GENCAPD MINING

Source of mercury in mining communities of Guyana.

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Background

- Modern gold rush started in the late 1970's;
- Mercury release estimates by Malm (1998), Pfeiffer and Lacerda (1988) and Pfeiffer et al. (1993);
- Environmental consequences of Hg; amalgamation mining on the tropical ecosystems of South America began in the mid- to late-1980s (Pfeiffer and Lacerda, 1988; Martinelli et al., 1988; Lacerda et al., 1989, 1990; 1991a, 1991b; Malm et al. 1990; Pfeiffer et al., 1989, 1991; Lacerda and Salomons, 1992; Nriagu et al., 1992);

- Other source of Hg to the aquatic environment on a regional scale:
  1. Hg concentrations in no known mining areas exhibit values on a regional scale that are comparable to those in basins with extensive mining operations (Forsberg et al., 1995; Malm, 1998; Roulet et al. 1998);
  2. Hg concentrations do not systematically decrease downstream of the mining camps as expected from point sources of contamination (Lechler et al., 2000; Roulet et al., 1998);

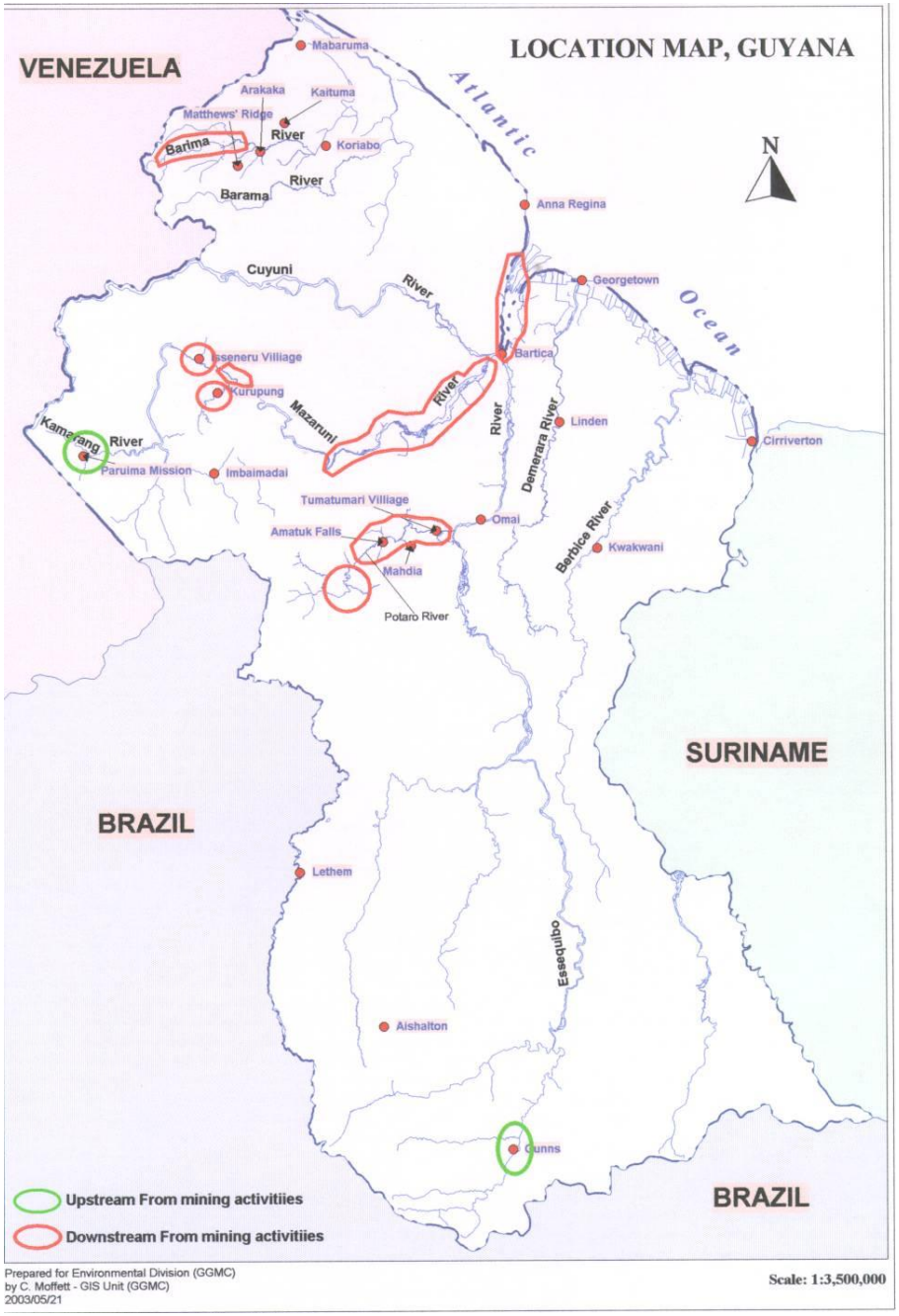
Objectives of the study

1. Provide measurements of mercury from amalgam mining areas and from areas of no-known modern mining activity;

2. Investigate if mercury manipulation during the gold amalgamation process can be link to the mercury found in the aquatic environment.

