Annex U
Target Landscape Profile

Introduction

The selection of project sites was conducted using the following general considerations and criteria:

- Legality of the mining site (formal concession)
- Safety of the site
- Favourable attitude of the concession owner (formal/informal)
- A nearby community
- ASM operations use mercury
- Focus on alluvial deposits and alluvial mining of tailings
- Presence of an interested group of gold miners
- Geology of the area supports gold occurrences
- Deforestation caused by hydraulic mining
- High biodiversity impact of mining
- Sufficient exposure and potential to have broader impact
- Accessibility of the site and expense of getting there

As a result of the site selection process, and following consultations, the project development team selected a general pilot region (Brokopondo North of the Lake) and within this region two possible pilot locations - Nieuw Koffiekamp and Companiekreek (Figure 2). A third site in Snesi Kondre was also selected – while not a mining site, the town is a hub for gold miners who travel there on their way to and from sites.

However, conditions in ASM areas can change very rapidly. Changing prices of gold, new land claims (legal or customary) and shifting power relations, new governmental policies vis-à-vis ASM, and new gold discoveries by ASM can change what locations are most affected by ASM. It is advisable to allow for some flexibility in the selection of pilot locations.

Characteristics of The Green Stone Belt area

Most of the gold mining in Suriname, and indeed ASGM, takes place in the Green Stone Belt area. The GSB in Suriname covers an area of approximately 24,000 km2, as outlined in figure 1[1]. The GSB is defined mainly on the basis of its geology, part of a nearly continuous formation along the NE margin of the Guiana Shield, splitting into two branches from French Guiana eastwards and continuing into NE Brazil. In Suriname, it covers the area from Benzdorp in the South going NW to Goliath. Mountain in the central part of the country. The characteristic geology of the GSB is reflected in its geomorphology, hydrology, and vegetation as rock composition determines weathering patterns. [2]

Climate

[1] PlantProp, Grenstone Belt Gold Mining Regional Environmental Assessment, 2003, Ministry of Labour, Technological Development and Environment (NIMOS)

[2] Heemskerk, M. 2017, Strategic project interventions to address environmental impacts & socioeconomic issues.

Most of the Surinamese GSB presents a Tropical Rainforest climate. Historical average annual rainfall in the area ranges between 2,136 and 2,482 mm. The average daily air temperature 27° C., with high levels of humidity year long – up to 85% in the rainy season and down to 68% in dry seasons[3].

Hydrology

The GSB is drained by the Marowijne River, the Suriname River (21%), the Saramacca River and the Commewijne River (8%). The Marowinje watershed is shared with French Guyana.
Lake Brokopondo is located within the Suriname river basin. The lake, which is actually a reservoir created from a dam located in Afokaba village, collects the water of approximately 15% of the GSB, which is subsequently drained towards the Suriname River. The lake has a surface of 1,579 km^2, a maximum depth of about 48 m and an average depth of about 14 m.
The landscape is dotted with creeks, most of which are intermittent, meaning they have no discharge during part of the dry seasons. Nearly all rivers and creeks in the interior are clear waters, which is the most prevalent water type in the GSB. Clear waters are greenish to transparent, are nearly saturated with oxygen and contain few suspended particles. The pH ranges from very acid to neutral (pH 4.5-7.8). As clear waters are oligotrophic, their natural productivity is low. However, in the GSB many of the larger food-fish species are found in clear waters because of deep light penetration.

Vegetation/forests

In mountain areas above 500 meters, two main types of forests can be distinguished. Mountain areas with deeper soils are covered with " high mountain dryland forest". On the shallower soils, xerophytic forest is found, in Suriname known as "mountain savanna forest". Some Cloud forest occurs, characterized by its richness in epiphytes such as mosses, ferns, bromeliads and orchids.

The majority of the ASGM is taking place in areas covered by lowland forest, in Suriname known as "lowland high dryland forest". This high dryland forest is found on the well-drained soils of mountains, plateaus and hills lower than 500 m, and on the imperfectly drained soils of colluvial foot slopes and river terraces. In all cases soils do not desiccate during dry seasons. The presence of several strata and a high diversity of flora and fauna characterize the forest. As a rule, palms are prevalent in the sub-growth[4].

