

# Suriname

## Environmental and Social Reconnaissance The Bakhuy's Bauxite Mine Project



*With notes on the proposed Kabalebo Hydroproject &  
Comparisons with Alcoa/BHP/Billiton's recent track record*

*By Robert Goodland*

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**A report prepared for**  
**The Association of Indigenous Village Leaders of**  
**Suriname (VIDS) and The North-South Institute (NSI)**

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## Acronyms & Abbreviations

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ACT	Amazon Conservation Team (ethnobotany.org)
AIDS	Acquired Immune Deficiency Syndrome
AKA	Also known as
ASL	Above mean sea level
BHPB	Broken Hill Proprietary & Billiton Corporation
CBD	Convention on Biological Diversity
CI	Conservation International
CIS	Conservation International Suriname
CNEC	Brazilian Engineering Consultants
CSNR	Central Suriname Nature Reserve
EBS	Suriname's Energy Authority
EDF	Électricité de France
EIA	Environmental (and Social) Impact Assessment, now ESA
EITI	Extractive Industry Transparency Initiative (eitransparency.org)
ESA	Environmental and Social Assessment
FPIC	Free Prior Informed Consent
FPP	Forest Peoples Program
GMD	Suriname Government: Geologische Mijnbouwkundige Dienst
GHG	Green House Gas emissions
HA	Hectares
HIA	Health Impact Assessment (part of ESA)
ICMM	International Council on Mining and Minerals
IIED	International Institute of Environment and Development
IMF	International Monetary Fund
IUCN	International Union for the Conservation of Nature
KITLV	Koninklijk Instituut voor Taal-, Land- en Volkenkunde
KIT	Royal Tropical Institute (Netherlands)
MER	Netherlands Environmental Assessment Commission
MMSD	Mining, Minerals and Sustainable Development (of IIED)
MTPY	Million tons per year
MW	Megawatt
NIMOS	Nationaal Instituut voor Milieu en Ontwikkeling in Suriname
NSI	The North-South Institute of Canada
NTFP	Non-Timber Forest Products
PAHO	PanAmerican Health Organization
POS	SRK's Aug '05 'Plan of Study' for the Bakhuis ESA

SBB	Stichting Bosbeheer en Bostoezicht (Suriname Forest Control Foundation)
SENES	Canadian consulting Ltd
SIA	Social Impact Assessment (part of ESA)
SIL	Summer Institute of Linguistics
SRD	Suriname Dollars
SRK	Steffen, Robertson & Kirsten (South Africa) Ltd, Consulting Engineers and Scientists
STINASU	Foundation for Nature Conservation in Suriname: <a href="http://www.stinasu.sr">www.stinasu.sr</a>
TOR	Terms of Reference
UNESCO	United Nations Education, Scientific and Cultural Organization
VIDS	Vereniging van Inheemse Dorpshoofden in Suriname (Association of Indigenous Village Leaders of Suriname)
WBG	World Bank Group
WHO	World Health Organization
WWF	World Wildlife Fund

## **Part 1: The Bakuys Bauxite Mine**

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### **Introduction**

#### ***Goals and Targets of this Report***

This report has three parts. Part 1 comments on the social and environmental assessment (ESA) processes of Suriname's proposed Bakuys bauxite mine. Part 2 is a note on the possible impacts of refining, smelting, the proposed Kabalebo hydroproject, and comparisons with other relevant bauxite and hydro projects. Part 3 is a guide to the literature.

This report is primarily directed at BHPB, the proponent of the Bakuys bauxite mine, and at SRK, the consulting firm hired by BHPB to perform an ESA for the Bakuys project. It is directed at BHPB and SRK in order to prevent adverse social and environmental impacts. It also seeks to help the Indigenous Peoples who may suffer most from adverse impacts unless the ESA is performed well. This report also is designed to inform VIDS, NSI, NIMOS and people concerned with reducing the social and environmental impacts of mining in Suriname.

#### ***Background of this Report***

This report stems from a request from VIDS (vids@sr.net), chaired by Captain Ricardo Pané and directed by Loreen Jubitana, for support on understanding the process of social and environmental assessment. This request was taken up by the North-South Institute (www.nsi-ins.ca), a non-profit institute researching international development and Canadian foreign policy that has been undertaking research on issues at the interface of mining and Indigenous Peoples in the Americas (co-ordinated by Viviane Weitzner, vweitzner@nsi-ins.ca). The VIDS requested to become a partner in this research, and with funding from Canada's International Development Research Centre, VIDS contracted the author<sup>1</sup> to facilitate ESA understanding and to provide a perspective on the ESA of Bakuys and Kabalebo, by means of a 12-day reconnaissance in Suriname between 29 August and 10 September 2005.

The ESA process of these projects may continue for the next 10-20 years, including implementation of the precautions and safeguards. The most vulnerable stakeholders<sup>2</sup>, those most likely to suffer the most severe impacts, are the Indigenous Peoples of Western Suriname. Most of the information used in this report and most of the points of view were obtained directly from the Indigenous Peoples and their advocates, namely VIDS. To that extent, it is a bottom-up report, leavened by my personal experience of the social and environmental assessment of mining in general. However, I cannot claim that this report represents the views of the impacted Indigenous Peoples as they have not read and discussed this paper as yet. This paper would have to be translated and presented in a meaningful manner if it is to be of direct use to the Indigenous People themselves.

### *Asymmetric Power*

The Bakhuis bauxite mine project is a classic case of asymmetric power. Unsustainable mining confronts sustainable traditional societies. Rich and powerful multinationals will impose potentially severe impacts on inexperienced, weak, largely illiterate and poor Indigenous Peoples. Multinationals have great difficulty even in communicating with the affected people. Practically all the benefits will accrue to two stakeholders, namely the multinationals as they will reap a saleable commodity (bauxite) and the government as they will reap taxes and royalties. These two stakeholders will gain substantial benefits, but bear no adverse impacts. The Indigenous Peoples, on the contrary, will bear practically all the negative impacts and few, if any, of the benefits, unless the suggestions here outlined are implemented.

History worldwide shows that impacted Indigenous Peoples have not received much benefit trickling down from government's receipts from mining or hydroelectricity. Figure 1 shows the direction and scale of benefits and impacts of a generalized mining project. That is the asymmetric situation that the ESA and the impact/benefit agreements stemming from it seek to avoid. The first step in preventing the 'normal' – and unacceptable -- situation portrayed in Figure 1 is transparency in both benefits and impacts. SRK's ESA will make the impacts transparent. Standard transparency codes will make the benefits transparent. For example, the Extractive Industry Transparency Initiative (EITI) aims to ensure that the revenues from extractive industries contribute to sustainable development and poverty reduction. At the core of the initiative is a set of Principles and Criteria that establish how EITI should be implemented ([eitransparency.org](http://eitransparency.org)). Following standard industry practice will ensure transparency of benefits, such as the "publish what you pay"<sup>3</sup> code of corporate social responsibility.

This report makes the case that, faced by such inequalities and asymmetry, the proponent must make best efforts to reduce impacts on Indigenous Peoples to acceptability, and to guarantee that they will be better off with the project. One tool – indeed the first tool in any project cycle – to minimize impacts and optimize benefits for the Indigenous Peoples is ESA. ESA is the means by which the proponent can protect the society and their resource base, and can enhance livelihoods of the impacted people. The ESA process can be used as a participatory mechanism and negotiating space to reduce imbalances of power. This process minimizes impacts and optimizes benefits for the Indigenous Peoples throughout the ESA. The ESA process suggests how meaningful negotiation between asymmetric people could be achieved.

### *Strengthen the Indigenous Peoples*

Success demands that the proponent strengthen the weakest stakeholder so that Indigenous Peoples can negotiate meaningfully and protect their livelihoods. This can be through direct means (e.g., provision of e-mail to the impacted people), or indirect through a third party. An example of the third party approach is to persuade the government to expedite land titling for project-affected communities. Similarly the proponent can catalyze EBS to supply long-promised electricity for the communities. Another third party approach is to contract with representatives of the impacted people such as VIDS, to facilitate communications between proponents and Indigenous Peoples. Only by such equilibration can meaningful dialogue with the most impacted stakeholder be achieved, and asymmetries reduced.

### *Environmental and Social Assessment*

ESA is essentially experienced prediction. Experience comes from (a) knowing what happened in similar cases elsewhere, (b) comparing recent similar projects, and (c) examining the recent track record of the proponents, in this case BHP/Billiton and Alcoa/Suralco. The ESA itself provides the important element of getting a team of seasoned professional specialists to study the proposals on the ground. This report provides perspective on the Bakhuis bauxite mine and Kabalebo hydro projects in two ways. First, the literature about Suriname's environment about these two projects, and the

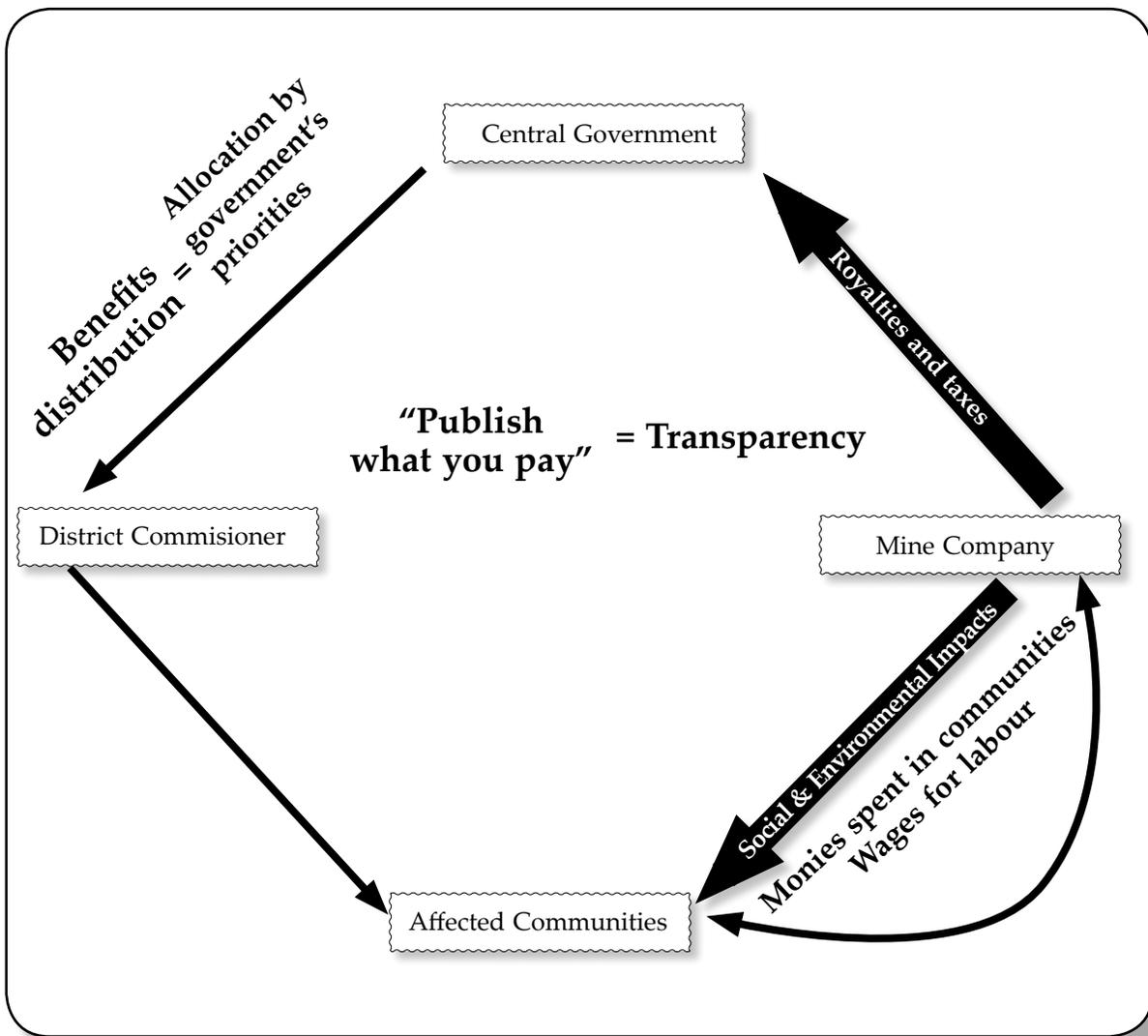


Fig. 1: The distribution of benefits and impacts in a generalized mining project.