Sampling programme

- Methyl-mercury in:
  - Fish (80 samples)
- Total-mercury in:
  - Water (350 samples)
  - Riverbed sediments (400)
  - Land sediments (100)
  - Fish (1 200)

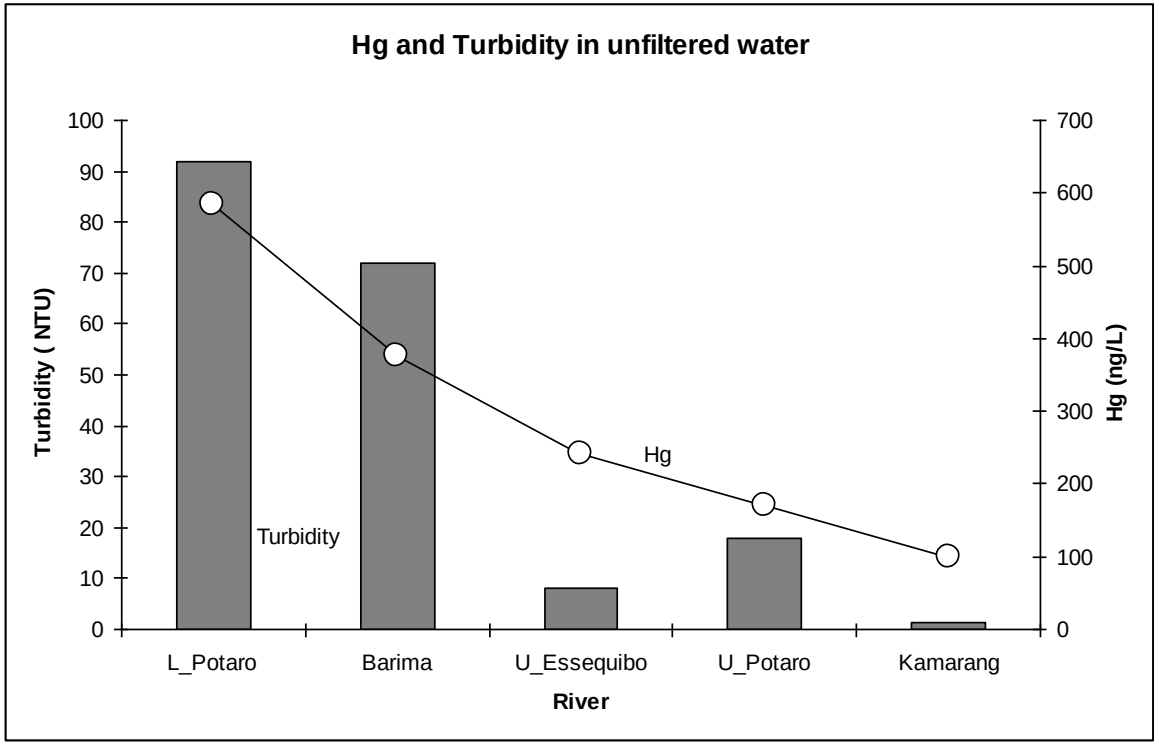


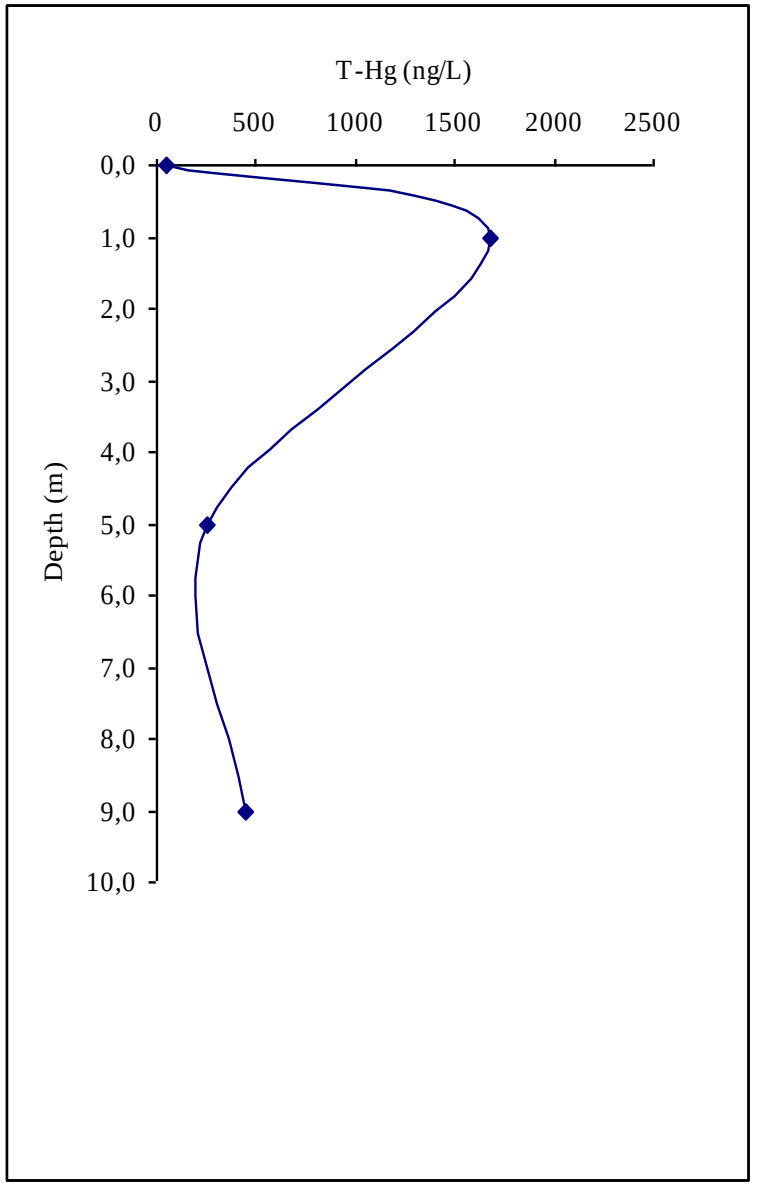
Study sites

- Lower Potaro River
- Upper Potaro River
- Lower Essequibo River
- Upper Essequibo River
- Kamarang River
- Mazaruni River
