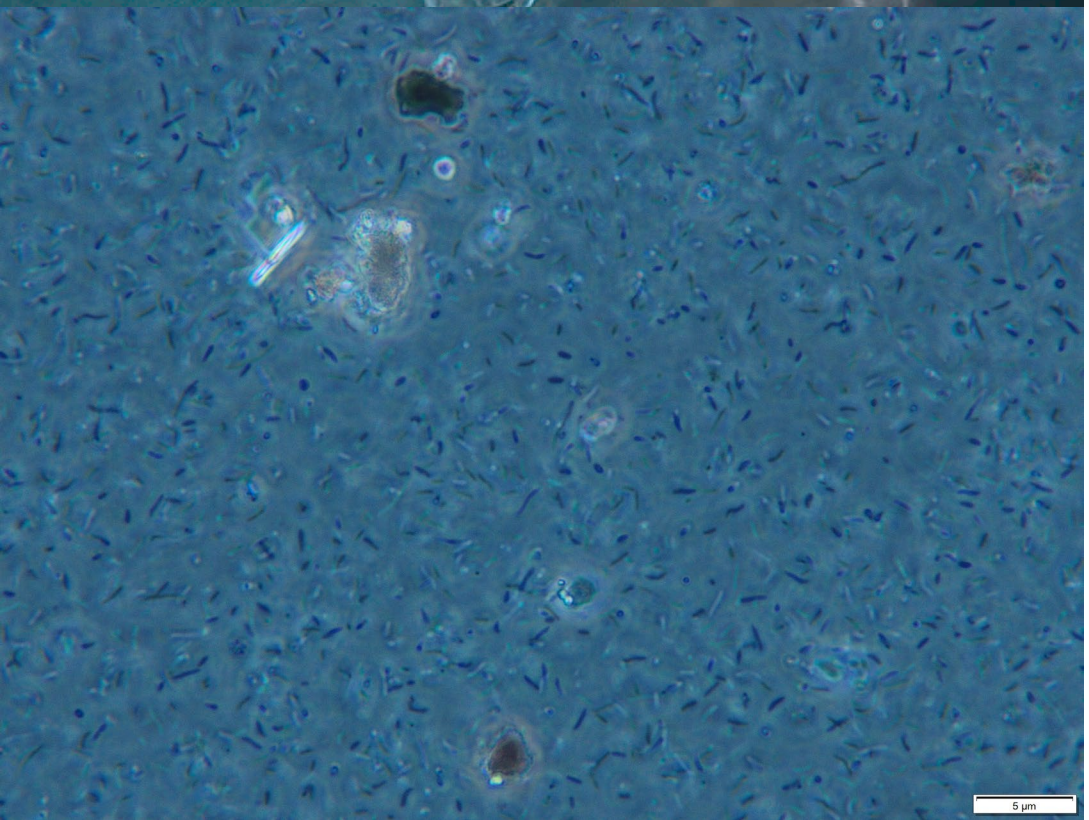
Right now, no. In the future, probably, in part.

While these microscopic crawlers are not poised to take over the supply chain of all transition minerals, they are certainly willing to help.

If you’re a microbe that eats nothing but copper ore, you ought to be thrilled with what the future has in store” *

*From the Petri Dish to the Mine: These Microbes Dissolve Minerals Sep 09, 2024 By Andrew Kaminsky

www.triplepundit.com/story/2024/biomining-clean-energy/809756



Bioleaching development by PX Group - Brain Biotech

Laboratory Research

Initial tests in **microliter scale** confirm extraction principles. Optimal conditions and microbial strains are identified

Process Adaptation

Scaling to **few liters** requires refined bioprospecting techniques. Microbes and **waste pretreatment** must be adapted to varied waste inputs.

Where we are: Pilot demonstrator

Our **2m³ bioreactor** demonstrates technical feasibility. This represents a critical step toward TEA assessment

From lab to pilot scale: Proof-of-concept accomplished

First tests in production environment at precious metals refinery PX Precinox (TRL 5-6)

Towards a Sustainable Future ….

- Collaborative Framework for Urban Mining
  - Already a lot of building block and actors
  - Research Partnerships: Academia, industry and government collaboration. Sharing knowledge and resources.
  - No single entity can solve these challenges alone. We need coordinated efforts across sectors.
- Realize the Vision
  - Create a true circular economy for metals while reducing environmental impact.
  - Innovation Investment: Targeted R&D funding for new technologies. Accelerated commercial implementation

Join in!