Figure 1 outlines the major flows of taxes and royalties from the mining proponent that are paid to the central government. Major social and environmental impacts harm societies surrounding the mine. There is a small trickle-down of money from central government to the local government or Commissioner of the impacted district. A fraction of that actually reaches the impacted people. There are some direct benefits from the proponent to the affected communities, such as wage labor.

impacts of mines and dams in general is provided. Second, the impacts from similar mining and dam projects are compared. The Indigenous Peoples have inspected Suralco’s bauxite mines in NE Suriname, and the Brokopondo hydroproject.

**Role of ESA in ‘Ruling Out’ Irrelevant Topics**

An important role in any ESA is to address all concerns, state which have no relevance in the particular case being assessed, and fully justify their exclusion. In this way the ESA process increasingly focuses on relevant issues and leaves unimportant ones behind. However, the justification for excluding a certain topic is essential. In the face of power asymmetries and unknowns, there always

will be uncertainty, fears and rumors. The ESA is the means to confront all fears and rumors, state which are relevant and which are unfounded. It is unprofessional to rule out any topic by unsubstantiated assertion. For example, is there a risk of disease x in the bauxite mine? The response, should be: no because disease x has only been found in country y which is 2000 kms distant, and depends on the z vector which only occurs in country y, and according to the cited literature has never been associated with bauxite mining.

### *Positive and Negative Impacts*

Most environmental and social impacts are negative. ESA traditionally has focused largely on the negative impacts, namely the effects of the project which could prejudice the people nearby or the environment on which they depend. An example would be removal of 100 sq kms of forest, which the neighbors used to hunt and fish. This is a negative impact because it reduces the wildlife that the neighbors used to harvest. The positive results of a project usually are not environmental; they are often financial (Fig.1). The neighbors may get jobs created by the project. The wages could be positive impacts or benefits. A fraction of the royalties from the project may accrue to the impacted people; that is a positive impact or benefit. That is not to say the benefits of the fraction of royalties exceed the negative impacts, but is a step in the right direction. Unless discriminated, 'impact' in this report refers to a negative impact.

### *The Start of ESA*

SRK began ESA work on the Bakhuy's bauxite project in 2004 and kicked off the ESA process formally in August 2005 by producing their 65-page "Plan of Study" (POS). This is a landmark step. Both proponents commendably emphasize that their projects and specifically their ESAs will fully meet international standards. SRK commendably cite the World Bank's environmental assessment policy, but have still to justify why they exclude the use of the World Bank's other social and environmental policies<sup>4</sup> in the Bakhuy's case. The Indigenous Peoples Policy is critical for the Bakhuy's project, yet it is excluded in SRK's POS. Since then, SRK announced they plan to use OD 4.10 Indigenous Policy.

## **The Bakhuy's Bauxite Mine Project**

### *Exploration*

Exploration here means searching for bauxite in a concession of 2,800 sq km of primary tropical rainforests. The process of estimating how much bauxite is in the ground causes major impacts. In the case of Bakhuy's, exploration was completed before any environmental and social precautions were in place. Thus, several hundred of kilometers of roads, and major bridges, were built or upgraded through rainforest. The major impacts are facilitating access to the untouched forest by loggers. This fails to meet best practice and would not be tolerated in many countries. Without special precautions, once the loggers and miners come in, game will be poached and scared away by traffic, the noise of construction, and loss of forest, thus reducing the traditional fish and game on which Indigenous People have depended for centuries. The companies also prohibit indigenous peoples from accessing the exploration areas for traditional activities such as hunting in violation of company policies and international human rights standards

In addition, about one thousand kilometers of drill lines have been cut in the forest. Drill lines are paths cut through the forest to enable the mobile drilling rigs, all-terrain vehicles, mechanical 'mules', and even some 4-wheel drive vehicles to drill in the right places. About 7000 boreholes have been drilled. Drill lines are often 2m-wide, hence constitute a major un-assessed impact already. This opens up vast areas for such traffic. BHP/Billiton are to be commended for publicly apologizing in August 2005 for failing to assess the environmental and social impacts of their exploration or pre-feasibility phase which was scheduled to end in October 2005. BHPB have recently improved policies; now BHPB mandates ESA for exploration. Exploration must be subject to ESA from now on,

according to BHPB. Commendably, BHP/Billiton also has adopted new corporate policies on Stakeholders and on Community Development as of August 2005<sup>5</sup>. BHP Billiton's commitment to responsible business practice was recognized in October 2005 by ICMM with a Company of the Year Award at the Business in the Community (BITC) National Awards for Excellence. Also commendable is that BHPB has contracted with Conservation International to undertake environmental work at other potential bauxite deposits in Suriname. This work involves (a) a rapid biological survey of the Lely and Nassau plateaus in eastern Suriname, where both BHPB and mining joint venture partner Alcoa have concessions, and (b) a "Conservation Threats and Opportunities Workshop" immediately after the survey. Data collected from the survey and the results of the workshop will be used by CI to create a set of conservation-related recommendations for BHPB to incorporate into its decision-making process. Best practice is to complete environmental and social assessments before exploration begins. Bakhuis may contain enough bauxite for 25 years of production.

### ***Exploitation***

When the bauxite deposits have been found and their extent and composition estimated by means of exploratory drilling, the phase of exploitation begins.

### **Forest Removal**

In the Bakhuis bauxite mine, the first step in exploitation is removal of the forest covering the bauxite deposits. This is one of the biggest impacts as tropical forests are threatened worldwide and contain most of the world's biodiversity. In addition, Indigenous Peoples depend on relatively intact forest for their livelihoods. Forest removal decreases the amount of forest resources (e.g., fish & game, timber & fuelwood, fruits, seeds, medicinals, honey, resins, thatch) available to these people. Forest removal impacts fish and aquatic resources because fish depend on forest fruits etc which fall into or end up in river water. Forest removal also sharply increases surface erosion. Fish thrive only in clean water. Fish generally avoid turbid water. Sediment and turbidity entering water courses harms fish by reducing visibility in turbid water. Silt interferes with gill function and with reproductive stages. Sand banks built up from erosion and sedimentation interfere with navigation.

Forest removal is a problem for Bakhuis. Such deforestation is expensive in terms of bulldozers and fuel. BHPB proposes to call in logging corporations to accelerate deforestation. This is risky because of conflicting goals. BHP/Billiton wants vegetation to be cleaned only where forest covers the bauxite. The Government (GMD meeting 31 Aug 2005) actually state that logging corporations will use the recently constructed bauxite roads. Loggers are interested only in hi-grading the forest, extracting only the few commercial sizes and species of trees, while leaving behind most of the forest as it is not commercially worthwhile. Loggers are more interested in sites where there are more commercial trees, not on the bauxite areas. In fact there may be an inverse correlation between bauxite richness and commercial trees. Once loggers have arrived in a region such as Bakhuis, it is very difficult to make them stick to the specific areas to be mined. Because logging corporations already own logging concessions to much of the Bakhuis range, and because BHP/Billiton have made those concessions more valuable by opening access roads, logging could become an unwanted negative impact (see SBB's Map: Bauxite & Overlapping Logging Concessions). The ESA will have to carefully advise on the pros and cons of inviting logging corporations to Bakhuis.

### **Overburden Removal**

Once the forest vegetation covering the bauxite deposits has been scraped off, the overburden is next removed by bulldozers. The impacts of overburden removal accrue from its stockpiling. Overburden is estimated to average only 50 cm. in depth, which is fortunate. Surface erosion rates jump orders of magnitude during scraping away the overburden. BHP/Billiton may want to stockpile such overburden for subsequent re-use in restoration and rehabilitation after each area is mined out. The ESA needs to assess if the slightly higher organic matter and nutrient status of overburden makes it worth stockpiling. As there are commonly many months -- if not years -- between overburden

removal and restoration, heavy rainfall, high temperatures, insolation and oxidation may leach most of the nutrients away. Design of overburden stockpiles is critical in reducing the risks of erosion and sedimentation.

### **Bauxite Mining**

Once the vegetation and overburden have been removed, the 6 meters or so of bauxite can be mined. The ESA will assess the relative impacts of dynamite vs. pneumatic drills, bulldozer removal etc. At this stage only crushing and possibly ore washing are expected. Assessment of the impacts of crushing and washing bauxite ore will be essential. Sources of water, payment for water used for washing, aquifer conservation, and the disposal of ore residues and effluent after washing will be the main topics. Noise, dust and any use of explosives create impacts much wider than the specific area mined.

### **Acid Leachate**

When the bauxite is removed, the risk of acid leachate from the spoils and from the newly exposed risks increases substantially. The ESA will address this issue in order to prevent acidity harming forest or fish. SRK's Plan of Study seems to have this issue well in hand.

### **Greenhouse Gas Emissions**

International good practice is to calculate greenhouse gas emissions from major infrastructure projects from early in the feasibility stage, and especially in the ESA. GHG emissions from diesel use in road construction, drill lanes, drilling rigs, caterpillar and earth-moving, overburden stock-piling etc need to be accounted. As would transport of ore from the mine to the washing plant and refinery. Decay of biomass removed to expose the ore also needs to be figured in.

### **Minesite Rehabilitation**

The difficulties of re-establishing tropical wet forest ecosystems are well documented and unlikely to be realized for several decades after the end of mining in each segment. The substrate remaining after bauxite removal is likely to be exceptionally poor in nutrients. Respreading stockpiled "topsoil" or overburden will be assessed. It is likely that organic matter and fertilizer will need to be imported to the restoration sites. Leguminous vines and aggressive legumes probably will be the start. Nurseries will be important from early on so that adequate numbers of seedlings and saplings of the best species are available for revegetation as mining ends in each segment. Seed collection, nursery management, revegetation and maintenance are activities in which Indigenous Peoples excel. The ESA will optimize this opportunity.

The ESA will assess Suralco's and BHPB's recent track record of restoration of their depleted mines in Suriname in order to judge what systems of incentives and penalties will be needed to achieve best practice. For example, early in 2005, a group of Indigenous People, who may be impacted by the proposed Bakhuis bauxite mine, visited similar bauxite mines in Northeastern Suriname, and the Coermotibo site. They heard that the Wane Hills bauxite mine was opened inside an officially protected area and wildlife reserve (Sahdew & Ouboter 2003). The Indigenous People saw exhausted mines where no attempt had been made to rehabilitate. Widespread areas looked like moonscapes. Alien pines have been tried, but their choice seems inappropriate. The affected people have to be convinced that such unacceptable practices will not be repeated at Bakhuis. What are the mechanisms to guarantee rehabilitation will be professionally achieved at Bakhuis? What sort of restoration or clean-up insurance or performance bonds will be necessary?

Where open pits remain, the decision arises if such pits are to be filled up to original grade, or leveled or restored to some contour system. Itinerant miners and water-filled pits intensify the risk of malaria. (See Health Impact Assessment)

### **Performance Bonds or Insurance**

The ESA will evaluate BHPB's recent track record of restoration of mined-out sites in Suriname (e.g., Wane Hills etc) or elsewhere in order to judge what mechanisms will be needed to ensure adequate restoration in the Bakhuis case. If BHPB's track record in restoration is below best practice, raising standards to adequacy may be necessary through insurance or performance bonds that deal with the financing of responsible restoration and waste management. Insurance and bonds need to be set at realistic levels and monitored by independent reliable third-party specialists.