- Kurupung River
- Barima River
- Multiple Creeks

Results – Objective 1

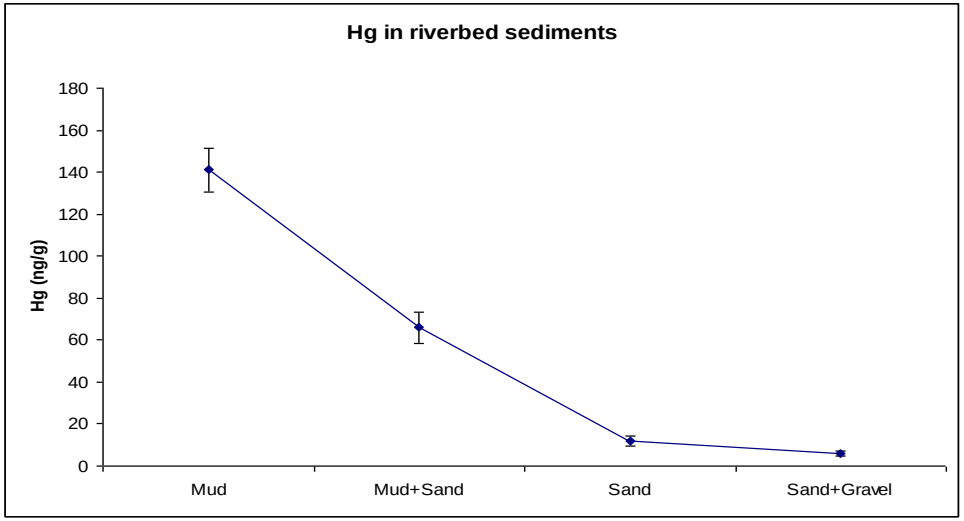
- **Hg in water:**
  - Typical water column vertical distribution shows Hg peak concentration at 1m depth in all mining and non-mining areas;
  - The similar trend between turbidity and Hg in unfiltered water suggests equivalent **[Hg]/sediment load** for mining and non-mining areas.

