

Economic Perspectives on Artisanal and Small-scale Gold Mining (ASGM)¹

Rationale and Scoping Document

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Note by UNEP

UNEP-DTIE Chemicals Branch work on artisanal and small-scale gold mining (ASGM) is based on the fact that this is the largest demand sector for mercury globally. A number of targeted actions to promote the reduction of mercury use and releases in ASGM are on-going within the Global Mercury Partnership while negotiations on the forthcoming Global Mercury instrument are underway.

ASGM provides an important employment opportunity where alternative livelihoods are often not easily found or developed. Yet, ASGM currently can not reach its full potential to contribute to economic development, in part due to improper use and management of mercury in artisanal gold production. What is more, mercury-intensive ASGM operations also have negative external impacts on other economic sectors.

In this context, UNEP-DTIE Chemicals Branch proposes a study to explore the economic case for ‘greening’² ASGM in order to realize and articulate potential environment and development co-benefits from elimination, reduction and safer use of mercury in this activity.

I. Objectives

1. This document outlines an initial rationale and scope for a more comprehensive report articulating some potential economic benefits from ‘greening’ the ASGM sector through better mercury management. This approach ultimately seeks to motivate greater political, private sector and civil society support on elimination, reduction and safer use of mercury in ASGM. The objective of this rationale and scoping document is to elicit feedback and early input from stakeholders and partners on this proposed approach.

II. Background

2. Broadly speaking, artisanal and small-scale gold mining refers to mostly informal (often illegal) gold production by individuals, groups, families or cooperatives with minimal or no mechanization. In general, the term artisanal miners is used to encompass all small, medium, large, informal, legal and illegal miners who use rudimentary processes to extract gold from secondary and primary ore bodies. There are an estimated 10 million miners participating in ASGM activities.³ Conservative estimates states that ASGM supplies approximately 12 percent (330 tonnes of 2009 mining production) of the world’s gold production

¹ This document is intended to provide an analytical foundation for the forthcoming Guidance on Formalization described in <http://www.unep.org/hazardoussubstances/LinkClick.aspx?fileticket=RQdcS9-ErXP%3d&tabid=3391&language=en-US>

² The terms ‘greening’ and ‘green’ are employed in this document in line with UNEP’s Green Economy Initiative. “Greening the economy refers to the process of reconfiguring businesses and infrastructure to deliver better returns on natural, human and economic capital investments, while at the same time reducing greenhouse gas emissions, extracting and using less natural resources, creating less waste and reducing social disparities.” <http://www.unep.org/greeneconomy/>

³ Telmer K. and Veiga M. (2009) World mercury emissions from small scale artisanal gold mining in 2008, in N. Pirrone and R. Mason (eds.), Mercury Fate and Transport in the Global Atmosphere, DOI: 10.1007/978-0-387-93958-2_6, © Springer Science

per annum.⁴ Based on this figure, the current value of ASGM production at 70% of the average price for gold in 2010 can be estimated at around 8.1 billion.⁵

3. Many small-scale and artisanal miners the world over use mercury, a persistent and toxic chemical, to extract gold from ore. This is one significant obstacle to sustainable development faced by ASGM communities and broader society in countries connected to this industry.
4. The sector is a major source of global mercury demand, with most mercury used by artisanal miners illegally diverted from legitimate end uses in electronic and chemical industries or in dentistry, for example.⁶
5. UNEP estimates that ASGM uses 640 to 1350 tonnes of mercury a year, averaging 1,000 tonnes a year.⁷ This translates into roughly one third of global mercury use. If ASGM production equals approximately 310 tonnes per annum, this level of mercury use means for every 1kg of gold mined, roughly 3 kg of mercury are lost to the environment with severe impacts on human health. Approximately 40 percent is released into the air – in the case of open burning of amalgam often inhaled by the miner/processor. The remaining 60 percent largely makes its way into waterways and onto land.⁸ Other environmental problems caused by ASGM include water siltation, deforestation, loss of habitat's biodiversity and soil erosion. These impacts can in turn have serious consequences for economic development.
6. When the gold prices have risen from 272US\$/oz to more than 1300US\$/oz from 2000 to date, a gold rush looks inevitable. Indeed, latest market intelligence suggests that (comparing Q2 results for 2009 and 2010) gold supply from mine production increased 6 percent.⁹ The inference from this trend is that mercury-related health and environment impacts, as well as other environmental problems, are set to increase unless other actions are taken.
7. Low-cost alternatives available exist that have the potential to reduce mercury pollution in the sector dramatically. Solutions to decrease the use of mercury in ASGM exist including emission control through the use of fume hoods and retorts, mercury re-activation etc. Other non mercury alternatives such as gravity separation and chemical leaching can also be used once they do not reduce productivity. But due to lack of resources and/or knowledge mercury continues to be used widely. By supporting miners with knowledge and resources to adopt these new technologies and with the right policies in place at the local, national and global level, we can work to reduce a significant source of global mercury pollution now.