### **Social Impact Assessment**

BHPB commendably state that they aim at "zero harm to people and the environment"....and that all impacts "will be assessed to the highest international standard".... (POS, p.4). However, the Plan of Study claims that there are no communities within the concession area (POS p.8). "There are no people living within the concessions" (SRK's TOR, p. 2), without any source provided for this claim. "There are no villages or communities living in the concession area." Again, no source for this assertion is included. (SRK TOR p. 7, Para 11.3)

SRK admits that the communities of Apoera, Section and Washabo "are likely to be directly affected by the project" (SRK TOR p.2), although only two examples are used (mine wage labor, and transport impacts). While it is to be hoped that no villagers use the area to be impacted, this claim has to be thoroughly documented. For example, in 1843 Schomburgk's<sup>6</sup> "Reisen...." mentioned that he found low population densities in some sections of rivers, and higher populations in other sections during his boundary survey of the Corantijn. Contradictory evidence, such as statements from community leaders that they have been denied access to hunting areas in the exploration concession also need to be evaluated as this leads to the conclusion that they are actively using that area and consider it part of their territory in accordance with their customary laws.

The overlaps between the concession area and the traditional territory and customary use areas of the affected communities are especially important to clarify. The mapping project conducted by VIDS with funding from IUCN Netherlands, in collaboration with communities in West Suriname is very preliminary, and further studies are needed to map these areas and document customary use and laws in order to ascertain the scope of impacts from the mine. Archaeological evidence – which already indicates that Karinya (Caribs) and Arawaks are ancient occupants of West Suriname – also needs to be assessed as part of determining the nature and extent of traditional occupation and use.

As SRK acknowledge that Indigenous Peoples will be impacted directly, it is odd that the international standard (Indigenous Peoples Policy OP 4. /20 WB 1991, and OP 4.10) is nowhere mentioned, nor are the UNESCO/MAB AkweKon Guidelines on impact assessment adopted by the Conference of Parties to the CBD to apply to activities affecting indigenous peoples' traditional territories. These Guidelines are incorporated by reference into the World Bank Operational Policy OP 4.01 on impact assessment as part of respecting Suriname's obligations under international environmental law.

SRK's weakest section is SIA. Sociological and anthropological expertise is needed for SIA. Ethnozoologists and ethnobotanists can help the core team. The ethnic composition of the peoples using the forest and aquatic resources likely to be affected by the bauxite mine must be understood before an ESA can be successful. As it stands, SRK's repeated but unsubstantiated claims that there are no Indigenous Peoples living in the bauxite concession, is moot, misleading and risky. There may not be any villages inside the concession but Indigenous Peoples worldwide attach much less importance to their dwelling places (thatched huts are frequently moved) than do city dwellers to their housing. Relatively intact land and water areas are much more important to Indigenous Peoples than to city dwellers.

The essential point is the livelihoods of the Indigenous Peoples. These communities depend on a wide ambit of relatively untouched forest and waterways for their survival. The resource systems of forest and water are far more important than today's location of the villages. It seems indisput-

able that the Indigenous Peoples depend on the forest and aquatic resources that will be impacted by bauxite mining. This is the main social impact that needs assessing. As there are at least four distinct vulnerable ethnic minorities (Arawak, Warau, Trio, Karinya/Carib) in the indigenous communities likely to be impacted by Bakhuy's, this gap in SRK's Plan of Study needs to be rectified. Affected Amerindian communities would include: downstream of the Nickerie, Tapoeripa, Post, Utrecht and Cupido; downstream of the Wayambo, Donderskamp and Corneliskondre; downstream of the Kabalebo and Corantijn, Apoera, Section, Washabo, Zandlanding and several Guyanese villages including Orealla and Siperuta.

### ***Land Titling***

SRK's ESA will have to clarify this fundamentally important topic before impact/benefit negotiations can even begin, and before compensation and mitigation for the potential losses of natural resources used by the Indigenous Peoples can be designed. VIDS and the Indigenous Communities have cooperatively mapped some areas; CIS also has progressed with some mapping; ACT has mapped some of the Wayana areas as well. Such initiatives differ such that they need to be reconciled and completed. When the mapping is complete and affected people agree on the result, the Indigenous Peoples long term requests to the Government will become clear. It is in the interests of BHPB to encourage the government to legally recognize land rights, and secure those rights through effective and collective land titling promptly.

### ***Gender Impacts***

Bakhuy's impacts on the different social groups will, of course, vary. The impact of wage labor by Indigenous Peoples has been mentioned. The greater impact will be on women, together with the two groups they closely support, namely children and the aged or infirm. Wages do not all trickle down to wives where the need is greatest. Men working away from home cannot attend to their normal and necessary duties in familial support, especially attending to their agricultural plots, gathering NTFP, maintenance, hunting and fishing. This already changes assignment of duties, which leads to further repercussions. Splitting husbands from wives, such as in mainly male mining camps, is so serious in some projects that the impacted people have negotiated a ban on men's camps, using daily bussing instead. Absence of husbands imposes onerous burdens on women. SRK will need to explore these impacts collaboratively and come up with effective and agreed on impact mitigation.

### ***Health Impact Assessment***

One of the most important components of SIA is Health Impact Assessment (HIA), yet this is largely absent from SRK's POS. The United Nations World Health Organization has codified standard practice in HIA (Bos et al. 2003, WHO, 1999, Jobin 1999, Eichler 1999). WHO & PAHO offer HIA services nowadays. This includes public health, communicable diseases, disease vectors that may proliferate because of the project together with measures to prevent any worsening of public health. The health, education and nutritional status and trends of the impacted societies must be understood, if not thoroughly assessed. Understanding the demography of the various ethnic groups will be important in assessing the impact of fit young men providing wage labor to the project.

Any project, such as the Bakhuy's mine, involving truck drivers needs an effective AIDS prevention component. Education campaigns will be essential. Curing common sexually transmitted diseases is an effective way of reducing AIDS risk. Curing those can be made a pre-condition of employment. Pre-hiring health examination is essential. Stringent immunization requirements should be mandatory. Free condoms with each weekly pay packet reduce AIDS risks too. The relationships between Paramaribo laborers, Indigenous People (employed or not), and garimpeiros (often from Brazil and Venezuela) need to be assessed. Now that garimpeiros are helicoptered to remote sites and dropped with all their food and equipment in an ATV, their impacts are huge. Fortunately in this case, there is a negative correlation between bauxite and gold. If there is to be a port or river

ship-loading facility, health management of the sailors reduces risks too. Malaria control<sup>7</sup> (treated bednets), snake bite risks and contingencies need to be assessed beforehand.

Alcoa and BHPB will benefit if the risk of schistosomiasis is reduced. Once it arrives in a reservoir or other water body, it is almost impossible to disinfect. It would be low cost to remove the risk of Schistosomiasis spreading to the Kabalebo hydroproject from Nieuw Nickerie for example, and PAHO/WHO are likely to support this public health risk reduction.

### ***Social Impacts of Laborers***

Mining up to 300 million tones of bauxite from the concession area will require more than a thousand workers for 25 years. The SIA should concentrate on the impacts of the mineworkers on the communities and on the environment. Hiring practices, workers camps, transport and traffic safety, food, sewage and solid waste, together with rules need to be assessed.

### ***Food***

The exploration stage already has encountered problems with impacts of their few workers on the environment. There is a notice at the exploration camp prohibiting hunting. But BHPB is asked to provide bushmeat weekly, and fish more frequently. This may be acceptable for the small numbers of exploration workers, but is likely to be unsustainable for the thousand or so exploitation workers. SRK's ESA should advise if any bushmeat can be used during exploitation. In some projects, 'country food' is supplied only to the Indigenous Peoples, and not to allochthonous workers. Demand for bushmeat could encourage over-hunting and possibly depletion of endangered species (e.g., Tapir).

Employees should not be allowed to hunt or trap animals, nor to buy, sell, possess or eat bushmeat, skins or bodyparts. SRK needs to advise if fish can be harvested sustainably for a thousand workers for 25 years. A priori it seems risky. Fish ponds and raising pigs, paca, deer or labba may have a useful role, although the HIA may find caged mammals can act as reservoirs of communicable disease. (Primates and birds such as parrots also should not be caged as should be provided for by BHPB's corporate policy). Most, if not all, food and fuel should be imported from Paramaribo. Similarly with timber: while timber that has to be removed from the ore bodies should be utilized, no further timber or NTFP extraction from the forest should be permitted. The SIA will advise if the Indigenous Peoples can be asked to supply produce on the needed scale. If fruit trees, breadfruit, jackfruit, nut trees, vegetables etc can be grown in time to provision one thousand workers for 25 years, that may be another useful niche for the communities.

### ***Indigenous Peoples' Free, Prior and Informed Consent***

BHPB announced to VIDS, community Captains and others in a May, 2005 meeting that it would negotiate a protocol on consultation and free, prior and informed consent, and common understandings of what are traditional rights with the affected Indigenous communities. This was reiterated by BHPB at a meeting in the Corner House on September 1st 2005, when BHPB stated that new corporate policy mandated that they will be seeking consent of the stakeholders. This best practice and respect for indigenous peoples' internationally guaranteed rights is commendable.

SRK confirmed on 9/29/05: "It is our understanding that BHP Billiton have had discussions around the concept of free, prior & informed consent". BHPB's official position on consent now needs to be clarified, disseminated and implemented. However it is not easy to ensure the meaningful and fully informed participation of the main group likely to be impacted, namely the Indigenous Peoples. BHPB are further to be commended that "simply seeking permission" (TOR p. 4) is not enough, and that BHPB aims "to facilitate empowerment" (HSEC Guideline No. G07 of 2002). Participation in industrialized countries usually begins by mailing draft documents to stakeholders for comments. This may be an alien concept to West Suriname communities. Post office mail is rare or non-existent in most Indigenous Communities including those in Suriname.

### *Language and Translation*

SRK note that summary documents will be distributed “in the appropriate language” (SRK TOR, Table 10.1; p.5) but does not identify which those languages are. This important aspect of participation, informed consent and Social Impact Assessment seems to have been overlooked in SRK’s Plan of Study. Admittedly it is not immediately clear which languages would be the most useful for BHP/ Billiton, yet accessibility of the ESA documents is pivotal to reliable participation and SIA in general. English is not common in the impacted communities; Dutch somewhat more so, and is the main written language.

Creole Sranan Tongo<sup>8</sup>, is the most widespread language in Suriname, and is also the lingua franca between ethnic groups. It is not clear if environmental and social assessment documentation can be meaningfully translated into Sranan Tongo, which is not widely read. In West Suriname, Sranan and English are the most widely spoken. Although literacy is low, Dutch and English the most widely read. The main languages of the project area, Lokono (Arawak)<sup>9</sup>, & possibly Kali’na (Karinya/Carib), have all been written and codified. Lokono is used by the elders, but less so by the young. Warau<sup>10</sup> (aka Guarao) is spoken by Warau and some Arawak and Karinya/Caribs but mainly outside Suriname, in Guyana and part of Venezuela. Kalina (aff. Kalinago) is spoken in the three Guianas and part of Brazil. It may have arisen from island Caribs. Trio language also is written; most Trio speak only Trio. Most elders have learned to read and write in Trio.

The main point here is that SRK’s POS seems not yet to have appreciated the importance of language to ensure the participation of the most vulnerable of BHP/Billiton’s stakeholders.

### *Forms of Communication*

Effective communication is of the essence in SIA, participation and receiving free, prior, and informed consent. It is not easy for Indigenous Peoples to participate in meetings. Attendance at a meeting may require someone to fly or navigate to the villages to inform them of the requested meeting. Then the Indigenous Peoples have to canoe to the appointed meeting site which may take a couple of days each way. Having canoed for a couple of days, the attendees require a place to stay and sustenance. These expenses are increased because while attending meetings, their agricultural plots and fishing have to be neglected.

Attending a meeting without prior information is usually the least effective form of communication. People participate best if they are fully informed beforehand of the topic and know what their room for maneuver might be. Translation too is never perfect, yet mining proponents may be more satisfied with a meeting than attendees who are reluctant to say that they did not understand the translation nor the topic. Best communication methods are usually addressed in Stakeholder Analysis which usually precedes the standard Scoping and Screening phases. Stakeholder Analysis commendably is mandated by BHPB HSEC Guideline No. G05 “Stakeholder Identification” as well as by the BHPB Guideline G06 “Consultation and Participation Processes”.... It is risky to delay the Public Consultation Plan until after the ESA as envisaged by SRK (Plan of Study TOR p.2). In fact it could be claimed that without an effective consultation plan, one could not complete a reliable assessment.

