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Estelle Levin Ltd.



REPORT

JUNE

2012



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ARTISANAL AND SMALL-SCALE MINING IN AND AROUND PROTECTED AREAS AND CRITICAL ECOSYSTEMS PROJECT (ASM-PACE)

MADAGASCAR CASE STUDY: ARTISANAL MINING RUSHES IN PROTECTED AREAS AND A RESPONSE TOOLKIT

FINAL REPORT BY RUPERT COOK AND TIMOTHY HEALY
30 JUNE 2012

The aim of **ASM-PACE** is to address the environmental impacts of artisanal and small scale mining (ASM) whilst building on its economic, social, and empowerment potential in some of the world's most important ecosystems. The project uses a scientific foundation of knowledge, participatory methods and rights-based approaches to work with miners and their communities – rather than in opposition – to design sustainable, win-win solutions that will last. The project is focused exclusively on ASM occurring in and around protected areas and critical ecosystems. ASM-PACE is a joint-programme of WWF and Estelle Levin, Ltd. Fauna & Flora International (FFI) is an implementing partner in Liberia. For more information please visit www.asm-pace.org.

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- Create a network of protected areas to conserve biodiversity
- Encourage logging and mining companies to promote good management practices
- Promote the reduction of greenhouse gas emissions from deforestation and degradation of forests
- Support sustainable business practices and financial investments in development and infrastructure projects
- Improve the livelihoods of indigenous and local peoples
- Reduce wildlife poaching and the bushmeat trade
- For more information, please visit www.panda.org

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ACRONYMS AND ABBREVIATIONS

AiM-SMART	ASM in Madagascar Strategic Management of Artisanal Rushes Tool and Lessons Learned Study
ANGAP	Association National de Gestion des Aires Protégées
APSM	Agence de Promotion du Secteur Minier
ASM	Artisanal and Small-scale Mining
ASM-PACE	Artisanal and Small-Scale Mining in and around Protected Areas and Critical Ecosystems Project
ATPEM	Assistance Technique aux Petites Exploitations Minières
BAM	Bureau d'Administration Minière
BCM or BCMM	Bureau du Cadastre Minier de Madagascar
BPGRM	Base de Données Pour la Gouvernance des Ressources Minérales
CAZ	Corridor Ankeniheny-Zahamena
CEA	Commissariat à l'Energie Atomique
CI	Conservation International
COAP	Code des Aires Protégées
COFAV	Corridor Fandriana-Vondrozo
CSR	Corporate Social Responsibility
DGF	Directeur Générale des Forêts
EIA	Environmental Impact Assessment
EPP	Ecole Primaire Publique
GCF	Gestion Contractualisée des Forêts
GDP	Gross Domestic Product
GELOSE	Gestion Local Securisée
GoM	Government of Madagascar
H&S	Health and Safety
HAT	High Authority of Transition
IGM	Institut de Gemmologie de Madagascar
IUCN	International Union for the Conservation of Nature
LGIM	Loi sur les Grands Investissements Miniers

MAP	Madagascar Action Plan
MECIE	Mise en Compatibilité des Investissements avec l'Environnement
MEF	Ministère de l'Environnement et Forêts
MGA	Malagasy Ariary
MNP	Madagascar National Parks
IGM	Institut de Gemmologie de Madagascar
IUCN	International Union for the Conservation of Nature
LGIM	Loi sur les Grands Investissements Miniers
MAP	Madagascar Action Plan
MECIE	Mise en Compatibilité des Investissements avec l'Environnement
MEF	Ministère de l'Environnement et Forêts
MGA	Malagasy Ariary
MNP	Madagascar National Parks
MoM	Ministry of Mines
NAP	Nouvelles Aires Protégées
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organisation
OMNIS	Office des Mines Nationales et des Industries Stratégiques
ONE	Office National pour l'Environnement
PA	Protected Areas
PEE	Plan d'Engagement Environnemental
PGRM	Projet de Gouvernance des Ressources Minérales
PRA	Participatory Rural Appraisal
PRE	Permis Réservé aux petits Exploitants miniers
PRSM	Projet de Réforme du Secteur Minier
REBIOMA	Réseau de la Biodiversité de Madagascar
SAPM	Système d'Aires Protégées de Madagascar
SDM	Strategic Decision Meeting
STD	Sexually Transmitted Disease
TOR	Terms of Reference

UN	United Nations
USAID	United States Agency for International Development
VAT	Value Added Tax
VOI	Vondron'olona ifotony
WIO	Western Indian Ocean
WIOMER	Western Indian Ocean Marine Ecoregion
WISCO	Wuhan Iron and Steel (Group) Company
WWF-CARPO	WWF's Central Africa Regional Programme Office
WWF	World Wide Fund for Nature

1. INTRODUCTION

This report forms the first part of a two-part project, entitled “ASM in Madagascar (AiM) Strategic Management of Artisanal Rushes Tool (SMART) and Lessons Learned Study”. It is intended as a national-level review of artisanal and small-scale mining (ASM) occurring in Madagascar’s protected areas and other critical ecosystems.

1.1 Context

Madagascar is an island of exceptional biological importance. The world’s fourth largest island, Madagascar broke off from the Gondwanaland supercontinent over 160 million years ago. According to Conservation International, Madagascar provides an important example of “species evolution in isolation”. Accordingly, Madagascar is home to an exceptional level of endemic animal and plant species; some 25per cent of the world’s primates and 4per cent of the world’s plants are only found on this island. Some of the interesting and unique species of flora and fauna on the island include the baobab (bottle) tree, the traveller’s ‘signature’ tree, cuckoo-rollers, 97 different types of lemurs, the Madagascar flying fox, and many more. Approximately 90per cent of plant life, 60per cent of birdlife, 90per cent of mammals, 96per cent of reptiles, 86per cent of invertebrates and nearly one 100per cent of amphibians are endemic to the island. Indeed, of the approximately 300 species of birds found on the island, fifty-five are endemic and threatened and thirty-two have already become extinct. Forty percent of the island’s endemic mammals are endangered, as are one quarter of endemic birds and amphibians. “Madagascar is irreplaceable” states WWF (WWF), which considers the entire island a WWF Priority Place. Madagascar hosts twenty WWF flagship species and is home to five WWF Ecoregions: Madagascar Forests and Shrublands, Madagascar Dry Forests, Madagascar Spiny Thicket, Madagascar Mangroves, and the Madagascar Freshwater ecoregion. There are two natural World Heritage Sites on the island, which include the Rainforests of the Atsinanana and Tsingy de Bemaraha Strict Nature Reserve.