III. A Vision for 'Green' Artisanal and Small-scale Gold Mining

8. Entering into ASGM is more often than not the beginning of a cycle of poverty. Why is this so? Given the value of gold compared to other commodities, why is it that artisanal miners, rather than breaking free of poverty, find themselves caught in a hand-to-mouth existence? The vision for 'green' ASGM is as one where artisanal gold mining provides poverty reduction and economic development opportunities to communities. In essence, 'green' ASGM should enable communities to reap the full benefits of ASGM, not just the human and environmental costs associated with this economic activity.
9. This vision also encompasses individuals and communities beyond artisanal miners. For example, conflict over land – particularly the environmental degradation that mining can result in – is a common point of contention between miners and local indigenous populations. Greater prosperity for miners must also come

⁴ UNEP (2010) *Squeezing Gold from a Stone*, United Nations Environment Programme, Geneva.

⁵ <http://www.unep.org/hazardoussubstances/LinkClick.aspx?fileticket=moBI0BDq8bM%3D&tabid=4489&language=en-US>, accessed 1 December 2011

⁶ Averaging monthly gold prices from January to October 2010 gives a figure US\$1,193.41/oz(troy) based on data available from the World Gold Council at http://www.gold.org/investment/statistics/prices/average_monthly_gold_prices_since_1971/, accessed 1 December 2010.

⁷ Veiga, Marcello M., Stephen M. Metcalf, Randy F. Baker, Bern Klein, Gillian Davis, Andrew Bamber, Shefa Siegel, and Patience Singo (2006). *Manual for Training Artisanal and Small-Scale Gold Miners*, Global Mercury Project, GEF/UNDP/UNIDO: 54

⁸ Telmer, Kevin H. and Marcello M. Veiga (2008). 'World Emissions of Mercury from Artisanal and Small Scale Gold Mining', Chapter 6 in N. Pirrone and R. Mason (eds.) (2008) *Mercury Fate and Transport in the Global Atmosphere.: Emissions, Measurements and Models*, Springer Science and Business Media: New York

⁹ *Idem*:20

⁹ World Gold Council http://www.gold.org/download/value/stats/statistics/pdf/Supply_Demand.pdf, accessed 1 December 2010

with greater responsibility, whereby the contribution to local and national economies of ASGM is maximized through better environmental management, including for mercury.

10. Banning mercury use in these operations is not necessarily effective given the high costs of monitoring and lack of capacity for enforcement. As such, the chief goal envisioned for mercury under ‘green’ artisanal and small-scale gold mining is reduction and safer use, and where feasible, elimination in such mining. The forthcoming Mercury Instrument will provide one driver, amongst others, for realizing this vision (*See the targets for mercury reduction, safer use and elimination in ASGM included in the draft text to be negotiated at INC2¹⁰*).

IV. Problem Statement

11. ASGM has been on the radar of the international development community for around 30 years. Progress has been made - in the last 10 years for example, the international donor agencies have recognized the link between ASGM and development and the sector is gaining more international attention. However, overall progress has been slow, uncoordinated and much remains to be done.
12. In part, the complexity of ASGM – with its strong link to rural poverty, the marginalized nature of the communities engaged in this activity, its designation as an illegal activity in some jurisdictions – has meant that moving this issue forward in international policy agendas is a slow process.
13. A second key barrier to progress is the lack of recognition for the economic importance of ASGM, as well as of the implications for achieving sustainable forms of development if reduction and safer use of mercury in ASGM is realized. In policy-making, the costs of a policy are explicitly or implicitly weighed against the benefits for society from that policy to determine how best to invest scarce public resources. In the case of ASGM however, the costs of investing in mining communities are typically better understood than the benefits of such policies. Furthermore, the empirical evidence for the human health, environment and socio-economic impacts of ASGM has not been articulated in the economic language of key financial decision makers.
14. An asymmetrical analysis such as this leads to ASGM being excluded from national, regional and global economic perspectives in any meaningful way – and given the size of the potential contribution of ASGM to local and national economies, this is a lost opportunity.