It is important to highlight difficulties with cross-cultural communication here as well and to note that these can be addressed in the protocol on FPIC. For instance, indigenous peoples, particularly in this area, usually do not make decisions during the meeting itself, but through diffused processes at home and with neighbors while conducting daily activities. Meetings are simply a place for further discussion eventually culminating a decision a some future date. Also, people not only are reluctant to say they don’t understand. Silence more often suggests disagreement rather than agreement. GoS and miners often assume silence as consent: this is not what it means most times.

As Stakeholder Analysis does not yet seem to have been completed as judged from SRK’s Plan of Study, the most effective means of communication with the impacted communities have not been divulged. In view of the importance of communication and taking into consideration that the ESA pro-

cess and its implementation may last five or ten years just in the first instance, linking the impacted communities with Blackberry or the type of e-mail currently used by BHPB's exploration camp looks like being very cost effective for BHPB. The sooner it starts, the better communications can become for BHPB and SRK. A new and tall antenna is under advanced construction in Apoera. This should be checked out and any opportunities grasped.

It is unclear why the main impacted society has not yet received SRK's Plan of Study, when the deadline for comments was 30 September 2005. SRK acknowledged (29 September 2005, Gephardt to VIDS) that "there has been a delay in the delivery of the background information documents sent to the community (which should have reached them on about the 12 Sept). We will therefore be willing to extend the comment period". This is not an encouraging beginning to a crucial and difficult process. We don't know what sort of document sending or delivery SRK envisaged, but we emphasize that just dropping off a report and expecting comments from the impacted Indigenous Peoples will not work, and is unacceptable to the impacted communities. The villages in question do not have photocopy, computers, e-mail or telephones. Plan Apoera's Primary School has a slow photocopier, but it rarely works. The two biggest logging corporations have special telephones and the Health Clinic has a radiophone. There is one public phone, which sometimes functions. There are no post offices.

Of the three or four ethnic groups in question, only one received a single copy of the SRK's Background Report, and after the September 2005 deadline for comments. Village leaders are scrupulous in consulting with the people they were elected to represent in such matters. It might take several days to get a copy to Amotopo or Wanapan by outboard canoe. The 15th. September 2005 100% gasoline price hike in Paramaribo (more in Western Suriname) means the cost of outboard fuel to deliver a document to Wanapan will exceed several hundred SRDs. Several days or weeks to canvass the views of the villagers, and a couple of days to somehow get their views back to Apoera is an almost impossible schedule. What next steps did SRK envisage to obtain consolidated comments to SRK's Paramaribo office? Were airfares provided to enable the Indigenous Peoples to fulfil such requests by SRK? The Indigenous People are not able to hop on planes, let alone charter flights. SRK's response to the Indigenous Peoples lack of air ticket and accommodation funds: "We unfortunately do not have funds available for specific organization or the general public's accommodation" discriminates against consultation with Indigenous Peoples, and reveals SRK's naiveté or lack of experience at best.

While industrial countries rely on printed documents, they are not a common form of communication in indigenous circles. Indigenous Peoples cannot be forced to use communication methods that are unfamiliar to them. SRK may find that live presentations are more effective. Video presentations (TV or CD/DVD) and the community radio are more effective than only the printed word. The impacted communities like to re-show a video or re-broadcast an important milestone like the POS many times and to different audiences. Diagrams, posters, pamphlets, brochures, leaflets, and cartoons have been effectively used in similar projects elsewhere. Battery-powered video is available in some of the communities right now. It is in BHPB's interest to accelerate the provision of electricity to all communities potentially to be affected by the project. This does not mean BHPB has to provide electricity for every village. It means BHPB could catalyze the Government to unscramble the bottlenecks preventing the arrival of electricity, as the transmission poles and most lines have long been in place.

SRK should know that Indigenous Peoples impacted by Bakhuys are not as aggressive as Paramaribo citizens, nor very assertive, especially when faced with unfamiliar languages, especially when written rather than following the prevailing oral tradition, and especially when the topic is very technical, as in ESAs. It is important to acknowledge that "silence is not consent" in such cases. Silence is more likely to mean that one side was using communication techniques totally alien to the people whose comments are being sought. SRK's behavior has imposed impossible demands on the Indigenous peoples. Dropping off one paper copy of SRK's POS in English passed the due date in West Suriname and expecting comments raises doubts about the experience or good faith of the comments

seeker. SRK has already rejected the clear requests for means of communications suggested by the Captains. SRK now need to restore and enhance bridges with the Indigenous Peoples and rectify the break-down in communications.

### *Compensatory Offsets*

Once removed, tropical rainforests cannot be restored or rehabilitated to their original richness and productivity. Once destroyed for bauxite mining, they are essentially lost permanently. The two main losers are the Indigenous People, whose livelihood depended on sustainable use of the forest, and biodiversity. Even the best restored vegetation after mining contains a tiny fraction of the original biodiversity. Because these two losses are major and permanent, international practice is to compensate for irreversible loss by means of offsets. Compensatory offsets should be designed first to offer the Indigenous People at least as much habitat in which to fish and hunt as they had before the mine project. Second, such offsets conserve biodiversity.

For every known endangered species listed from an area, there are inevitably many more as yet undiscovered species. That is why conservation of a large tract of environmentally equivalent ecosystem adjacent to the mining project is often the most cost-effective mitigation. Captive breeding of a few charismatic species can be a useful but minor add-on. Conservation concessions support protected areas near the mining concession, or the establishment of private parks on lands owned or managed by the industry. This enables the proponent to share benefits with those impacted the most.

### *'Net Benefit' or Offsets*

Offsets are tracts of land supporting the same or similar ecosystems to those destroyed by the mining project. They are areas that can be conserved by the mining industry, either adjacent to the project or elsewhere such that the environment is unambiguously better off with the project, despite the destruction. Codified offsets for air pollution following the U.S.A.'s 1970 Clean Air Act provided for a firm to build a new plant if it reduces emissions at existing plants. Each U.S. state mandates the ratio of pollution reduced to pollution added, which can be 10:1.

Environmental offsets follow this pattern. Offsets typically substitute one area for another. The 'best technology' mandated in the air pollution case becomes the best practice design in the extractive case. The ratio of conserved habitat to destroyed habitat is best practice if it also follows the 10:1 ratio of the Clean Air Act.

Depending on the size of habitat to be converted, a 1:1 ratio would not function adequately to conserve biodiversity, so a 1:1 ratio would be unacceptable. There is a minimum critical size of habitat below which the edge effects (fires, drying etc) render the area unsustainable. This size varies with ecosystem and local conditions. For example, 10 sq. km may be on the big size for an actual mine, whereas a 10 sq. km conserved area may not be viable. Often it is better to add the offset area onto an existing conservation unit, rather than creating a new and small one. So the range for offset ratios is more than 1 and up to or beyond best practice (10). While there are no hard-and-fast rules for this ratio, it needs to be an unambiguous net benefit in order to be granted the exception to the rules that industry seeks. Usually, the ratio will be part of the net benefits package of offsets, damage prevention and mitigation, and sustainable financing. The other part may include a foundation financing national biodiversity priorities or a fund receiving a small fraction of profits, or linked to volume of wastes, or to area affected.

Given so many variables and the need for flexibility, only examples can show the range of solutions available. The social and environmental assessment is the tool needed to provide specifics.

Some extractive industries find that strengthening the national protected area system by allocating a fraction of profits to an endowment in perpetuity is the national priority and is industry's preferred way to ensure a net benefit offset. This follows the approach mandated by the governments of China, Brazil and others of allocating small fractions (1%-2% each) of total project costs to social and

environmental priorities. Promising results have been obtained by a modest fraction of the profits to be allocated to social and environmental precautions. As most mines are exhausted within a few decades, some mining corporations endow an independent offshore foundation with an invested capital providing interest in perpetuity into an escrow account for such purposes.

Because BHPB's 2800 sq km Bakuys bauxite mining concession is adjacent to Suriname's largest conservation area, the 1.6 M ha. Central Suriname Nature Reserve (CSNR), the ESA will advise if the most prudent course is to (a) improve the protection of this reserve or to (b) extend the CSNR, or (c) to conserve the 15 km gap between the Bakuys Concession and the CSNR. Some combination of the above suggestions, added to financial mechanisms (e.g., impact-benefit agreements), and acceptable recognition of territorial rights could form a commendable offset package such that Suriname's Indigenous and other people and their environment are better off with the bauxite mine. The Indigenous Peoples direct loss of up to 2,800 sq km of Bakuys forest resources needs to be compensated for. SRK's ESA should focus on what activities (e.g., hunting, collecting, temporary agricultural plots) are sustainable inside which types of areas – existing or to be set up -- for the Indigenous People.

Buying then annulling logging concession contracts often is an effective way to compensate for ecosystem loss. The Adampada Creek which flows from the Bakuys bauxite concession through the CSNR to the Coppename River will be critical in SRK's ESA.

## **Recommendations**

### 1. Indigenous Peoples

- (a) The sections referring to Indigenous Peoples in SRK's August 2005 Plan of Study need to be revised. Effective and mutually acceptable forms of communication need to be included, as matter of urgency, before the ESA begins.
- (b) SRK needs to strengthen its SIA team to address impacts on Indigenous Peoples with adequate zeal from now on.
- (c) SRK should consider the advisability of continuing to try to communicate directly with Indigenous Peoples, or if SRK should use the services of VIDS to facilitate such communication and to rectify recent mistakes.

### 2. Benefits Sharing

Benefits sharing, the fraction of royalties now paid by the proponent to government for resource extraction, is possibly the single most important agreement on the way to FPIC and a successful mine. SRK's ESA is the tool to start negotiating Impact/Benefit Assessment. BHPB would be well advised to discuss benefits sharing as soon as it has decided to continue at Bakuys. This would help BHPB achieve the best practice they meet in their mines in Canada, Peru and elsewhere, and have sworn to meet in Suriname.

### 3. FPIC

BHPB are warmly commended on FPIC in Peru's Tintaya copper mine, in their Canadian operations, and in other recent BHPB mining projects. BHPB are commended for emphasizing the need for FPIC in the case of Bakuys, and should follow through on its public commitment to negotiate a protocol on FPIC with the affected communities and their advisors. BHPB should ensure that SRK are fully familiar with BHPB's mandate to achieve FPIC in Bakuys. The Bakuys ESA should be revamped in order to fully meet such FPIC and other standards.

### 4. Best Practice

In view of their current less-than-best-practice track record in NE Suriname (e.g., rehabilitation of abandoned mines), BHPB should discuss with stakeholders raising standards and tightening up on implementation<sup>11</sup>. Such standards should be:

- (a) Financially enforceable, such as by realistic liability insurance or performance bonds, with offshore escrow accounts, governed by independent boards.
- (b) Justiciable or subject to legal action for non-compliance in a specific court agreed to before the ESA is permitted to start.
- (c) Monitored by independent, reputable and experienced groups (e.g., IMF's use of 'Global Witness' (globalwitness.org) to monitor Cambodia's forest management agreements. The Netherlands MER Commission (mer@eia.nl) provides excellent services in evaluating ESAs worldwide).
- (d) A commitment to be made by the government to share responsibility for the bauxite extraction it supports especially protecting citizens, and equitable benefits sharing, as well as accidents, restoration and decommissioning costs.

#### 5. Revenue Management

Sensitive revenue management is the keystone for a well thought-out extractive project. It ensures that the profits from the extraction are distributed with a mind to the future and to equity, rather dispersed or misspent. Environmental liability insurance, bonds and stability and other funds set up by the extractor are examples of methods to achieve the same goal, namely that in case of environmental or social damage, there are earmarked monies available sufficient to cover the harm fully and in a worst-case scenario. Many negative side effects of extractive industry activity, such as social trauma and pollution, remain externalized costs. The economics of this project must represent the true cost of doing business by internalizing all the costs they create through methods such as emissions trading, and the mechanisms mentioned above.

### **Conclusions**

The two overarching conclusions drawn from this brief reconnaissance are linked:

#### 1. Equitable distribution of benefits

First, ensure equitable distribution of benefits, especially royalties. If the fraction of benefits accruing to the impacted communities is unambiguously greater than recent historic agreements, and seems, a priori, to exceed best estimates from the ESA of the costs of impacts, that will suggest an successful project.