In September 2003, President Ravalomanana announced his commitment to triple Madagascar's protected areas in five years at the World Parks Congress in Durban, South Africa. This commitment was called the "Durban Vision". Since 2005, following the “Durban Vision”, the PA network includes both pre-existing and new PAs managed under the structure known as the System of Protected Areas of Madagascar (*Système des Aires Protégées de Madagascar*, or SAPM) controlled by the Ministry of Environment and Forests (MEF). Since 2005, SAPM has both reached and surpassed their objectives, although many PAs have temporary status at present.

This plenitude of biodiversity, and the efforts to conserve it, are at risk. Human activities such as deforestation, mining, wildlife trade, etc., are the main threats to the habitats of endemic species. WWF has warned that if the use of natural resources does not soon drastically change, many endangered and endemic chameleons and lemurs will become extinct by the end of the century. Human activities such as deforestation, agriculture, wildlife trade, fishing and soil erosion are the main threats to the habitats of these endemic species (WWF, 2011). These habitats can be restored; but there needs to be a more concerted effort to reduce the human impact on the environment.

Concomitant with Madagascar’s status as a biodiversity hotspot has been the country’s emergence, especially over the last twenty years, as a significant locus for ASM activity. While artisanal gold mining has occurred in Madagascar for centuries, artisanal miners are now also producing significant quantities of gemstones, including sapphires, rubies, aquamarine, tourmaline, topaz, amethyst, and emeralds (World Bank, 2010b). Rubies and sapphires are the country’s major gemstone exports (Cartier, 2009). An estimated 450-500,000 miners are involved in ASM (World Bank, 2010b); there are an estimated 150,000 artisanal sapphire miners and 350,000 artisanal gold miners (World Bank, 2010b). Over the last 20 years, ASM activity in Madagascar has been marked by a succession of rushes, sometimes with miners in the tens of thousands converging on specific areas. Many, if not most, ASM rushes have taken place in or very near to protected areas and critical ecosystems (PACE). This has resulted in serious environmental impacts on PACE, besides the socio-economic ramifications of mass migration in a country already beset by problems of limited infrastructure.

The rise in ASM activity and rushes has coincided with a series of three major political crises, over the last two decades. These crises have enfeebled an already fragile state, with deteriorating economic conditions also contributing to the expansion of ASM activity. Given Madagascar’s status as resource rich but economically poor, ASM in PAs provides a rare opportunity for people to engage in entrepreneurial and independent income generation without having to worry about the property holder (Walsh, 2011). Political instability, with its impact on the capacity of the country’s institutions of governance, has exacerbated the problem.

1.2 Objectives

The overall objective of the AiM-SMART project is to address the growing threat of ASM on, in and around Madagascar's protected areas (PAs) and critical ecosystems, and ideally in a way that can ensure continued socio-economic development without undermining ecological resiliency.

This report's remit is both to provide an historical perspective, and to illustrate the extent of ASM activity and rushes - focusing on successful and failed methods to cope with mineral rushes, and what has been learned in terms of effective ASM and ASM-rush management as a result. A principal objective of the review is to provide analysis on progress, or lack thereof, made toward the reduction of ASM rushes. Thus the study embraces both current and historical incidences of ASM activity and rushes, with an element of analytical comparison between different experiences and approaches to rushes.

1.3 Methodology and framework

1.3.1 Methodology

As per the original TOR, a number of methodological approaches have contributed to the preparation of this report. Firstly, extensive desk-based study was deployed for the writing of the historical overview of ASM in Madagascar, as well as the country's system of protected areas and sensitive zones. This was complemented by 60+ interviews with a range of interlocutors from key stake-holding groups, including current and former staff of PGRM, WWF, MNP, CI, Ministry of Mines, Fanamby, Durrell Wildlife Trust, USAID, the Mines-Forest Committee, ONE, various Inter-regional Mines Offices, Ministry of Environment and Forests, Ministry of Finance, Voahary Gasy, IGM, Madagascar Central Bank, the commercial jewellers association FIRAVAKA, Ambatovy Project, UNICEF, National Committee of Mines, and the Chamber of Mines.¹

1.3.2 Methodology for Field Site Visits

Key Points to Methodology during Site Visits

- Face-to-face interviews with artisanal miners and their families, local officials, park authorities, local villagers
- Accurate pinpointing of ASM activities and rushes at the selected sites, with recording of GPS coordinates
- Participatory Rural Appraisal (PRA) approaches, e.g. participative mapping, was used with an open-ended questionnaire to guide the study at each site
- Photographic record of locations where ASM and rushes have taken place
- Photographic record, where possible, of environmental degradation caused by ASM and rushes in protected areas
- In-depth research of different perspectives from interlocutors (e.g. motivations of miners/push and pull factors) - focusing on the differing perceptions of ASM in protected areas from respective vantage points. This provides the review with an on-the-ground, indirect dialogue between groups frequently in conflict over ASM in protected areas

PRA approaches with local people and/or authorities:

- Participatory mapping to describe the current and historical situation at the site (homes, mines, access, conflicts zones, etc)
- Site observations and discussions with oblique photography to describe the current situation or residual impacts
- Ranking and weighting of issues during a "rush" with small key focus groups
- Key open-ended, semi-structured questions posed to local participants, with responses used to generate subsequent and related questions and answers to mining issues

Bio-physical and human impact site reconnaissance

At each site key observations regarding biophysical features were noted as follows:

¹ A comprehensive list of contacts is contained in Appendix 1

- Description of habitat (rainforest, savannah, etc.); whether pristine or degraded condition
- Description of soils and geology
- Topography
- Description of human impact on environment (pre-mining)
- Description of mining impact
- Description of water bodies in the area (e.g. streams, rivers, springs, etc.)
- Human economic activities, other than mining, at the site
- Nature of access between site and transportation routes

1.3.3 Report Framework

Sections 1-6 of the report are mainly empirical, based upon desk-based research, interviews with key stakeholders, and observations gleaned from the site visits.

Sections 7-9 are organized thematically, exploring some of the key impacts and issues, which emerged from the empirical research.

Section 10 presents some potential future scenarios, in terms of key stakeholder responses to ASM rushes in protected areas.

Section 11 contains the conclusion.

1.4 Sites selected

The TOR stipulated nine potential locations for review/documentation of experiences associated with ASM activity and rushes: Ankarana, Ambanja, Daraina, Andapa, Fandrina-Moralombo-Vondrozo (FMV) Corridor, Isalo, Zombitse-Vohibasia, Amboron Onilahy, and the Madrare Basin.

After consultation with a range of stakeholders in this project (WWF, PGRM, The World Bank, ELL, Ministry of Mines) it was decided that there should be site visits to the following locations: Isalo PA, the COFAV Corridor (including Ranomafana PA), Ankarana PA, Antetetzambato/Ambanja, Betsiaka, subject to time and rainy season weather constraints (see **Figure 1**).

