# COMMENTS ON THE CLASSIFICATION PROPOSAL: LEAD TO BE CLASSIFIED AS REPRODUCTVE TOXICANT (SCL 0.03%)

As the representative of the European copper industry and a member of the Copper Alliance, the European Copper Institute (ECI) hereby takes the opportunity to inform regulatory stakeholders on the outcome of the Socio-Economic Analysis (SEA) relevant to the lead CLH (Harmonised Classification and Labelling) proposal.


In summary, we acknowledge that lead-ions released from lead containing materials may damage fertility and the development of unborn and breast-fed children.

We therefore agree to classify alloys (special preparations[1] under REACH), as reproductive toxicant (for fertility) Cat 1A, at a cut-off value of 0.3% lead. We further consider it appropriate to also align the lead classification for developmental toxicity to the existing classification of lead compounds.

**Therefore we propose to classify alloys regarded as special preparations as reproductive toxicant Cat 1A (for fertility <u>and</u> developmental toxicity), at a cut-off value of 0.3% lead.**


Acknowledging that lead is a controversial issue, the copper alloy industry has invested significantly, during the last 10-15 years, in searching for lead substitutes and in reducing the lead content in products. As demonstrated in the socio-economic analysis, lead substitutes that deliver the required technical properties (machineability (precise cutting) and malleability (critical attribute for high precision applications such as valves and keys), recycling and economic viability), at an increased cost. The estimated additional cost of substituting the most likely impacted markets (plumbing and consumer products with >0.03% Pb – 345,000 tonnes/year) from leaded brasses to silicon containing brasses for is estimated at 1.1 billion €/yr[2]. Silicon containing brasses are therefore only developed for some niche applications.

The R&D investments have however enabled a general, reduced lead content in most copper alloys. Today, 174 CEN standardised copper alloys exist, with lead contents between 0.02 and 4% (mostly < 2.2%). Lead is also present as a recycling impurity in "lead-free alloys" (usually <0.1%, but can be up to 1%). It is estimated that around 80% of the alloys market have a lead content above 0.03%[3].

During the last 10-15 years, the copper alloy industry has also cooperated closely with regulatory authorities and reached agreements relevant to the implementation of various lead restriction directives. Two examples:

⇒ Under the EU Drinking Water Directive (98/83/EC), the copper alloy industry has invested intensively to assess and reduce lead migration into drinking water. This effort

[1] Most of the copper alloys are articles under REACH and do not require classification as special preparations under CLP (Classification, labelling and Packaging Directive). For most articles made of copper alloys, the lead content and/or the lead releases are already regulated through various existing European directives, such as the drinking water directive, toys directive, ROHS, REACH lead restrictions in jewellery and REACH lead restrictions in consumer products.

[2] Cost of substitution: additional material costs (2000 €/ton); loss of scrap value (700€/ton); increased re-smelting costs (480 €/ton)

[3] Extrapolated from information on consumer market volume (21% of the alloys market with <0.05%Pb)

has resulted in a list of accepted materials by EU Member States[4], with demonstrated lead migrations into drinking water below 5 µg Pb/L (50% of the drinking water limit value). The list includes alloys with up to 3.5% lead.

⇒ Under the REACH regulation, a restriction limit of 0.05% lead for the marketing of consumer products that can be mouthed by children is under discussion. Considering the copper industry lead migration data, RAC and SEAC proposed an exemption for brass articles with up to 0.5% Pb[5], as well as exemptions for keys, padlocks, etc.

From a health perspective, there are no human health studies that can quantify the effects of consumer goods/construction materials with a lead content of 0.03%. We are therefore aligned with the position of the International Lead Association: a specific concentration limit for the classification of lead as reproductive toxicant of 0.03% is over-precautionary.

**The detailed SEA further demonstrates that the classification of alloys, with ≥0.03 % lead, as reproductive toxicant will have a severe impact on the on the perception of copper alloys in the market**. Current EU market demand for copper in alloys is estimated at 1,426,000 tonnes copper/yr, with a market value of 7.6 billion €/yr[6]. The market value of the most likely impacted markets (plumbing and consumer products with >0.03% Pb – 345,000 tonnes/year) is estimated at **1.8 billion €/yr**. Losses in annual market demand due to classification as reproductive toxicant would undermine the viability of the basic alloying industry sector.

**The proposed regulations will also reduce the incentives to collect and recycle copper**. Today's EU copper scrap volume is 2.4 million tonnes/yr, with the market value of the different grades being a function of the many other materials present. Using a conservative average value of 1,000 €/T, the proposed cut of value of 0.03% will result in approximately 80% of copper and copper alloy scrap, with a market value of **1.9 billion €/year** being classified as hazardous. The CLH cut-off value of 0.03% will therefore encourage exports and discourage imports of scrap. It will seriously damage the European recycling industry and copper flows

It is further anticipated that the proposal will impact significantly on the broader non-ferrous metals industry. If a SCL of 0.03% applies to lead, **extrapolation to lead compounds and complex materials is anticipated**. High volume products of the non-ferrous metals industry, such as metal concentrates, intermediates, scrap and metal slags, will be affected with huge consequential costs for industry and the loss of valuable EU resources. The competitiveness of the European copper smelters will face challenges that can end up in relocation of those activities outside Europe

⇒ The EU copper smelter's production of "Final Copper Slags", with CEN standard (TC 154), used in under more construction products, is estimated at 3.5 million tonnes/year. At 0.03% Pb, these would be classified and likely lose their by-product status at additional cost and environmental impact generated from the need of treating the product as a dangerous waste. This will create an extra cost for the copper smelting industry of more than **50 million €/year[7].**

⇒ The industry R&D investments done to reduce lead from final products and by-products will lose their value and create a disadvantage for European facilities.

[4] See also http://www.umweltbundesamt.de/wasser/themen/trinkwasser/4ms- initiative.htm
[5] Based on reasonable worst case risk assessment assumptions, ECI proposed exemption up to 2% - See also ECI comments on lead restrictions in consumer products
[6] The copper content is values at 5300 €/ton
[7] Cost of disposal between 15 and 25 €//ton, value used for this SEA : 15 €/ton

**In consideration of all the above, ECI proposes to classify alloys considered as special preparations as reproductive toxicant Cat 1A (for fertility and developmental toxicity), at a cut-off value of 0.3% lead. For those alloys regarded as special preparations (see CLP guidance), information on the release of lead ions, during normal handling and use, should be part of the alloys classification procedure.** Such proposal would be aligned to the existing classification of lead compounds and, therefore, ensure increased protection of humans (lead is currently not classified) and have a bearable impact on the copper production and copper alloying industries. The proposed classification will have positive consequences in alloys, final slags and raw material as described hereunder:

⇒ The majority of lead-free alloys and the high quality copper scrap (Pb only present as impurity) would not be classified;

⇒ Final slags would not merit classification as reproductive toxicant: the REACH dossier on final slag streams, from European copper production, demonstrated lead concentrations between 0.02 and 0.65% and relative lead bio-availability[8]<0.3%.