#### 2. Enforcement of impact mitigation

Second, guarantee justiciable enforcement of impact mitigation. If the impacts are minimized to acceptability by means of indigenous participation, bonds, insurance, fines, third party monitoring and certification etc, then FPIC is more likely to be achieved, and the project will have achieved best practice.

## Part 2: Refining Bauxite, Smelting, the Kabalebo Hydroproject, and Comparisons

### Refining Bauxite and Smelting Alumina

It seems likely that refining bauxite to alumina will take place within Suriname because it is probably too expensive to export unbeneficiated bauxite ore. If this is the case, then the ESA of refining becomes important. The existing 72-km-long railroad from Bakhuyts to the port at Apoera built in the 1970s could be rehabilitated. The siting of the refinery is one of the best ways to reduce impacts, but that will be addressed only when the decision of refine locally has been firmed up.

Bauxite is typically about half hydrated hydroxides of aluminum. The other half of bauxite consists of oxides of iron and titanium, with sodium silicates. If the bauxite contains high levels of organic matter, the bauxite liquor is burned to oxidize the organic matter. This stage also causes pollution. More than one of Alcoa's Australian bauxite plants have been fined recently for pollution harming humans ([www.aluminum.org.au/npi/documents/smelters.pdf](http://www.aluminum.org.au/npi/documents/smelters.pdf)).

Refining hydrated aluminum hydroxide (bauxite) into aluminum oxide (alumina) by the Bayer process means dissolving the bauxite under high temperatures and pressures in concentrated sodium hydroxide. Insoluble impurities of bauxite ore (iron and other oxides, titanium, silica) are then filtered out as a highly caustic sludge called "Red Mud" (pH >13). After filtration, the remaining solution is clarified and precipitated out as crystals of aluminum oxide (alumina). The alumina is then washed, dewatered and baked into a fine white powder. About three tons of bauxite produce one ton of alumina.

Disposal of the Red Mud is often the biggest impact of refining bauxite. If the red mud is pumped to mined-out pits, revegetation is postponed for years. Any red mud eventually seeping into the ground water, aquifers, wells or water courses kills all plants and animals for long distances downstream. Red Mud scarcely dries, especially in wet tropical mines where most bauxite occurs. In dry climates with no rainfall, a thin skin forms on the red mud, but below a couple of centimeters, the red mud remains as partly colloidal, thixotropic jelly. It is so caustic that it can damage biota for many years if untreated. Lining red mud waste ponds reduces seepage into water courses for some years at least. Wind also spreads caustic soda dust where it damages vegetation and humans (sinusitis, asthma, allergies). Thickening by drying the red mud is expensive in energy costs, but reduces risks. Capping red mud ponds with thick layers of clay also reduces the mobility of red mud. The healthiest and most sustainable solution is to neutralize the red mud with limestone. Although refining bauxite to alumina is not as energy intensive as the next stage, namely smelting alumina into metal aluminum, much energy is required. The impacts of energy used can be serious especially if the fuel is coal or hi-sulfur oils. SRK's ESA will assess such options as soon as refining is judged feasible.

Tailings disposal is becoming more expensive as the damage from tailings dam ruptures increase. Managing the risks of tailings lagoons after mine closure is becoming more important internationally. Best practice demands stiff performance bonds or liability insurance to improve dam safety and to ensure adequate clean-up after closure. As tailings disposal has an almost reckless record, critics point out that that prudent management is too expensive, is a weak claim. The mining industry is ethically bound to select the least harmful method of waste disposal even at greater cost, with the fully-informed, freely-given, prior consent of potentially affected people and civil society.

Alumina Pipeline: As of 2004, an Alcoa subsidiary plans to build a 230 Km-long bauxite slurry pipeline from its Paragominas mine to its Alunorte refinery in Barcarena, near Belem. Alcoa informed the Western Surinamers that a bauxite slurry pipeline from Bakhuyts to Paranaam also was a possibility being studied. The impacts of such a pipeline accrue mainly from the construction road which opens forest access to loggers and hunters, while increasing the risk of fires. Pipelines buried

a meter or so underground can create less impact than above-ground pipelines. Social and environmental impacts of pipelines are outlined in Goodland (2005)

### **Smelting Alumina to Metal**

Smelting alumina into aluminum metal consumes more energy than any other industrial process. Essentially, the alumina is mixed with molten cryolite as a flux through which electricity is passed at very high temperatures (<1,200oC). The electricity splits off the oxygen ions from the aluminum oxide where they migrate to the carbon anodes submerged in the mixture. Molten aluminum is then poured from the electrolytic pots. Such electrolysis reducing alumina to metal is highly pollutive. Switkes (2005) lists nine major pollutants. "Gaseous hydrogen fluoride, fluoride particulates, alumina, carbon monoxide, volatile organics, and sulfur dioxide from the anode baking furnaces". Pollution by fluoride and polycyclic aromatic hydrocarbons are especially damaging to human health in many aluminum smelters. Alcan's Saguenay smelters are linked to the highest cancer rate in the world among non-humans, in Beluga whales in the St Lawrence River into which the Saguenay river feeds. ([www.the-scientist.com/yr2000/oct/research](http://www.the-scientist.com/yr2000/oct/research)).

As smelting is so energy intensive, the location of the smelter is determined primarily by the source of cheap electricity. That is the reason Alcoa is looking into the possibility of the Kabalebo hydroproject adjacent to the Bakhuy's bauxite mine, and to the Jai Kreek and Tapanahoni hydro proposals, nearer Afobakka. In view of the likelihood of some hydroprojects going ahead in Suriname to

### **The Kaburi Kreek Nature Reserve Debate**

This 68,000ha Nature Reserve is contiguous with Washabo on a black-water tributary of the Corantijn. It is an important harvesting and fishing area for the Indigenous Peoples of Washabo, Section, and Apoera, who have conserved it intact for centuries so it remains at its original productivity today. Kaburi Kreek joins the Nanni Lake/Nanni Swamp proposed protected area just south of Nieuw Nickerie. The Nanni/Kaburi Kreek was proposed for protection in 1978.

Recently, the Government decided to convert the areas to biodiversity conservation and keep the Indigenous Peoples either out or constrain their use of this traditional area. The Indigenous Peoples claim they have not been adequately consulted and are reluctant to forfeit this tract on which they depend. They have not been offered any compensation if they are to agree to the loss of resources. Joint-use agreements have not been mentioned to ensure compatibility of traditional use with biodiversity or other uses. Officials armed with sub-machine guns and body armor were patrolling the area during my September 2005 visit. Stinasu proposed eco-tourism for the area in 2001. The Indigenous Peoples are concerned that their livelihoods are being squeezed, without their participation, and without compensation. Indigenous Peoples use rights in the contiguous Snake Kreek Forest Reserve, and the MacClemen Eiland Forest Reserve similarly need to be clarified.

Sources: Baal, F. L.J. 2000. Natural Heritage in Suriname. Paramaribo, Nature Conservation Division of the Forest. Service of Suriname. Duplaix, N. 1980. Observations on the ecology and behavior of the giant otter *Pteuroneura brasiliensis* in Suriname. *Rev. Ecol.* 34: 495-620. Duplaix N., Linaard M. & Sakimin C. 2002? A survey of Kaburi Kreek, West Suriname, and its conservation implications. San Francisco, The Oceanic Society 34 p. Webster T. & Roebuck L. 2001. Water resources assessment of Suriname. Alexandria VA., US Army Corps of Engineers, ERDC: 111 p.

power an aluminum smelter for the Bakhuis mine, Part 2 of this report is an environmental and social reconnaissance of these proposals. Alcoa's most recent hydroprojects to provide cheap electricity for smelting in Brazil and Iceland are outlined below; all are controversial. I have been unable to find a recent example of an Alcoa hydro & smelter that was completed without controversy.

### **The Precautionary Principle, Environmental Liability Insurance, and Performance Bonds**

Extractive Industries should foster the precautionary principle as the norm, as is already long mandated by national governments, OECD, the EU, UN's Agenda 21, and many regulatory agencies. When there is any doubt if potential social and environmental impacts of extractive industries can be prevented or fully mitigated, the industry should err on the side of caution. The precautionary principle means industry should not use 'worst practices' such as riverine tailings disposal. Performance bonds, insurance, and escrow accounts need to become the norm in order to guarantee reimbursement to society for whatever damages are not prevented.

Extraction should be permitted only if the industry is required to bear the full costs of its proposed extraction. Such internalization is economically efficient, equitable and sustainable. The precautionary principle can be used to resolve differences of opinion or conflicts. The industry agrees to internalize the environmental and social costs of their proposed action. This kind of financial assurance is already commonplace with building contractors and has been used to foster proper rehabilitation of opencast mines.

#### ***The Precautionary Principle***

The precautionary principle works by the extractor buying insurance or posting an assurance bond before the extraction starts, large enough to remedy the worst-case damage scenario. The bond is deposited in an interest-bearing escrowed account that can be tapped by the harmed persons. The norm today is to under-estimate worst-case costs. All or part of the insurance or bond is used to mitigate any damage and to compensate affected people. During extraction and when the project is complete, if the industry can prove that there has been no damage – no social and environmental costs – the assurance bond reverts back to the industry. The burden of proof thus shifts from the public to the extractor.

Environmental liability insurance or surety bonds internalize environmental clean-up costs from taxpayers to the extractive industry. Such bonds have become key risk finance solutions in such cases. Such insurance has enabled many companies to strengthen their balance sheets and enhance stock value. Environmental insurance is an essential component in risk management strategies, for example before the purchase of a brownfield (previously contaminated land) site, to ensure latent pollution or pollution risks from tailings dams, and to meet decommissioning and rehabilitation obligations. The European Union's 13 Nov 2001 "Environmental Liability" Directive will do much to raise the importance of environmental liabilities.

Although mining corporations have depended on insurers for financial guarantees to governments to ensure proper rehabilitation, since 9/11, and many massive bankruptcies, insurers are refusing to issue the so-called reclamation bonds, saying they are too risky. The Surety Association of America wants finite time requirements, rather than an uncertain liability in perpetuity. Regulations now require potential liability for water pollution (e.g., cyanide leaks, acid drainage) for as long as 70 years. As governments have been sharply upping bonding requirements to ensure taxpayers will not have to bear the cost of reclamation, corporate profits decline, threatening some mines with closure. Montana increased the reclamation bond requirement for Black Pine silver mine to \$8 million from \$70,000. New Mexico raised the bonds of Phelps Dodge copper mines there from \$115 million to \$900 million.

Bonding requirements exist and are increasing. Not enough bond leads to burdens on taxpayers, but bonds can reduce gross corporate profits. This mechanism provides dynamic incentives to

the extractor to prevent damage. As the extractor is confident that environmental and social damage can be prevented or minimized in this case, they should readily agree to post the bond because they expect to get all or most of it back later. Opponents also should agree because the bond will fully remedy any damage promptly and will penalize the extractor if their confidence proves to have been false.

Some industries prefer to pay into a fund over the duration of the extraction so that the fund increases with the increase of risk. Some prefer environmental liability insurance. Others find the bond approach, especially when prudently sited in an offshore escrow account, administered by an independent board with representation from the affected community. Government sometimes sets the bond amount. If not, agreement needs to be reached in advance, preferably by certified specialists. The common but unacceptable case where the clean-up costs exceed the bond amount needs to be prevented by realistic bond-setting. Even so, dispute procedures and legal recourse by individuals, communities or by the government acting for the affected people, need to be fostered.

### *The Kabalebo Hydroproject*

**Introduction:** This note outlines the potential social and environmental impacts of the proposed Kabalebo and other hydroprojects to support smelting. These hydro projects, which are proposed for the near future, are then put into perspective by comparing them with Suriname's only existing hydro (Brokopondo), with a new hydro in neighboring French Guiana (Petit Saut), and finally with Alcoa's most recent hydro (Karahnjukar in Iceland).