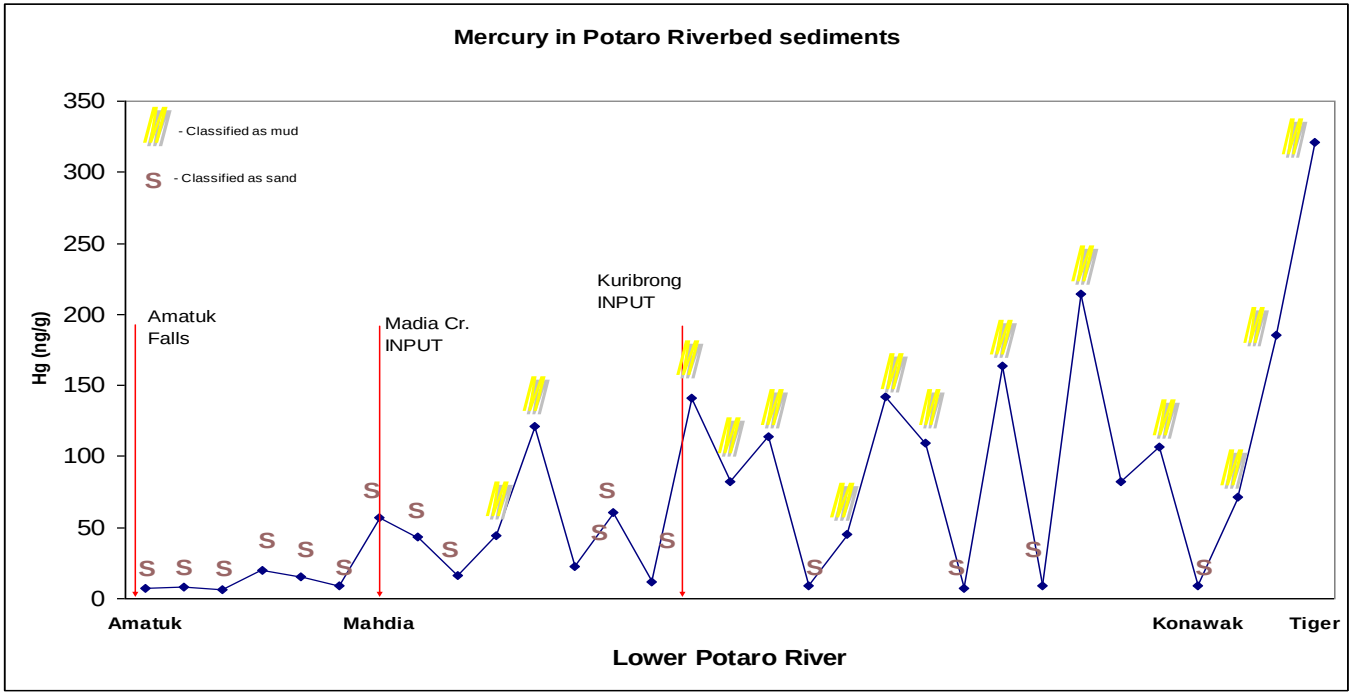




Results – Objective 1

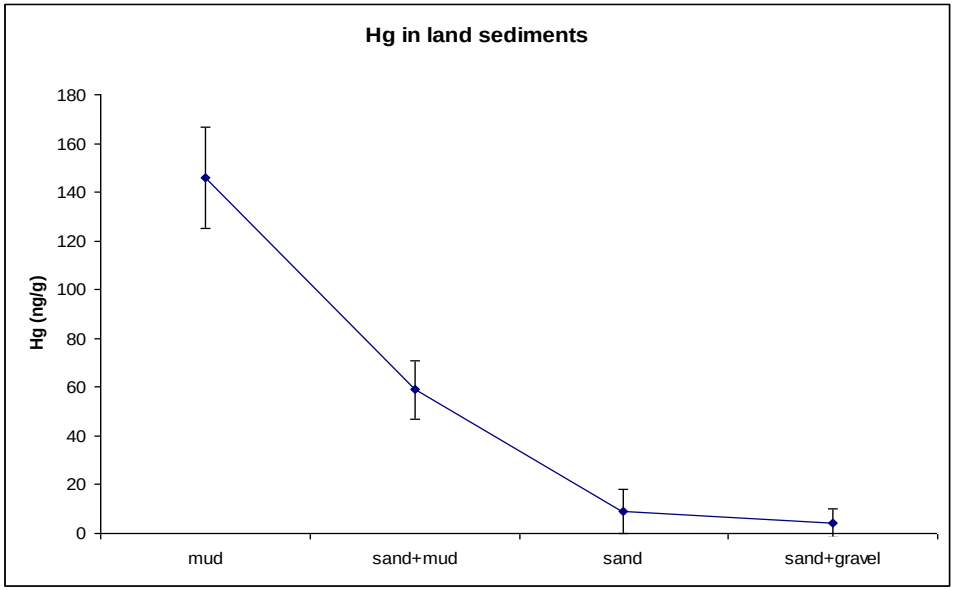
- **Hg in riverbed sediments:**
  - 90% of Hg is associated with mud;
  - Low [Hg] variability in the mud fraction between mining or non-mining areas;
  - Thin mud layer on the riverbed which is more extended downstream mining creeks than upstream and than in non-mining areas.

