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Research Application Summary

Reviewing the effects of gold mining on deterioration of forests cover

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Abstract

Gold mining has rapidly increased in Sudan and in many other countries. As reported by many authors mining activity is considered as one of the forests and biodiversity disturbing agent. This study reviews studies related to the effect of gold mining activities on forest tree covers. Secondary data were obtained from journals and reports and analyzed. In general small scale gold mining negatively affects water resources and causes biodiversity degradation and dust pollution. Vegetation cover change and deterioration were detected within and around mining activities. Rehabilitation of mining sites and role enforcement and monitoring are recommended.

Key words: Forest deterioration, forest disturbance, gold mining, land degradation, Sudan, tree cover

Résumé

L'extraction de l'or a rapidement augmenté au Soudan et dans de nombreux autres pays. Comme l'ont rapporté de nombreux auteurs, l'activité minière est considérée comme l'un des agents perturbateurs des forêts et de la biodiversité. Cette étude révisé les études liées à l'effet des activités d'extraction de l'or sur le couvert forestier. Les données secondaires ont été obtenues à partir de revues et de rapports et analysées. En général, l'extraction de l'or à petite échelle affecte négativement les ressources en eau et provoque la dégradation de la biodiversité et la pollution par les poussières. Un changement et une détérioration du couvert végétal ont été détectés à l'intérieur et autour des activités minières. La réhabilitation des sites miniers et l'application et le suivi des rôles sont recommandés.

Mots clés: Détérioration des forêts, perturbation des forêts, extraction de l'or, dégradation des terres, Soudan, couvert arboré

Introduction

Hadri *et al.* (2011) defined forest as “land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 per cent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use”. Mining is the process of obtaining useful minerals from the earth’s crust including both underground and surface activities (U. S. Department of Agriculture, 2001). The mineral gold is a subtle which is very valuable. Aside, it has been used to make jewelry and serves the purpose of electronics since it can be shaped into a very fine wire and is resistant to corrosion (McAra, 1978).

Gold mines are usually operated by small-scale self-employed indigenous young men while Mining National Companies operate large-scale gold mines with operations that are large in physical size and capacity and utilize heavy equipment and the latest mining technology are generally operated in Ghana (Jnr *et al.*, 2015). Furthermore, Africa is noted as the birthplace of mining activities, where the oldest mines were discovered in an iron ore site in Swaziland 45,000 years ago. Although traditionally gold was used as currency, it had diversified purpose in other places before extending to Africa (Yachir, 1988).

According to many authors the main causes of forest degradation includes forest fires, fuel wood harvesting, climate change, mining, amongst other causes. In this paper we review studies on the effects of gold mining activities on deterioration of forest cover in some areas. Secondary data from related sources were the sources of information related to this review.

Methodology

We collected information and analyzed the effects of gold mining activities on livelihoods and people using purposive sampling method and structured and semi structured questionnaires which were randomly distributed to households in villages adjacent to the mining area. Data from individual respondents and key informants interview involving forest officials and Local leaders and quantitative social economic data were analyzed using SPSS (Nzunda, 2013; Boadi *et al.*, 2017). Others used sample plots and measurements to estimate deterioration of stocking, basal area, volume and tree species diversity as a results of mining activities side effects (Nzunda, 2013; Boadi *et al.*, 2017). Some authors used GPS coordinates and GPS data methods for mapping and spatial data as a methodology to estimate degraded area (Nzunda, 2013; Boadi *et al.*, 2017). Other proposed methods and recommended equipment are meant to ensure sustainable and environmentally friendly ASGM operations (Salati *et al.*, 2016a). Also Lacey and Moffat (2012) described interdisciplinary domain of Technology Assessment (TA) framework and flagship social analysis of mining technologies for providing an appropriate overarching structure.

Results and discussions

In many countries mining activities were practiced at small scale or by companies. Furthermore, the engagement of foreign investors in this practice resulted in creation of jobs for the local

people and helped to boost the countries' economies. Apart from the mining activities which provided jobs and contributed to the economic growth of many African countries, it has negative impact on environment and communities at large and loss of agriculture and livelihood as negative impacts of mining, especially illegal mining (Kwateng, 2012). In some cases it led to reduction in total productivity and lowered crop yields in mining areas by to 40% between 1998 and 2005 due to polluting effects of mines (Arag and Rud, 2016). This indirectly has led to dire environmental consequences and huge loss to national economies due to use of inadequate mining and processing methods especially by the local miners at small-scale level of gold mining (Salati *et al.*, 2016a).