Alcoa commissioned the Brazilian engineering firm CNEC Engenharia S.A. (cneccom.br), subsidiary of the big construction corporation Camargo Corrêa (camargocorrea.com.br), to review all previous hydro proposals in Suriname according to Alcoa's Pat Grover (1st Sept '05 mtg). The CNEC/Camargo Corrêa consortium decided not to bid on the ESA contract partly because they expect to bid on the civil works of whatever hydroproject may be finally chosen. CNEC (2005) is the source of most of this section.

**History:** The Kabalebo hydroproject was designed in the 1970s and advanced to feasibility in 1975 as Suriname became independent. In 1980, the World Bank was invited to participate. Ilaco's 6-volume environmental report was completed in 1981, and Vari's fish impact study in 1982. Attractive hydroelectricity costs US\$0.2c/kwh or less; Kabalebo output was about US\$0.8c/kwh. Increases in earth-moving technology since the 1970s/early 1980s may have lowered such costs. After the coup d'état and the army killing opposition leaders in 1982, the Netherlands and the World Bank withdrew. Now that Suralco's sources of bauxite in NE Suriname may come to an end by 2007, the Bakhuy's bauxite has become attractive, and with it the possibility of more refining and smelting capacity, which needs hydro. In the late 1990s/early 2000s, Alcoa began studying the potential for hydropower in Suriname, including Kabalebo.

**Current Plans:** CNEC mention an installed capacity of 650MW from two hydropower plants (Tijger & Avanavero) an aggregate inundation area of 2,460 sq km, costing about US\$650 million. Alcoa mentioned a 450MW firm power hydroproject costing c.\$900million to supply sufficient power to meet Suriname's domestic demand for one or two decades, as well as to power a c.300,000 t/yr smelter. The goal is to generate enough hydropower to supply Suriname's needs, and to substitute for some thermal power, and at the same time to supply a more economic big smelter. As Suriname's rivers have only modest head, it is difficult to achieve both goals with acceptable social and environmental impacts. Kabalebo hydro will be connected to Afobaka by a transmission line, but the decision about where to site a smelter has yet to be announced.

Refinery and smelter sites mentioned as possible include:

- (a) Near Paranaam, linked by road or even a bauxite slurry pipeline from Bakhuy's.
- (b) Near where Kabalabo power may be generated, e.g., Matapi

- (c) Apoera port at the end of the existing railroad from Bakhuy's
- (d) Upgrade the existing rail from Bakhuy's to Apoera port, thence to be barged to Trinidad
- (e) Existing rail to Apoera, then new rail to Nieuw Nickerie, then barge to Trinidad (to avoid Lower Corantijn's sandbanks.)

Current plans suggest three reservoirs totaling 2,460sq km in area – Corantijn-Lucie, Tijger & Avanavero – thus exceeding the size of Brokopondo, which is nominally 1600 sq kms. Alcoa is trying to reduce reservoir area without unduly compromising capacity. Whichever plans are adopted, the topography suggests that the impounded area will be shallow and will fluctuate seasonally in extent. The best single proxy of the relative environmental and social impacts compared with the benefits in terms of electric power generated is the ratio of area flooded to rated capacity (Goodland 1997). Any project with a ratio (ha/MW) much exceeding 100 is poor. Brokopondo's ratio exceeds 1000; Petit Saut is even worse. Kabalebo's ESA should compute the ratio for all proposed hydroprojects. The Kabalebo may be dammed just below its confluence with Dalbana Kreek, upstream of Matapi. Kabalebo's flow will be augmented by diverting much (89%) of two rivers into it, namely the Upper Corantijn near Anora Falls, and the Lucie River.

Average flows in the 45 km stretch of the Middle Corantijn between Amotopo/Anora Falls/Lucie mouth, all the way for 260 km to Matapi and the Kabalabo Corantijn confluence, will be permanently cut in half. This would approximate today's dry seasonal low flows, which currently average 350cumecs. During the few years of reservoir filling, Corantijn River flows would be much less than that, and could be almost dry for a time. CNEC commendably note that an 'environmental' flow of 100 cumecs would be maintained. When Corantijn River flows decrease to 100 cumecs, diversion would be reduced to ensure the 100 cumec minimum. However, these impacts would still reduce fish catch, impair navigation for the communities on the river banks, interfere with log rafts, and reduce their water supply. The relatively new concept of 'environmental flows' will be introduced by the ESA.

The vastly augmented flows below Matapi are expected to erode the Corantijn river bank on the Guyana side. Expensive civil works are contemplated to protect some of the river banks. If much sediment will be deposited in the lower Corantijn, this will impact navigation and fish.

Most of the area to be impounded is fairly intact Rain Forest, which is also the traditional territory of Indigenous Peoples on which they depend for their livelihoods. Loss of at least 2,460sq km of forest means that much less habitat from which the forest dwellers can harvest. Commendably, CNEC already mention compensatory offsets. It remains to be seen however if these off-sets will benefit indigenous peoples as there is a possibility that they could become protected areas in which indigenous peoples rights may be restricted thus further compounding the negative impact of the bauxite project.

### ***Biomass Removal***

Commercial tree trunks will be exploited, but the forest to be flooded does not contain attractive volumes of commercial timber. CNEC mentions 120 cumts/ha. In any event, removal of commercial tree trunks scarcely reduces biomass, so is less useful with respect to Greenhouse Gas Emissions (GHG) such as methane from rotting organic matter. Although Alcoa, Nimos and GMD firmly expect all or most of the forest and other vegetation to be cleared before impoundment in order to prevent the damaging water quality that was created at Brokopondo, this may prove difficult. 2,460 sq kms of forest is a very large area with some rugged terrain. It will be difficult to ascertain where the future reservoir level may be -- even with GPS -- as the reservoir will be dendritic, and reliably surveyed elevations are rare. The key to preventing toxic water quality is to remove enough organic matter before impoundment. Much organic matter in tropical forests lies in the topsoil, mulch and litter. Removal of trees and shrubs will not reduce that organic matter substantially. Some use of fire may be part of the best option as long as most ash can be flushed in the last wet season before

impoundment, without letting sprouts grow too voluminously. The ESA will importantly advise on these tricky issues.

### ***Water Quality***

If water quality is impaired, water weeds may proliferate in the impoundment causing similar damage as occurred at Brokopondo. Below the dam, poor water quality will harm fish and all other aquatic resources severely just below Matapi, and possibly as far as the Atlantic estuary at Nieuw Nickerie. SENES (2003) predicts about 900 families could be impacted and will lose about 140,000 kg of their main protein sources – mainly fish -- annually, at least for the first few decades after impoundment. Both reservoir fish and river fish are expected to contain unsafe levels of mercury (SENES, 2003). This is one of the easiest impacts to monetize. The loss is expected to be about \$0.5million annually. In addition, conversion of free-flowing rivers into stagnant reservoirs increases the production of toxic gas and greenhouse gases from rotting biomass. Dying water weeds is a risk to be assessed. The reservoir water levels are expected to fluctuate significantly between wet and dry seasons. This too may harm fish breeding.

### ***Water-Borne Diseases***

CNEC (2005) commendably note that the water-borne disease, schistosomiasis, is present in the region of the Kabalebo Hydroproject, in Nieuw Nickerie. Kabalebo's ESA must take this very seriously as schistosomiasis has already spread in some Brazilian reservoirs, so must be prevented from entering Kabalebo.

### ***Impacts of Workers***

The impact of c.2000 dam workers for the few years of dam construction will be a major impact on the environment and especially on the Indigenous Peoples. (See Section on the impact of Bakhuy's workers on the environment and communities).

### **The Jai Kreek & Tapanahoni Diversions**

Diversions, hydro schemes which divert water from one or more rivers in order to augment flow in the third river, are being considered to boost Afobaka Hydro's capacity. Alcoa has proposed to divert the Tapanahoni and Jai Kreek into the Suriname River in order to raise the level of the Brokopondo reservoir, thus boosting electricity generation.

The details of the Jai Kreek/Tapanahoni diversions have not yet been worked out. Suffice to say at this stage that displacement of Indigenous Peoples and maroons may well be by far the biggest impact of the proposed diversions.

Worldwide, human displacement has never worked very well. The people displaced almost invariably become poorer as a result of their move. The poor subsidize the generation of power for distant cities. Of the types of people displaced, experience shows that city dwellers can be resettled with relatively less trauma. If a city street is widened, for example, the people having to move manage to find other dwelling often nearby. They keep their social networks and employment. Rural displacement is numerically the most numerous category. Even if small farmers receive replacement land, their social networks have been impaired, the soil fertility will be different, and the detailed knowledge of how best to manage each different plot has to be accumulated through the years. If the replacement land is distant, then schooling, transport, friends and access to rivers and forests usually suffer. Rurally displaced people rarely regain their pre-move standards of living.

The most vulnerable category of people to be displaced is Indigenous Peoples. Nowhere in the world have such societies been displaced successfully. They are worse off after their move for compelling anthropological reasons. The damage to the social fabric of displaced Indigenous Peoples is so great that best practice is to re-site the project in order not to impact the Indigenous peoples. Additionally, international law contains strong protections against any forcible resettlement of indige-

nous peoples, as does the new World Bank Operational Policy 4.10 of May 2005, and the International Finance Corporation's draft Performance Standards on indigenous peoples and on resettlement.

The Jai Kreek/Tapanahoni diversion looks likely to provoke major involuntary displacement of Indigenous Peoples, including the sizeable town of Palumeu, at the confluence of the Palumeu River with the Tapanahoni. The Wayana and Trio ethnic minorities may be severely impacted, as may N'djuka maroon communities on the Tapanahoni River. The canal and construction road planned to connect Jai Kreek also will provoke major impacts. Raising the water level of Afobaka reservoir itself may impact lake-side Saramakka maroon communities, including those that previously lost their lands when the Afobaka dam was constructed in the 1960s. Decreases downstream of the diversions also impair fish and other aquatic resources.

### **Comparison: Brokopondo Hydro**

Because several proposals for hydropower are planned which may impact the Indigenous Peoples of Western Suriname, a group of about 30 Indigenous Peoples visited the only hydroproject in Suriname on 2 September 2005 in order to learn what sort of impacts should be expected. The Indigenous Peoples listened at length to the people, mainly maroons, displaced by the Brokopondo reservoir.

Afobakka or the 'Prof. Dr. Ir. Van Blommenstein Stuwmeer' hydroproject or Brokopondo was built by Suralco (=Alcoa & BHPB) between 1959 and 1964, and started generating in 1965. It provides approximately half of Suriname's domestic electrical need. In addition, Afobakka powers a bauxite refinery and a smelter (ceased operations in 1999) at Paranam. About 80 million kwh of its 1 billion kwh annual production is reserved for the Government of Suriname. Brokopondo's installed capacity of 189MW has never been reached.

The recent 250,000 mtpy expansion, completed at a total cost of approximately \$65 million or approximately \$260/ton, brings the facility's total capacity to approximately 2.2 million mtpy.

In the late 1950s and early 1960s, social and environmental impacts of big infrastructure projects were not deemed important by proponents. Brokopondo was one of the first major hydroprojects in the world to be built in tropical ecosystems. Several years after the reservoir was filled and only when the engineering and civil works were being damaged by environmental impacts were scientific studies begun. Engineers in the powerhouse were gassed by toxic hydrogen sulfide (H<sub>2</sub>S) for the first few years and had to wear gas masks. This gas was generated by inundated biomass. This poisonous gas also corroded the new steel of the turbines and started to kill fish in the Suriname River all the way to the ocean 80 km downstream. Tarpon entering the estuary of the Suriname River were also killed. Decline in fish catch between Brokopondo and the ocean harmed all the riverside villages up to 80 km downstream from the dam. No commercial fishery in the reservoir has been developed. Mercury levels in fish exceed safety standards.

Brokopondo reservoir drowned 1600 sq kms of pristine tropical forest. Its full reservoir area of 2350 sq km has never been achieved; apparently estimates of river flows were far too optimistic. The rising waters eventually killed off all the trees. As no trees were removed before inundation, they remain sticking up through the surface of the reservoir today. Early in the 2000s, a project was begun to harvest some of the dead trees in the reservoir. As all trees and smaller vegetation remained in the reservoir, it was impossible to use fish nets. Decaying vegetation especially proliferating water weeds died, fell to the bottom and decayed. This decay reduced oxygen levels and generated poisonous gases which killed fish.