Biodiversity

Suriname is rich in plant and animal species. While no decisive biodiversity census exists for the GSB area, some studies note up to 55 endemic species, and 8 species that are classified as endemic or rare, half of which are found at elevations higher then 500 m. No endemic mammals, birds, reptiles and amphibians are known from the GSB area. However, occurrence of endemic species or subspecies may be expected at the higher isolated mountaintops of Brownsberg, Nassau and Lely. the species composition of the fish fauna in various river systems differs considerably while

[3] PlantProp, Grenstone Belt Gold Mining Regional Environmental Assessment, 2003, Ministry of Labour, Technological Development and Environment (NIMOS)
[4] PlantProp, Grenstone Belt Gold Mining Regional Environmental Assessment, 2003, Ministry of Labour, Technological Development and Environment (NIMOS)

some species are only known from one single river system. Based on these and other unpublished surveys they consider at least 57 fish species to be endemic for Suriname which implies that endemic fish species may be found elsewhere in the country and therefore also in river systems of the GSB[5]

Land use, including ASGM

Nearly all small-scale gold mining activities are practiced in the alluvial creek valleys and on their neighboring colluvial foot-slopes. In addition, some scattered activities are found on some of the terraces along the main rivers. The creek valleys and adjacent foot-slopes have a width of less than one hundred meter to some hundreds of meters at most. The valley soils are poorly drained and have a rather heterogenic soil pattern ranging from sand to clay, and sometimes with a thin peat layer on top. The foot- slopes are imperfectly drained with variable textures, often containing gravel, depending on the parent material. The terraces have usually (moderately) well drained sand to loam sometimes overlaying sandy clay. In the gold mining areas gravel is usually found in the deep subs oil.

The soils in the GSB are used for shifting cultivation. The largest areas are found in the populated parts of the GSB, along the rivers and the larger creeks and along the roads. The total shifting cultivation area within the GSB is an estimated 60,000 ha. Predominantly, well-drained soils of the river terraces and low hills are used for this type of agriculture.

[5] Id.

Figure 1: Green Stone Belt of Suriname

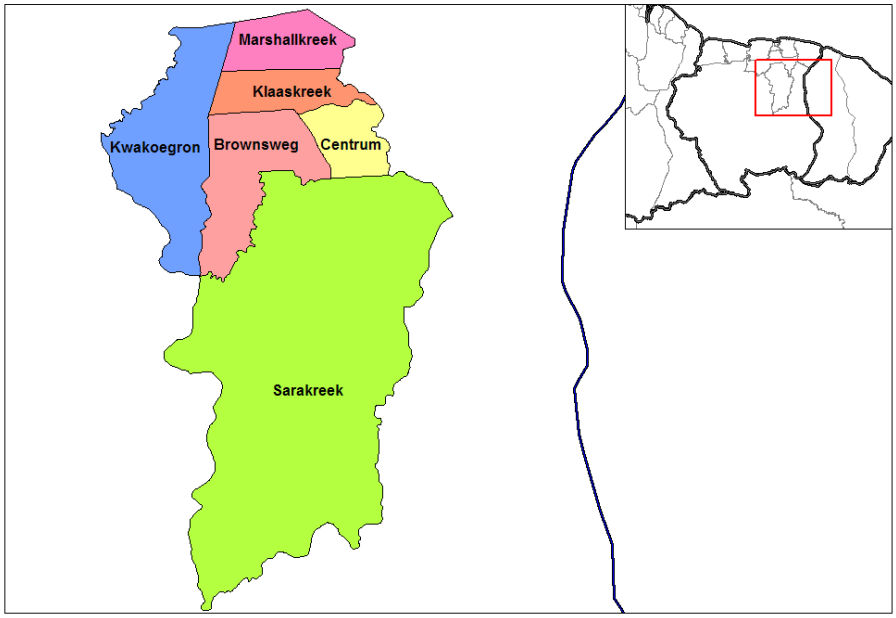
ASM sites → Criteria ↓	Companiekreek	Nw. Koffiekamp	Snesi Kondre (transport hub)
District	Brokopondo North of the Lake		Sipaliwini (Resort Tapanahoni)
Deal breakers (e.g. no gold, no gold miners)			
Geology and Gold occurrence - must be verified through research prior to project	Suggested by ASM presence	Suggested by ASM presence	In surroundings, not at Snesi kondre itself
Traitional communities in the close vicinity	Companiekreek	Nw. Koffiekamp	Langetabbetje just across the river
Presence of several ASM operations	Yes, est. 10 teams	Yes, many	Yes, in surroundings
Local area inhabitants involved in ASM	Yes, local, other Surinamese & international	Yes, local and other Surinamese	Yes, local, other Surinamese & international
Access and infrastructure	Good; can be reached in ~2 hr from Paramaribo by car	Good; can be reached in <2 hr from Pbo by car	Medium; can be reached in ~4-5 hr from Paramaribo by 4WD vehicle
Clear licence status	Community firm (NV) has applied for concession	In IAMGOLD concession (problematic b.o. mineral agreement)	Government land
Good relations ASM and nearby communities	Yes	Variable; community has little grip on ASM. Chaotic situation	Yes
Security issues - This information must be updated with ASM in the area, as armed assaults often go unreported	Nearest police posts at Klaaskreek and Bropondo Centrum (at ~30 min). Recent assault was reported	Police post at Nw. Koffiekamp and IAMGOLD security guards. No reported problem with armed robbery	Police post at Snesi Kondre, assaults have been reported along road to Snesi kondre
License owner welcomes the project	N/A	History of conflict between ASM and LSM; chaotic	N/A
Informal land boss/claimant welcomes the project	N/A		N/A
Locsl ASM groups have expressed motivation to participate in the project	N/A		N/A
Government priority area/interest and endorsement	N/A		N/A

