Impacts of 'Galamsey' on Drainage and Sanitation in the Mining Communities of Tarkwa, Ghana

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Key words: "Galamsey", illegal, small scale, mining, ridge, flood plain, drainage, pollution and sanitation

ABSTRACT

The effects of illegal small scale mining, popularly called 'galamsey', on the environment has been a cause for concern for government, environmentalist, health workers, socialists, engineers and other stakeholders in the mining industry of Ghana for sometime now, and investigations have been underway to access the impacts on various aspects of the physical and socioeconomic environment. This paper gives an overview of galamsey operations in Ghana and examines its impacts on drainage and sanitation in Tarkwa and the surrounding mining communities. The methods used include literature review on the subject, direct field visits, observations and interview at galamsey sites in the study area and measurements of the geographic locations of the sites. Things observed include the locations of the site relative to water courses, nature of topography, structures like residential buildings, roads, rail lines and refuge dumps in the area and evidence of impacts of galamsey operations on these. The observations were analyzed and discussed against conditions that existed prior to the intensive operations of galamsey. The Study reports that galamsey activities have dire consequences on drainage and sanitation problems in the communities where they are prevalent, such as the Tarkwa areas. There is the need for galamsey and its negative impacts on the environment to be monitored regularly in order to apply mitigation measures at appropriate periods.

1. INTRODUCTION

One of the effects of 'galamsey', unregistered or illegal small scale mining, that deserve attention is its impacts on drainage and sanitation in communities where it is prevalent. 'Galamsey' or illegal small scale mining activities and operations usually take place along the spur of gold bearing ridges or mountains and in the valleys or flood plain of streams and rivers where alluvial deposits are expected. It involves excavating, removal, grinding and washing of earth materials and the application of chemicals like mercury or cyanide to extract gold from the ore (Fig. 1). These results in the creation of

multitudes of pits and heaps of waste materials (sand) scattered indiscriminately within the valley plain.

The immediate consequences of galamsey include pollution and stagnation of water in the cities and obstruction in the natural courses of water bodies that may result in flooding during raining season. There is also the siting of temporal structures for the grinding, washing and extraction of gold from the ore as well as sitting of residential structures and refuge dumps within or near galamsey sites on the spurs and valleys. These results in extensive sanitation and health problems for the communities where galamsey are operate. (Adjei *el tal*, 2012; Kwesi *el tal*, 2013). This paper examines these matters in some selected communities within the Tarkwa- Nsuam municipality and makes recommendations for dealing with the problems.

Fig. 1 Excavations, Grinding and Washing of Earth Materials for Gold at

2. STUDY AREA

The study area falls within the Tarkwa-Nsuaem Municipality and Prestea-Hunivalley District which is located in the Western Region of Ghana between latitude 5^{o} 10′ N to 5^{o} 40′ N and longitude 1^{o} 40′ W to 2^{o} 1′ W (Fig. 2). It has an area of about 4000 km^2, a population of about 250 000, and about 500 settlements. Its capital and central town is Tarkwa, a famous mining centre that attracts many people from other parts of the country, Africa and the world. Many of the mining companies in the country are located in and around Tarkwa, and galamsey activities are very rampant. The area is said to host halve of all large scale mining in Ghana, over 100 registered or legal small scale mining and over 600 galamsey operators by 2012, and that registered mining and galamsey at the place date back to 1877 and the 10^{th} century respectively (Kumi-Boateng, 2012; Hilson, 2006; Griffis *al et*, 2002). It is also an important commercial and transit centre. These factors draw many people to the city daily to look for jobs and do business. (Kwesi *el tal*, 2014 a; Kusi-Ampofo, and Boachie-Yiadom, 2012; Anon, 2009). A significant number of the unskilled immigrants find themselves in the galamsey job. The population growth rate is about 3.0%. Huge volumes of waste are being generated that are beyond the resources and capabilities of the Municipal Assembly to handle. This has given rise to a number of sporadic open dumps at unapproved locations in the city and other parts of the municipality, especially at galamsey sites, and these are creating health, environmental and socio-economic problems. (Kwesi, 2014 b). Mean rainfall, temperature and humidity are 187.83 mm, 28 ^{0}C and 77% respectively. Tarkwa and its environs fall within the forest dissected plateaus physiographic region. The topography generally consist of a series of ridges and valleys that run parallel to each other in north-south direction. Average heights ranges from about 40 meters to 300 meters above mean sea level. The drainage pattern of the area is dendritic, with river Ankobra, Bonsa, Huni and their tributaries (e.g. Bediabewu, Buri, Anoni, Sumin, and Ayiasu) constituting the main water bodies.