Thousand of wild animals were drowned as the reservoir filled. Operation Gwamba was a private effort to save some of the bigger animals which could not swim to safety (Walsh, 1967).

The biggest impact was the displacement of about 6000<sup>12</sup> maroons from several ethnic minorities that formerly lived along the Surinam River and its tributaries. In 1964 these people were relocated by the Surinamese government when the gates of the Afobaka Dam closed, forming the Brokopondo Lake. As most of the oustee's villages are located away from a river and away from forest, the two

mainstays of the maroon society have been lost. Fish and forest resources were not replaced by other means of livelihood, so unemployment is very high. The villages have been abandoned by those youths able to obtain work in Paramaribo or elsewhere, leaving mainly elderly people in the villages. Frankly, the villages of the maroons displaced by Brokopondo reservoir are dysfunctional, even now four decades after being displaced.

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### **Comparison, French Guiana: Petit Saut Hydro Project**

Petit-Saut is France's biggest hydro reservoir as it filled 370 sq km by 1994. It is the most recent hydro project to be built in the vicinity since Brokopondo, hence can be a useful comparative learning experience for Kabalebo. Petit-Saut's 26.5 MW hydro was constructed by EDF in French Guiana on the Sinnamary River about 70 km from the Atlantic coast. The shallow reservoir (av. depth: 15 m) floods pristine Amazon forest, none of which was removed before the reservoir was filled. It has three branches extending about 50 km up three tributaries. The access road was built between 1987 and 1989. Dam construction began in 1989. The dam itself was finished in 1990, and commissioned

in 1994. The three year delay appears to have been because the faulty design failed to predict rotting of submerged forest, production of toxic gas, anoxic water below the dam and accumulation of mercury in the reservoir.

The electricity is primarily needed for Europe's €1.6 billion Spaceport which is at Kourou, 5' north of the Equator and 65 km NW along the coast from the capital Cayenne.

EDF claims that « La production d'ozone due à la décomposition des masses végétales englouties serait considérable ». If true, this is the only hydroproject in the world that generates ozone from rotting vegetation.

The main environmental study, by EDF's Hydraulic Department, is dated 2000, which suggests environmental assessment was a retroactive afterthought. This study highlighted elevated mercury levels in fish, high methane production and anoxia downstream of the dam. These problems were mitigated during the three year delay by redesigning the project and by installation of a re-oxygenation weir at the foot of the dam. Generation had to be suspended while the weir and aeration (bubble) systems were retrofitted. This led to a 15% permanent loss of electric output. EDF awarded themselves a prize for the quality of this hydroproject

The 18-month \$6 million faunal rescue dealt with "3,278 mammals (47 species), 799 snakes (68 species), 1 386 tortoises". How many humans were displaced is not apparent.

Another EDF-sponsored hydro, in Lao called Nam Theun 2 is relying on the expensive corrective measures of Petit Saut. NT2's website writes: "On the issue of water reoxygenation before release into the Xe Bang Fai River, Mr. Olivier Salignat, environmentalist at EDF, explained that the aeration weir to be located in the downstream channel has been designed based on the successful experience at another EDF hydro scheme at Petit Saut in French Guyana, and it proves to be reliable in removing substantially the methane that is due to biomass degradation."

### **Comparison: Alcoa's Karahnjukar Hydroproject**

Suriname's proposed Kabalebo hydroproject in Suriname can be compared with Alcoa's most recent hydroproject, which is the US\$3bn. Karahnjukar Hydropower Project<sup>13</sup> in Iceland, authorized in 2003, and now under advanced construction. Karahnjukar includes an aluminum smelter, a 690 MW hydropower plant of eight or nine dams to be financed by Iceland's National Power Company, and a harbor facility at Mjoevri to be financed by the Fjardabyggd Harbor Fund. The project is scheduled to operate by 2007. Alcoa's 2004 Sustainability Report [www.alcoa.com/sustainability] reviews the company's global environmental, social and economic performance.

Earlier, on 1st. August 2001, Iceland's National Planning Agency (NPA) rejected the Karahnjukar project on the grounds of "substantial, irreversible negative environmental impact". NPA has authorized 120 hydropower projects; Karahnjukar is the only one NPA has rejected. Iceland's National Power Company, Landsvirkjun, appealed to Iceland's environment minister, Siv Fridleifsdóttir, who, ignoring her own Planning Agency, granted permission to proceed with the project on December 20, 2001 provided that steps are taken to limit the amount of environmental damage. This sparked a series of lawsuits, and raised doubts about democracy in Iceland. Lawyer Atli Gíslason and a group of 26 citizens brought separate cases before the Icelandic high court and European Free Trade Association surveillance authority, challenging the government's lack of transparency and Minister Fridleifsdóttir's decision. Siv Fridleifsdóttir, minister for the environment, is a qualified physiotherapist with no parliamentary or environmental experience. According to the Government's Planning Agency, "the plans to build an aluminum smelter in Reydarfjardur are not likely to have a considerable environmental impact, and are not to be subject to an environmental evaluation." In March of 2003, Iceland's Environmental Agency issued an Operating Permit for Alcoa's Fjarðaál primary aluminum smelter. (Detailed history at <http://www.lv.is>)

The Iceland Nature Conservation Association, ICNA ([www.inca.is](http://www.inca.is)) claims that the Karahnjukar Hydropower Project "will be the one of the greatest environmental disasters in recent decades,

something that generations to come will damn us for.” The Karahnjukar Hydropower Project is sited in Iceland’s Eastern Highlands, which contains one of Europe’s largest remaining wildernesses. The World Wide Fund for Nature (WWF, [www.wwf.org](http://www.wwf.org)) opposes the project, and ranks the Eastern Highlands as Europe’s second-largest wilderness area (trailing only Svalbard, a Norse territory in the Arctic region).

The US\$1bn smelter is designed to produce 290,339 tons per year. Landsvirkjun ([www.lv.is/lv.nsf/pages/english.html](http://www.lv.is/lv.nsf/pages/english.html)), the national power company, is set to develop a 500 or 690 MW facility that will supply all of the power for Alcoa’s smelter. No energy produced by the dams will go for domestic use. The eight dams will impound two rivers, the Jokulsa a Dal and the Jokulsa i Fljotsdal, drained through 25 miles (40.2 kilometers) of tunnels. The 190m high, 730m wide main dam, Europe’s highest, two smaller saddle dams and 53km of headrace tunnels will be paid for by Landsvirkjun (the national power company, owned jointly by the Icelandic government, the city of Reykjavik and the town of Akureyri). The main dam will create a huge reservoir, to be called Halslon, which will inundate 57sq km of the highlands to the south before running on to the glacier itself. The resulting hydroelectricity is contracted for sale for 50 years to Alcoa, which is closing two smelters in the US and relocating to Iceland as a cost-cutting measure.

Environmentalists charge that the damming of the Jokulsa a Dal, and creating a 57sq km reservoir, will trigger 70 percent of the project’s damage, destroying wildlife and vegetation. The flows of 60 waterfalls will be impaired. This is one of the main breeding grounds for the area’s 2000 reindeer - according to Skuli Sveinsson, a tracker, a cull of one third of the population has already begun in anticipation of the drastic reduction in feeding grounds. Thousands of pink-footed geese (*Anser brachyrhynchus*) graze these uplands, a protected nesting ground. The world’s largest pink-footed goose molting area has been offered free by the government for the hydroproject. This violates the Bern Convention on the Conservation of European Wildlife and Natural Habitats, as both pink-footed and greylag (*Anser anser*) geese are “protected fauna species” under the convention’s Annex III.

The value of this vast area of natural land has not been factored into the subsidy offered to Alcoa, WWF says. It is also a favorite haunt of the snowy owl, ptarmigan and the gyrfalcon. Iceland’s equivalent of America’s Grand Canyon, Dimmugljufur, or Dark Canyon, is a deep cleft carved out by the region’s most powerful glacial river, the Jokulsa a Bru. The part of the canyon between the edge of the glacier and the dam will be submerged; on the far side of the dam, it will become a dry gulch.

**Sedimentation:** Located just 20 kilometers north of Europe’s largest glacier Vatnajokull, the heavy silt content of Jokulsa a Dal will eventually fill the reservoir. Expert opinion is divided only on how long the dam will remain operational. Estimates range from 50-400 years. The hydroproject will divert Jokulsa a Dal at the main dam into tunnels that are planned to debouch into the slow-moving Jokulsa i Fljotsdal, which feeds Iceland’s longest lake, Lagarfljot. The calm, silver surface of this tourist attraction will become muddy, turbulent and un-navigable. The migratory salmon (*Salmo salar*) also listed under the Berne Convention, are likely to be impacted. In the Herardsfloi delta, heavy silt deposits from Jokulsa a Dal currently prevent the sea from encroaching on the land. This will impact a habitat for a significant harbor seal population (*Phoca vitulina*), also listed under the Berne Convention. Once the silt is trapped by the new dam, fields will be flooded and two established farms - one an eco-tourism centre - almost certainly will be destroyed.

**Wind Erosion:** The level of the reservoir will fluctuate seasonally, from 170 to 250 feet elevation asl. This will expose vast areas of reservoir bottom to the wind. In summer, when the water is low, strong eastern winds will whip up dried silt at the edge of the reservoir, blowing dust storms over the highlands towards farms further east. Iceland is a very windy country. The soil particles are relatively light. Iceland is concerned about wind erosion as it has probably lost half of its original vegetation to erosion since the country was settled. “What people are concerned about is if the wind starts blowing all this loose soil material over the vegetation.”

Violation of officially protected areas: One third of the officially protected area, Kringilsarrani at the foot of the glacier will be submerged. In a radio interview, Environment Minister Siv Fríðleifsdóttir said that, in her view, “protected” did not mean “for ever protected”. Fríðrik Sophusson, Landsvirkjun’s managing director, supports her decision, and claims that the government “has the right to change such a human decision”. In September 2003, the minister for industry overruled an environmental impact assessment and authorized a project on the Thjorsa River that will inundate part of a protected area, a project that had already been rejected by the local authority.”

Esthetic Impacts: Dettifoss, the most powerful waterfall in Europe, officially protected and one of Iceland’s great tourist attractions will be damaged. Professor Gisli Mar Gislason, who was part of a government think-tank consulted on proposed power projects, says, “Landsvirkjun intends to divert Jokulsa a Fjollum, cutting off the water to Dettifoss for most of the year but turning it on for the tourist season.”

Subsidies to Alcoa: Hydroelectricity for the aluminum plant will be subsidized at about 1.5 cents/kWh. The price will rise and fall with the price of aluminum (currently low due to a glut on the market). The utility has yet to release the price at which it will sell Alcoa its hydropower.

Greenhouse Gas Emissions: Aluminum smelters emit enormous quantities of greenhouse gases. In 2001, super-clean Iceland was able to negotiate a 10% increase in permitted emissions under the Kyoto protocol - the biggest increase in the world. In effect, Alcoa is buying Iceland’s license to pollute, as well as cheap electricity. The ministry of environment also gave Alcoa a license to emit 12kg of sulfur dioxide (SO<sub>2</sub>) per tonne of aluminum produced - 12 times the level the World Bank expects from modern smelters. SO<sub>2</sub> and fluoride, the most dangerous pollutants in terms of public health and land damage, will be pumped directly into the air via giant chimneys. The electrolytic processes involved in aluminum smelting also lead to emissions of tetrafluoromethane and hexafluoromethane – greenhouse gases that are thousands of times more powerful in trapping the sun’s heat than carbon dioxide.

Peter Bosshard, the author of the recent report “Karahnjukar: a project on thin ice” calculates that achieving a higher recycling rate for the 100 billion drinks cans Alcoa produces every year could easily generate more aluminum than several new smelters like the one planned in Iceland.

