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UNEP

International Resource Panel

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*UNEP will launch the report, **"Recycling Rates of Metals: A Status Report,**" at media briefings on May 26 at 9.15 am in London at the London Metal Exchange and at 2.30 pm in Brussels at the Green Week, EC Charlemagne Building, Salon Rouge. Authors are available for advance interviews. The full report is available for media preview at www.unep.org/resourcepanel/metals_recycling (Login: resourcepanel; password: metals123)*

Dramatically Raising Low Metal Recycling Rates Part of Path To Green Economy: UNEP

Less than one-third of 60 metals studied have end-of-life recycling rate above 50%; 34 are under 1%

Among recommendations: Boost waste management in developing economies; End hoarding of old phones, other electronic products

London/Brussels, 26 May 2011—Smarter product designs, support for developing country waste management schemes, and encouraging developed country households not to 'squirrel away' old electronic goods in drawers and closets could help boost recycling of metals world-wide.

According to a report released today by the United Nations Environment Programme (UNEP), recycling rates of metals are in many cases far lower than their potential for re-use.

Less than one-third of some 60 metals studied have an end-of-life recycling rate above 50 per cent and 34 elements are below 1 per cent recycling, yet many of them are crucial to clean technologies such as batteries for hybrid cars to the magnets in wind turbines, says the study.

"In spite of significant efforts in a number of countries and regions, many metal recycling

rates are discouragingly low, and a 'recycling society' appears no more than a distant hope," states the *Recycling Rates of Metals: A Status Report*, compiled by UNEP's International Resource Panel.

The weak performance is especially frustrating because, unlike some other resources, metals are "inherently recyclable," says the study, released at the London Metal Exchange in the United Kingdom, and in Brussels at 'Green Week' by Achim Steiner, UN Under-Secretary General and UNEP's Executive Director.

"In theory, metals can be used over and over again, minimizing the need to mine and process virgin materials and thus saving substantial amounts of energy and water while minimizing environmental degradation. Raising levels of recycling world-wide can therefore contribute to a transition to a low carbon, resource efficient Green Economy while assisting to generate 'green jobs'," said Mr. Steiner.

Indeed, by some estimates recycling metals is between two and 10 times more energy efficient than smelting the metals from virgin ores. Meanwhile extraction alone currently accounts for seven per cent of the world's energy consumption, with emissions contributing significantly to climate change.

A separate report by the Panel, also released today in Brussels, looks at 'decoupling' economic growth rates from rates of resource use and notes that extraction of ores and minerals grew 27 fold during the 20th century—a rate higher than world economic growth.

It cites evidence that the era of cheap and easily accessible ores is running out. For example, about three times more material needs to be moved for the same ore extraction than a century ago, with corresponding increases in land disruption, water impacts and energy use.

Says John Atherton, Director, International Council on Mining and Metals (ICMM) speaking today at the launch of the *Recycling Rates of Metals* report: "We hope this report encourages policy makers and product designers to adopt life cycle thinking when planning for materials recycling."

The landmark report is the first attempt to gather accurate and consistent information about the extent to which metals are collected, processed and reused in new products, says Thomas Graedel, a professor of industrial ecology at Yale University and one of the report's eight authors.

"Previously published recycling rates were defined in different ways," he says. "The data

were highly variable and we couldn't be sure how to draw comparisons between published numbers. The work will help assess recycling rates in future and ways to improve our success moving forward."

Recycling Rates and Specialty Metals

The report says lead is the most recycled metal: Nearly 80 per cent of products that contain lead – mainly batteries – are recycled when they reach the end of their useful life.

More than half of the iron and other main components of steel and stainless steel, as well as platinum, gold, silver and most other precious metals, are recycled.

But even here there are wide variations with, for example, 70 to 90 per cent of gold in industrial applications recycled versus only 10 to 15 per cent of gold in electronic goods.

Meanwhile, globally there is virtually no recycling of the rest, including metals like Indium used in semiconductors, energy efficient light emitting diodes (LEDs), advanced medical imaging and photovoltaics.