Project sites

In general terms, the pilot projects will be executed in the district of Brokopondo, North-Central of the Hydropower lake; in the resorts (administrative section or "counties") of Brownsweg (731 km^2), Klaaskreek (349 km^2) and/or Brokopondo Centrum (314 km^2) (Figure 1). These counties have a total surface area of about 1400 km^2 and a population of 5,777 persons in total. Gold mining, large and small-scale, is by far the main source of income in these resorts of Brokopondo district. Other livelihood activities include agriculture – mostly subsistence-, logging, and work for the government.

The Saramacca and the Marowijne River, and their tributaries the Tapanahoni and Lawa Rivers, are the main access routes to the communities along their upper stretches. The majority of persons and cargo that travel to and from these hinterland communities are transported over water, including boats with tourist groups. Along the Brokopondo Lake, persons and cargo are transported between Afobaka and the Sara Creek area, as well as to some recreation resorts in and along the lake. Transport here is far less frequent than along the above -mentioned rivers.

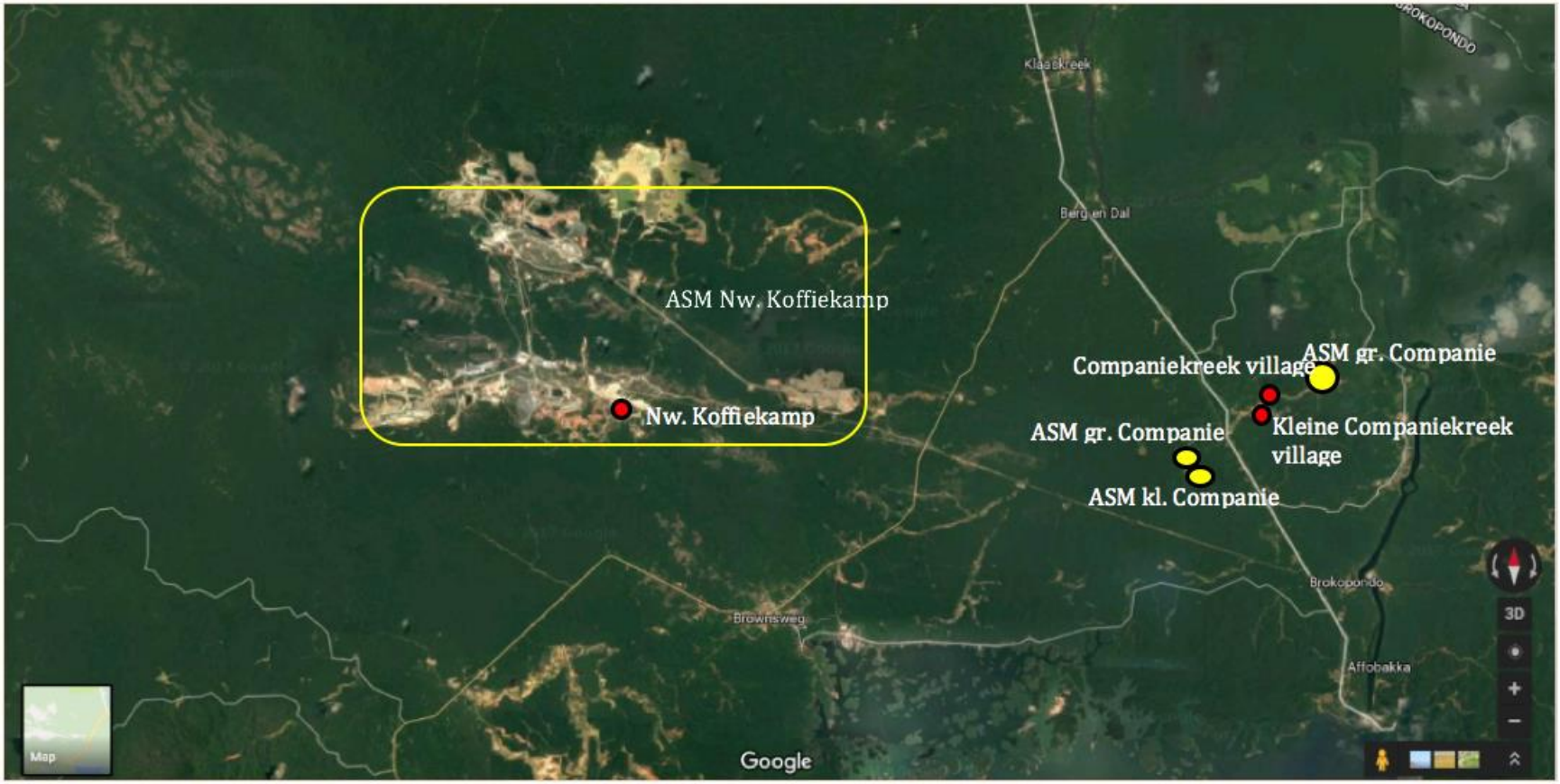
Figure 2. Resorts of Brokopondo district