Seismic, Volcanic and Tectonic Risks: Landsvirkjun does not generally welcome adverse scientific findings. Many geologists fear catastrophic flooding may result from regular glacial surges and eruptions in Karahnjukar’s catchment area. They also question the consequences of building a colossal dam on a substructure weakened by geothermal fissures. These concerns were brought before parliament by scientists earlier this year, but the Left-Green MP, Kolbrun Halldorsdóttir, reports, “The minister for industry advised the house that these scientists were politically motivated and not to be listened to.” Thorsteinn Siglaugsson, a risk specialist, prepared a recent independent economic report on Karahnjukar for the Icelandic Nature Conservation Agency. “Landsvirkjun’s figures do not comprise adequate cost and risk analysis,” he says, “nor realistic contingencies for overruns.” Had the state not guaranteed the loans for the project, Siglaugsson adds, it would never have attracted private finance. “Karahnjukar will never make a profit, and the Icelandic taxpayer may well end up subsidizing Alcoa.”

In July 2003, a consortium of 19 banks led by Barclays arranged the final \$400m loan required by Landsvirkjun, apparently in breach of the “Equator Principles” it had signed up to only one month earlier, demanding “sound environmental management practices as a financing prerequisite”. Barclays has denied it is in breach of this voluntary code of practice, pointing to a “second opinion” it commissioned from Texan engineering and construction corporation “Stone and Webster”. Stone and Webster’s leaked report concluded, “Objection will continue from some NGOs with the potential for some short-term negative publicity but this is likely to diminish as the project moves forward, and can be controlled by ongoing public relations activities.” Stone & Webster claims environmental experience, but this is little evident. It has specialized in construction, engineering and the US atomic

energy industry and has a record of environmental quasi-greenwashes as publicized in the German Parliament when, trying to get WestLB off the hook, Stone & Webster claimed Peru's Camisea gas pipeline fully met World Bank standards (Goodland 2003). WestLB subsequently let go its top management and was embroiled in financial and other trials.

Protesters organized a camp and setup a blockade in August 2005 which included the first ever lock-down in Icelandic history. Police arrived on the scene and ordered the workers to use the heavy equipment which would cause direct injury to the activists. Several activists were violently arrested and some face deportation. Activists also occupied the Alcoa aluminum smelter site slowing down construction

Compensatory Offsets: There don't seem to be any compensatory offsets. There are two financial transactions. First, Alcoa's support to the Leif Erikson foundation for some scholarships from Iceland to the US. Second (AP 2005) Alcoa contributes US\$1.3 million toward a US\$6.4M sports facility in East Iceland, near where the company is building an aluminum smelter. Company officials say the facility will include a 100-meter track and full-length soccer field. The local municipality (Fjardabyggd) is overseeing the construction and will own and operate the sports facility.

CorpWatch 26 Jan 2005: Alcoa's Track record.

1. In 2003, Alcoa was found guilty by the United States Justice Department and the EPA of violating the Clean Air Act at its Rockdale Aluminum smelter near Austin, Texas. The Rockdale smelter was producing 260,000 tons of aluminum a year, while emitting the largest amount of nitrogen oxide and sulfur dioxide of any single source in the country, with the exception of electric utilities. From Alcoa's own estimates 104,000 tons of emissions were pouring annually from the plant; including 40,000 tons of smog-producing nitrogen dioxide and 60,000 tons of acid-rain-generating sulfur dioxide, as well as highly toxic metals such as mercury, copper, lead, and others, which eventually accumulated in Texas lakes and rivers.
2. Alcoa's aluminum smelter at Massena, New York, was one of three plants which poisoned the St Lawrence River - a river which for centuries sustained the Mohawk indigenous community of Akwesasne. After being used as a dumping ground through much of the twentieth century, the river and its ecosystem became so contaminated that in 1986, the Mohawk community was advised to eat a minimal amount of fish from the river. Their traditional economy collapsed. In addition, the PCBs, dioxins, heavy metals, and other pollutants left the Mohawk community with birth defects, miscarriages, and cancer. Mothers are advised not to breastfeed their children because of industrial contaminants in the food chain. The slow process of environmental litigation and cleanup eventually revealed some of the scope of corporate abuse of the St. Lawrence. The Alcoa refinery eventually received a \$3.75 million fine, the largest criminal penalty ever assessed in the history of the United States, for a hazardous waste violation.
3. In the period between 1987 and 1999, more than 47 Alcoa facilities were cited by US state and federal anti-pollution regulators. In March 1999, Alcoa agreed to an \$8.8-million settlement with the Environmental Protection Agency after being charged with illegally discharging inadequately treated wastewater from its Warrick County plant into the Ohio River between 1994 and 1999. In September 1999, Discovery Aluminas Inc., an Alcoa subsidiary, agreed to plea guilty to similar discharge violations and to pay more than \$1 million in fines.
4. On May 2, 2002, it was reported that Alcoa Inc. had offered to pay nine Australian workers \$A350,000 each (US\$187,337) in compensation for injuries allegedly caused by exposure to pollutants while working at the firm's Wagerup plant. The workers allege that their illnesses were caused by exposure to heavy chemicals and chemicals while working at the facility. Injuries alleged include multiple chemical sensitivity, reactive airways dysfunction and renal failure. Alcoa offered the settlement on the condition that the workers drop their lawsuits seeking compensation and damages. Eight of the workers accepted the settlement offer.

5. In November 2004, Alcoa reported the eighth waste spill at its Western Australian Kwinana refinery in the space of five months.
6. Sarawak's proposed new 2400MW US\$4bn. Bakun dam<sup>14</sup>, to be completed by 2007, to power a US\$2.4 billion aluminium smelter "Smelter Asia" near Bintulu will produce 500,000 tonnes of aluminium annually. BHPB and Mitsubishi announced plan in October 2005 to buy about half Bakun's output to power their smelter. Rio Tinto and Alcan are planning to build smelters nearby. The reservoir could force the resettlement of 10,000 Orang Ulu and other Indigenous Peoples. Dr. Kua Kia Soong, head of a non-governmental coalition in Sarawak asks: "Why do we want toxic and energy-hungry industries such as aluminum smelters? Aluminum smelting is one industry that the developed countries want to dump on suckers like us because it is environmentally toxic and it consumes voracious amounts of energy."

### **Comparison: Alcoa's Recent Hydro Track Record in Brazil**

Alcoa's Barra Grande dam in Rio Grande do Sul will inundate 8,138 ha of endangered Atlantic forest. The 1999 ESA compiled by Engevix, an engineering corporation, has been found 'fraudulent' because it omitted the fact that over 2,000 ha of primary Paraná pine forests (*Araucaria angustifolia*) and 4,000 ha of other types of forest are in the impact zone. ALCOA has been denounced as violating human rights to OECD in June 2005. ALCOA and its partners are investing in three other hydroprojects for smelters in Brazil. (a) Estreito 1087MW on Amazonia's Tocantins River. (b) the 292 MW Pai Querê on the Pelotas River near Barra Grande. (c) the 220 MW Serra do Facão near Catalão, Goiás. All three have failed so far to have their construction permits approved as a result of environmental and social problems.

## Part 3: Sources of Information and Literature Cited

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## Endnotes

- 1 The author, Robert Goodland, has 25 years of experience in the World Bank on social and environmental assessment of economic development projects. He helped to create and start-up the World Commission on Dams, and recently was the chief technical advisor to the independent Extractive Industry Review of the World Bank Group's oil, gas and mining portfolio.
- 2 The Indigenous Peoples will be impacted. To that extent they are stakeholders in BHPB's ESA, which began in August 2005 by the ESA team of SRK. More importantly, the Indigenous Peoples consider themselves to be 'Rightsholders' (vide infra).
- 3 The Publish What You Pay campaign ([publishwhatyoupay.org](http://publishwhatyoupay.org)) helps citizens of resource-rich developing countries to hold their governments accountable for the management of revenues from the oil, gas and mining industries. When properly managed these revenues should serve as a basis for poverty reduction, and sustainable economic development rather than exacerbating corruption, conflict and social divisiveness. The campaign calls for the mandatory disclosure of the payments made by oil, gas and mining companies' to all governments for the extraction of natural resources. This is a necessary first step towards a more accountable system for the management of revenues in resource-rich developing countries.
- 4 For example, the reasons justifying the exclusion of the Natural Habitats (Biodiversity) Policy, Cultural Property Policy, Downstream Riparian Policy, Disputed Areas Policy and others need to be stated. In addition, the EA Policy is not being strictly adhered to as the mandatory first step of creating a Panel of Social and Environmental Experts, for example, has not been met.
- 5 (a) N.V. BHP Billiton Maatschappij Suriname: Policy: Community Policy, 04 August 2005: 1 p. (b) N.V. BHP Billiton Maatschappij Suriname: Policy on Stakeholder Communication & Participation, 01.August 2005; 1 p. Even more progress was announced in October 2005: Alcoa Foundation's Conservation and Sustainability Fellowship Program began a unique \$8.6 million Signature Program to advance the knowledge in the field of conservation and sustainability through fellowships to outstanding academics and practitioners from non-governmental organizations, in partnership with IUCN.
- 6 Robert Hermann Schomburgk (1804-1865) was contracted by the British government in 1840 to survey the boundary between Dutch and British Guiana, which he started in 1843. He was accompanied by his brother, Moritz Richard Schomburgk (1811-1890). They published their results between 1847 and 1848 in the Proceedings of the Royal Geographic Society. These essays were later republished as a 3-vol. book in Leipzig entitled "Reisen....". Reisen was translated into English by Walter Roth and republished as a 2-volume book in 1923 in Georgetown.
- 7 Suriname: malaria and mosquitos: Kruif 1972, Kuyp 1950, Kaay 1975, Bone 1925. Schistosomiasis: Tewarie-Mungra 1972; Snails: Giejskes 1968.
- 8 SIL has compiled a Dutch dictionary, wordbooks, grammars and the Bible in Sranan. A Sranan Tongo thesaurus is at [thesaurus@kitlv.nl](mailto:thesaurus@kitlv.nl). See also: Echteld, J. J. M. 1961. The English words in Sranan; Negro English of Surinam. Groningen, J. B. Wolters Publ., 219 p. Sranan is sometimes called Creole-Amerindian pidgin. Pejorative and obsolete term: taki taki.
- 9 Pet, W. J. A. 1987. Lokono Dian, the Arawak language of Suriname: a sketch of its grammatical structure and lexicon. Ph.D. thesis. Ithaca NY, Cornell University. 383 p.
- 10 For example, Edwards, W. F. & Charette E. (eds.) 1980. A Short Dictionary of the Warau Language of Guyana. Georgetown, Guyana, UG, Amerindian Languages Project 167. Barral, B. M. de. 1979. Diccionario warao-castellano, castellano-warao. Caracas, Universidad Católica Andrés Bello, 730 p. Carlin, E.B. & Arends, J. (eds.) 2002. Atlas of the languages of Suriname. Leiden, KITLV Press, 345 p.

- 11 Some regulatory agencies would insist on cleaning up old unsafe operations before a new permit is granted. Rehabilitation of BHPB's NE operations in Suriname do not reassure stakeholders of BHPB's new corporate goals for Bakhuis.
- 12 When the Indigenous Peoples asked three Suralco engineers at the Afobaka damsite on 2 Sept '05 how many people had been displaced by Brokopondo, no one knew. Afterwards, one Suralco representative said that it may have been about 3000 people. The literature suggests it was at least 6000 people.
- 13 Sources: [www.INCA.is](http://www.INCA.is). Susan de Muth, The Guardian 29th Nov 2003. CorpWatch.org. Swan, J. "The Icelandic Rift: Industry versus natural splendor in a 'progressive' nation". Orion Magazine Mch/Apr 2004. [nsi@mmedia.is](mailto:nsi@mmedia.is). Damned Nation; Peter Bosshard 2004. "Barclays and the Karahnjukar project" IRN & FOE; 8 p. Council of Europe 24/9/'03, Convention on the Conservation of European Wildlife and Natural Habitats, Strasbourg: "Hydropower development in Iceland" T-PVS/Files (2003)15, 22 p. Mark Lynas The Ecologist 33 (10) 1 Jan '04.
- 14 Percy Barnevik, then President of ABB, informed me some years ago that I could not have a copy of the Bakun Hydro ESA as it is confidential. He went on to say it was the only confidential ESA of any hydroprojects in ABB's portfolio. I understand ABB withdrew shortly thereafter.



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