The story is similar with other specialty metals like tellurium and selenium, used for high efficiency solar cells, and for neodymium and dysprosium used for wind turbine magnets, lanthanum for hybrid vehicle batteries, and gallium used for LEDs.

"By failing to recycle metals and simply disposing of these kinds of metal, economies are foregoing important environmental benefits and increasing the possibility of shortages," says Dr Graedel. "If we do not have these materials readily available at reasonable prices, a lot of modern technology simply cannot happen."

It is not yet possible to estimate how close industry is to a shortage of these specialty or rare earth metals, mainly because so little is known about the potential of mining to continue as their main source.

"We don't think immediate shortages are likely," says Dr Graedel, "but we are absolutely unable to make predictions based on the very limited geological exploration currently conducted."

"In principle, the amount of recycling of metal offsets the same amount of metals that need to be mined," says Guido Sonnemann of UNEP, an innovation and product life cycle management expert. "Because demand for metals overall is increasing, recycling can't offset all mining but can contribute to a more sustainable mining industry."

Boosting Waste Management to Clearing out the Closet

There report makes several recommendations on how recycling could be boosted world-wide:

- Encouraging product design that makes disassembly and material separation easier
- Improving waste management and recycling infrastructure for complex end-of-life products in developing countries and emerging economies
- In industrialized countries, addressing the fact that many metal-containing products are 'hibernating' in places likes drawers and closets and others, such as mobile phones, are all too often ending up in dustbins

Says Nick Nuttall, UNEP Spokesperson: "I am as guilty as anyone here. Like a squirrel or a magpie, my home and office drawers and cupboards are packed with old mobile phone chargers, USB cables, defunct laptops and the like. I somehow imagine that they might come in useful one day—but of course they never do as they have been superceded by the latest model."

Another recommendation: Improve recycling technologies and collection systems to keep pace with ever more complex products created with an increasingly diverse range of metals and alloys.

"More and more products use an ever wider range of components with highly specialized materials with very special properties. Without them, performance would suffer – slower computers, fuzzier medical images, heavier and slower aircraft, for example. Recovering such element is a recycling challenge requiring a far smarter response than at present," says Dr Graedel.

Quotable quotes

"The report makes available to governments and industry the relevant baseline information on metal recycling rates, also at a global scale, to foster recycling and make more intelligent and targeted decisions on metals management worldwide. This is the first time ever that this information has been brought together in such a comprehensive way.
***Achim Steiner**, UN Under-Secretary General and Executive Director of UNEP, which hosts the Panel*

"The report on recycling rates of metals, containing stupendous figures of low recycling rates of most of the high tech "spice" metals, calls for strategic action to increase the recovery of those metals. Industrial design should be improved with a view of easy recovery even of small quantities of them, and advanced techniques of separating metals should be developed. Fascinating tasks for a new generation of engineers!"
***Ernst U. von Weizsaecker**, co-chair of the Panel*

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Recycling rates reported for the 60 elements studied:

More than 50 per cent recycling: 18 elements

1. **Lead** (main use: batteries)
2. **Gold** (main uses: jewelry, electronics)
3. **Silver** (main uses: electronics, industrial applications (catalysts, batteries, glass/mirrors), jewelry);
4. **Aluminium** (main uses: in construction and transportation)
5. **Tin** (main uses: cans and solders)
6. **Copper** (main uses: conducting electricity and heat)
7. **Chromium** (main use: stainless steels)
8. **Nickel** (main uses: stainless steels and super-alloys)
9. **Niobium** (main uses: high strength / low alloy steels and super-alloys)
10. **Manganese** (main use: steel)
11. **Zinc** (main uses: coating steel - galvanizing)
12. **Iron** (the basis and chief constituent of all ferrous metals)
13. **Cobalt** (main uses: super-alloys, catalysts, batteries)
14. **Rhenium** (a super-alloy component; main uses: gas turbines (perhaps 60% of use), and catalysts)
15. **Titanium** (main uses: paint, transportation)