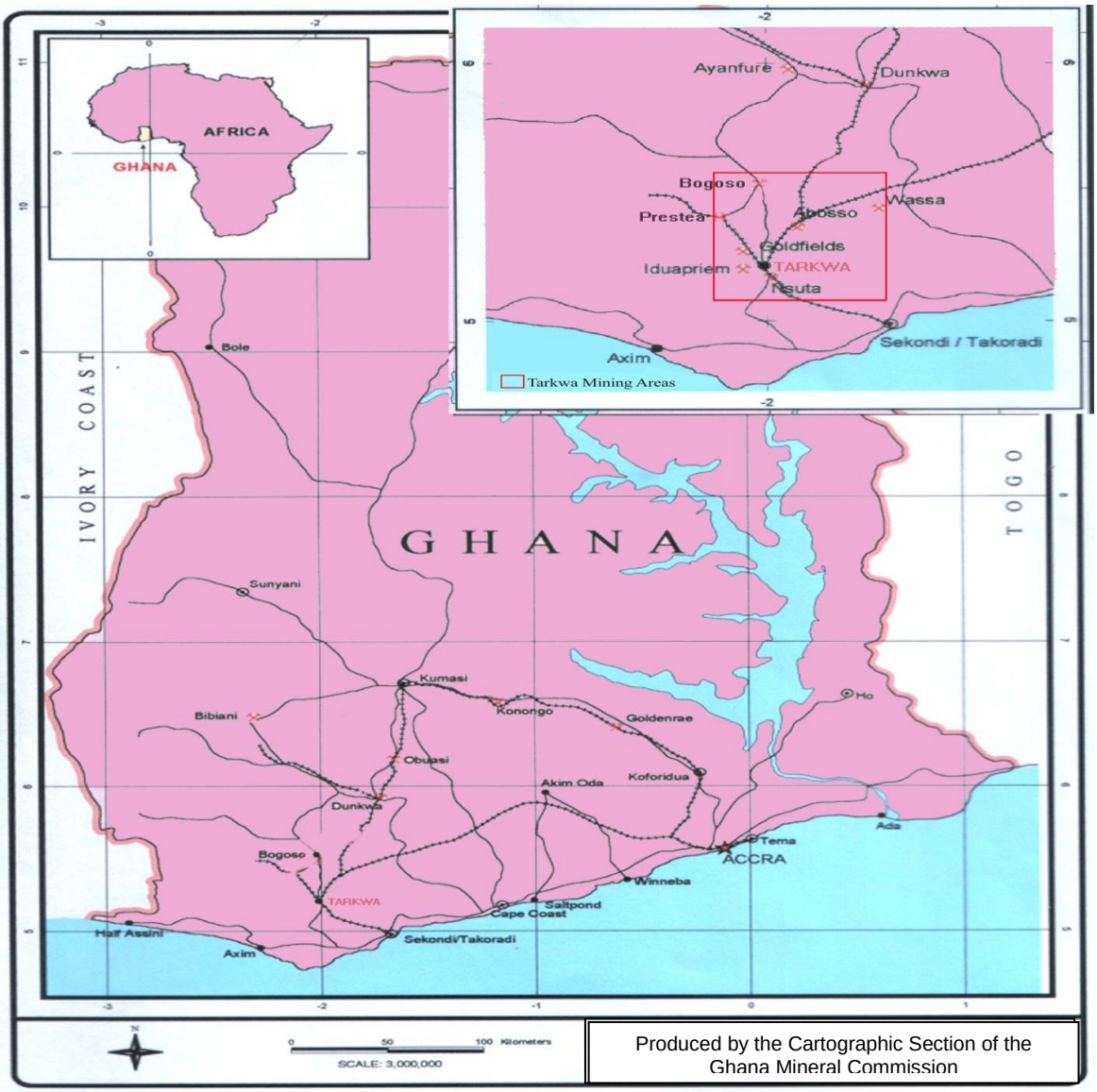

Fig. 2 Map Showing the Location of Tarkwa and Its Surrounding Mining Areas

The underlying rocks are of the Birimian and Tarkwaian formations (Fig. 3). Some of the ridges are associated with gold bearing rocks of the non-sulphidic paleplacer and oxide ore types while some of the streams and flood plains are associated with placer or alluvial ore deposits. Galamsey operations are take place along these ridges and valleys. As a result of the increasing galamsey operations, there have been frequent drainage, flooding and sanitation problems in the area (Anon, 2009, Asante, 2011)