The sites selected combined ASM of both gems (Isalo PA, Ankarana PA, Antetetzambato/Ambanja) and gold (Ranomafana PA, Betsiaka).

Besides the prerequisite for visits to sites of both gem and gold mining, the respective sites were also selected on the basis of a number of other criteria: as broad as possible a range in terms of geographical locations (Isalo PA, Ranomafana PA in the south, and Ankarana PA, Betsiaka, Antetetzambato/Ambanja in the north); differing habitats (mangrove/marine in the case of Antetetzambato/Ambanja; terrestrial for the rest); differing historical perceptions of past ASM management, success or failure; differing stages of maturity in terms of current ASM rushes, e.g. Ranomafana PA, ongoing for a number of months.

In the field, it proved possible to visit additional sites – Zombitse PA in the south, Ankotika (Andampy) and Antsirabe in the north, and Soamahamanina, near Arivonimamo in the province of Tananarive. Due to extreme logistical difficulties in accessibility during the rainy season, and following advice from the Inter-regional Director of Mines in Antsiranana, Betsiaka proved impossible to access. It has instead been covered as a desk-based study.

The additional locations for field visits were selected as the project developed. Gemstone ASM in and around Zombitse PA serves as an interesting contrast to the Isalo PA case study. The relatively small sapphire rushes in Ankotika (Andampy) and Antsirabe complement research done in Ankarana and Antetetzambato, illustrating the “vector effect” whereby the catalyst for some rushes, besides the obvious requirement of gemstones or gold, often seems to be existing or newly opened transport routes, with miners commuting between the sites. Soamahamanina, near Arivonimamo is a very recent gold-rush, dating from March 2012, close to the capital Antananarivo, and interestingly illustrative of how commune-based local authorities are in the process of semi-formalising the ongoing rush, independently of central government and the Ministry of Mines. While the Soamahamanina ASM gold rush site is neither a PA nor a critical ecosystem, it lies less than 500m from a water

source, which is used as part of the ASM activities, and thus under current Malagasy legislation qualifies as a sensitive zone (see **Section 4.2**).

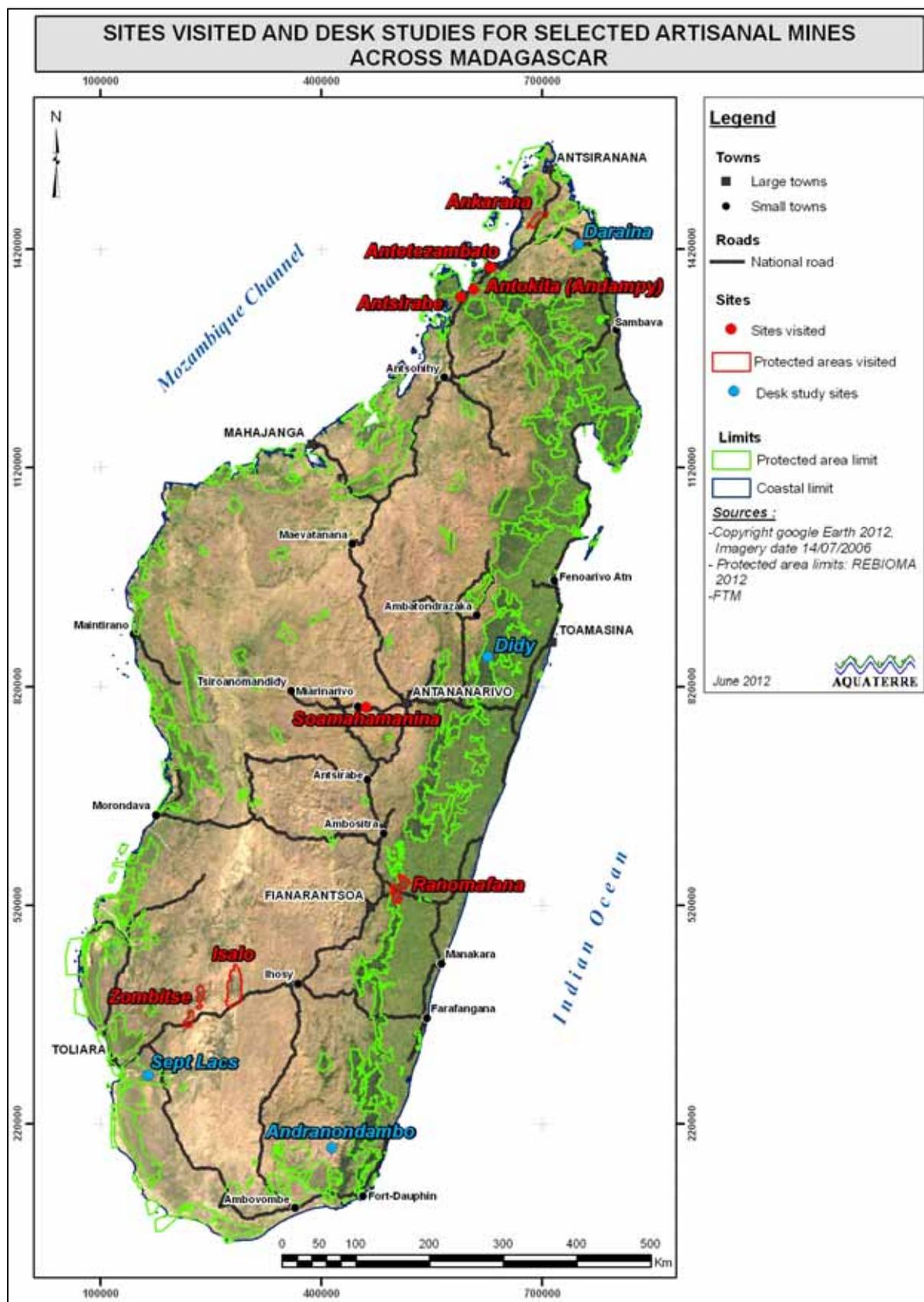
In addition, during the course of the study, in late March/early April, a new and very significant ruby and sapphire rush occurred near Didy, in a CI-sponsored New Protected Area or NAP in the Ankeniheny-Zahamena Corridor, in the east of the country. Despite considerable difficulties of access, this rush in the heart of a protected area soon attracted tens of thousands of miners. Up until the point of writing, there has been no significant response or intervention from the government. As part of this report, we were able to follow relatively closely the various institutional responses to this developing situation.

1.5 Time frame

Site visits were carried out between 31 March and 16 April 2012, with the Soamahamanina site visit taking place on 23 May 2012.

Desk-based study and key interlocutor interviews took place between 23 March and 30 May 2012.

