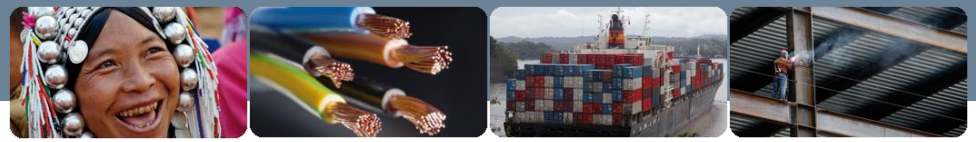
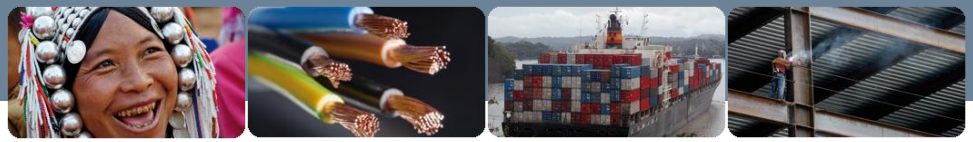


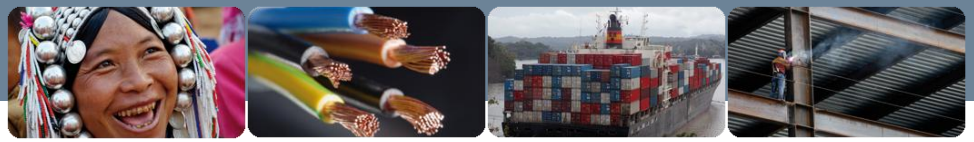
New York City, 13 May 2010
Welcome to the presentation of the

International Panel for Sustainable Resource Management



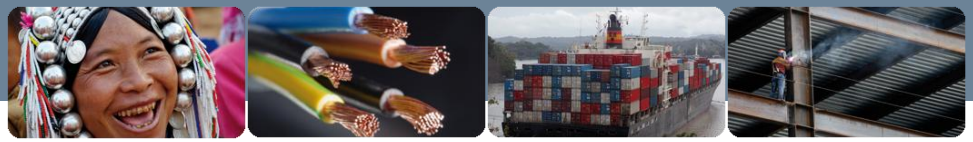
The metals challenge

- **Metals are essential for economic development**
  - Base metals like steel and aluminum, mainly for buildings and infrastructure
  - Precious and specialty metals, like palladium and indium for modern/clean technologies
- **Global demand for metals is increasing**
  - E.g. copper and aluminum have doubled in the past 2 decades
  - Rising demand in emerging economies and developing countries
  - Very strong demand growth for many precious and specialty ('technology') metals
- **The increasing global demand for metals causes many problems and challenges**
  - Increasing environmental pressures from extraction and manufacturing of raw materials
  - Growing dependence on regional or economic concentrations of natural resources
  - Increasing risks of international crisis (e.g. war lord activities in parts of Africa)
  - Social tensions among local populations (land owner issues etc.)



UNEP's Global Metals Flows Group

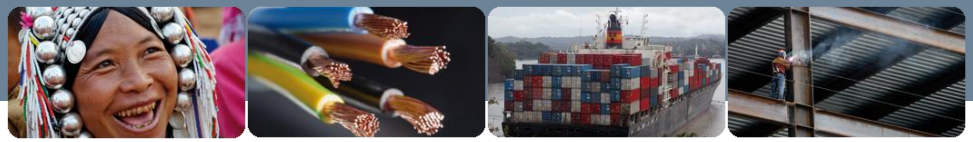
- **Promoting the recycling of metals and a "circular economy"**
- **Work on a series of six assessment reports**
  - Report 1: Metal Stocks in Society (published now)
  - Report 2: Recycling Rates (will be published in Oct.; first results presented today)
  - Report 3: Environmental Impacts of Metals
  - Report 4: Geological Metal Stocks
  - Report 5: Future Demand Scenarios of Metals
  - Report 6: Critical Metals and Metals Policy Options