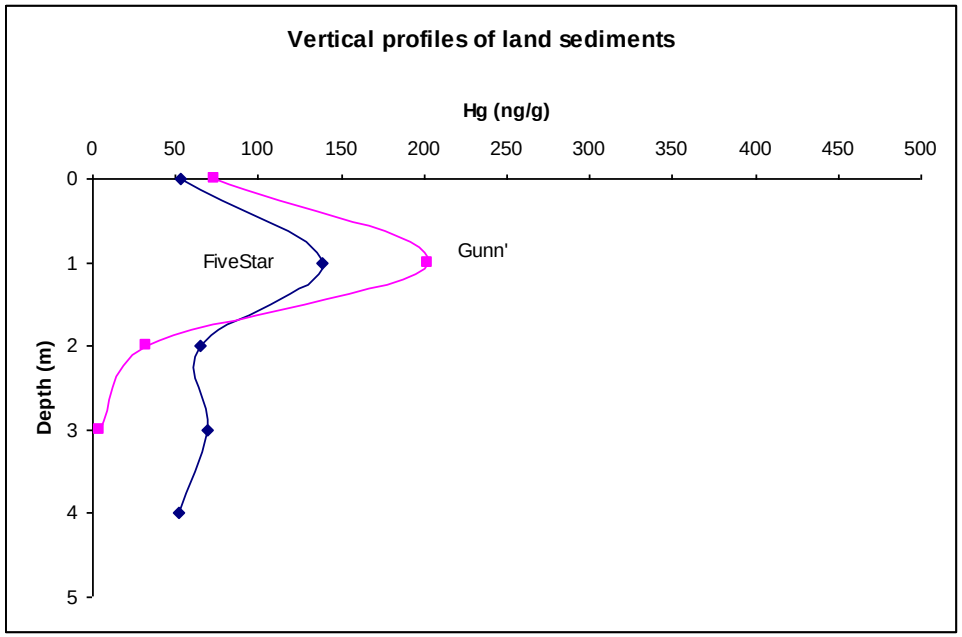




Results – Objective 1

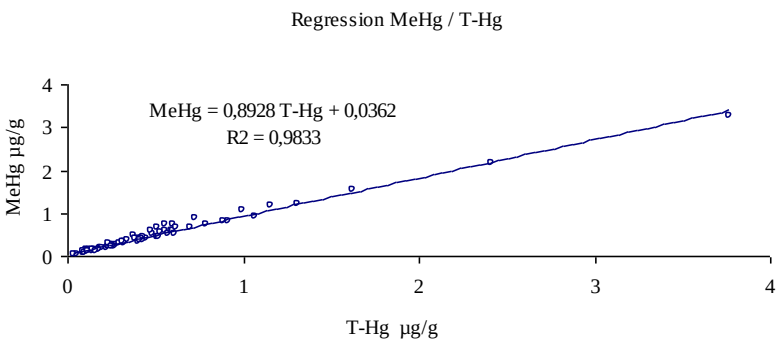
- **Hg in land sediments:**
  - 90% Hg is associated with mud;
  - Low [Hg] variability in the mud fraction between mining or non-mining areas;
  - Peak mud abundance found in the overburden;
  - Comparable profiles in pristine and mining areas.