Figure 1: Sites Visited and Desk Studies



2. GENERAL POLITICAL AND SOCIO-ECONOMIC CONTEXT

2.1 Political history to the present

Prior to the French colonisation of Madagascar in 1896, the country was ruled by a patchwork of kingdoms across the country, with the most dominant being the Merina Kingdom of the Highlands. The French military conquest resulted in the abolition of the Merina monarchy. Official independence for Madagascar came in 1960.

The First Republic began under the authority of President Tsiranana, whose regime was regarded as closely aligned to the interests of French post-colonial policy. This period inspired unrest with major opposition demonstrations in 1972, leading to an interim government with nationalistic foreign and domestic policies. Later in 1975, a military directorate handed over power to a naval officer, Didier Ratsiraka, who aligned Madagascar with Marxist countries and similar agendas (Randrianja and Ellis, 2009). An ideology of “Scientific Socialism” (World Bank, 2010b) brought about large-scale nationalisations of various companies. Within a few years the country’s economy collapsed, with the legacy of its failure continuing until today.

In 1991, a political crisis forced the incumbent, Didier Ratsiraka, to relinquish most of his power, agreeing to a Constitutional Referendum and fresh elections. These ushered in the government of President Zafy Albert, who came to power in 1993. Didier Ratsiraka regained power in 1997 through democratic elections, followed by a reassertion of an increasingly authoritarian presidential diktat. The dominant concentration of power in hands of the Presidency remains an ongoing issue in terms of Madagascar’s governance (World Bank, 2010b).

Elections in December 2001, with Didier Ratsiraka running against Marc Ravalomanana, the then mayor of Antananarivo and a self-made business tycoon, led to a protracted political crisis in 2002. After several months, power started to shift towards Marc Ravalomanana, who was sworn in as president.

Since the beginning of 2009, Madagascar has been plunged into its as yet longest political crisis. This was precipitated by the rivalry between the incumbent Ravalomanana and another former Antananarivo mayor, Andry Rajoelina.

Ravalomanana lost power in March 2009 when a military-backed coup forced him to go into exile in South Africa. Subsequently, Rajoelina proclaimed himself President of a new governing entity, the High Authority of the Transition (HAT). The take-over of power was rejected by most of the international community, with many condemning it as an unconstitutional and undemocratic transfer of power. Negotiations in various countries, such as those culminating in the Maputo Agreement, have up till now failed to resolve the crisis. Meanwhile, the international community continues to search, through negotiations, for a route to presidential elections under the auspices of a consensual and democratic transitional government.

Madagascar’s cycle of political and economic crisis has been a relative constant in the country’s political economy for the last twenty or more years. Yet, despite the crises there have been periods of stability; and the political history of Madagascar has also brought about significant reforms in recent times in terms of mining, with the notable Mining Policy Decree in 1998 and subsequent Mining Law of 1999. These steps attempted to improve transparency of all mining activities and were later reinforced with the Mining Codes of 2003 and the revised Code of 2005. Legislation in Madagascar has shown a will to improve mining practices, and is discussed in more detail in Section 5. However, as this report will illustrate, the current political crisis, combined with over 20 years of practical ASM rush experience for tens of thousands of miners across the country, as well as the current high spot price for gold, has exacerbated and brought to the surface underlying fault-lines between PACE and the ASM sector.

2.2 Social characteristics

Madagascar’s population has been increasing steadily as a result of improved hygiene and health conditions (GEF, 2008) combined with a demographic growth of approximately 2.8per cent per annum (World Bank, 2010a). The population was estimated at 6.2 million in 1966 and is now almost 4 times more than that figure in 2011 with over 21 million people. In 2008, the average density of the population was estimated at over 20.5 inhabitants per square kilometre, while a 70per cent majority live in rural areas (World Bank, 2010a). The demographic structure of the Malagasy population is young, with more than 60per cent of the Malagasy population being under 25 years of age owing to current high fertility rates and declining mortality rates (GEF, 2008). In context, the Malagasy population is expected to more than double in number by 2040 (UNESA, 2012).

The rural areas of Madagascar are characterised by widespread and extreme poverty. The rate of illiteracy in the Malagasy language is estimated at just under 30per cent of the population across the country (Action for Southern Africa, 2012). Standard of living indices for the capital, Antananarivo, are not necessarily representative of the country as a whole, which is composed of principally rural and often isolated communities.

2.3 Economy

Over the past 40 years Madagascar has declined from being a moderately prosperous country to becoming one of the poorest countries in the world. The Second Republic under Ratsiraka was principally responsible for this demise. After being one of the better-performing African economies in the 1960s, Madagascar lost ground due to several decades of economic mismanagement. From the 1970s until the mid-1990s, growth of Gross Domestic Product (GDP) averaged only 0.5per cent, while the population grew at about 2.8per cent per annum. Per capita income declined from US\$473 in 1970 to USD410 in 2008 placing Madagascar amongst the world's poorest countries (World Bank, 2010a). Close to 70per cent of the population live below the poverty line, on less than US\$1 per day (Action for Southern Africa, 2012). Meanwhile over 80per cent of the poor are rural people living as subsistence farmers with limited education and means of communication (Instat, 2009). Poverty in rural areas is significantly higher than in urban areas. Meanwhile, the 2009 Human Development Index ranked Madagascar 145 out of 182 countries (World Bank, 2010a).

Between 2002 and 2008, Madagascar embarked on an ambitious transformation path that brought some improvements in social, economic and governance indicators with the evolution of the Madagascar Action Plan (MAP). The economy grew at an average of 5per cent per year, and poverty declined to 69per cent from its peak of 80per cent in 2002. But the macroeconomic situation remained fragile. Governance continued to be weak, with social indicators still low, while prospects were slim that Madagascar would be able to achieve its Millennium Development Goals by 2015 (World Bank, 2010b). Magnifying these challenges were significant and persistent deficits in human capital, which continued to place enormous demands on the government and the economy, firstly to educate people, then to generate jobs for them.

Since the beginning of 2009, the political crisis has led to a decline in economic growth, exacerbated by the negative impact of global financial turmoil upon export-oriented activities. The local economy has been in recession since the second quarter of 2009, while GDP contracted by almost 5per cent in the same year (World Bank, 2010b). There has been a marked decline in export-oriented sectors, as well as tourism, and a drastic cut in construction because of lower public investment.

The political crisis has had a negative impact on the economy, but with marked variations across sectors. Most export-oriented activities, as well as those linked to public sector funding (such as construction) have been in disarray, as reflected by the fall in exports (down by 50per cent between 2008 and 2010). Concurrently, the primary sector has been resilient with an exceptional rice harvest in 2009 (up by 40per cent from 2008 levels) and mining sector production jumping significantly due to the Rio Tinto (QMM) mining project starting production in mid-2009 (World Bank, 2010b).