⇒ Most copper concentrates would not merit classification as reproductive toxicant. Copper concentrates, collected from ore bodies world-wide, indicate that 80% of the concentrates have lead content above 0.03% and relative lead bio-availability <0.3%.

Such a classification would be consistent with the current state of the art: (1) lead is naturally occurring within the earth's crust, soils and till at concentrations ranging between 2 and 1000 mg lead/kg (=0.1%) and up to 5.5% lead in lead-enriched ore bodies; (2) alloys are considered as "special preparations" or "articles" under REACH whose characteristics cannot be directly related to the metal content and (3) bio-available lead ions are responsible for the observed reproductive toxicity.

*The European Copper Institute*
*February 2014*

[8] In vitro bio-accessibility tests in gastric fluids, in accordance to the international protocol ASTM D 5517-07

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Copper Alliance

# SOCIO-ECONOMIC ANALYSIS ON THE CLASSIFICATION PROPOSAL: LEAD TO BE CLASSIFIED AS REPRODUCTVE TOXICANT (SCL 0.03%)

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## 1) INTRODUCTION

The aim of this Socio Economic Analysis (SEA) is to evaluate the effect of the proposed classification cut-off value of lead and lead compounds, of 0.03%, due to their potential characterisation as a "high potency substance for reproductive effects". This would impact the classification of lead-containing copper alloys. It is anticipated that copper slags and copper scrap markets would be the most impacted by the proposed changes.

The goal of the analysis is to assess whether the proposal is appropriate from a community-wide point of view. This SEA follows the structured advice by ECHA in its Guidance for Socio-Economic Analysis-Restrictions. It will start by defining the scope of the SEA, follow with analyses of the impacts, a comparison of the scenarios and finally the conclusions.

The assessment is based on the information currently available and includes expert judgement. Some of the data used for this analysis has been provided by ECI's members and remains confidential.

## 2) SCOPE OF THE SEA

The Swedish Chemicals Agency, KEMI, assessed the health effects from lead exposure and proposed to classify lead-metal as reproductive toxicant with a classification cut-off value of 0.03 % lead for mixtures and lead-containing materials (e.g. alloys). The proposal has been endorsed by the ECHA Risk assessment Committee in December 2013. Detailed commenting on the effects from lead exposures is however outside the scope of the ECI mandate.

It is nevertheless expected that the proposal will impact significantly the broader non-ferrous metals industry. Several aspects shall be considered: a) up to now, lead metal was not classified, so there is a change from no classification to classification; b) the Specific Concentration Limit (SCL) of 0.03% impacts a number of important end-use markets for alloys, included recycling; c) the SCL of 0.03% will, by extrapolation to complex materials containing lead and lead compounds, also impact the transport and use of various materials, such as metal scrap, metal intermediates and metal slags.

In this SEA, the baseline scenario is to define the consequences of the proposed legislative situation. The socio-economic consequence of being classified as reproductive toxicant at cut-off values of respectively 0.3% (baseline cut-off value, applicable to lead compounds in Europe and typically under GHS classification, world-wide) and 0.03% (proposed specific concentration limit) was retained for this assessment.

### ***Baseline Scenario***

#### *Copper Alloys – current regulatory framework*

Lead, in its metal form, is currently not classified, while lead compounds are classified for reproductive toxicity at levels > 0.3%.

There is a wide range of copper-lead alloys currently manufactured as articles in Europe. These are already well regulated through several EU directives and voluntary initiatives:

⇒ Drinking water: 98/83/EC

⇒ Toy Safety : 2009/48/EC

⇒ Lead in jewellery and watches: EU/836/2012

⇒ Lead in end of life vehicles: 2000/53/EC

⇒ Lead in electronic devices: 2002/95/C

⇒ Voluntary industry initiative: Oeko-Tex© 100 standard for textiles

An example of a regulation that is highly relevant for human health protection is the drinking water directive. Lead-containing copper alloys are used extensively in drinking water installations. They are subject to compliance with the EU drinking water directive 98/83/EC (DWD). This harmonised the quality of drinking water across the European Union, with a transition period of 15 years (ending in 2013) during which time the limit values (e.g. < 10 µg Pb/L drinking water) are to be implemented.

The European copper industry has, over the past 15 years, been intensively involved in EU activities on drinking water quality as well as in providing relevant life-cycle and emissions information to regulators and interested stakeholders. In a joint effort between EU Member States and the metal alloys industry, the metal releases from various metallic materials have been assessed in order to secure high quality drinking water. The initiative has resulted in four Member States' common composition list of metallic materials accepted for contact with drinking water (See also annex 1 and annex 2 and http://www.umweltbundesamt.de/wasser/themen/trinkwasser/4ms-initiative.htm). A more detailed summary, covering 15 years of industry efforts, is provided as annex 3. The list, now agreed by several other Member States, represents the most thoroughly investigated instrument, fully accounting for potential human health hazards of the metallic materials used for products in contact with drinking water. This includes alloys, with lead levels up to 3.5%, which have been shown, in accordance to an agreed testing protocol, to release lead below 5 µg/L in drinking water.

The copper used in alloys in the EU was estimated at **1,426,000 tonnes** in 2011 (32% of total EU copper demand) with a market value of **7.6 billion €/yr**[9]. Brass (Cu/Zn) is the most important alloy family with a copper requirement of ca 750,000 tonnes/year.

The main EU producers of copper alloys employ around **15,000 people.**

Furthermore, the EU copper smelting and refining industry (which produces copper metal) has been able to grow, primarily by securing primary raw materials on the international market and by making use of "urban mining". The latter consists of copper scrap and residues, generated by consumers and processors, as well as by building demolition and end of life of articles, such as vehicles and electric and electronic waste. The small number of European copper smelters mainly import concentrates and has been able to remain globally competitive primarily because of their ability to secure supplies of scrap in their raw material mix.

Alloys contain major elements (e.g. Cu/Zn in brass) and small amounts of other alloying elements (Pb, Ni, Mn) as functional elements, or as impurities (mainly through recycling).