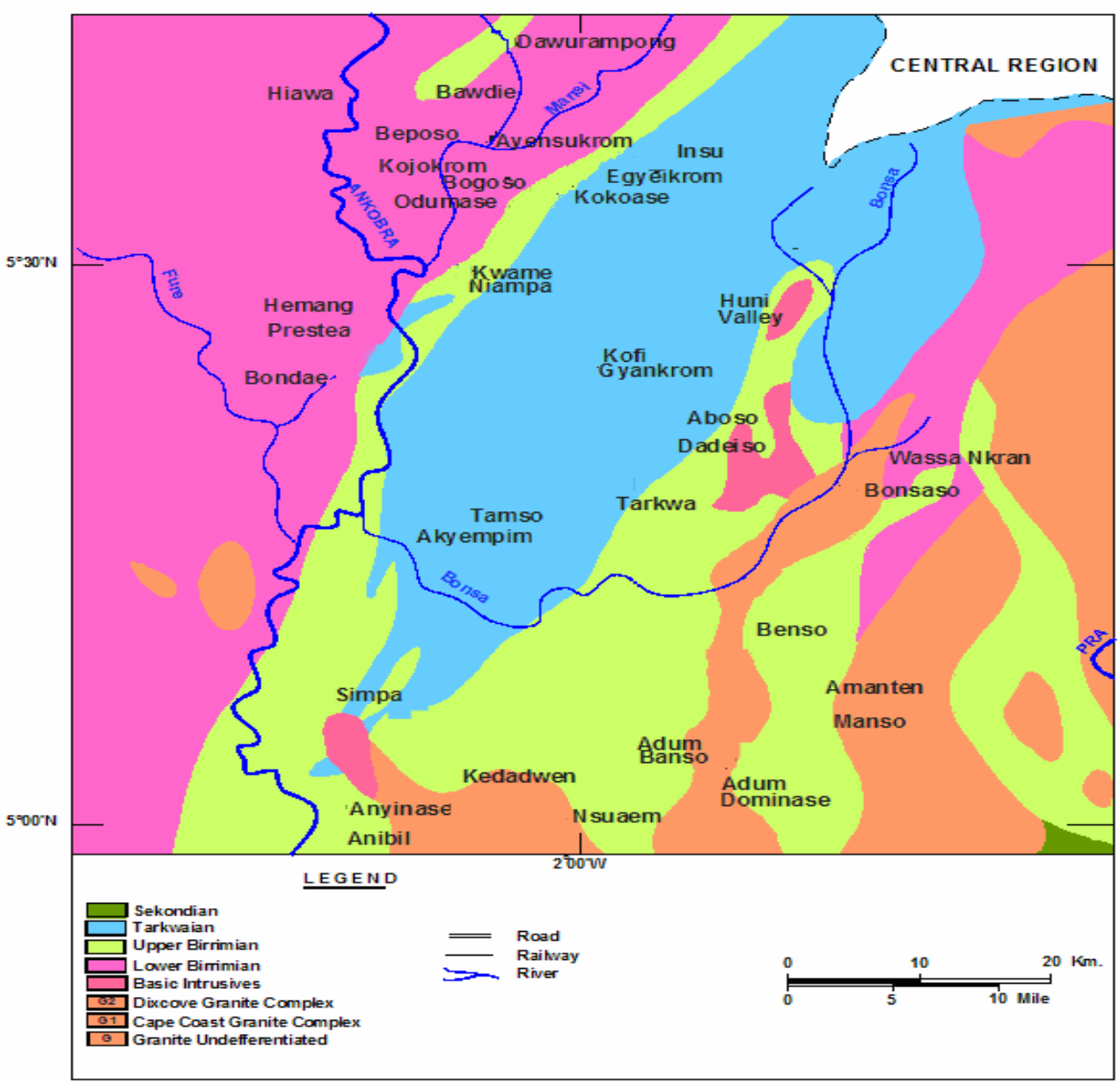

Fig. 3 Geological Map of the Tarkwa-Prestea Area (modified from Kortatsi 2004)
(Source: Kusi-Ampofo and Boachie-Yiadom, 2012)

3. METHOD

The methods used includes literature survey, direct field visits, observations and interviews at galamsey sites in the study area. Things observed include locations of operations relative to water courses, nature of topography, buildings, roads, rail lines in the area and evidence of impacts on these

and sanitation. Questions asked include evidence of registration and licensing, safety measures and plans for environmental protection and remediation. Materials used include digital cameras for taking photographs and videos of the sites and surrounding environment, hand held GPS for the coordinates of the sites and other features of interest, and mineral and topographic maps for navigation to sites and to provide the base information for the thematic data.