Metal stocks in society

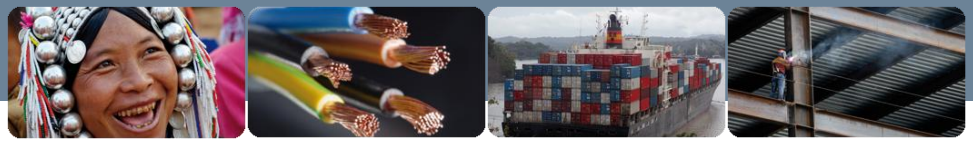
- **The metals stocks in society are increasing worldwide**
  - In-use stock of copper has grown in the US from 73 to 238 kg per capita (1932-1999)
  - The world average is 50 kg copper per capita (2000)
  - In-use stock of steel in China is 1.5 tons (2004) per capita, but in the USA it is 11-12 tons per capita (2004)
  - If the whole world would copy the industrialized countries the global in-use metal stocks would be 3 to 9 times present levels
  - For many technology metals, like indium and rhodium, more than 80% extracted from natural resources was in the past 3 decades
- **There is a substantial shift in metals stocks from below ground to above ground**
- **These "mines above ground" have growing potential for future metals supply**

  E.g. average lifetime of copper in buildings is 25 to 40 years, but for metals in cell phones and PCs it less than 5 years



The relevance of recycling

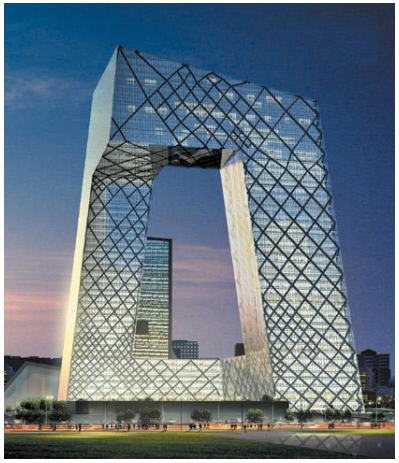
- **Enhanced recycling of metals from in-use stocks is a key solution for SD**
- **The production of metals from secondary raw materials reduces environmental impacts compared to primary metals production**
  - High energy savings and reductions of greenhouse gas emissions
  - Secondary steel causes 75% less GHG emissions compared to primary steel
  - GHG emissions of secondary aluminum production are about 12 times lower than of primary aluminum production
  - Recycling reduces the pressure on biodiversity, water resources etc.
- **Recycling of metals moderates dependencies on natural resources, which are often concentrated in insecure regions**
- **Recycling ensures sustainable access to potentially scarce metals**
- **Recycling creates new jobs and income all over the world**

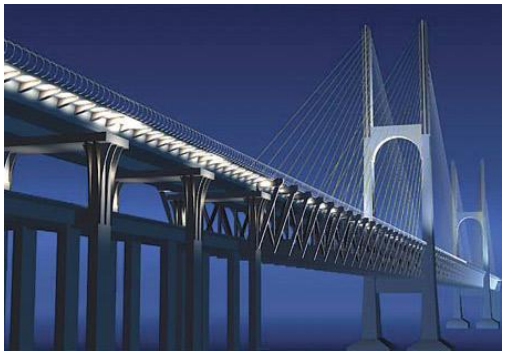


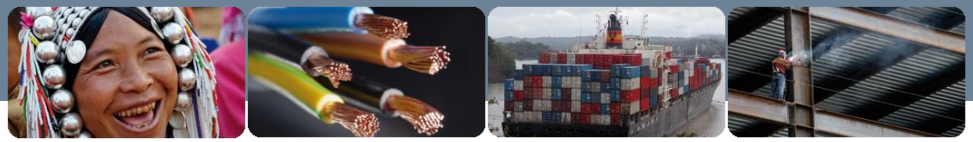
Recycling rates of metals

- **Investigation of 62 different metals**
- **The metals are grouped into four categories**
  - 9 ferrous metals: iron, manganese, nickel, chromium etc.
  - 8 non-ferrous metals: aluminum, copper, lead, zinc, tin, magnesium etc.
  - 8 precious metals: gold, silver, platinum, palladium, rhodium etc.
  - 37 specialty metals: indium, gallium, lithium, tantalum, rare earth metals, tellurium etc.
- **The most important metric is the end-of-life recycling rate**
  - A high end-of-life recycling rate for a metal indicates a high efficiency of the related post -consumer recycling system
- **Only a few metals, like iron and platinum, currently have an end-of-life recycling rate of above 50%**

Ferrous metals: steel example





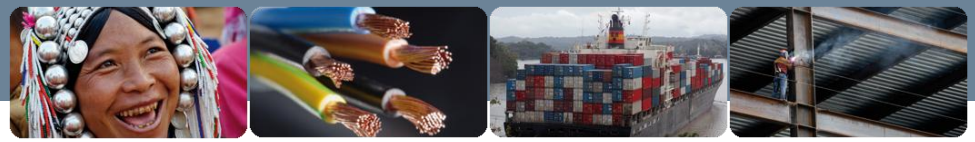


Recycling rates of steel

- The most widely-used metal – construction, infrastructure, vehicles, etc.
- Current global production counts on 1.3 billion tons steel per year, which causes 2.2 billion tons of greenhouse gas emissions (4-5% of total man-made emissions)
- Often used in very large pieces (steel beams, auto bodies), which makes recycling more probable
- Recycled iron requires only about 25% of the energy needed to produce virgin iron
- Estimated 2009 end-of-life recycling rate: >50% (varies among countries and iron-containing products)
- An additional substitution of just 100 million tons of primary steel by secondary steel has a GHG reduction potential of about 150 million tons CO_2