The EU alloy market includes 174 CEN standardized alloys with the following lead content:

⇒ 49 alloys with Pb impurity ≤ 0.05 %
⇒ 41 alloys with Pb impurity between 0.05 and 1%
⇒ 84 alloys with Pb functionally added (typically between 1 - 3.5%)

Details on lead content of the various CEN standardized copper alloys, used as consumer products, are specified in table 1. The impurity % is, for each alloy family, the result of years of industry investigation and development to reuse and recycle valuable raw materials. It is estimated that 80% of the copper alloys used in consumer products have lead content <0.03%.

[9] For simplicity, only the copper content is valued (5300 €/Ton)

***Table 1:*** *CEN standardized lead containing material groups, material numbers and lead content of the materials delivered to the consumer market*[10].

| Material group | Why Pb? | Material number according to CEN standards | Pb content according to CEN standards | Pb content, grouped |
|---|---|---|---|---|
| **copper nickel zinc alloys (nickel silver)** | impurity | CuNi12Zn24 | 0,03 | < 0,1 % |
| | | CuNi18Zn20 | 0,03 | < 0,1 % |
| | | CuNi18Zn27 | 0,03 | < 0,1 % |
| | functional | CuNi12Zn25Pb1 | 0,5 - 1,5 | up to 1,5 % |
| | | CuNi12Zn30Pb1 | 0,5 - 1,5 | up to 1,5 % |
| | | CuNi12Zn38Mn5Pb2 | 1,0 - 2,5 | up to 2,5 % |
| | | CuNi18Zn19Pb1 | 0,5 - 1,5 | up to 1,5 % |
| | | CuNi7Zn39Pb3Mn2 | 2,3 - 3,3 | up to 3,5 % |
| | | CuNi8Zn26Pb1 | 0,5 - 1,5 | up to 1,5 % |
| **copper tin alloys (tin bronze)** | impurity | CuSn5 | 0,02 | < 0,1 % |
| | | CuSn6 | 0,02 | < 0,1 % |
| | | CuSn8 | 0,02 | < 0,1 % |
| **copper zinc alloys** | impurity | CuZn5 | 0,05 | < 0,1 % |
| | | CuZn10 | 0,05 | < 0,1 % |
| | | CuZn15 | 0,05 | < 0,1 % |
| | | CuZn20 | 0,05 | < 0,1 % |
| | | CuZn28 | 0,05 | < 0,1 % |
| | | CuZn30 | 0,05 | < 0,1 % |
| | | CuZn33 | 0,05 | < 0,1 % |
| | | CuZn36 | 0,05 | < 0,1 % |
| | | CuZn37 | 0,1 | < 0,1 % |
| | | CuZn40 | 0,3 | < 0,3 % |
| | | CuZn42 | 0,3 | < 0,3 % |
| **copper zinc alloys, complex (special brass)** | impurity | CuSn3Zn9 | 0,1 | < 0,1 % |
| | | CuZn21Si3P | 0,10 | < 0,1 % |
| | | CuZn23Al3Co | 0,05 | < 0,1 % |
| | | CuZn31Si1 | 0,8 | up to 1% |
| | functional | CuZn31Si1 | 0,2 - 0,8 | up to 1% |
| | | CuZn35Ni3Mn2AlPb | 0,2 - 0,8 | up to 1% |
| | | CuZn37Mn3Al2PbSi | 0,2 - 0,8 | up to 1% |
| | | CuZn40Mn2Fe1 | 0,2 - 0,8 | up to 1% |
| **copper zinc lead alloys (free cutting brass)** | functional | CuZn35Pb1 | 0,8 - 1,6 | up to 2 % |
| | | CuZn35Pb2 | 1,6 - 2,5 | up to 2,5 % |
| | | CuZn36Pb2As | 1,7 - 2,8 | up to 2,5 % |
| | | CuZn36Pb3 | 2,5 - 3,5 | up to 3,5 % |
| | | CuZn37Pb0,5 | 0,1 - 0,8 | up to 1% |
| | | CuZn38Pb2 | 1,6 - 2,5 | up to 2,5 % |
| | | CuZn38Pb3 | 1.6 - 3,5 | up to 3,5 % |
| | | CuZn39Pb2 | 1,6 - 2,5 | up to 2,5 % |
| | | CuZn39Pb3 | 2,5 - 3,5 | up to 3,5 % |
| | | CuZn40Pb2 | 1,6 - 2,5 | up to 2,5 % |
| | | CuZn43Pb2Al | 1,6 – 3,0 | up to 3,5 % |

10 A list of all lead containing copper alloys (impurity and functional) present in European standards can be obtained upon request

*Slags, copper smelting (EC number 266-968-3) - current regulatory framework as product of copper smelting*

Slags, copper smelting, is a metal-containing, complex UVCB substance, often called “final copper slag”. It is one of the three key end products coming out of the copper smelting process – the other two are copper metal and sulphur dioxide (converted into sulphuric acid for sale to the chemical industry).

Under REACH, Final Copper Slag is defined as a “Substance produced, from heterogeneous mixtures of copper contained material formed during the copper production, by reduction at high temperature in molten state (i.e. melting and processing in a furnace) or by flotation processes. Main constituents are iron silicate and calcium-aluminium silicates, with the amount of non-ferrous metals reduced to the lowest extent economically and technologically viable”.

The European industry has invested substantially, during the last 10-15 years, to reduce the non-ferrous metal content in “Final Copper Slags” in order to ensure their continued acceptance as construction products. The lead content of the slag streams varies between 0.02 and 0.65% and is mainly present as galena (lead sulphide), or in metallic form. The human health classification under REACH is based on elemental and mineralogical compositions and in vitro-bio-accessibility tests in gastric fluids, in accordance to the international protocol ASTM D 5517-07. These demonstrate that “Final Copper Slags” do not merit environmental or human health classification entries if 0.3% lead is used as cut-off value.

Based on confidential data, collected by ECI under its REACH Copper Consortium, the EU production of “Final Copper Slags” is 3.5 million tonnes/year. These materials, not classified under the current CLP guidelines, are used as construction materials, raw material in cement plants and as abrasive product (sand blasting use) and have been included in CEN TC 154 “Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas”. These slags have a commercial value and their use avoids the substantial costs and environmental burdens of land filling.

*Copper Scrap – current regulatory framework*

Copper scrap is an extremely important source of raw material. It can be classified as *new scrap*, coming directly from discarded materials within the downstream copper value chain, or *old scrap*, recovered from obsolete, end-of-life products.