Both The communities of Nw. Koffiekamp and Companiekreek are inhabited by tribal people belonging to the Saakiiki Ndyuka Maroons. Also, both communities are resettlement communities; the original villages of Koffiekamp and Pisian were flooded when the hydro-power lake was constructed. The transportation hun Snesi kondre is located on the ancestral lands of the Paamaka Maroons, in Sipaliwini district.

ASGM in Suriname is male-dominated. It is estimated that 10-12.000 people are working in the gold mining sites in Suriname of whom only 10% are thought to be women.
The majority of the population in the ASGM zones are Maroon people. Other groups are Brazilian, Chinese, Venezuelans, Guyanese, Colombian and people of other ethnic descent of Suriname.

Figure 3. Proposed pilot project locations with surrounding ASGM sites



Companiekreek is located about 2 hours driving distance from the capital city of Paramaribo. At the time of transmigration (1964-65), different original communities were moved to this location. This original divide may not be relevant to outsiders, but is still important in the organization of the community and must be taken into account in the development of projects[6]. The section that is named Large Companie is inhabited by two clans of the Saakiiki Ndyuka: Misidjan and Dju, who live in two different village sections Pisian I and Pisian II. This section counts approximately 200 permanent residents. In addition, there is a section named Small Companie, which is inhabited by the members of one extended family.

Main income earning activities include work for the (district) government, small-scale gold mining and some working for IAMGOLD (staff and contractors). Many women are planting for auto-consumption, and may sell some of the surplus when they have extra. One person is starting commercial cassava production.

Large Companie has rights to a Community Forest concession of 1650 ha. ~ 8 km^2 for Pisian I and another ~ 8 km^2 for Pisian II. External firms conduct logging activities and young boys from the community find occasional employment there. The logging firm pays the community a fee per m^3 wood collected. This money is deposited on a community account, which is managed by a group of community members (M/F) appointed by the traditional authorities.

Mostly, however, Companiekreek is a gold mining community. ASM has been taking place here for more than 20 years, but is not performed on a legal mining concession. Presently, ASM is taking place in the Community Forest concession of the community of Grote (Large) Companiekreek. A firm from Kleine Companiekreek, NV Lingisi mining, requested a mining concession to the ASM area from the Ministry of Natural Resources. It has been agreed between the two communities that the people from Grote Company can perform ASM activities in part of this area, while people from Kleine Companie exploit another part. Currently there is some irritation about gold miners associated with Kl. Companie extracting wood from the Community Forest concession of Gr. Companie, without compensating the latter community. This is being resolved through communication.

In terms of mining technologies, the site hosts several Brazilian teams that are tunneling, under the supervision of a community member. In addition, there are teams working with hydraulic methods. Several community men are panning remains or spills from other mines. Lingisi Mining NV is planning to bring a jig to the site – a technique that is rarely used in Suriname.