Non-ferrous metals: copper example

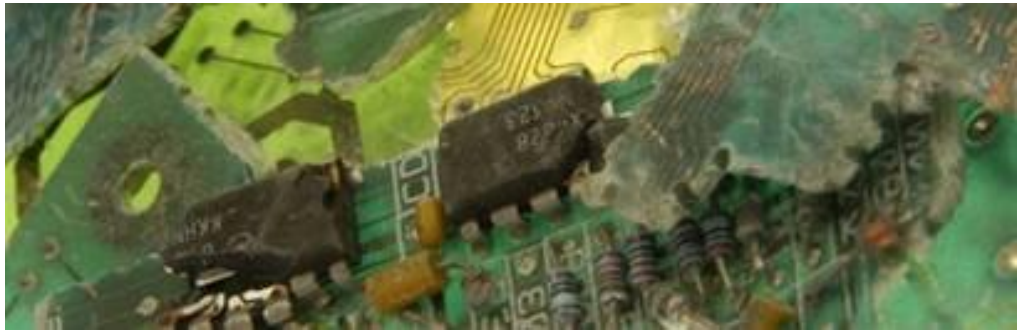
Courtesy of International Copper Association

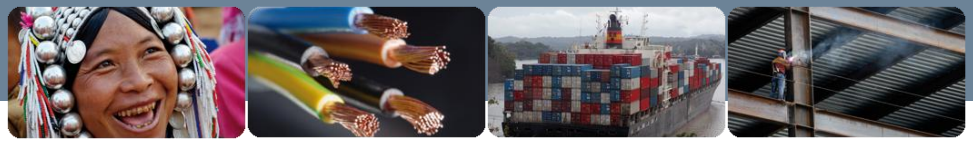


Recycling rates of copper

- **Common uses: power distribution, electrical wiring, plumbing**
- **Usually used in pure form and in rather large pieces, which makes recycling more probable (exception: electric and electronic devices)**
  - Increasing demand for infrastructure and innovative technologies , like electric vehicles
  - Increasing small-scale applications in which copper is embedded in a complex matrix: cell phones, DVD players, electronic toys etc.
- **Estimated 2009 end-of-life recycling rate: 25-50% (varies among countries and copper-containing products)**
  - Lack of adequate recycling infrastructure for WEEE (Waste Electrical and Electronic Equipment) in most parts of the world causes total losses of copper and other valuable metals like gold, silver, palladium, tin etc.

Precious metals: palladium example





Recycling rates of palladium

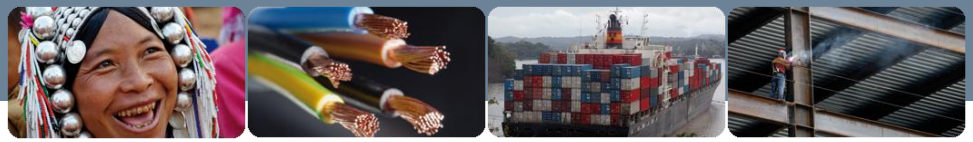
- **Current global mine production about 220 tons/year; high regional concentration**
  - Main applications are automotive catalysts (> 60%) and electronics (> 16%); further applications industrial catalysts, dental, jewellery
- **Current end-of-life recycling rate 60-70% (global average)**
  - Excellent rates for industrial applications: 80-90%
  - Moderate rates for automotive applications: 50-55%
  - Poor rates for electronic applications: 5-10%
- **Increasing problems due to lack of recycling infrastructure for consumer goods**
  - Less than 10% of post-consumer cell phones are recycled in an appropriate way
  - The main problems are insufficient collection and pre-treatment schemes in the most countries of the world