Following approval of the EU regulation 715/2013, that established criteria determining when copper scrap ceases to be waste. A material with > 98% copper content by weight is considered copper scrap, while under this limit, it remains under the waste regime. This matches the copper scrap grades defined in the standard EN 12861:1999. Grades S-Cu-1, 2, 3, 4 and 5 have a minimum purity of copper of 99.9%, allowing up to 0.005% of lead.

To facilitate EU trade, copper scrap grades are usually classified in 4 main groups, as show in Table 2, with No2, medium quality copper scrap, having the largest share. From data available from the ICSG and the “*End-of-waste Criteria for Copper and Copper Alloy Scrap” (JRC 2013),* it can be deduced that high quality scrap, with less than 0.03% Pb content, accounts for only 20% of the total scrap trade in the EU.

***Table 2:*** *CEN standardized high quality copper scrap groups, maximum permitted lead contents and estimated share per group in EU.*

| Material group | Why Pb? | Scrap code according with EN 12861 | Pb content according to CEN standards | Estimated percentage of market in EU (source end-of-waste criteria for copper scrap, JRC 2013) |
|---|---|---|---|---|
| **Copper scrap No1 High** | impurity | S-Cu-1 | max 0.005 % | 35% |
| | | S-Cu-2 | max 0.005 % | |
| | | S-Cu-3 | max 0.005 % | |
| | | S-Cu-4 | max 0.005 % | |
| | | S-Cu-5 | max 0.005 % | |
| | | S-Cu-6 | max 0.04 % | |
| | | S-Cu-10A | max 0.005 % | |
| | | S-Cu-10B | max 0.02 % | |
| | | S-Cu-10C | max 0.8 % | |
| | | S-Cu-10D | max 1 % | |
| | | S-Cu-7 | max 0.1 % | |
| **Copper scrap No2 Medium** | impurity | S-Cu-8 | max 0.5 % | 20-40% |
| | | S-Cu-9 | max 1.5 % | |
| **High alloy** | impurity | S-CuZn-1A | max 0.005 % | 15% |
| | | S-CuZn-1B | max 0.1 % | |
| | | S-CuZn-1C | max 0.3 % | |
| | | S-CuZn-2 | max 0.05 % | |
| | | S-CuZn-3 | max 0.05 % | |
| | | S-CuZn-4A | max 3.5 % | |
| | | S-CuZn-4B | max 3.5 % | |
| **Medium alloy** | impurity | S-CuZn-5A | max 3.5 % | 15% |
| | | S-CuZn-5B | max 3.5 % | |
| | | S-CuZn-6 | max 3.5 % | |
| | | S-CuZn-7 | max 3.5 % | |

The collection and recycling of copper, in the EU, is an important pillar in the EU's Raw Materials Initiative. Not only does it retain valuable raw materials within Europe, it also avoids exporting the significant amount of energy embodied within them. According to the International Copper Study Group and ECI's internal sources, the 2011 recycling of copper scrap, within the EU, was 1.95 million tonnes, plus net exports of 450 thousand tonnes. Therefore, the total scrap market had a value of approximately **2,4 billion €** (1,000 €/tonne used as conservative, average price of high and low quality scrap).

*Copper concentrates - current regulatory framework*

Copper concentrates are natural, not chemically modified, UVCB substances, produced in, or imported into, Europe. Information collected from >100 ore bodies world-wide, indicates lead concentrations ranging between <0.01 to 13%, with lead present in the form of galena. A typical copper concentrate has a bioavailable lead content of <0.3% and does not merit CLP classification at the current cut-off value of 0.3% for reproductive lead toxicity. Concentrates with high lead contents do need to be classified.

Concentrates are a very important intermediate step between the mining of copper containing ores and final metal production. EU's copper smelters needs of raw material are distributed between European mine production, EU imported mine production and secondary sources. Thus, a third of EU based smelters/refiners raw input is based on the imports of bulk concentrates from countries such as Chile and Indonesia. According to the International Copper

Study Group, the gross weight of the imports of concentrates into Europe during 2012 was of 3.5 million tonnes with a total market value of **5.2 billion€/yr**[11] .

***Proposed "classification scenario"***

The ECHA/RAC proposal is that the classification cut-off value under CLP, for reproductive effects induced by lead (and, by read-across, also lead compounds) in alloys, slags, scrap and concentrates, would be reduced to 0.03%.

Lead is present as an impurity or functional element in copper alloys and as a natural impurity in the copper industry's complex, metal-containing UVCB substances, identified as slags, copper smelting slags, copper scrap and copper concentrates, usually at concentrations above 0.03%.

The impact of classifying lead as reproductive toxicant, with a specific concentration limit of 0.03% is outlined below.

*Copper alloys would be classified and no longer be used in production of consumer products*

The proposal would impact most of the CEN standardised "lead-free" alloys. Most of these are currently not classified, but would become classified as reproductive toxicants.

Useful to mention that, lead is added as a functional alloy constituent because lead, embedded as tiny globules (e.g. in brass alloys), acts as lubricant and, most importantly, as a chip breaker, allowing high performance machining of semi-products without continuously damaging the product itself or the production tools. In addition, lead exhibits corrosion inhibition characteristics, minimising the corrosion/metal release of other constituents.

The combination of these properties presents a significant challenge in the search for a suitable substitute. Nevertheless, over the last 10-15 years, the industry has reduced, to a minimum, the amount of lead needed for a series of copper alloys while still fulfilling downstream customer requirements. This was successfully achieved by either reducing, as far as technically feasible, the lead content in the alloy itself and/or by adding other elements. There are, however, still uses where leaded copper alloys are the only solution. This has, for example, been acknowledged in the RoHS and ELV directives by exempting lead in copper alloys up to 4 % from the general lead restriction.

Another significant challenge, in the efforts to replace substances of concern, has been to avoid impacting one of the most valuable characteristics of copper alloys – their recyclability. As elsewhere in the world, the European copper industry has explored the use of bismuth as a replacement for lead. However, bismuth exhibits a series of technically and environmentally relevant disadvantages. Amongst other adverse outcomes, bismuth seriously impacts the copper alloy recycling loop[12].

Silicon-containing brasses have been known since the 1920s and experienced a more intensive development during the last 15 years. Today, they can be considered as a technical alternative to lead-containing brasses for premium niche products in drinking water applications. However, they are not a commercial alternative for the "bulk" usages of lead containing brasses. Silicon-

[11] The value of copper concentrate is approximately 1,500€/ton.

[12] See: http://www.eurocopper.org/doc/uploaded/Bismuthnonsuitability.pdf

containing brasses are much more energy intensive and therefore costly to produce. They also require separate scrap cycles.