4. RESULTS AND DISCUSSIONS

4.1 Data Processing and Presentation

The point data was processed, classified and plotted on a base map (Fig. 4). A total of 30 sites were observed in Tarkwa and its immediate settlements and of these 67% were classified as galamsey sites. 'Galamsey' as used here should be understood in context. The term is often used at the scholarly level to refer to illegal small scale mining, that is, small scale mining operating without license from authorized bodies such as Mineral Commission, the District Assemblies and EPA. This definition does not strictly apply in this article. On the field it is difficult distinguishing between registered (legal) and unregistered (illegal or galamsey) small scale mining sites. Their operational activities and equipment or tools are generally the same, and they work together. Some without license excavate materials from somewhere and bring them to registered sites to process them. Others set up their own temporal ore processing structures just like the structures of the registered sites. The field observations and interviews revealed that these small scale miners usually operate without conscious efforts or plans to protect the environment (water, air, vegetation, land and other things on it) against pollution nor reclaiming it from the damages they cause to it and the safety hazards it subsequently poses to humans and other living things. Their focus is just to get and process the ore for gold and then move on to another site. However, the structures of the unregistered ones appear more haphazard and temporal, appearing at a spot for some time and disappearing or being abandoned the next time. Therefore, where there were no evidence of licensing or authorization for operation, (such as sign post or certificates with authorization from the licensing bodies, relatively permanent office or structures and a history of being in existence for some time, and being on the list of mineral commission), sites observed during the field survey were classified as galamsey sites. These usually occurred along the gold bearing ridges and flood plains running through the town (Fig 4).

