



December 6, 2011

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RE: Comments on the document entitled: Reducing Mercury Use in Artisanal and Small Scale Gold Mining: A practical guide.

Dear Brenda,

Thanks for the opportunity to comment on this important document. We applaud UNEP for taking concrete steps to create much-needed materials to disseminate information about reducing mercury in ASGM.

General comments on the document:

The technical document contains a wealth of useful information that can aid miners in the transition to low-mercury or mercury free technologies. In general (except as noted below), the level of detail provided is appropriate for the target audiences intended.

The overall document layout and formatting can be improved. The layout gives the impression there is “too much going on”. It would aid the reader to have not only a good structure for the substantive discussion, but also a form that helps readers with the flow of the document. For instance, the constant color changes in the document are a bit jarring. Developing a format for each chapter and sticking to it consistently will help readers transition from one chapter to another.

The document could be improved by substantial reorganization of the discussion, as currently it lacks a clear and logical flow of ideas, where background, basic concepts, and critical problems are first introduced and then technical solutions are offered. In particular Chapter 1 is not easy to follow. As one example, on pages 6 and 7, there is a description of mapping solutions, but these “maps” contain words and concepts that have not yet been introduced in the document. As another example, the discussion of why mercury matters should occur near the beginning of the document, as mercury reduction is the focus of the document.

It is recommended that the first chapter be reorganized as follows:

CHAPTER 1 – The Basics

Who Can Use This Document – some comments about who are the target audiences for the document

Quick Facts about ASGM – general background on ASGM

Mercury Use in ASGM – general background on mercury use in ASGM – how much is used, why it is a problem

A Primer on ASGM: How Miners Use Mercury to Capture Gold – a more specific technical description (step by step) of the process:

1. Mining : note the document should include a photo of a simple locally made hoisting machine for ore (practiced either in Indonesia/Brazil; AGC has a photo of this),
2. Crushing/milling,
3. Processing and amalgamation: note this section should include a discussion of whole ore amalgamation as well as concentrate amalgamation,
4. Burning of amalgam, and
5. Refining of sponge gold.

There should also be some discussion of waste/tailings management in the document. Waste management is an important issue in general, and should not be neglected, and further a discussion of tailings management will serve to motivate the discussion later in the document about avoiding the use of cyanide on mercury contaminated tailings.

The following chapters then flow more easily from this organization, as all of the major concepts will have been introduced. The presentation of solutions should be divided into two chapters on reduced-mercury technologies and mercury-free technologies as follows:

CHAPTER 2 – Reducing Mercury Use in ASGM

This chapter can begin with the “map” diagram of how to move from current to better practices.

2.1 Concentration

Introduction to Gravity Methods

Panning

Sluicing

Magnets

Centrifuges

Spiral Concentrators

Vortexes

Shaker Tables

Flotation

2.2 Reducing Mercury Releases During Processing and Refining

Retorts

Fume Hoods

2.3 Mercury Management and Recycling

What To Do With Captured Mercury

Mercury Reactivation

Avoiding cyanide use on mercury contaminated tailings – this section should also discuss the mercury emissions from these tailings

CHAPTER 3 – Eliminating Mercury Use

This chapter can begin with the “map” diagram of how to move from better to best practices.

Gravity-only Methods
Chemical Leaching
Direct Smelting of Concentrates

Appendices

1. Mercury Use Reduction via Improved Exploration and Planning
2. Types of Gold Ore and Mercury Reduction
3. Gold Liberation –Crushing and Milling
4. Grain Size
5. Purifying Gold – note there is a discussion on pages 48 -51 about purifying gold. This is a rather complicated technique and will likely be of interest to a limited number of readers. Therefore this discussion should be included as Appendix 5. Also, the introduction of this section needs to be simplified, and the text and photos better coordinated. Currently it is also hard to follow the captions and illustrations, which is confusing to the reader.

The current document also contains a discussion on the history of ASGM, ASGM in development and other “big picture” topics. These topics may be relevant to the general picture about ASGM, but they are out of place in a technical document where the focus is on alternative technologies. Therefore, pages 52, 53, 56, and 57 should be removed from the document altogether (pages 54 and 55 will be subsumed under the “Quick Facts about ASGM” at the beginning of the document).

A final general comment : we strongly recommend that this document be translated into other languages (Spanish and French at a minimum), in order to make it more accessible to people in ASGM-practicing countries.

Specific comments on the document:

Why mercury matters: Bullets should be added pertaining to difficulty and challenges in curing mercury poisoning as well as technical, financial, environmental and health challenges in decontaminating mercury polluted sites.

Identifying Worst Practices: It might be useful to designate an icon for worst practices, so that readers can immediately identify worst practices with the icon.