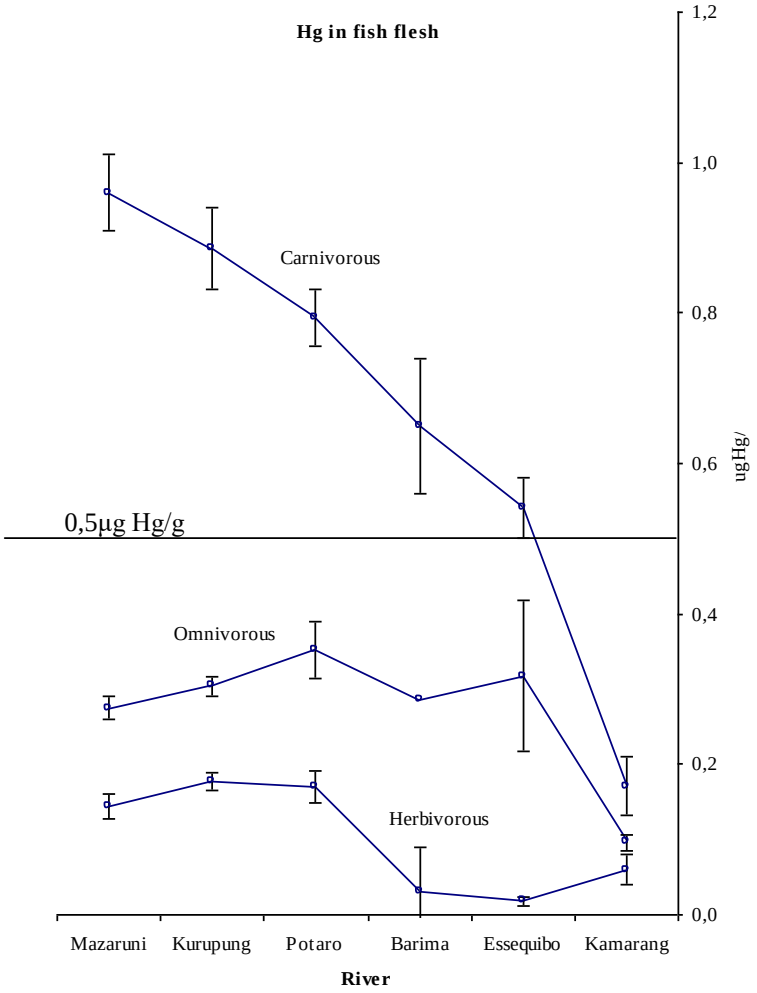




Results – Objective 1

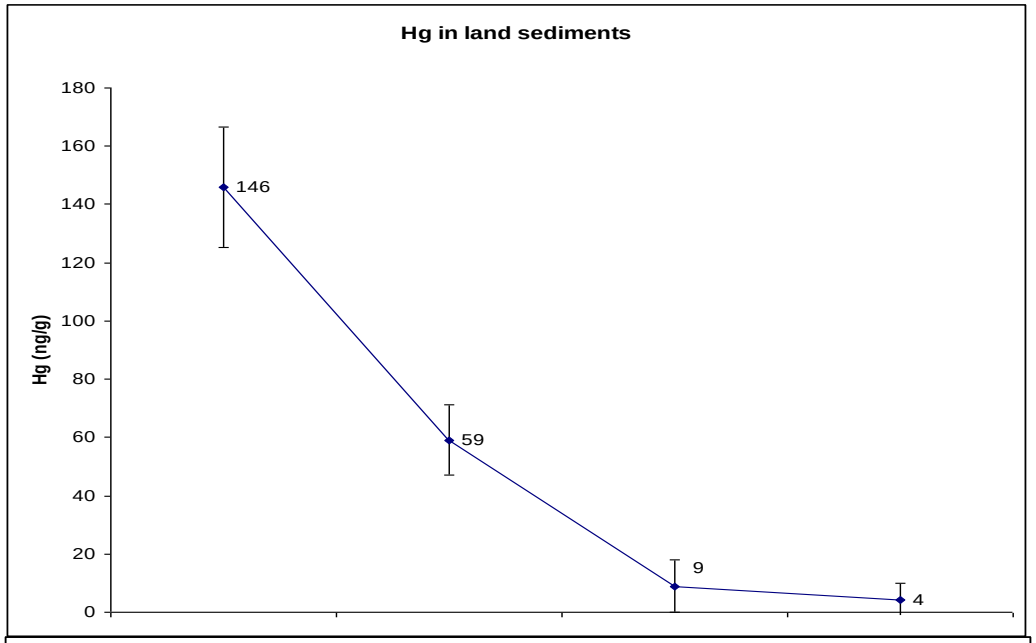
- **Hg in fish:**
  - 90% T-Hg is in the form of Me-Hg;
  - Mining areas show highest Hg levels in carnivorous fish;
  - Omnivorous and herbivorous fish are below 0,5µg Hg/g (WHO) in mining and non-mining areas.