V. Scope of Proposed Report

15. UNEP-DTIE Chemicals Branch proposes to explore the economic case for ‘greening’ ASGM to demonstrate how potential environment and development co-benefits of better mercury management in this sector can be achieved. Our hypothesis is that ensuring reduction and safer use of mercury in this activity is an important step in maximizing the contribution this sector can make to national and local economies.

A. *Economic Sizing of Artisanal and Small-scale Gold Mining*

16. The scope of the proposed study would include an analysis of the economic ‘sizing’ of the ASGM sector world wide. The types of information to be included are:
 - *Strong demand for gold.* Total gold demand in the second quarter of 2010 rose by 36 percent largely reflecting strong gold investment demand compared to the second quarter of 2009.¹¹ In US dollars, demand increased 77 percent to US\$40 billion.¹² Gold is, and has been for centuries, considered a ‘safe haven’ for investment and a traditional store of value for individuals. Gold is both a commodity and a monetary asset; in particular, it is a reserve asset for governments and individual investors alike. It

¹⁰ This document can be found at http://www.unep.org/hazardoussubstances/Portals/9/Mercury/Documents/INC2/INC2_3_elements%20.pdf

¹¹ World Gold Council http://www.gold.org/investment/statistics/demand_and_supply_statistics/, accessed 1 December 2010

¹² *Idem.*

currently accounts for around 11 percent of reserves held by central banks worldwide.¹³ Jewellery accounts for over two-thirds of total gold demand (US\$61 billion in 2008). Gold as an investment attracted US\$32 billion in 2008. It is also increasingly being used in industry/technology development.

- *Livelihood Development.* The UNIDO Global Mercury Project¹⁴ estimated at least 50 million people in over 70 countries depend on ASGM for their livelihood, mainly in Africa, Asia and South America. It is believed that the exceptional rise in the gold price (currently in excess of \$1,300 USD), along with increasing global population will compel additional growing numbers of people with limited economic opportunities in many parts of the world to this sector.
- *Contribution of ASGM to national economies.* Current high gold prices offer an opportunity for bringing new wealth into impoverished communities that often lack alternative industrial development opportunities. But the extent to which ASGM is integrated into the formal economy varies greatly from place to place – depending on the country, ASGM is generally either tolerated or designated a criminal activity.¹⁵ Dividing the conservative estimate of US\$10 billion for annual gold production from artisanal mining over the 10 million miners thought to be earning or supplementing their livelihood from this practice gives us a conservative range of US\$ 3-4 per day in potential earnings per miner.¹⁶

B. Costs of Inaction on ‘Greening’ Artisanal and Small-scale Gold Mining

17. Some of the costs of inaction on ‘greening’ ASGM to be catalogued, quantified and monetized (where possible and appropriate) in the proposed study include:

- *Poverty.* ASGM provides an important source of primary and secondary income for rural communities and regions where economic alternatives are extremely limited. By not recognizing ASGM activities and nurturing it as a viable livelihood, an opportunity is lost for national poverty reduction efforts
- *Human health and productivity.* Mercury is a potent neurological toxicant that interferes with brain functions and the nervous system. In adults, mercury can cause numbness and tingling, vision abnormalities and memory problems. It is particularly harmful to neurological development of babies and young children. With an estimated 4.5 million women working in artisanal mining¹⁷, many of childbearing age, low-level exposure to infants during gestation is a risk.
- *Reduced Rural Economic diversification-* legal communities can create value added products- technology or jewelry or growth in the secondary service sector
- *Reduced Education*
- *Reduced productivity from not capturing and reactivating mercury.* Mercury can be re-cycled and reactivated by simple processes. This way the miners can use their mercury numerous times (indefinitely in a perfectly closed circuit). The benefits are threefold: significantly less use of mercury, cost reduction, and reactivated mercury amalgamates gold more efficiently (giving more profit).
- *Child labor.* An estimated 1-2 million children may be involved in ASGM¹⁸, with children as young as 3 years-old working within or outside the family unit. They work in dangerous conditions which expose

¹³ World Gold Council “http://www.gold.org/deliver.php?file=/value/stats/statistics/archive/pdf/World_Official_Gold_Holdings_September_2010.pdf”, accessed 29 November 2010

¹⁴ GMP (2006). Global Impacts of Mercury Supply and Demand in Small-Scale Gold Mining. Global Mercury Partnership Report to the UNEP Governing Council Meeting, February, 2007. Dated October, 2006.