Specialty metals: indium example

indium

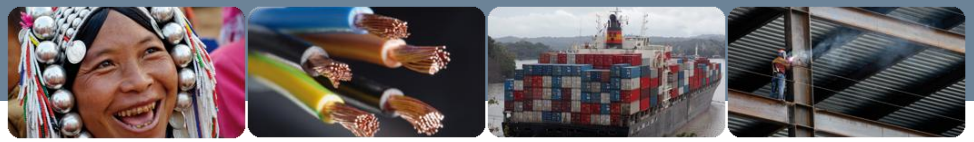
tellurium

Courtesy of Umicore Precious Metals Refining



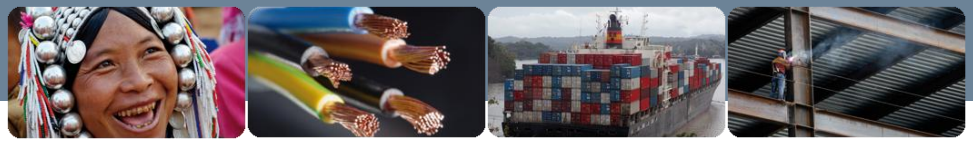
Recycling rates of indium

- Strategic metal used for LCD glass, lead-free solders, semiconductors/LED, photovoltaic etc.
- Strong growth in gross demand is predicted for indium: from ca. 1,200 tons (2010) to ca. 2,600 tons (2020)
- Specialty metals like indium are crucial for future sustainable technologies like PV, battery technologies, catalysts, efficient lighting systems etc.
- The supply of indium from natural resources is crucial: so-called minor metal, which occurs just as a by-product (mainly zinc ores) in low concentrations
- The current end-of -life recycling rate of indium is below 1% like for the most other specialty metals: urgent progress is necessary to enhance their recycling



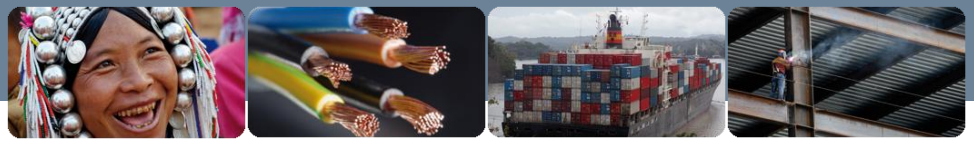
Critical metals for clean technologies - examples

- Tellurium, selenium for high efficiency solar cells
- Neodymium and dysprosium for wind turbine magnets
- Lanthanum and cobalt for hybrid vehicle batteries
- Terbium and indium for advanced metal imaging
- Gallium for LED
- Platinum for automotive catalysts and fuel cells
- These and other critical metals become essentially unavailable for use in modern technology without enhanced end-of-life recycling rates in the future!



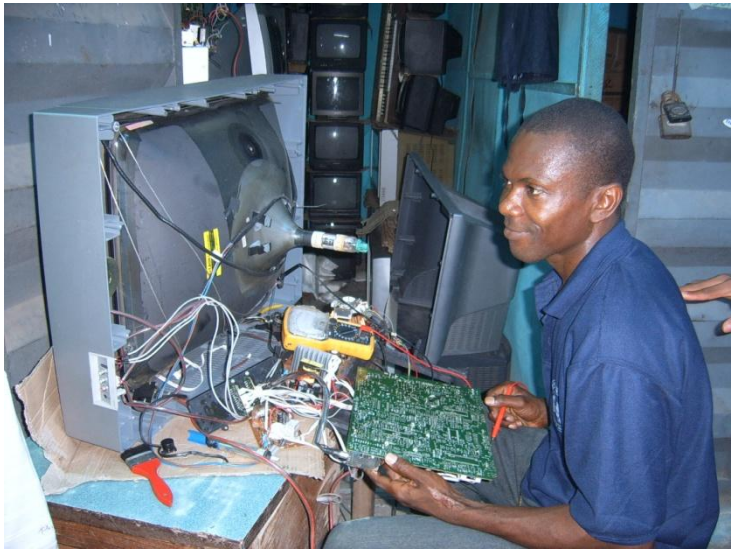
Conclusions

- **Metal stocks in society are increasing continuously**
- **These "mines above ground" could contribute to decoupling of resource use from economic growth by efficient recycling**
- **UNEP's work on metals has shown just moderate or even poor end-of-life recycling rates for many metals**
  - Only for a limited number of metals, like iron/steel, palladium and platinum , could rates above 50% be stated
  - Many metals show rates below 25%, or even below 1% (for many specialty metals)
  - Serious data gaps on stocks in society and recycling rates have to be closed
- **Enhanced recycling rates could help to reduce environmental pressures (GHG emissions, water and land consumption, waste, pressure on biodiversity), and it is crucial to secure sustainable supply of critical metals**
- **Improved recycling schemes will give many people new jobs and a living**



UNEP's e-waste Africa project

Goal: Create new partnerships and small businesses in the recycling sector in Africa.



Photos by Öko-Institut e.V.