



## Case Study Bulletin 9

# The uncontrolled impacts of artisanal mining on our water resources

### At a glance

Artisanal Small-scale Gold Mining (ASGM) is big business in Tanzania. ASGM produces 10% of national gold output, is estimated to provide work for up to one and a half million people, and to support the livelihoods of many more<sup>1</sup>. This case study documents the absence of environmental protection measures within this key economic sector, and the devastation this causes for human health and water resources.

Our team worked with mining communities in Chunya District, Mbeya Region during 2016 to help them understand water risks, legal rights and environmental obligations. When the community formally wrote for help from the authorities mandated to support the industry and to regulate their activities, the response was a deafening silence. This case shows that despite good laws, policies and guidance to control the impacts of small-scale mining, implementation is still very weak. A lack of funding and low prioritisation means that miners are not receiving the support they need to operate safely - even when they ask for help directly. The result is a ticking time-bomb of health and environmental problems for many millions of Tanzanians. Based on the evidence generated we pose a series of questions for debate, and recommend urgent

action at both a local and national level to curb the impacts of ASGM on our water resources.

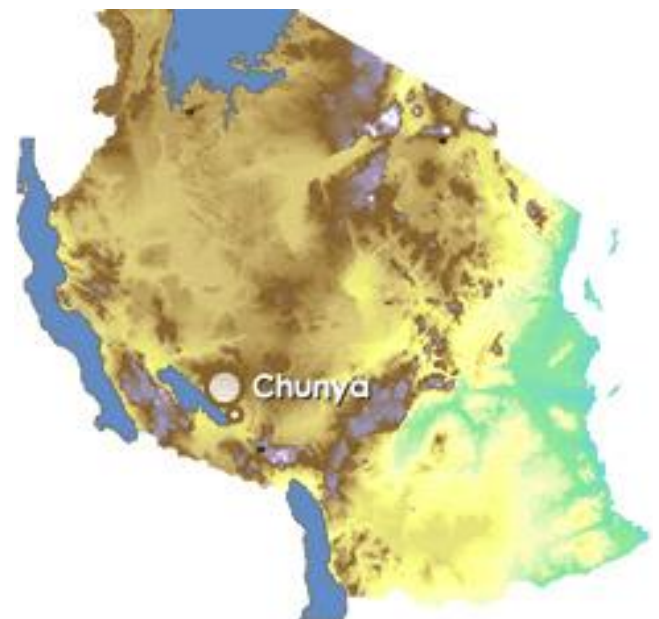


Figure 1. Case study location: Chunya and the Lupa River in the Songwe subcatchment of Lake Rukwa Basin

This bulletin was produced by the Uhakika wa Maji Programme, a joint initiative between Shahidi wa Maji, TaWaSaNeT and Water Witness International. Uhakika wa Maji undertakes high quality action research to generate evidence and advocacy materials to improve water resource management and water security for all Tanzanians. To find out more contact the Country Programme Manager, Pendo Hyera at [pendohyera@waterwitness.org](mailto:pendohyera@waterwitness.org), or write to [info@waterwitness.org](mailto:info@waterwitness.org)



## Water impacts from mining in Chunya: what's happening?

Chunya District is endowed with one of the country's major gold fields and is well known for its non-alluvial gold. Itumbi and Matundasi are very productive mining sites located 20 km from Chunya District headquarters. Mining activities began there during colonial times. There are more than 70 licenced small-scale miners, and a substantial number of unlicensed miners operating illegally.



**Plate 1. ASGM produces 10% of Tanzania's gold output and supports livelihoods of up to 4.5 million people.**

The Tanzania Mining Act 2010 recognises the contribution of small scale mining to the national economy and establishes a regulatory framework which requires small-scale miners to hold a primary mining license which specifies environmental protection measures. ASGM is also regulated by the Environment Management Act 2004, and the Water Resource Management Act of 2009 which provide significant powers to the National Environment Management Council (NEMC) and the Basin Water Boards to control pollution, and prevent degradation of water sources.

The Uhakika project team visited Itumbi mining site on six occasions between 2015 and 2017 to assess water security issues and document the situation. We met with 93 members of the community, Itumbi Miners Association, Ward and Village leaders accompanied by experts from Rukwa Basin Water Office, Chunya District Council, and the Zonal Mining Office. The team trained miners on practical and legal aspects of water and environmental protection, and health and safety.

The community reported significant pollution of the Lupa River by mining activities, despite the Lupa river being the main source of water for local people. The majority were not aware of policy and law on water and environment or the role of organisations such as the Water Users Association. Some miners were aware of health and safety rules but found problems in complying.