16-18. **Palladium, Platinum, Rhodium** (main use of all three: auto catalysts)

25 to 50 per cent recycling: 3 elements

1. **Magnesium** (main uses: construction and transportation)
2. **Molybdenum** (main uses: high-performance stainless steels)
3. **Iridium** (main uses: electro-chemistry, crucibles for mono-crystal growing, spark plugs)

10 to 25 per cent recycling: 3 elements

1. **Tungsten** (main use: carbide cutting tools)
2. **Ruthenium** (main uses: electronics (hard disk drives), process catalysts / electrochemistry)
3. **Cadmium** (main uses: batteries (85%), pigments (10%))

1 to 10 per cent recycling: 2 elements

1. **Mercury** (largely being phased out; main remaining uses: chlorine / caustic soda production)
2. **Antimony** (main uses: flame retardant (65% of use), lead acid batteries (23%))

Less than 1 per cent recycling: 34 elements

1. **Beryllium** (main use: electronics)
2. **Gallium** (main use: electronics: ICs, LEDs, diodes, solar cells
3. **Indium** (main use: as a coating in flat-panel displays)
4. **Selenium** (main uses: manufacturing glass, manganese production, LEDs, photovoltaics, infrared optics)
5. **Strontium** (main uses: pyrotechnics, ferrite ceramic magnets for electronics)
6. **Tantalum** (main uses: in capacitors in electronics)
7. **Germanium** (main uses: in night vision (infrared) lenses (30%), PET catalysts (30%), solar cell concentrators, fiber optics)
8. **Erbium** (main use: fiber-optics)

9. **Tellurium** (main uses: steel additives, solar cells, thermo-electronics)

10. **Hafnium** (main uses: in nuclear reactors, and to a small degree in electronics)

11. **Zirconium** (main use: in nuclear reactors)

12. **Thallium** (occasional use in medical equipment)

13. **Vanadium** (main use: high strength-low alloy steels)

14. **Arsenic** (Arsenic metal is used in semiconductors (electronics, photovoltaics) and as an alloying element; Arsenic oxide is used in wood preservatives and glass manufacture)

15. **Barium** (main uses: drilling fluid (perhaps 80% of use); as a filler in plastic, paint and rubber (about 20%)

16. **Bismuth** (principal uses: metallurgical additive and alloy constituent)

17. **Lithium** (main use: in batteries)

18. **Lanthanum** (main use: in batteries)

19. **Scandium** (main uses: in aluminium alloys)

20. **Yttrium** (main use: as a phosphor)

21. **Europium** (main use: as a phosphor)

22. **Ytterbium** (main use: as a phosphor)

23. **Lutetium** (main use: a scintillator in computerized tomography)

24. **Cerium** (main use: as a catalyst)

25. **Osmium** (occasionally used as a catalyst, but has little industrial importance)

26. Thulium (no significant uses)

27. Praseodymium (main use: glass manufacturing and magnets)

28. Gadolinium (main use: in ceramics and magnets)

29. Boron (main uses: in glass, ceramics, magnets)

30-34**: Neodymium, Samarium, Terbium**, **Dysprosium, Holmium** (main use for all five: in magnets)

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To download the report "Recycling Rates of Metals: A Status Report":
www.unep.org/resourcepanel/metals_recycling

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To download the report "Decoupling natural resource use and environmental impacts from economic growth":
www.unep.org/resourcepanel/Publications/Decoupling/tabid/56048/Default.aspx

About the Resource Panel

Some 27 high-level experts form the International Panel for Sustainable Resource Management, created in late 2007 to provide the scientific impetus for decoupling economic growth and resource use from environmental degradation. The objectives of the Resource Panel are to:

* Provide independent, coherent and authoritative scientific assessments of policy relevance on the sustainable use of natural resources and in particular their environmental impacts over the full life cycle; and
* Contribute to a better understanding of how to decouple economic growth from environmental degradation.

For more information: www.unep.fr/scp/rpanel

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