Today, the content of lead in "lead-free" copper alloys is considered to be the "lowest level technically feasible". Not being able to recycle end of life alloys requires the use of more expensive primary metals which has pushed up prices for consumers. The introduction of a reprotox classification, not only for "lead free" but also for all lead-containing copper alloys, is expected to motivate end-users to substitute with other materials (most likely steel or plastics).

ECI estimates that a specific concentration limit of 0.03% lead applicable to the classification as reproductive toxicant cat 1A, of lead containing substances and preparations, could seriously threaten the leaded-alloys markets (with functional lead) and the "lead-free" alloys markets (with lead present as a recycling impurity).

Applying a concentration limit of 0.3% (as applicable to lead compounds today) to the bio-available lead in the alloy, would keep most "lead-free alloys", out of the classification as reproductive toxicant.

*Slags would be classified and no longer used for construction*

For the CEN standardised "final copper-slag", a reduction of the lead classification limit from 0.3% to 0.03% lead (or even bio-available lead) would mean a shift from no-classification to classification, as a reproductive toxicant, of almost all "final copper slags".

This would, most likely, result in their non-acceptance as construction, cement and abrasive products and turn an economically valuable by-product into a waste. The latter would attract land fill fees, delivering a further serious debit to the global competitiveness of copper production in the EU.

It is estimated that 3.5 million tons of final copper slags are produced at EU level. We obtained information on additional commercial value of this by- product for an amount of 2 million €/year.

A more critical issue is the additional cost and environmental impact generated from the need of treating the product as a dangerous waste. Apart from the cost that can be estimated at more than 50 million €/year (cost of disposals: 15-25 €/ton), there is current no physical possibility to treat such an amount of slags.

Treating slags meeting dangerous waste requirements will be more expensive that its current market value, it will impact the competitiveness in a way that the industrial sector might need to consider relocation from EU community due to inability to produce its main product at a unit price which is able to reasonably compete with manufacturers outside the EU.

*Scrap would be classified and no longer collected and re-used*

The described impacts in copper alloys will affect the low quality copper scrap recycling chain. It will end up in a reduction on the scrap value, leading to a loss of incentives to be collected and treated. It will affect all players in the value chain and eventually the scrap will be doomed to be landfilled.

Furthermore it will lead to new administrative burdens on low and high quality scrap; a reduction of the lead classification limit from 0.3% to 0.03% would result in almost 80% of all copper and high quality copper alloy scrap being classified as reprotox. It will also include high quality copper scrap No1 as this group includes several grades that contain levels of lead ranging from 0.005% up to 0.1% (Table 2)

*Raw materials, such concentrates and blister, would be classified and impact EU's smelters competitiveness*

A reduction of the lead classification limit from 0.3% to 0.03% (or even bio-available lead) would result in the classification, as a reproductive toxicant, of most "concentrates" produced in, or imported into, the EU. It will create additional administrative burdens for copper smelters that will have to provision additional risk assessment studies and health and safety measures for loading, storing and processing classified input materials (concentrates, matte, blister). Such additional requirement will not be applied on smelters outside the EU, because the most wide spread cut-off for the classification of lead/lead compounds is 0.3%.

### Boundaries of the SEA

The study evaluates the consequences of the proposed scenario, within the European Union, in the mid-term. The impacts cover the potential threats for European industry as part of the global market.

## 3) IDENTIFYING AND ASSESSING IMPACTS

Under the proposed restriction scenario, the following impacts are considered.

***Economic***

- ⇒ Changes in sales and production
- ⇒ Changes in employment
- ⇒ Changes in innovation and research
- ⇒ Changes in product quality
- ⇒ Significant loss in value of products, containing copper alloys and copper alloy scrap, which are already in use

***Environmental***

- ⇒ Increase in emissions through the need to import or produce primary copper, zinc, nickel and other metals, used in alloys, versus recycling secondary materials
- ⇒ Reduction of copper recycling
- ⇒ Reduction of recycling of products containing copper alloys in the market
- ⇒ Increases in waste streams (copper scraps and copper slags)

***Health***

- ⇒ Reduction of the exposure of lead from consumer goods

***Social***

- ⇒ Changes in employment at EU level

***Trade and wider economic impacts***

- ⇒ Threat to European industry competitiveness
- ⇒ Changes in international trade

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***Economic***

The reduction in the classification cut-off value would result in the classification, as a reproductive toxicant, of:

- ⇒ Many copper alloys, especially copper brasses, characterised as “lead-free” after more than 15 years of investments and innovations
- ⇒ Almost all final copper slags, with minimum non-ferrous metal contents, used as construction products, again following years of innovations and investment
- ⇒ Most copper concentrate and scrap produced in, or imported into, Europe

Classification will have serious consequences for industry competitiveness, market prices, and product substitution.

*Copper alloys*

In 2011, 1,426 million tonnes of copper (source IWCC) were used in the EU to produce lead-containing copper alloys. These are valued at 7.6 billion €.

Classification, as a reproductive toxicant, is expected to shift markets towards a voluntary or mandatory (authorisations and restrictions) reduction of use and substitution to other materials. This substitution does not, a priori, affect the community. Nevertheless, there are products where substitution is technically difficult and/or where copper alloys represent an important functional and/or esthetical advantage.

For some applications, where lead is added for functionality reasons, the lead content could potentially be reduced to <0.03% through substitution. However, as one example of the challenges in doing so - despite extensive efforts between the copper and automotive industries, it has not been possible to substitute lead in the alloys used in applications such as injectors and valves for fuel efficiency, plus fittings and connectors for braking and traction control for passenger safety. This has been acknowledged in the RoHS and ELV directives, by exempting lead in copper alloys up to 4 % from the general lead restriction.

Most “lead-free” copper alloys contain impurities of lead between 0.02 to 1 %. These are the result of recycling scrap products after decades of use. Ultimately, these copper-alloys would need to be produced solely from primary raw materials, devaluating the stocks of products already in use in the market as well as increasing end user prices across the community.

*The loss of markets by substitution*

Considering the end-use market (Table 2), it is anticipated that the legislative measure of classification at 0.03% will have an immediate impact on the plumbing, architectural and consumer markets, with a total market of 431,000 tonnes. Considering that about 80% of these alloys have lead >0.03 % (similar to what has been assessed in details for consumer products), a market volume of 345,000 tons (24% of the total copper alloy market) is at direct risk of substitution (**1.8 billion €/yr)**.