Sluicing: regarding the discussion of flow rate, the comment about “regular flow can be obtained by loading a small reservoir...” should be illustrated to show a cheap and simple water supply system for the sluice. Attached (credit to AGENDA/ Haji Rehani) are a couple of photos that can be used to illustrate use of a common drum and siphon system as water supply for the sluice.

Re the paragraph about dredging, sluicing and discharging in rivers: It is not clear how refilling pits and not discharging directly to rivers is a solution for the destruction caused by dredging in river beds. Either elaborate or leave out.

The discussion about optimizing the slope of the sluice, and the use of zigzag sluices, needs a better introduction. A section heading saying “Optimizing Slope of Sluice” should be created. The angle or slope of the sluice is also important an important factor in increasing the efficiency rate of gold capture. Too steep a slope could make the sluicing effort inefficient.

Also the discussion about the gold trapping surface is too brief. The use of a better gold trapping surface is a fairly easy, low cost way for miners to improve their sluicing, so the merits of different materials should be discussed in more detail.

Magnets – the document says in “certain cases” magnetic sluice carpets can improve efficiency, etc. Which certain cases, for which types of ore?

Centrifuges - Some of this discussion is too technical for the intended audiences. The section “*The bed of concentrate that becomes lodged in the ridges must be fluidized...This design mimics the original Knudsen concentrator, California*” should be either simplified greatly or deleted. Similarly the section that begins “*The liberation of gold from the ore by milling must be well understood...losses to the tailings can be substantial*” should be deleted or reworded to get across the most basic point (that ores need to be processed to a small size and screened in order for the centrifuge to work). Also where possible, the document should give common ways for miners to estimate recommended measurements; for example, the document says ores should be milled to 0.5 mm – how small is this? what can you compare that size to? Is it like sand? Is it like flour?

Spiral concentrator and Vortex – these technologies seem very similar, can you provide advice about when each should be used?

Flotation – this section is too technical and needs to be edited for simpler language.

Retorts/close circuit burning – would it be possible to prepare some simple diagrams of retort designs and post them to the web (either UNEP or AGC website) and reference that link in the document?

Fume hoods- should mention that these are meant for gold shops. The water box condenser would be a good design to place on the web. The mercury capture system already has a website that could be referenced <http://epa.gov/oia/toxics/HgManual.pdf> or the youtube video could also be referenced <http://www.youtube.com/watch?v=4ZpeQEkiWP4>.

Mercury reactivation – If possible it would be good to have a photo to accompany each step. In step 4, the sentence “This is the result of impurities....salt solution” should be deleted.

Avoid the use of cyanide on mercury contaminated tailings – as suggested by the outline given above, it would be preferable to move this discussion to a section devoted to the topic of mercury management and recycling, which would include mercury storage and reactivation as well as avoiding the use of cyanide on mercury-contaminated tailings. Some attention should be devoted to mercury emissions from tailings especially when cyanide is used on them.

It would also be useful to elaborate on why gold losses occur even with cyanide use. Connecting the discussion to the mercury flouring phenomena would be useful.

Gravity-Only methods – This section is good but needs to explain how the method described is different from the section on concentration methods which are followed by amalgamation.

Basic Panning techniques: in some countries, such as the Philippines, miners dilute laundry detergent or soap in the concentrate before panning to aid in separating the gold particles from other impurities. In some instances, citrus fruit or crushed leaves are used for this purpose.

Better gold quality/grade: in some cases there's a slight improvement in gold grade or quality when no mercury is used, and this should be noted.

Chemical leaching – This section is too detailed and technical and needs to be edited to be more brief and concise. That said, the section should talk about other kinds of chemical leaching besides cyanide, even if those other methods are only in research stages, to indicate that there may be other technologies in the future.

Direct smelting – this section is good, but it is noticeable that the discussion explicitly points out some of the obstacles to using this method. Explicit discussion of obstacles is not consistently discussed for the other methods, although they are sometimes mentioned in the text. Consideration should be given to having a consistent format for presenting pros/cons/obstacles for *each* process discussed.

For the Philippines, the term "Borax method" has been used only for smelting no-mercury concentrate. So as not to cause confusion about the "Borax method" in the Philippines, the second paragraph for direct smelting could be modified as follows:

"This method often uses borax, sodium tetraborate, as one of the possible "fluxes"."

Appendix 1, Mercury reduction through exploration and planning and Appendix 2, how gold ores relate to mercury reduction options, need to be rewritten for clarity and expanded in some instances (e.g., extraction planning does not give any examples of what ASG miners can feasible do for extraction planning).

We hope these comments can help in the finalization of the document. For further information please contact Susan Keane at skeane@nrdc.org.