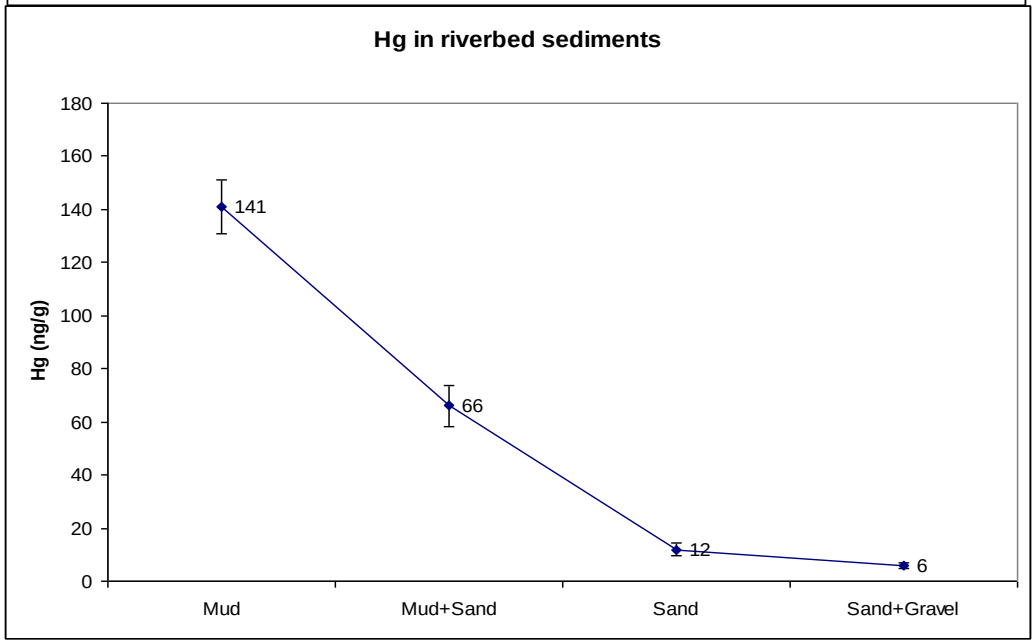




Results – Objective 2

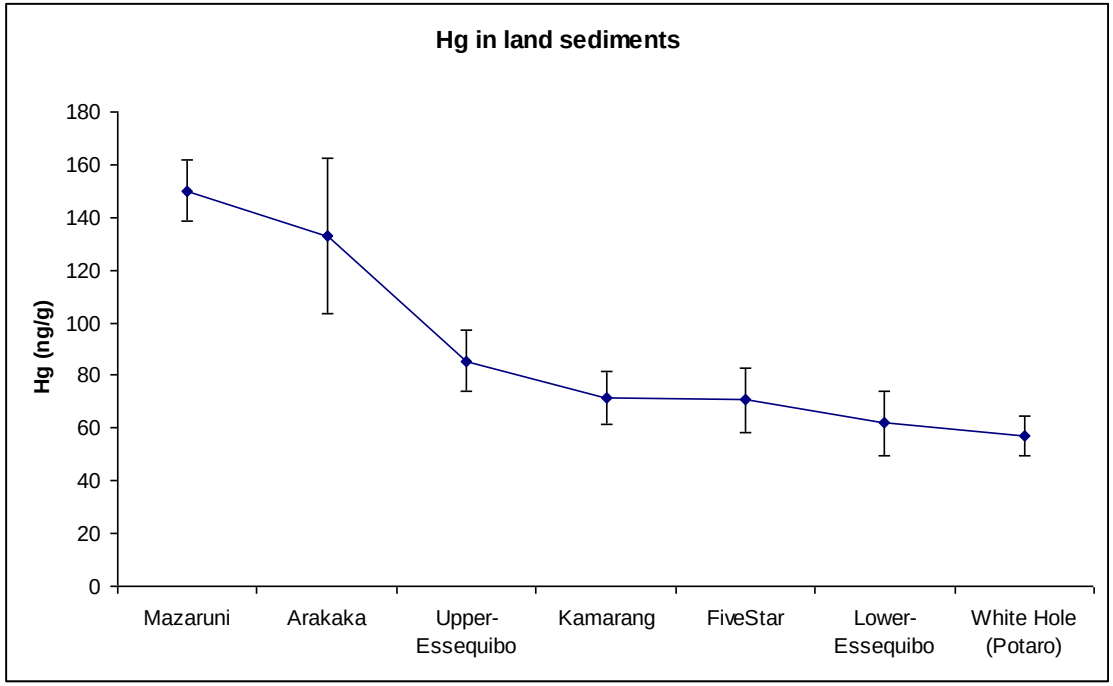
- **Source of Hg**
  - Irrespective of the sampling area (mining or non-mining), [Hg] is related to size class of substrat;
  - Irrespective of the sampling area (mining or non-mining) [Hg] is the same on land and on riverbeds;
  - As showed from the Potaro river riverbed sediment study, the extension of the mud layer on the riverbed is greater downstream mining creeks.