***Table 3:*** *EU 27 end use matrix of brass alloys in 2011 (from IWCC)*

| EU 27 end use matrix of alloys ('000 t) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Building Construction** | | | **Infrst.** | **Equipment Manufacture** | | | | | | | | |
| Plumbing | Architecture | Electrical Power | Power Utility | Electrical | Non Electrical | Automotive Electrical | Automotive Non Electrical | Other Vehicles | Consumer and general products | Electronic equipment | | **Total** |
| Water distrib., heating, gas, sprinkler | Roofs, gutters, flashing, decor., builders h/w | Power distrib. earth, ground, light, wire device | Utility transm. and distribution network | Industrial transformers & motors | Valves, fittings, instruments and in plant equipment | Harnesses, motors | Radiators and tubing | Railroad, shipping and marine | Appliances, instruments, tools and other | Industrial/ commercial electronics and PCs | Others | |
| 313 | 35 | 47 | 48 | 33 | 386 | 48 | 42 | 20 | 83 | 24 | 346 | 1426 |

Assuming employment is a direct function of production, a 24% reduction in the production of copper alloys would result in the loss of around **4,000 jobs**.

Additionally, the relative competitiveness of copper producers is lower than outside the EU. Operational costs are higher, mainly due to environmental compliance, energy and labour costs, while product revenues are set globally through mechanisms such as the London Metal Exchange. It is the existence of a well established recycling chain for metals, such as copper, that has sustained the industry and its workforce. The inability to directly use EU sourced scrap alloys will lower the added value for the European production of copper and could lead, eventually, to **closure, or delocalisation of copper production to other regions**.

The scenario will also directly affect **innovation.** Both producers (smelters) and manufacturers have invested, over many 15 years, in the development of efficient recycling techniques to recover copper scrap. The European metal industry is a leader in the technologies for recycling and has developed a business out of this competence. It has achieved a large reduction in the concentration of lead in copper-alloys reaching 0.02-1% (Table 1). The proposed classification scenario will, in one act, wipe out the value of all this effort.

It will affect the recycling market and will result in increased exports of EU scrap to countries with much lower yield recoveries and far poorer standards for human health and the environment. Possibly, industry will not find it advantageous to continue to invest in research for copper scrap products in the EU.

This loss of potential innovation in the copper alloy industry may not necessarily be supplemented by innovations in other sectors.

## The costs of substitution

The costs related to the reduction, to 0.03% lead, by substitution from leaded brasses (up to 3.5% lead) to silicon containing brasses (the most plausible solution) has been estimated by a semi-fabricator to amount to **1.1 billion €/yr**[13]. The cost can be broken down to:

⇒ Additional material costs and processing costs of leaded brass versus silicon-brass : 2,000 €/ton or 690 million €/yr (for 345,000 tons)

⇒ Additionally, when copper alloy scrap can't be used any more for the production of new materials it will lose most of its financial value. This is particularly true for leaded brass scrap and pure metallic scrap which is used directly at the fabricators site. The loss of value related to re-smelting (only recovery of the copper price) instead of recycling (alloy market price) amounts to ca 700 €/ton or 241million Euro/yr (for 345,000 tons)

⇒ Copper smelters will need to increase their capacity for re-smelting at an increased operational cost of 480 €/ton or 166 million Euro/yr (for 345,000 tons)

### *Slag, by product of copper smelting facilities*

The smelting industry has also invested, over the last 10- 15 years, in the development of technologies to lower the lead concentrations in "clean" copper slags allowing them to be used as construction and blasting products and raw material for cement industry. This proposal would completely negate this investment. Slags will be classified in Europe but not outside. These slags, now valuable products, will become a hazardous waste and will have serious economic consequences for the copper smelting industry, as well as for the slag using industries. The slags used as construction products will need to be substituted by other mineral resources, with their associated environmental costs and availability restraints.

This will probably result in:

⇒ Increased costs of copper and copper products

⇒ No further industry attempts to produce "clean slags"

⇒ Loss of competitiveness and jobs in the copper industry

⇒ Delocalisation of copper production outside Europe, thus affecting the whole chain of producers, transporters and users.

### *Change in the classification of most copper concentrates and high quality scrap.*

Once a substance is classify as a reproductive toxicant, industrial sites have to compile with several additional measures when loading, storing and processing the substances. It includes provisions for environmental risk studies or the review of the health and safety measures on site. Those additional burdens will increase the production cost of copper smelting and refining facilities, and will also be applied to other players in the value chain (traders of raw material, scrap dealers, fabricators...)

### ***Environmental***

[13] The basis for the assessment was provided to ECHA in view of the SEAC discussions ion restrictions of lead in consumer products

The main environmental impacts will be:

⇒ Lower uses of lead containing alloys and slags will reduce environmental lead exposures. However, the relative contributions of these to the total lead emissions in Europe are expected to be negligible:

⇒ A decrease in the recycling value and thus the recycling rate of copper alloys. Goods that will be substituted by copper-alloys with lead contents lower than 0.03%, or 0.3% (but with Silicon and/or Bismuth), cannot be used directly (re-melting and casting) as scrap at the fabricators site for the production of new products. Recycling will need to take place through secondary smelting and refining processes. Higher EU needs for primary material imports can be anticipated (as more scrap is exported).

- It will increase the environmental foot print of those materials, increasing land use, energy consumption, CO2 emissions and acidification potential.
- Smelters will have to process much more lead containing scrap than before. This will result in a significantly higher environmental impact than just re-melting and casting lead containing material at the fabricators site.
- Reducing the lead content in the alloys will not necessarily result in a reduction in environmental lead concentrations because, depending on the market dynamics, it may result in a shift from secondary to primary copper production. Copper concentrates contain a range of metals, including lead at various concentrations (typically around 0.05%, but up to 13%). A shift in copper production from less secondary (use of scrap) to more primary (concentrates as raw material) copper production will therefore increase the amount of "new lead" imported into the EU and subsequently used and/or land-filled.

⇒ increased production of slag wastes and reduced efforts in producing "clean slags"

***Health***

The proposed classification scenario will reduce the exposure of lead from copper alloy consumer goods in the community and copper slags used as construction products.

The proposed classification scenario was initiated to protect small children from potential lead-induced "neuro-developmental effects". However, the most relevant exposure products are already regulated (e.g. drinking water directive, jewellery, toys directive, voluntary industry initiatives on textiles, and the proposed restriction on consumer articles). Furthermore, there are not, at this stage, human health studies that can quantify the effects of massive consumer goods/construction materials with a lead content of 0.03%.