Since the beginning of the political crisis, the government has followed prudent fiscal and monetary policies. On the fiscal front, the level of expenditures has been aligned to domestic revenues, with limited use of domestic borrowing. As a result, monetary expansion and inflation have remained under control, as well as other financial indicators, i.e. interest and exchange rates, over the past year. This cautious behaviour has led to drastic cuts in public expenditures (others than wages), with almost no capital spending from 2009 into 2010.

New external financing from recent Chinese investment through WISCO in the mining sector provided around US\$100 million in budget support, which was allocated by the HAT Presidency to finance a series of new investment projects (hospitals, sports arenas, etc.) (World Bank, 2010b). Similar projects may evolve through the recently established Madagascar–China International Fund Ltd., created by the HAT and a Chinese company, and reportedly keen to invest in various domains including mining of various mineral resources. Established investors in Madagascar are reported to be worried that the State would give privileges to this large investor (Midi Madagasikara, 2011).

The economic situation nonetheless remains extremely fragile. Firstly, economic recovery is still linked to the resolution of the political crisis and recognition by the international community. A large proportion of donor aid, which represents 40per cent of the budget and 75per cent of public investment, remains on hold, leading to a decline in the delivery of social services and significant cuts in the public investment program. Secondly, a series of policy decisions in strategic sectors, such as in telecommunications, petroleum and mining exploration and food production/distribution, have sent mixed signals to operators and new investors. These decisions have raised concerns about the HAT government's commitment to reforms and the potential risks of collusion between

dominant firms and decision-makers, as has been inferred in relation to Madagascar–China International Fund Ltd. Thirdly, Madagascar remains vulnerable to external shocks, including changes in food (rice) and oil prices on international markets and climatic disasters, notably cyclones across the country and droughts in the south (World Bank, 2010a).

The structure of the economy, in 2008 prior to the political crisis, can be described in percentage terms of GDP and average annual growth as follows (World Bank, 2010a):

- Agriculture: 25.2per cent GDP and 2.8per cent growth;
- Industry: 17.3 per cent GDP and 6.8per cent growth;
- Manufacturing: 15.3per cent GDP and 6.4per cent growth;
- Services (includes tourism): 57.5per cent GDP and 9.3per cent growth.

Mining would have formed part of the percentage of GDP and growth for the industry sector, accounting for approximately 0.7per cent of GDP in 2008. These figures do not include the significant economic impact of informal mining activities. They will be considerably more significant when both the Ambatovy Project and Rio Tinto (QMM) are producing from their respective mines.

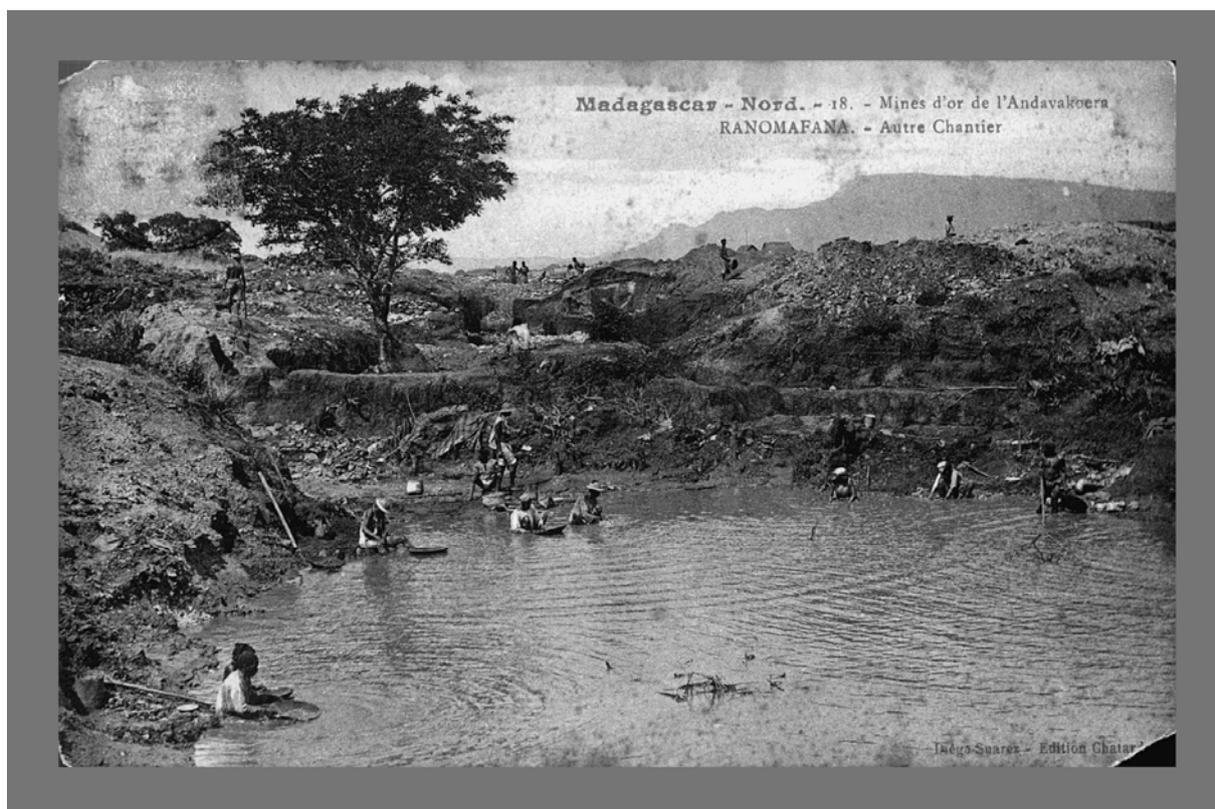
3. OVERVIEW OF ASM AND RUSHES IN MADAGASCAR

3.1 General history of gold and gemstone mining in Madagascar

The first historically documented gold mining concession in Madagascar was granted in December 1886 by the Merina Kingdom to a Frenchman, Monsieur Suberie (Belleville, 2008). The mine site was located near Maevatanana, in the central-north part of the island, which until today remains the most significant area for gold mining,² with the added attraction of a relatively high gold purity of around 95per cent³. The concession was effectively a joint venture between the French concessionaire and the Malagasy government. However, the arrangement came to an end in 1893 – with an officially recorded production of 835kg over 6 years.

1. Figure 2: Photograph of gold ASM near Daraina in the north of Madagascar, c.1910

(Credit: Smithsonian Institution Research Information System (SIRIS))



With the French colonization of the country in 1896, there came an influx of foreign prospectors eager to prospect for gold, with individuals coming from as far afield as California and South Africa. Subsequently, the colonial-era Mines Service or *Service des Mines* began to produce regular statistical analyses of gold production, which coincided with the first colonial government decrees regulating prospection and mining (Belleville, 2008). The initial focus of the miners was on areas already known for their gold deposits, such as Ankaratra and Betsiriry. In 1907, production peaked with discovery of a rich gold field in Andavakoera, in the north of the country. In the following years levels of production generally oscillated in tandem with movements in the international price of gold, e.g. a plummeting of production following the Great Depression in 1929, and likewise in 1970 when gold hit an all-time low of US\$35/ounce.