¹⁵ Siegel, Shefa and Marcello M. Veiga, (2009). Artisanal and small-scale mining as an extralegal economy: De Soto and the redefinition of ‘formalization’, *Resources Policy*, 34(1-2):51-56

¹⁶ Calculated assuming no increased production on 2009 gold supply, using the average annual price (to date) for 2010 .260 days per year giving \$1000/ year or 3.85\$/day.

¹⁷ *Idem.*

¹⁸ *Idem.*

them to mercury; and what is more, they do not get access to education which in turn has implications for development.

- *Biodiversity*. In many cases mercury-containing tailings are dumped into or besides bodies of water, and this result in soil, rivers, stream, ponds and lakes are contaminated for a very long period of time, posing a threat to water quality, forestry and biodiversity and ecosystem functioning.
- Increased amount of black marketeering and increased illegal mercury trade and production.

C. Opportunities for 'Greening' Artisanal and Small-scale Gold Mining

18. Certain factors show that the time is ripe to push a transition to 'green' ASGM practices globally:

- *Public profile of gold as an alternative monetary asset*. Public attention is firmly fixed on gold due to the 'gold rush' resulting from financial crises and, more recently, concerns over currency stability and inflation in many countries. As long as the demand for gold as an alternative investment option remains high, a window of opportunity on ASGM exists.
- *Expected growth in artisanal and small-scale gold activities*. Despite record high prices, combined output fell in mature mining operations in South Africa, the US, Canada and Australia from 1,260 tonnes in 2000 to 756 tonnes in 2009. Mining operations are seen to be shifting to Africa and central Asia, where environmental and social costs are perceived to be lower as they are typically external to production costs – where ASGM activities are most prevalent. As well these areas are the least explored or exploited due to poor capacity and investment climate in the past.¹⁹
- *Supply restrictions to come due to the forthcoming Mercury Treaty*. The artisanal miners usually acquire mercury from legal suppliers.²⁰ When the Treaty comes into force, it is expected that legal sources of mercury will be severely restricted, which in turn will affect availability of mercury in ASGM activities.
- *New market creation mechanisms to differentiate gold sources*. Fairtrade Labelling Organisation International (FLO) and the Alliance for Responsible Mining (ARM) launched the first ever third party independent certification for gold, opening up new market opportunities for millions of impoverished artisanal small-scale miners in March 2010.²¹ Other initiatives such as those discussed by the Responsible Jewellery Council (RJC) are underway as well.
- *The future of the World Bank's Communities and Small-scale Mining (CASM) group*. A summary of lessons learned from the past ten years of CASM and an options paper outlining potential configurations for a new model is currently under preparation. It is expected that a new coordination model may be developed through this process, enhancing and revitalizing outreach capacity on ASGM.
- Reputation building for the gold sector at large.

D. Enabling the Transition to 'Green' Artisanal and Small-scale Gold Mining

19. The proposed report aims to explore how to reconfigure public policy, businesses and infrastructure to deliver better returns on natural, human and economic capital investments in ASGM. This will necessarily consider questions on legal status of ASGM and institutional arrangements for policy implementation. Finally, enabling artisanal miners' access to financial resources is a critical aspect of encouraging adoption

¹⁹ Financial Times, 12 November 2010 'World Economy: In Gold they Rush' <http://www.ft.com/cms/s/0/d77d01f8-ee90-11df-9db0-00144feab49a.html#axzz15SYoPHE1>, accessed 16 November 2010.

²⁰ Veiga, Marcello M., Stephen M. Metcalf, Randy F. Baker, Bern Klein, Gillian Davis, Andrew Bamber, Shefa Siegel, and Patience Singo (2006). *Manual for Training Artisanal and Small-Scale Gold Miners*, Global Mercury Project, GEF/UNDP/UNIDO: 54

²¹ Fair Trade Foundation, 17 March 2010,

http://www.fairtrade.org.uk/press_office/press_releases_and_statements/march_2010/fairtrade_and_fairmined_gold_standards_launched.aspx, accessed 16 November 2010.

of new technologies that will also be examined, taking into account the role of government, private sector and ASGM communities themselves.

20. If the formal mining sector is any indication, then a significant financial mechanism will be required as capital expenditures for single formal mines can be billions.

VI. Proposed Drafting Process

21. This proposed study will be drafted by UNEP-DTIE Chemicals Branch, in close collaboration with members of the Global Mercury Partnership and other stakeholders. An initial draft will be finalized by April 2011. The Global Forum on Artisanal and Small-scale Gold Mining presents an important opportunity for consultation on this document. Early input is welcomed. For further information or to submit feedback please e-mail mercury@unep.org.

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