In Sudan for example, a Government company called Sudan Company for Gold Mining managed production of gold mining at large scale level in which, they got 10% from production by any miner of gold as royalty while individual small scale miners producers support their costs (Onour, 2018). In Ghana, respondents indicated that there had been loss of agriculture and livelihood as negative impacts of mining especially illegal mining. Ocansey (2013) documented the affect of gold mining activities on communities livelihood. These affects caused people displacement, transfer and even immigration from mining areas. This movement is one of the causes of socio-economic constrains like food shortages, environment effects such as land degradation and water pollution. Further the lives of the inhabitants were affected by high cost of living, food price hikes and many other factors as a consequence of the mining production in small or large scale levels (Kwateng, 2012; Ocansey, 2013; Salati *et al.*, 2016b).

The effects of gold mining have been studied by many authors such as Obiri *et al.* (2016) who examined the impact of gold mining practices on environment and livelihoods of communities in Ghana. They explained that water resources degradation, loss of biodiversity and dust pollution were the main environmental impacts resulting from small scale artisanal gold mining activities. Also Bansah *et al.* (2016) indicated that environmental degradation and weak national security were associated with poor operation monitoring and lack of policy and regulatory framework for precious minerals and metals in Ghana. Further, improper choice of tools, land degradation, lack of personal protecting equipment, drilling and blasting in confined spaces are associated with small scale underground mining activities.

Illegal mining activities have increased recently due to several factors effecting crop production (Poku, 2016). Also the negative effects on land by small scale mining in Ghana has resulted in decline in flora and fauna diversity. Also mining activities resulting in dred washing of alluvial gold into water, and siltation is common in main rivers and streams (Coomson, 2004; Oblokuteye, 2010). Estimation of air quality around small scale mining areas indicated that dust emissions rose from surface operations that potentially threaten miners' health (Al-Hassan and Amoako, 2014). Other researchers such as Donkor *et al.* (2006) and Opoku-Antwi (2010) have also studied effects of small scale mining and reported negative affects on farmers and human life and the ecosystem, including reduced crop yields, loss of agricultural labour and land degradation (Musah, 2009; Jnr *et al.*, 2015). Nzunda (2013) reported that mining activities impacted on land cover and forest stock in

Mbozi district, Mbeya region, Tanzania. The author indicated that land cover derived from land sat images from 1991 to 2011 shows the increase of mining area from 0.77 ha to 517.44 ha and bush land from 397.91 ha to 807.61 ha, while forest area decreased from 567.55 ha to 0.77 ha. Average number of stems per hectare in un-mined area was 151.31 ± 31 (SE) N/ha and in mined area 25.01 ± 6.276 (SE) N/ha, mean basal area for un-mined forest area was 2.50 ± 0.26 (SE) m²/ha and in mined forest area was 0.21 m²/ha. The mean volume for un-mined area was 9.61 ± 0.19 m³/ha and 0.51 ± 1.18 m³/ha for mined forest area. These findings show that the drivers of land cover changes are mining activities which accounted for 50 %, charcoal burning 27.8 %, uncontrolled bush fires 11.1 %; fire wood 6.7 % and 4.4 % due to crop cultivation. Furthermore, loss of agricultural land due to large-scale gold mining on agriculture in Ghana occurs especially in Western Region, where notable reduction in farming activities is reported from 90% to 76% (Jnr *et al.*, 2015; Boadi *et al.*, 2017).

Concluding remarks

Increasing mining activities constrain tropical forests at both small and large scales levels. There is evidence to indicate that gold mining has resulted in high cost of living, health hazards (drug abuse, prostitution), physical/environmental degradation (noise and ground vibration, chemical pollution and environmental disaster). As well, gold mining activities have negatively affected rural settlement, land use loss of crops land, flora degradation and food insecurity (Ocansey, 2013; Nzunda, 2013; Jnr *et al.*, 2015; Boadi *et al.*, 2017). There has also been water resources degradation, loss of biodiversity and dust pollution. It is concluded that recognition of role and constraints facing different stakeholders as result of gold mining needs to be considered. Besides, rehabilitation of mining sites and role enforcement and monitoring is suggested. Finally there is need to develop monitoring actions to alleviate the harmful issues connected with small scale mining.

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