To seek assistance in the prevention and control of health and environmental problems associated with mining, the community representatives (Mashahidi wa Maji) have written letters to responsible institutions including the Basin Water Board, Chunya District and the Zonal Mining Office. Specifically they have requested action to protect water resources, build the capacity of the local Water User Association, improved water supply infrastructure and practical support for miners' health and welfare. Key insights generated by the case are documented here.

### 1. Pollution and environmental degradation through mining threatens the Lake Rukwa Basin with catastrophic impacts

Small-scale mining causes serious pollution problems through the use of cyanide and mercury in the gold extraction process. Mining

also causes physical disturbance to the land, river banks and bed, accelerating erosion and siltation of rivers.

- The most dangerous problem is the uncontrolled use of mercury and its escape into the atmosphere and rivers where it can enter the human food chain. Mercury is an extremely toxic heavy metal and the effects of poisoning include: muscle weakness; skin rashes and peeling; mental health and memory problems; deafness, blindness and speech impairment<sup>2</sup>. High level exposure causes kidney problems, decreased intelligence, birth deformities and death via 'Minamata' disease – named after a famous case of mercury pollution in Japan which killed 1,784 people and left 10,000 very ill<sup>3</sup>.



**Plate 2. Mercury used as an amalgam prior to open burning by miners in Chunya.**

- Mercury is used to extract gold from mined ore and is panned and then burnt. Open burning (rather than in a retort to collect fumes) results in mercury being deposited to the local environment, and along with spillages and sluice water is a major route for mercury poisoning and contamination.
- Mercury persists in the environment and bio-accumulates in fish and animals over time. Bioaccumulation is when toxins build up in a food chain. The animals at the top of the food chain are affected most severely. This is why the poisoning hazards for humans eating fish exposed to mercury is so significant.
- In 2013 international researchers from the IPEN Heavy Metals Working Group found that **between 1000kg and 3000kg of mercury are released each year in the Lupa Basin** by ASGM<sup>4</sup>. The same researchers sampled the hair of residents to check for mercury poisoning. Two of each three samples exceeded normal levels on average by a factor of three. The **highest levels of contamination found, at 236 ppm are comparable with levels in Minamata**, and with highest levels found globally because of ASGM. They concluded that mercury contamination is extremely high along the Lupa River, and that mercury use and release should be prevented to avoid further impacts.
- A study by Mnali in 2001, **found high levels of mercury in the stream sediments of the Lupa River**<sup>5</sup>. However, according

**Box 1. According to the Lake Rukwa IWRM plan, the authorities do not have the ability to monitor pollution risks from ASGM in Rukwa Basin.**

*Very few water quality parameters are being analyzed and available information is incomplete making it difficult to carry out comprehensive water quality assessments. The biggest gap is with respect to heavy metal monitoring, with only a few samples having been analyzed for heavy metals...*

*... Besides the monitoring challenges highlighted above, the current data processing, quality control, and storage mechanisms of the LRBWB are inadequate. There is no coherent database and information management system in place to ensure proper data processing, quality control, and storage. Urgent measures are needed to strengthen the existing water resources monitoring and assessment capacity to ensure sustainable water resources management and development.*

**pp. 68 United Republic of Tanzania, Ministry of Water, 2016. Lake Rukwa Basin IWRMD Plan: Final Report, Volume II (b): Songwe Sub-basin Water Resources Management and Development Plan. WREM International.**

to the **Ministry of Water** (2016) they have been **unable to effectively monitor and assess mining pollution** problems because of a lack of facilities (see Box 1.) No water quality monitoring is carried out to track the risks.



**Plate 3. Stream bed gold mining in Makongolosi, Chunya**

- The **big public health risk is bio-accumulation of mercury in the fish of Rukwa** and onward poisoning of large numbers of the population. Lake Rukwa is an *internal* basin with no outlet, so that any contamination will simply accumulate and become more potent over time. The Ministry of Livestock and Fisheries Development (2013) report that **Rukwa produces 3.6 million kg of fish for market annually** in a fishery which employs 3500 people<sup>6</sup>.
- If mercury is reaching Rukwa then the health and livelihoods of millions of people who eat these fish are in jeopardy. A study by Mshana and Sokoine University (2015) suggests that this may be the case<sup>7</sup>. **After analysing fish muscle and lake sediments in Rukwa for mercury**, the study concludes that *concentrations of mercury in the muscles of catfish and tilapia were above World Health Organization (WHO) permissible limits, indicating that they are not safe for human consumption*, and recommends further research on the levels of mercury in humans, especially children and pregnant women.
- Pollution problems are of concern to communities who report that fish, hippos and crocodiles are regularly killed by mining pollution. They are particularly worried because the population of some 7869 in Chulangwa Ward largely rely on the Lupa River for water supply, domestic water needs and fish.