ASM has created a legacy of environmental problems, the most severe of which –in community members' perceptions- is fresh water contamination. The creek that runs through the community is totally spoiled and the water is turbid. People can no longer wash themselves in the creek, let alone drink this water. For drinking they rely on rainwater. Also, because the creeks are diverted and dammed, the area is disturbed. Places formerly used for cropping have become swamp areas. Moreover, when it rains now some parts of the village are flooded because the water cannot drain off. Places where people went to collect medicinal plants have been bulldozed away. Meanwhile gold miners involved in tunneling take valuable wood species from the forest.

[6] For example, when calling a community meeting it is important to make sure all three sections are represented.

A mentioned social impact was that there are also boys who still go to school, and pan in the afternoon to find some money. This is dangerous because when they get used to finding "easy" money, they become demotivated to complete their education.

Nieuw Koffiekamp (NKK) is located about 1 $^{1}/_{2}$ hours driving distance from the capital city of Paramaribo. The old community of Koffiekamp was flooded when the hydropower lake was constructed. The community counts approx. 400 registered inhabitants. Community authorities estimated that there were about 800-900 persons from NKK in the community at present; many of whom lived in Paramaribo but returned to the community for ASM activities. Also counting outsiders, there may be several thousands of persons in NKK.

The community of Nieuw Koffiekamp is situated within the industrial zone of mining multinational IAMGOLD. In the past 25 years, this situation has been the cause of a lot of tension and conflict (Box 1). All parties involved hope that the recent (June 2017) agreement between IAMGOLD, the Suriname government and Koffiekamp gold miners –organized in the CBO Makamboa- can improve this situation. This agreement is the reason why Nw. Koffiekamp was indicated by the Ministry of Natural Resources as a priority area for a project aimed at introducing more responsible ASM practices. The agreement is valid for two years, after which an evaluation will follow to decide about possible continuation.

Figure 3. Nieuw Koffiekamp in the middle of ASM activity and with the nearby large-scale mining pits

Box 1. IAMGOLD and Nieuw Koffiekamp

In 2006, IAMGOLD became the owner of the 17,000 ha Rosebel gold concession in Brokopondo district, 85 km south of Paramaribo city. The Ndyuka Maroon community of Nieuw Koffiekamp and the lands used by villages for subsistence activities are situated within this concession (Figure 2). Since the commencement of negotiations between the multinational mining companies, the Suriname government, and the community, periods of relative calm have alternated with conflicts with small-scale gold. (De Theije et al., 2014).

In June 2017, in an effort to resolve the NKK conflict, an agreement was signed between gold miners' association Makamboa, the national government (Ministry of Natural Resources and Ministry of Regional Development), and IAMGOLD. This agreement allows the Makamboa gold miners to mine in an area in the company's concession –behind the gate- referred to as "Pampu Creek". By signing this agreement, the gold miners committed themselves to phasing out mercury from the production process, and using more responsible mining methods. They do not yet know how to achieve this.

This agreement is a promising opportunity to work on improved ASM practices, but will not resolve all problems in Nw. Koffiekamp. The Makamboa gold miners have indicated that they have no power to control all the gold miners who are not part of their association, and mostly come from outside (other Suriname communities or Paramaribo). Makamboa gold miners have started to move to the new location, and time will tell whether the new agreement will last.

In Nieuw Koffiekamp, by far the most important livelihood activity in terms of the number of persons involved and incomes earned is ASM. Other income earning activities in NKK include work for the (district) government, working for IAMGOLD (staff and contractors), and the delivery of produce (eggs) to IAMGOLD. Some women plant for auto-consumption, and may sell some of the surplus when they have extra, but due to the mining activities (IAMGOLD and ASM), there are hardly any areas left to plant.

In terms of mining technologies, virtually all available techniques are used in Nieuw Koffiekamp (sluicing, ground sluicing, milling, manual washing with a gold pan, use of metal detectors). At Pampu creek, the most suitable mining method is milling (currently using hammer mills). The gold miners associated with Makamboa are already thinking about ways to reduce their impacts, i.e., reduce mercury use. They have found that if one uses too much mercury, one will lose money. Some use a retort to recycle mercury, but the problem is that these devices are often too small. They are now constructing a larger model that can burn more amalgam at once, so that burning the amalgam takes less time.

The consulted traditional authorities were pleased with the proposed project. They indicated many persons from the community are working in ASM on a smaller scale than the members of Makamboa, but still they would be interested in cooperation.