These sensitive populations are not present at the workplace and therefore reduced classification cut-off values will not deliver measurable benefit. Lead exposures at the work-place are already well regulated/accounted for in the copper industry via lead occupational exposure limits (usually biological limit values (BLVs)).

***Social***

Employment will be affected under the classification scenario. The loss of competitiveness of copper smelters, as well as the reduction of scrap available to be recovered in Europe, will drive production outside Europe.

*Trade and wider economic impacts*

There are four main consequences of the classification scenario that will reduce the competitiveness of the European copper industry.

Firstly, the classification scenario with SCL of 0.03% will result in further lead restrictions and even authorisations. This will result in the need to redefine a "lead-free" alloy and a "final slag". All protocols and standards, currently used in the international trade of alloys and slags, will have to be reviewed. The EU industry has invested, for more than 15 years, resources in developing common protocols and standards. The restriction will require further research and investment, the feasibility of which is far from clear, particularly in the current depressed market environment. If a cut-off value of 0.3% bio-available lead is agreed, this would be consistent with most of the currently defined "lead-free" alloys, as well as "final slags".

Secondly, re-classifications for lead in Europe do not necessarily mean that consumer goods shipped from outside Europe will be required to meet this requirement. The classification scenario will require a large amount of regulatory auditing and information transfer inside and outside Europe.

Thirdly the proposed new SCL will classify important raw materials (concentrates, blister, matte) as reproductive toxicant in EU but not elsewhere. It is anticipated that this will negatively impact the trade negotiations and thus the competitiveness of the EU smelters .

Additionally, EU smelters facilities will have to meet additional health and safety requirements when loading, storing and processing the classified input materials (concentrates, matte, and blister). Classification of copper concentrate, matte and / or blister will therefore create an increased cost of manufacturing copper in Europe that will reduce EU's smelters competitiveness.

The price of copper is set in London Metal Exchange, as many other commodities traded worldwide, and copper producers can not deviate from market prices. Production cost in Europe is usually higher than elsewhere due to the fact that smelters have to compile with strict environmental and health and safety regulations, which is not the case worldwide. However, those increases in production cost cannot be transferred to the products because, as explained above, the price is set equally for the product, independently of where it is made. Until now, copper smelters have managed to improve its organisation and production processes to remain competitive; however technologies have almost reached the limit of improvement. The classification of raw materials, such as concentrate, blister and or copper matte, will damage the EU smelting industry, as addition administrative burdens derivate from the lead classification will be apply exclusively to European smelters, and not to non EU smelters.

Fourthly, a reclassification of alloys will lead to a loss of value of low quality copper scrap affecting the whole recycling value chain of collectors, traders and processing facilities. Additionally the proposed cut of value of 0.03% will result in approximately 80% of copper and copper alloy scrap including the high quality scrap, with a market value of **1,92 billion€** being classified as hazardous. It will discourage international exporters of scrap to trade with European copper processing facilities to avoid the burdens associated with classification. It will damage and affect current copper and copper alloy scrap flows, and will place European industries, importing and processing scrap, in a disadvantageous position versus scrap importers from elsewhere. It will also seriously discourage the implementation of the Raw Materials Initiative, whose goal is to promote and encourage closed recycling loops for metals within the EU.

## 4) COMPARING THE SCENARIOS

This section compares the advantages and drawbacks of the proposed restriction scenario. The first section compares the impacts and tries to quantify them. The second part evaluates the distribution of impacts, clarifying who will be affected. It finishes with the uncertainty of the analyses and the conclusions.

The cost benefit matrix, below, recognises that there are impacts that cannot be readily quantified or monetised.

### *Comparison of impacts*

This table shows the costs and benefits of the proposed restriction scenario, based on the impacts explained above.

***Table 4**: Qualitatively and quantitatively comparing the main costs and benefits*

| Impact | Cost | Benefits |
|---|---|---|
| **Economic** | Additional cost of consumer goods made out of metal alloys and reduced market value of scrap. Total cost of substitution to e.g. Si-alloys): **1.1 billion €/yr** | |
| | Substantial decrease in research and innovation by the copper industry to recover copper scrap | Innovations on substitutes |
| | Substantial decrease in research and innovation by the copper industry to reduce the non-ferrous metal content in "final copper slags" | Innovations on substitutes |
| | Decrease of the production of copper alloys in the EU. At risk: the alloy market of 7.6 billion €/yr. Immediately at risk, plumbing and consumer markets (**1.8 billion €/yr**) | Increase of the production of substitutes |
| | Decrease or loss of the "final copper slags" market as construction products. Large costs for copper smelting industry and cement industry. Increased cost for land-filling : 50 **million €/yr** | Increase of the production of substitutes |
| | Change in copper concentrates, with market value of 5.2 billion €/yr | |
| | Increase in the costs associated with the trade and processing of copper scrap. | |
| **Environmental** | Decrease in the recycled content of copper products. | |
| | Decrease in the end-of-life recycling rate of copper alloy containing products and therefore increase of the environmental footprint (e.g. increased CO2 emissions) of copper-alloys not coming from scrap | |
| | Increased primary production and increased imports of copper concentrates leading to an increase in the amount of "new lead" imported in the EU and subsequently used and/or land-filled. | Reduction of the environmental releases of lead from consumer products (minor) |
| | Increased production of slag-wastes and increased use of other resources as substitutes | |
| | Exposure to substitutes | Reduction of the exposure of lead of |

| | | |
|---|---|---|
| | | consumers using lead containing alloys (minor) |
| **Health** | Increases in emissions from smelting processes. | Reduction of the exposure of lead from slags used in construction products |
| | Decrease of the competitiveness of the copper industry. Increase in the prices of copper alloy products | |
| **Social** | Estimated 25% loss of employment within the copper alloy industry (**4,000 jobs**) | |
| | Increases in authority resources to audit the trade of unleaded alloys, final copper slags and concentrates | |
| **Trade and economic impacts** | Re-definition of the chemical composition of nearly all copper alloys and scrap used in Europe | |
| | Increase of exports of copper scrap from the EU, with a market value of **1.9 billion €/yr** | |
| | Loss of competitiveness of the European copper smelting and refining facilities | |

### *Distribution of impacts*

The cost and benefits are not spread equally within the production chain. While some impacts may affect consumers, other could be damaging for producers or authorities. In the table below the main targeted stakeholders are identified.

