Copper stocks and flows

Katia Lacasse on behalf of Géraud Servin
ICSG recycling seminar @ 20141015
1. Hidden but everywhere
2. Models, data and partners
3. Stocks and flows, trade and recycling rates
4. Losses investigation
5. 2015 action plan
Agenda

1. Hidden but everywhere
2. Models, data and partners
3. Stocks and flows, recycling rates (global and regional)
4. Losses investigation
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How much copper is recycled?

Easy to ask, difficult to answer because...
Hidden, everywhere and in various quantities

<table>
<thead>
<tr>
<th>Item</th>
<th>Kg Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellular phone</td>
<td>0.015</td>
</tr>
<tr>
<td>Car</td>
<td>25</td>
</tr>
<tr>
<td>Electric/hybrid car</td>
<td>50</td>
</tr>
<tr>
<td>House</td>
<td>100</td>
</tr>
<tr>
<td>Windmill</td>
<td>5,000</td>
</tr>
<tr>
<td>High-speed train</td>
<td>10,000</td>
</tr>
</tbody>
</table>
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Models created by **Fraunhofer Institute**

- Global and regional
- Dynamic

**Data plus expertise kindly provided by ICSG and IWCC**

**Review by industry & recycling actors**

Discoveries

350 million tonnes of Cu in use (out of 550 million tonnes of Cu produced since 1900)

9 million tonnes of Cu recycled annually i.e. 40 million tonnes of CO₂ savings

End-of-life Cu recycled at 45%

“Recycled content” is 35%
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ICSG special

Slightly customized global model provided

Diagram and recycling rates published, for the first time, in the *World Copper Factbook 2013*
Geographical coverage
Europe: trade

Flow into EU / '000 tonnes Cu
(imports are positive, exports are negative)

Concentrate, mattes & cement
Blister & Refined
Semi-finished goods

Finished goods
Scrap
Sum

1995 2000 2005 2010
1995 2000 2005 2010
1995 2000 2005 2010

Europe: trade
Europe (draft)
China: trade

Flow into China / 1000 tonnes Cu (imports are positive, exports are negative)
Latin America: trade

[Graph showing trade flows for concentrate, mattes & cement, blister & refined, semi-finished goods, finished goods, scrap, and sum over the years 1995 to 2010.]
North America: trade

The chart illustrates the flow of copper (Cu) into North America from various sources: concentrate, mattes, and cement; blister and refined copper; and semi-finished goods. The data is presented from 1995 to 2010, with separate panels for finished goods, scrap, and a sum of all flows. The y-axis represents the flow in '000 tonnes of Cu, with imports being positive and exports negative.
## No beauty contest (draft)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>China</td>
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<td>Latin America</td>
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<td>North America</td>
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<td>49</td>
</tr>
<tr>
<td>Global</td>
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<td>47</td>
</tr>
</tbody>
</table>

Recycling Rate (2010 – 2011): China 48, 59; Europe 53, 54; Latin America 6, 12; North America 41, 40; Global 35, 37.

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The losses puzzle

Annual losses of 6 million tonnes i.e. $42 billion appears unreasonable

Disperse nature of scrap generation and ensuing difficulties in collection

Recycling is also subject to economic and technical constraints (100% recovery/efficiency does not exist)

A certain amount of loss is inevitable, but how much?
Preliminary results from Europe

Collection and recycling landscape is very heterogeneous

Informal actors play a role in curbside collection and exports are important sink for scrap

Manual separation is used for high-value components

Regulation drives metal recovery beyond conventional economics
Preliminary results from China

**Imported** scrap much more important than **domestic** scrap

Domestic scrap dominated by small/informal actors

Efficiency generally through labour intensity → if copper can be recovered by labour, it will be recovered, but limitation e.g. in electronics where more advanced processing needed

- Imported scrap subject to foreign level of losses in collection/dismantling
- “Invisible” losses are generally ignored/not considered
- Still many unknowns, especially regarding WEEE (imported/domestic), informal recycling (mainly domestic scrap) and collection and recycling away from cities
Consequences for the model

Adjusted i.e. longer lifetimes will lead to generally lower old scrap estimates and higher recycling rates (+5 to 10%)

Europe

- Non-reported scrap exports contained in “collection losses” → model can provide upper bound

China

- “Internal processing” of new scrap → changes will likely result in higher recycling indicators (not implemented yet)
- Must re-visit allocation of stock and scrap flows as share of global model (cf. EU model)
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2015 work plan

Update global and regional models with 2012/2013 data

Align global and regional models by incorporating results of Copper Losses Project

Map of inter-regional trade flows at the product level

Develop model for Japan
The models, the recycling rates and all the data, point us to where recycling could/has to be improved in the future
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