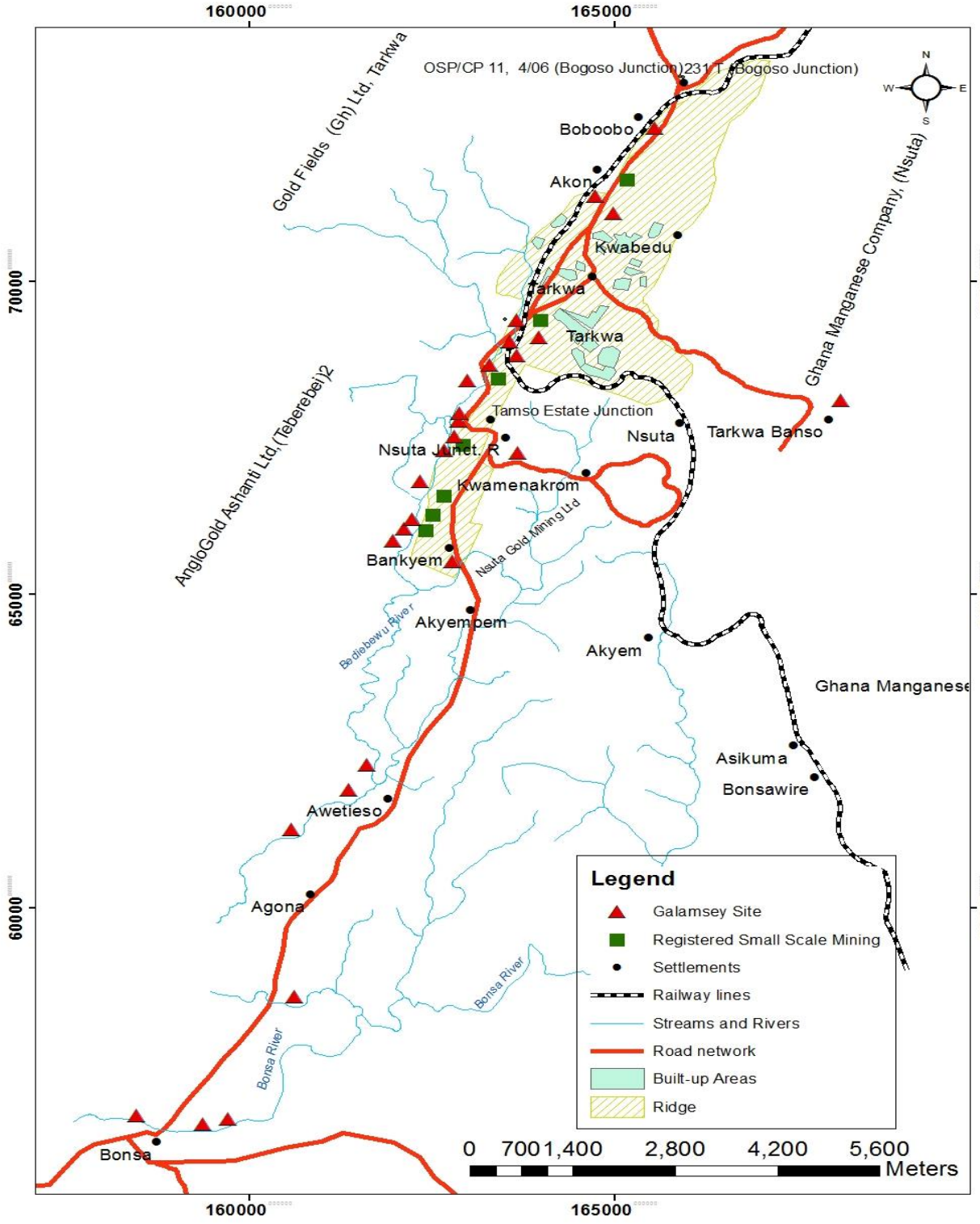

Fig. 4 Map Showing Locations of Galamsey Operations in Study Area

4.2 Impacts on Topography and Drainage Lines

Major interference of the natural topography and drainage courses due to excavations, pits and heaps of earth material that are continuously changing the topography and courses of drainage lines were observed. What we see today will be different from what we saw yesterday and what we can see tomorrow. Direct consequences of these changes include risk of falling into pits and dying, pit collapse and mud flow or slope failures, flood and dust pollution. The situation also poses danger to, and destruction of nearby roads, rail lines, buildings, farms, etc. Fig. 5 and Fig. 6 illustrate examples of the situation.

Fig. 5a Threat to Buildings and Infrastructure on Ridges by Galamsey Activities

Fig. 5b Galamsey Activities inside Water Bodies at Agona and Awhitieso Areas

Fig. 5c Galamsey Activities within Flood Plains of Streams at Tebrebie and Nkaponasi

Fig. 5d Galamsey Activities along Ridges at Tamso and Efuanta

Fig. 6a Creation of Stagnant Water at Galamsey Sites

Fig. 6b Galamsey Effects on Water Bodies

Fig. 6c Galamsey Impacts on the Bonsa River (Main Source of Water for Area)

4.3 Impacts on Sanitation and Waste Management

The valley plains and spurs of ridges that run through communities where galamsey take place are associated with indiscriminate dumping and lithering of refuse and human excreta that can be directly and indirectly linked to galamsey activities. Dumping of refuge in the swamp and pits, leaching, and erosion from refuse into stagnant waters, streams and into people houses during flooding in the raining seasons pose serious sanitation and environmental health problems on the miners themselves and people in the surrounding settlements (Fig. 7 and 8). These are also linked directly to epidemic like cholera, malaria, diahria and skin diseases. The locations of galamsey activities within the communities are mostly inaccessible to waste collection services by the district assembly. As a result, waste dumping in these areas go on without any controls or management.

Fig. 7 Galamsey Impacts on Drainage and Sanitation in Tarkwa-Nsuaem Areas

Fig. 8a Galamsey Impacts on Drainage and Sanitation at Tarkwa-Tamso Areas

Fig. 8b Galamsey Impacts on Waste and Sanitation at Tarkwa-Akyepim Areas

4.4 Impacts on Flooding

There have been frequent flooding events with associated socio-economic and environmental consequence in the study area that can be linked to galamsey operations as a result of the obstructions in the valley plains and natural courses of water bodies (with pits, heaps of sand, processing structures, refuse dumps and buildings) (Fig. 9). The consequences documented over the past decade include submergence of houses, roads, rail lines, schools and other structures within the flood plains and along

the spurs, collapse of walls, buildings and slopes, mud flow, waste flow and washing away of bridges, and lost of properties and lives, and closure of schools, roads, and other service centres.

Fig. 9 Galamsey Impacts on Flooding

5. CONCLUSIONS AND RECOMMENDATIONS

The Study has demonstrated that galamsey activities have dire consequences on drainage and sanitation in the communities of the Tarkwa mining areas. There is the need for galamsey and its effects in these areas to be monitored regularly in order to apply mitigation measures at appropriate periods. This in turn requires that galamsey operators should be regularized if it cannot be abolish now so that its effects as discussed can be monitored and controlled (eg. Filling back the pits, regular dredging of the stream and river beds, controlled excavations to avoid slope collapse, and provision of sumps or charnels to collect and control contaminated water from the washing, controlled refuse dumping, and collection/ burning and fumigation or spraying, etc, etc). When regulated, taxes can be

collected from the operations to support the monitoring and remedial actions to control the associated negative effects.

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