Given Madagascar's geological formation and history, gold is found within the country in the form of veins or sedimentary deposits following the erosion of mineral-rich bedrock. Madagascar's gold deposits are classified broadly into two categories, primary and secondary deposits. Madagascar's primary gold deposits, are found in

² Cushman, Tom. Founder and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal Communication. 12 May 2012

³ Manharlal, Razik. President of Jewelers Association FIRAVAKA. Personal Communication. 25 May 2012

Precambrian metamorphic terrains as veins of gold-bearing quartz, or finely disseminated in the various facies of the crystalline schists.

Secondary deposits are formed through the alteration of primary deposits. The re-concentration of gold by surface waters is a common mechanism in Madagascar, which has led to formation of economical grade gold deposits. These secondary deposits include eluvial deposits, where the secondary material has been transported along slopes. Eluvial processes can form locally valuable deposits, despite a low-grade origin. Old alluvial deposits occur where the gold-bearing sediment is consolidated. These alluvial deposits are common along valley floors and terraces. Present day alluvial deposits are found in the gravels and sediments of present-day riverbeds. These have been traditionally the easiest deposits to exploit artisanally. More than 80 per cent of Madagascar's historical gold production has originated from these deposits (Belleville, 2008).

Although sapphires and other gemstones have been known to exist in Madagascar since the 16th century, widespread mining is a relatively recent phenomenon. Exploitation of gemstones, such as sapphires, rubies, aquamarine, tourmaline, topaz, amethyst, and emeralds, developed later than that of gold, with the real boom starting in the early 1990s when the onset of sapphire rushes began to pepper the country's topography. However, despite the late start, rushes for gemstones have arguably eclipsed in scale those for gold, with often much larger and more frenetic migrations of artisanal miners to new rush sites. In 2002, just after the peak of the Ilakaka sapphire rush, it was estimated that 50 per cent of the world's sapphires came from Madagascar (USGS, 2003). While it's generally thought that production decreased significantly following government intervention in 2008 (see **Section 3.5**) and subsequent political ructions (USGS, 2010), Madagascar's contribution to the global sapphire market remains very considerable.

As with the case of gold, Madagascar's geological history is particularly interesting in terms of determining the location of sapphires and other gemstones. Sapphire deposits in the north come from alluvial deposits of weathered basaltic rocks, while those in the south have metamorphic origins. Mechanized mining is difficult given the scattered nature of the deposits and the high costs involved.

3.2 Respective characteristics of gold and gemstones ASM

The production of both gold and gemstones in Madagascar remains mainly reliant on ASM (World Bank, 2010a). This is due to a number of factors – geological formation, lack of infrastructure, remote locations of mining sites, confusing and contradictory laws, non-transparent and often informal regulatory structures in-situ (SDM, 2006). The ASM of both gold and gems is largely informal.

3.2.1 Gold Value Chain

The formal gold value chain is theoretically monitored by the *Agence de l'Or*. However, currently the function of the *Agence de l'Or* is being fulfilled by the BCMM, the Land Registry Office of the Ministry of Mines, which aside from its headquarters in Antananarivo maintains six provincial offices. In theory, the artisanal gold panners/prospectors, or "*orpailleurs*", should possess a permit. This is annually renewable and issued by the commune. Issuance is conditional on the panner committing to observe the commune's environmental, and health and safety regulations. Adherence to these is monitored by the commune. Collectors, who buy from the panners or from the "*Epicière*" (see **Figure 3**), are also obliged to have an annually renewable permit, which they must purchase from the commune, currently priced at MGA 200,000 per year. The collectors pay the royalty tax – the *redevance/ristorne*, totaling 2 per cent, of which respectively 0.6 per cent goes to the coffers of the state, and 1.4 per cent as *ristorne* is retained by the decentralized local authorities, region and commune. The next stage in the formal value chain is the gold *comptoir*, which is the theoretical interface between the panners, permit holders, collectors and the gold traders or gold users.

However, this formal value chain is largely academic in that most gold passes through an informal value chain – without formal payment of the *redevance/ristorne* to the state or commune.⁴ It is generally accepted that the difficulty of regulatory compliance (e.g. collector permits only valid for the issuing commune) effectively invites actors in the gold value chain to operate informally, rather than formally.

Estimates vary as to the number of gold panners. In 2001, it was thought that there might be 200,000 panners in Madagascar. Today, it is believed that these figures may have doubled over the intervening period – not least because of deteriorating economic conditions for the majority of the population, combined with the near tripling of gold's international spot price. Current estimates are between 350,000 and 500,000 panners. One

⁴ Though increasingly local authorities at the communal or regional levels are semi-formalizing rush sites with implementation of a locally regulated *redevance/ristorne*.

complication in estimating the number of panners is that most artisanal miners of gold combine ASM activities with subsistence agriculture. ASM activity decreases significantly during the rainy season.

Figure 3: Gold value chain (Source: excerpted from World Bank, 2010b)



	Agent	Activity Description
	Panners	Local individuals or small family groups pan for alluvial gold dust in current or former river beds. Often part-time in complement to agricultural activity. Gold panners often sell their findings daily to local grocery store owners, in return for goods or money. If they do not depend on daily sells, they can save their gold and skip one intermediary by selling directly on the weekly market.
	“Epicriere” (small grocery store owners)	A local “Epicriere” weights the gold, stores it and sells it every week to collectors on the market.
	Collector	(Often local) collectors buy gold on market day from “Epicures” or directly from panners. They typically do not use their own money, but are financed by super-collectors who come before the market day to provide collectors with cash.
	Super-collector (limited visibility)	Most super-collectors are not local, but come from the capital or a larger town. They typically run (finance) several collectors in different villages.
	Gold trader / Gold user (limited visibility)	Gold traders buy gold from super-collectors, either to use it for wealth storage in some quantity or export it. Gold users are domestic jewellers who buy gold (in part) for their own production.