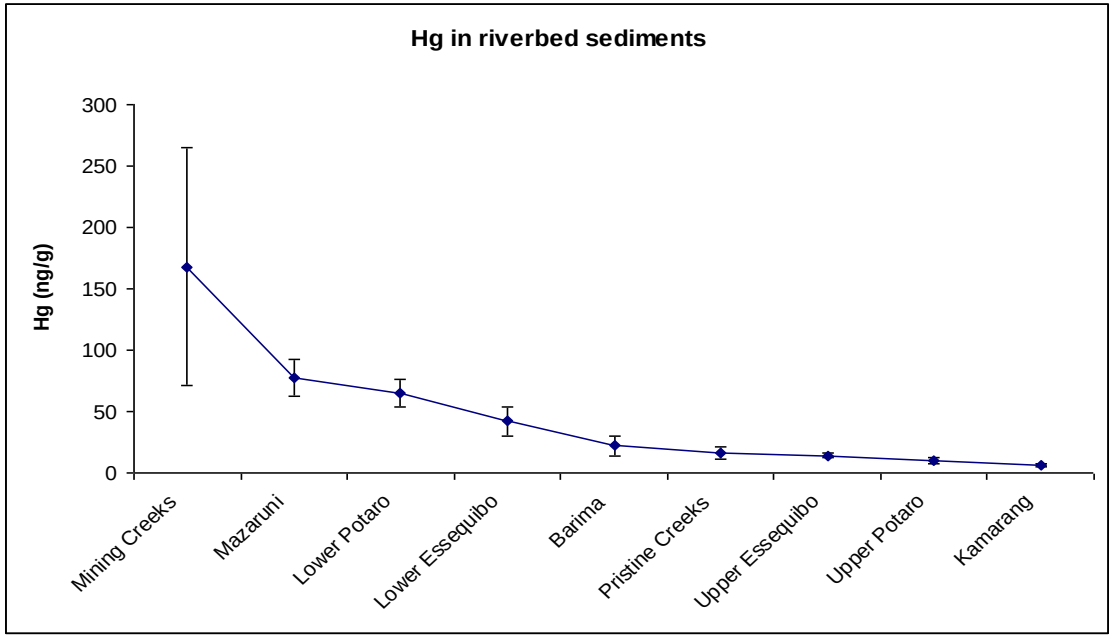




Results – Objective 2

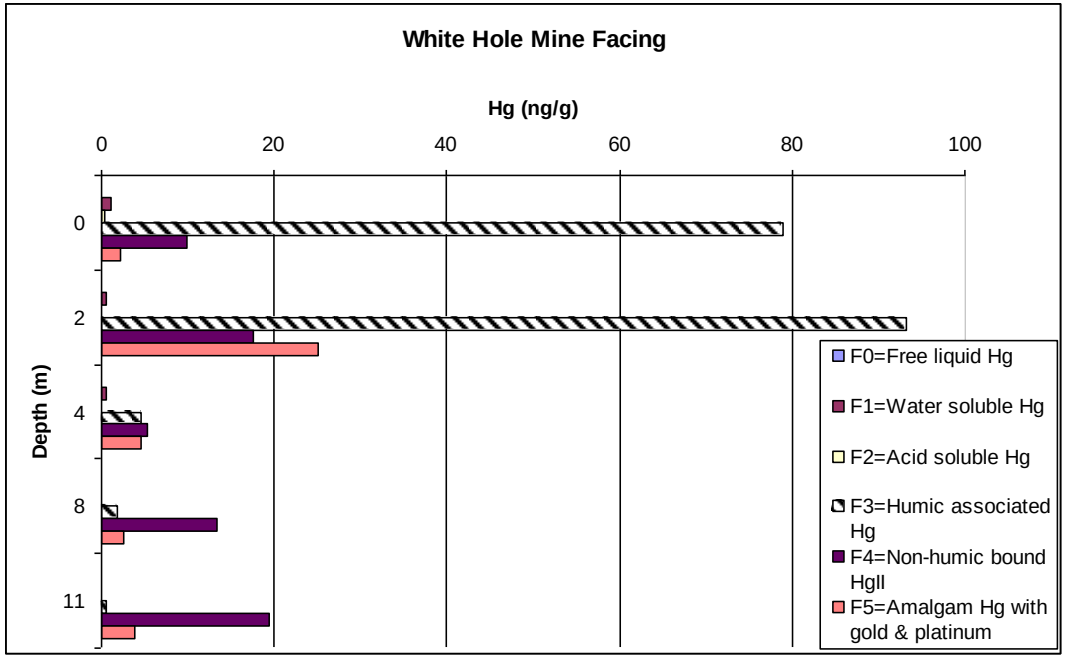
- **Source of Hg**
  - On land sediments, average concentration of Hg from all size classes is not mining related.
  - On riverbed sediments, average Hg concentration for all size classes shows that mining areas contain more Hg (mud) than from non-mining areas;

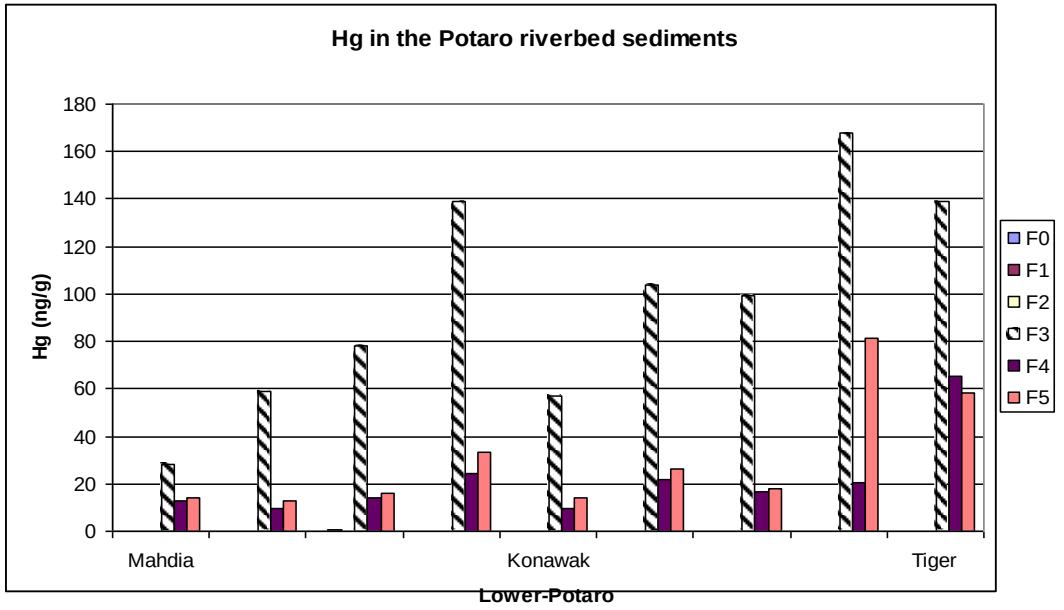




Results – Objective 2

- **Source of Hg**
  - On the riverbed of the Potaro River and in the White Hole mine facing Region 9), the most abundant fraction of Hg is associated with humic organic matter;
  - In the White Hole mine facing, this fraction is located in the overburden.





Conclusion

- Objective 1:
  - Hg is trapped in the mud fraction over all land areas but on the riverbeds it is concentrated downstream from mining activities;
  - Me-Hg exceeds WHO limits only in carnivorous fish and mainly in mining areas.

- Objective 2:
  - No indications that modern amalgam processing is responsible for the concentration of mercury measured in the aquatic environment;
  - Strong indications that jetting from land dredges in gold and diamond operations are responsible for the flushing of pre-modern mining mercury from the land overburden to the aquatic environment.