***Table 5:*** *Distribution of Impacts*

| Distribution analysis | Benefit from the proposed restriction | Damaged by the proposed restriction |
|---|---|---|
| **EU27 smelters and manufacturers** | More smelting throughput: **166 million €/yr** | Additional fabricator costs: **690 million €/year**<br>Decrease in scrap value: **241 million €/year**<br>Much more difficult to compete for concentrate needs on global market. |
| **NON-EU27 smelters and manufacturers** | Increase in the availability of raw materials, coming from EU scrap. Easier access to the international trade of copper concentrates. | Increased scrap export due to decreased scrap value in Europe<br>Increase scrap export and reduction of imports due to scrap traders looking to avoid classification requirements |
| **Consumers** | | Increases in copper and copper-alloy prices.<br>Decrease in innovation to recover copper scrap. |
| **Regulation authorities** | | Increase in the auditing of consumer goods manufactured outside Europe.<br>In contradiction to several EU targets: promotion of recycling, avoid waste, increase competitiveness, decrease greenhouse gas emissions, decrease energy consumption. |

### *Uncertainties*

There are several assumptions in this SEA report that may need further study. The most relevant are:

- Employment shifts. The reduction of share in copper-alloys and the resulting difficulties to use copper–alloy scrap may affect a wide range of persons that work indirectly for the copper industry.

- The cost/benefits of the classification scenario for human health will depend on the acceptance of e.g. solubilisation and/or bio-elution tests to read-across the effects from soluble lead compounds (e.g. Pb acetate) to the lead present in alloys and sparingly soluble minerals and structures (galena, slag silicates).

***SEA results***

Based on this analysis, it is extremely likely that the proposed classification scenario will have more EU drawbacks than benefits . The loss of jobs, the devaluation of the copper scrap chain and the price increases for copper products, copper-alloy products, final copper slags and concentrates will be a direct cost for the industry, its customers and the final consumers.

The content of lead, in lead-containing materials, is a controversial issue that has led to several European directives. It has further been recognised, in both the REACH and EU Classification guidelines, as well as in restriction scenarios, that alloys are "special mixtures" whose properties cannot reliably be predicted from the properties of each of the alloying elements.

Similarly, slags and concentrates are lead-containing, sparingly soluble UVCBs whose properties cannot reliably be predicted from the properties of each of the constituent elements. Therefore, to assess the hazards of these materials, information on composition and metal-ion release potentials need to be considered.

To better understand these, the copper industry has already invested substantially to assess potential health effects from lead in such complex materials. The clearest examples are:

⇒ **The Drinking Water Directive 98/83/EC (DWD).** The newest legislation in drinking water is the development of the EN 15664 a CEN standard. Four Member States (D, F, NL & UK), took up the challenge to address the health-related issues identified by the DWD. The EN15664 (parts 1 and 2) defines a test method for metallic materials for their conformity (metal release) with the DWD. A broad range of copper alloys are proven to be suitable for use in contact with drinking water, while a few other copper alloys failed to pass the EN 15664 test. Of those that failed the test, some will potentially completely disappear from the market. However, others are essential to downstream industry (e.g. taps and pumps) to provide the technical characteristics required of their products. These essential alloys have undergone iterative modification by the European copper industry towards significantly lower levels of metal release. This enormous effort has generated a list of copper alloys that represents both positively approved materials and candidates still subject to the approval/evaluation process. The alloys typically contain up to 2.2% lead and in some cases up to 3.5% lead (see annexes 1-3).

⇒ **Restrictions of the manufacture, placing on the market or use of a substance within the EU, according to article 71 of the REACH regulation***:* A restriction limit of 0.05% on lead-containing consumer products, that can be placed in the mouths of children, was agreed upon by the Committees for Risk Assessment (RAC) and Socio-Economic Analysis (SEAC) of the European Chemicals Agency (ECHA) and is now in its second round of public consultation. Information on lead migration from brasses in saliva demonstrated low lead release rates from brasses and allowed RAC and SEAC to propose an exemption for brass articles with 0.5% Pb. The socio-economic analysis still necessitates the inclusions of other exemptions e.g. keys, locks, etc.).

Considering the socio-economic impact and the available risk related information, ECI proposed (extract from confidential info submitted to SEAC in November 2013 in annex 4 a limit value of 2.2% lead in brass, corresponding to the lead content in the most common brass (see above). When applying the risk assessment approach outlined in the RAC document (formula below), a tolerable content of 1.7% Pb in brass is derived (close to 2.2% Pb)[14] and [15].

⇒ Slags from copper smelting. The smelting industry has invested, during the last 10-15 years, in the development of techniques that have achieved a large reduction in the concentration of lead in "final copper slags" and, as a result, kept open the market for their use as a safe construction product. "Final copper slags" has been registered, as a substance, under REACH. The REACH dossier's classification conclusion is summarised as: "Slag, copper smelting (high quality slag products) do not meet the criteria for classification as dangerous to the environment/human health". According to REACH Guidance, exposure assessment and risk characterisation is not required if the substance is not classified as dangerous. Nevertheless, given the high tonnage and various applications, the industry chose to demonstrate safe manufacturing and use. A risk based exposure assessment determined actual releases and potential risks from both the production and end-use applications. The assessment was focused on critical trace metals in the copper slag and critical exposure scenarios such as road construction. This allowed the industry to critically assess those slags that can be considered as "clean-slags" and used safely, and those that cannot.

In conclusion, this SEA advises an extension of the risk-based approach. Instead of a blanket reduction in the hazard cut-off value, it is recommended to continue to assess the exposure and use patterns of lead containing materials with due consideration of the complex matrixes and the exposed populations (children versus industry employees). This will ensure, on a case by case basis that the production/use scenarios are safe, without seriously affecting the production, market and international trade of copper, copper alloys, final copper slags, copper scrap and copper concentrates.

[14] Comments sent for the public consultation of Pb restriction on consumer products: acceptable limit of lead in brass: 0.05 µg Pb/kg bw.d (safe threshold dose for children) x 9.2 kg (weight child) / (0.08µg Pb/cm$^2$.h.%Pb (lead migration rate from brasses into saliva) x 10cm2 (surface exposure by child) x 0.33h/d (20 min mouthing time of leaded material/day) = 1.7 % Pb

[15] The rational for using a reduced mouthing time of 20 minutes/day (instead of 60 minutes) is provided in annex 5)

## 5) DATA AND REFERENCES

annex 1 : introduction to copper alloys list for products in contact with drinking water

annex 2 : 4MS acceptance of metallic materials for drinking water

annex 3 : copper alloys - 15 years of development

annex 4 : extract of ECI response (November 2013) to the proposal for Pb restriction in jewellery

annex 5 : ECI response to the proposal for Pb restriction in jewellery (August 2013)

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