3.2.2 Gemstone Value Chain

The vast majority of gems exported from Madagascar are informally mined and traded (SDM, 2006). The same principal of *redevance/ristorne* applies, though “enforcement of governing laws is usually not applied until the export stage” (SDM, 2006).⁵ The gemstones are usually exported to Asia in a rough, unprocessed state. Thailand and Sri Lanka are the two main destinations, and also their nationals make up the majority of foreign buyers operating in Madagascar. Official permits, known as *laissez-passer*, are required for legal export of the gemstones (see **Section 9.3**). Many foreign buyers, mainly western and Thai, also need *laissez-passer*, as a form of invoice, for their own tax returns in their countries of origin.⁶

It’s thought that, in terms of volume, most stones are legally exported. However, it’s also reported that foreign buyers tend not to declare the high value gems, and these are smuggled out (SDM, 2006). An impact of the political crisis, with increased opportunities for corruption and decreased enforcement, could be the fact that, whereas in the past only high quality stones were illicitly exported, currently average quality gems are also being smuggled, with only low quality being declared legally.⁷

Moreover, in recent years the emergence of Hong Kong as a principal trading centre for Malagasy gemstones has meant that buyers who would otherwise need to obtain in Madagascar the legal paperwork for tax returns in their countries of origin can now obtain the appropriate invoices in Hong Kong, which is effectively a free port for the entry of the stones. This has exacerbated the problem of illicit exports.

⁵ However, a number of interlocutors from local government, at the commune level, made the point that when the royalty tax is paid to central government, at the export stage, the *ristorne* normally due to the local authorities often does not find its way back to the region or commune.

⁶ Cushman, Tom. Founder and Director of IGM 2003-7, WB consultant - ASM issues, founding member National Committee of Mines. Personal communication. 12 May 2012

⁷ Ranorosoa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

Close to the ASM site, miners often sell their stones to “the ladies in hats”, who will in turn deal with “the men in cars”. The ladies wear hats as they sit out in the sun, waiting to trade with the miners; while the men sit in their cars waiting for the ladies. The value chain continues through the Malagasy “businessmen”, until finally the gemstones are sold to the foreign buyers (see Figure 4).⁸

Figure 4: Gemstone value chain (Source: excerpted from World Bank, 2010b)



Agent	Activity Description
Artisanal Miner	Artisanal miners may or may not be working on a registered mining claim. They work under three distinct types of arrangements: <ol style="list-style-type: none"> Independence. Most frequently artisanal miners work without the permission of the permit holder. They dig where they will and sell their findings to whom they will. Sponsorship. Sometimes, the permit-holder provides artisanal miners working on his permit area with their daily needs or a small salary in return for the gemstones they find. The permit-holder regularly sells the accumulated stock to buyers or exporters and typically retains 2/3rds of the proceeds, redistributing 1/3 to his diggers. First-right to purchase. Sometimes, instead of a sponsorship arrangement, the permit-holder can exercise his first right of purchase for stones found by diggers on his square, slightly below market price.
The “Ladies in Hats”	Often, artisanal miners sell their day’s production directly at the mine or the washing site near the mine to the “Ladies in Hats”. These ladies are small independent buyers who stay near the digging and buy daily for cash. As the daily production is usually small and the size of the merchandise also these women may be funded with only 4,000 to 20,000 Ar. The ladies return at the end of every workday to the nearby town or camp.
“Men with Cars”	“Men with Cars” have access to transport and either buy the stock of “Ladies with Hats” at towns/camps or transport several ladies to the regional commercial center.
“Businessmen”	In each commercial center is a daily market of Malagasy only. The “Businessmen” who participate in this market buy from the transporter and ladies who have their own means of coming to this market. The daily market is usually held at 6:00 am and foreigners are never welcome. The Businessmen make up lots from their purchases and then circulate among the foreign “Exporter/Buyers” offering each buyer the type of merchandise they desire. Most buyers and most different nationalities (Thai, Sri Lankan, African, and Western buyers) specialize in one type of product.
Exporter	The gemstones are usually exported to Asia in their rough state.

3.3 ASM rushes

3.3.1 Respective Characteristics of Gold and Gemstone Rushes

There are significant differences in the characteristics of gold and gemstone rushes. The latter tend to be much larger-scale, with the numbers of miners sometimes running into the tens of thousands; while the former, with the exception of Daraina, are generally more incremental, and less prone to such massive migratory influxes.

This difference can in part be attributed to the different scale of potential reward from the respective rushes. Although most artisanal miners will not make great fortunes from their ASM activity, there are regular cases of individual gemstone miners finding exceptionally valuable stones, which can be life transforming. These stories of relatively immense and immediate wealth have become apocryphal in the community of ASM rush miners (Walsh, 2003), and will doubtless continue to attract miners in their tens of thousands to future rushes, as in the case of the ongoing rush near Didy.

⁸ Cushman, Tom. Founder and Director of IGM 2003-7. Personal communication. 12 May 2012

However, there is also another school of thought, which takes a more nuanced position. After 20 years of rushes, there may have been a maturing of the ASM rush mentality. Given the grievous deterioration in the country's economy, following the political crisis of 2009, and the attendant further impoverishment of much of the population, one might expect that numbers involved in ASM rushes would have soared. This is thought not to be the case, instead remaining relatively constant. That could be a result of more realistic ASM rush expectations, as a large proportion of the population has become familiar over the course of two decades with the reality that most ASM gemstone miners will not attain sudden riches through mining.⁹

The scale of potential reward from ASM of gold tends to be much more limited, with little likelihood of making a fortune from the activity. Gold miners tend to combine mining activities with continuing subsistence agriculture. Most will produce between 0.10 and 0.20 g/gold per day.¹⁰ Thus gold can play an important role in cash income generation for the miner and his family, offering a relatively steady daily return when the miner needs to generate cash income. Moreover, the exponential increases in recent years of the international spot price for gold has made gold ASM an increasingly attractive option for miners.

3.3.2 Origin and Composition of ASM miners in Rushes

In the case of gemstone rushes, miners often come from all over the country. From our meetings with miner focus groups, as well as discussions with key stakeholders, there seems to be a perception that certain regions contribute more significantly to the migrant rush ASM population, especially Betsileo and Antankarana, from the region around Antsiranana. This may be linked to the historical legacy of mining activities in those areas. In large-scale gemstone rushes, miners often form themselves into associations based upon their regional origin, for example from the regions of Atsimo Andrefana, or Diana in the south and north, respectively.¹¹ These associations should not be confused with unions or syndicates. Attempts to assist artisanal miners in forming unions, or longer-term associations, have been unsuccessful.¹² This could be linked to an ASM mining culture of self-interest, as opposed to collectivity, as noted by the anthropologist Andrew Walsh (Walsh, 2003). In an ASM gemstone rush the initial cohort of miners will tend to be young men, with an average age of 20-35 years.¹³ Those who decide to remain at the site later send for their families as the rush stabilizes, as in the case of Ilakaka.¹⁴

Gold rushes tend to be much more localized than gemstone rushes, with miners coming from villages and communes in the immediate vicinity of the site. The numbers involved in the rushes are far lower than with gemstone rushes. Also, given the relative proximity of the site, the miners are often accompanied and assisted by family members, wives and children. The mining unit, usually of 5-6 people, has clearly delineated roles for its different members. The men will dig the mine, while the women and children will perform some of the lighter roles, such as panning in whatever nearby water source (Ecoex, 2003).