**2. A lack of infrastructure, support and non-compliance with the law exposes people to significant health risks**

- Mining accidents are a big problem for miners at Itumbi, and non-compliance with health and safety rules is behind this. Serious accidents happen all the time: from 2012 – 2016, 20 people died (10 falls, 6 gas, 2 rope cuts and 2 explosions) and 8 people have been left with permanent disabilities.
- Although health and safety rules must be observed by law, there is still weak implementation among artisanal and small-scale miners. No health and safety measures or protective gear were observed at the site.
- Domestic water supply is also a big problem in Itumbi. There are no boreholes or domestic water supply schemes in the area. Communities depend on open sources which are not safe for human consumption due to pollution.
- According to residents, water borne and related diseases such as skin disease, diarrhoea, stomach ache, typhoid and UTI's are particularly severe.
- The majority of miners lack knowledge on mining policy and laws.
- Amalgam is burned openly without a vapor capture system such as a retort or fume hood. Openly burned mercury vapours are released to the air and can be inhaled by the miners and others, and then enter the atmosphere and water contributing to mercury pollution.
- Unsustainable mining activities result from weak enforcement of existing laws. Mining activities are happening within 60m of water courses, jeopardising the quality and quantity of water depended on by many thousands of people.

**Community testimony of mining impacts:**



*Pollution is a big problem here caused by unsustainable mining activities along the Lupa River by both small and large-scale miners. A Chinese company was recently caught with excavators mining the river banks. Such activities are threatening the existence of our river which thousands of people depend on. Small-scale miners should be educated about the impacts of mercury, and sustainable water management. The authorities are not doing enough to protect our water.*

**Mawazo Kayola - Secretary, Lupa Water Users Association**

### 3. Communities have asked for support and advice from relevant authorities to help them address the health and environmental risks – they are yet to receive a response



**Plate 4: Sluicing creates significant pollution in ASGM**

Community members, local leaders and those miners working with Itumbi Miners Association are very concerned about the uncontrolled impacts of ASGM in the District. In December 2017, they wrote to the authorities including the District Council, Zonal Mining Office, Lake Rukwa Basin Water Board and the National Environmental Management Council with an urgent request to:

- Enforce pollution control and environmental protection law along the Lupa River to prevent illegal and dangerous mining operations;
  - Strengthen the Lupa Water User Association so that it can fulfil its mandate of water source protection;
  - Provide advice and training on the measures that small scale miners can take to operate safely and environmentally responsibly;
  - Address the difficult water supply and sanitation situation which drives people to use unsafe sources.
- 💧 No responses have been received to the letters detailing the community's legitimate concerns and request for support.
  - 💧 Staff from the Lake Rukwa Basin Water Board did visit the site to discuss the demarcation of water sources for future protection, but no further action has been taken because there is a 'lack of funds'.
  - 💧 Similarly, the District Council has been unable to respond due to informal feedback of a 'lack of money'.

Ironically, the knowledge and experience required to support safe and environmentally responsible ASGM already exists in Tanzania, but it is not being used. The Ministry of Energy and Minerals and others in government have partnered with the United Nations Industrial Development Organization (UNIDO) and the World Bank's Sustainable Management of Mineral Resources Project over many years to address the problems. Outputs have included a *Training Manual for Artisanal Miners*, training programs and booklets (in Swahili) on *Mercury and health*, *How to use and re-use mercury*, *How to protect your water*, and *How to get more gold*<sup>1</sup>. These initiatives have promoted cleaner technologies to miners and demonstrated the benefits of reduced mercury use. According to project evaluations, this led to improvements in gold extraction practices, including the uptake of retorts, the construction of safely protected amalgamation ponds, and environmental management safeguards. Key lessons from these initiatives are well documented and suggest that:

- Initiatives to tackle mercury need focus on empowerment as well as education, and should meet other locally defined priorities (mining accidents, poor ventilation and lighting, poor mining methods, HIV/AIDS, water access) using a bottom-up approach.
- Improving access to social services, credit, mining permits and improving security of tenure should be part of efforts to improve small-scale mining practices. Without formal legal status, poorer miners are likely to have the incentives to mine safely.

The Integrated Water Resource Management and Development Plan of the Lake Rukwa Basin Water Board fully recognises the hazard of mining pollution, *that heavy metals are present and likely accumulating in Lake Rukwa* (pp.5), and prioritises the need for proper monitoring and enforcement. However, like all of the Basin Plans in Tanzania, they are now mired in a process of further approval and uncertain financing. Over the last 3 years the government has approved allocations of on average only 20% of the planned requirement for water resource management, and in 2016/17 only 11% of planned financial needs were allocated<sup>8</sup>. Unless the financing gap for water resource protection is addressed, risks such as those facing Rukwa will be magnified.

#### What needs to change?

**Locally:** Urgent steps should be taken in the Rukwa Basin and in other areas facing acute risks from ASGM, to minimise impacts on people and the environment. We ask:

- a. How can the urgent priority of water quality monitoring focusing on ASGM hotspots and mercury pathways to human consumption be implemented and reported on given current resource constraints?
- b. Can the Ministry of Energy and Minerals fulfil its mandate to support ASGM miners through expedited permits, empowerment, provision of training and advice, access to finance and safety equipment - such as retorts?
- c. What steps are needed to enforce environmental protection law and the Water Resource Management Act 2009, and to curtail illegal mining and the unregulated, unsafe use of hazardous chemicals like mercury?
- d. Can investment under the Water Sector Development Programme II be targeted to meet the urgent water and sanitation needs of communities in Chunya?

**Nationally:** The Chunya case suggests that despite strong laws and policy, the system for regulating the health and environmental impacts of ASGM, and water pollution more widely are not working well, and that urgent attention is needed to safeguard our future environment. We ask:

1. Is it clear which agency has ultimate accountability for pollution prevention and control? At the moment responsibilities seem to fall between NEMC, the Basin Water Boards and District Authorities and this risks confusion, inefficiency, and a lack of effective action.
2. Is the lack of response to mining communities in Chunya satisfactory? Would a formal system of logging communications assist in transparency and accountability? This could be delivered through a national database of water related incidents (disasters, conflicts, pollution problems) or national incident reporting system (NIRS) to ensure effective responses to citizens' concerns.
3. Do we need a system of 'risk-based' regulation which targets limited resources in the BWBs and NEMC on the most serious issues for the health and environment?
4. Would a national campaign on pollution hotspots, which targets monitoring capacity, technical advice and enforcement action on the most serious issues - including areas worst affected by ASGM – be a useful step?
5. How can we ensure adequate funding for water resource management? The long-term health and economic risks flagged by our work in Chunya and elsewhere, suggests that the country can no longer afford for the Basin Water Boards and their Integrated Water Resource Management Plans to lie idle for want of the funding they need to become operational.

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<sup>1</sup> UNEP 2012, Analysis of formalization approaches in the artisanal and small-scale gold mining sector based on experiences in Ecuador, Mongolia, Peru, Tanzania and Uganda. Tanzania Case Study, June 2012.

[https://wedocs.unep.org/bitstream/handle/20.500.11822/11603/Case\\_Study\\_Tanzania\\_June\\_2012.pdf?sequence=1&isAllowed=](https://wedocs.unep.org/bitstream/handle/20.500.11822/11603/Case_Study_Tanzania_June_2012.pdf?sequence=1&isAllowed=)

<sup>2</sup> Mercury and health. WHO. January 2016. Retrieved 19 November 2016.

<sup>3</sup> <http://www.bu.edu/sustainability/minamata-disease/>

<sup>4</sup> IPEN Heavy Metals Working Group, 2013. ASGM sites: Matundasi and Makongolosi mining areas in Tanzania, IPEN Mercury-Free Campaign Report, prepared by AGENDA (Tanzania), Arnika Association (Czech Republic) and IPEN

<sup>5</sup> Mnali, S. R. (2001). "Assessment of the Heavy metals pollution in the Lupa Gold field, SW Tanzania." *Tanz. J. Sci.* 27A(Special Issue): 15-22.

<sup>6</sup> THE UNITED REPUBLIC OF TANZANIA, MINISTRY OF LIVESTOCK AND FISHERIES DEVELOPMENT FISHERIES DEVELOPMENT DIVISION, FISHERIES ANNUAL STATISTICS REPORT- 2013. Prepared and compiled by: Fisheries Statistics Section MAY, 2014

<sup>7</sup> Johnson Grayson Mshana (2015) Mercury and Lead Contamination in Three Fish Species and Sediments from Lake Rukwa and Catchment Areas in Tanzania. *Journal of Health and Pollution*: June 2015, Vol. 5, No. 8, pp. 7-18.

<sup>8</sup> Tawasanet 2016, Water Sector Equity Report. Water Security for All? The financing crisis in water resource management, WWF/Shahidi wa Maji, Tanzania. <http://www.tawasanet.or.tz/files/Equity%20report%202016.pdf>