Besides the artisanal miners and their families, ASM rushes are also composed of others who are essentially part of a service sector for the miners. These may well include shopkeepers, bar owners, sex workers, teachers, preachers of religion;¹⁵ and an Ilakaka-based casino business seems to be spreading to other ASM-linked locations, with the external murals, even architectural design, of its new branch in Ambilobe (conveniently close to the Ankarana, Antetazambato, Betsiaka rush sites) replicating exactly the same branding and colour scheme as the Ilakaka original (see **Figure 5**). In Ilakaka, people from the Merina and Betsimisaraka groups make up a substantial proportion of the service sector.¹⁶ At the Antsirabe village rush site in the north, it was estimated that approximately 80 per cent of the rush migrants were miners, with the remaining 20 per cent providing services.¹⁷

⁹ Rakototafika, Gérard, DG Ministry of Mines. Personal Communication. 28 March 2012

¹⁰ Tom Cushman, Founder, and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal Communication. 12 May 2012

¹¹ Mohamady, Bruno. Professional miner, and permit holder, working at Antetazambato. Personal Communication. 11 April 2012

¹² Rakotondravaly, Desiré. Director Technical Support, Gold Mining and Rushes, Ministry of Mines. Personal Communication. 8 May 2012

¹³ Rajaonarivo, Aro. Director of Isalo PA, MNP. Personal communication. 2 April 2012

¹⁴ M. Paraly, Ilakaka Fokontany chief, former miner. Personal communication. 2 April 2012

¹⁵ At the Antokita ASM rush in the north, at least two new churches, albeit of very basic construction, have opened since the onset of the rush.

¹⁶ Rajaonarivo, Aro. Director of Isalo NP, MNP. Personal communication. 2 April 2012

¹⁷ Razafimanantsoa, P. Deputy Mayor, Antsirabe. Personal communication. 12 April 2012

Figure 5: Jokers Casino, Ambilobe



3.4 General history of rushes

By overlaying data from the BPGRM database detailing the historical incidence of known gemstone sites and rushes onto a map of Madagascar's fully gazetted and temporary status PAs, from 2010 provided by REBIOMA, one can detect the general geographical hotspots for ASM gem rushes (see Figure 6). There is a large concentration in the central region of the country, verging into the eastern forest corridors, continuing to the south, with isolated incidence in the north. There is little activity on the west coast. In the case of gold, there are two clear concentrations of ASM gold sites and rush activity, in the central north area around Maevatanana, as well as the eastern forest corridor north and south of Fianarantsoa (see Figure 7).

Figure 6: Gemstones of Madagascar

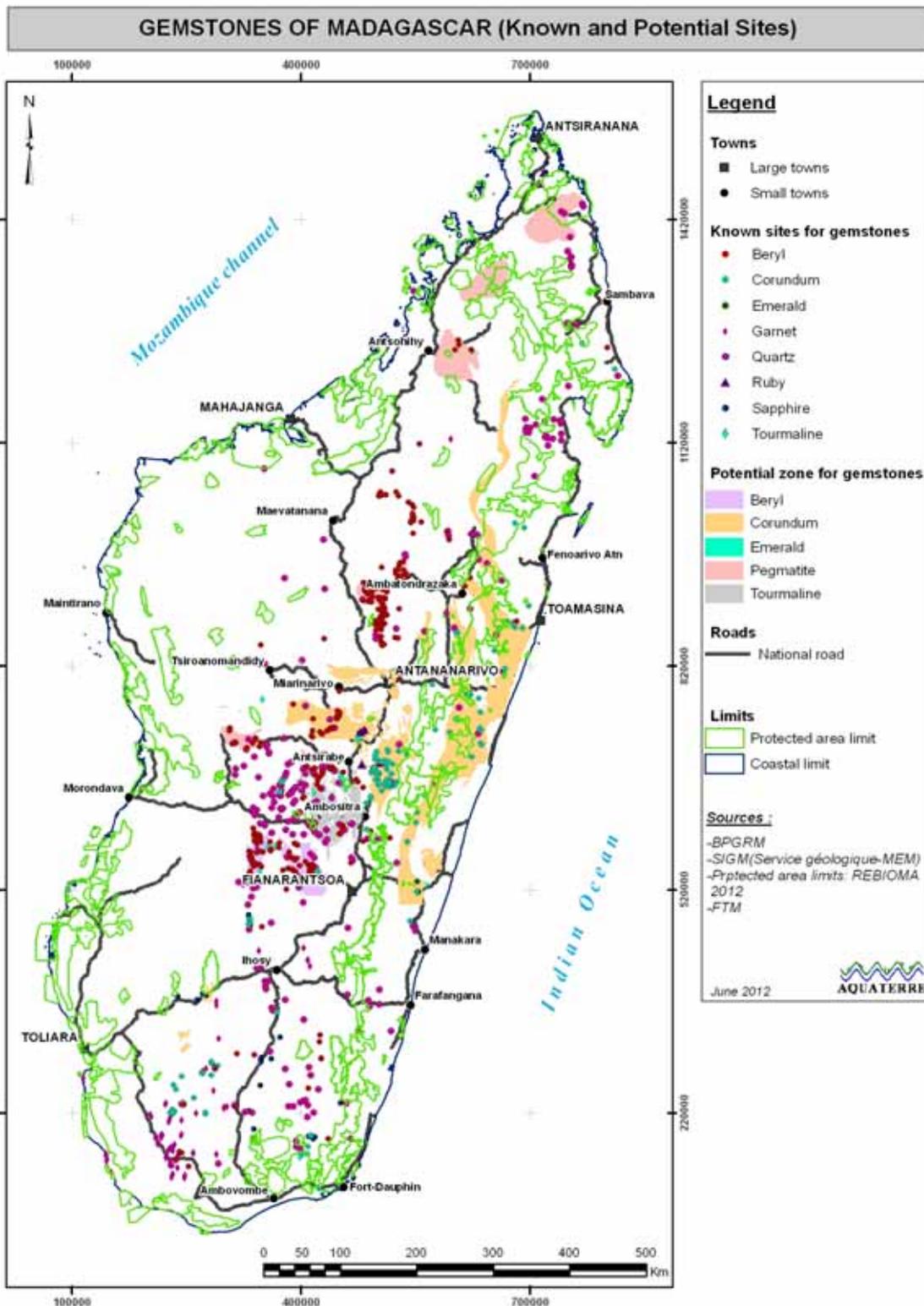
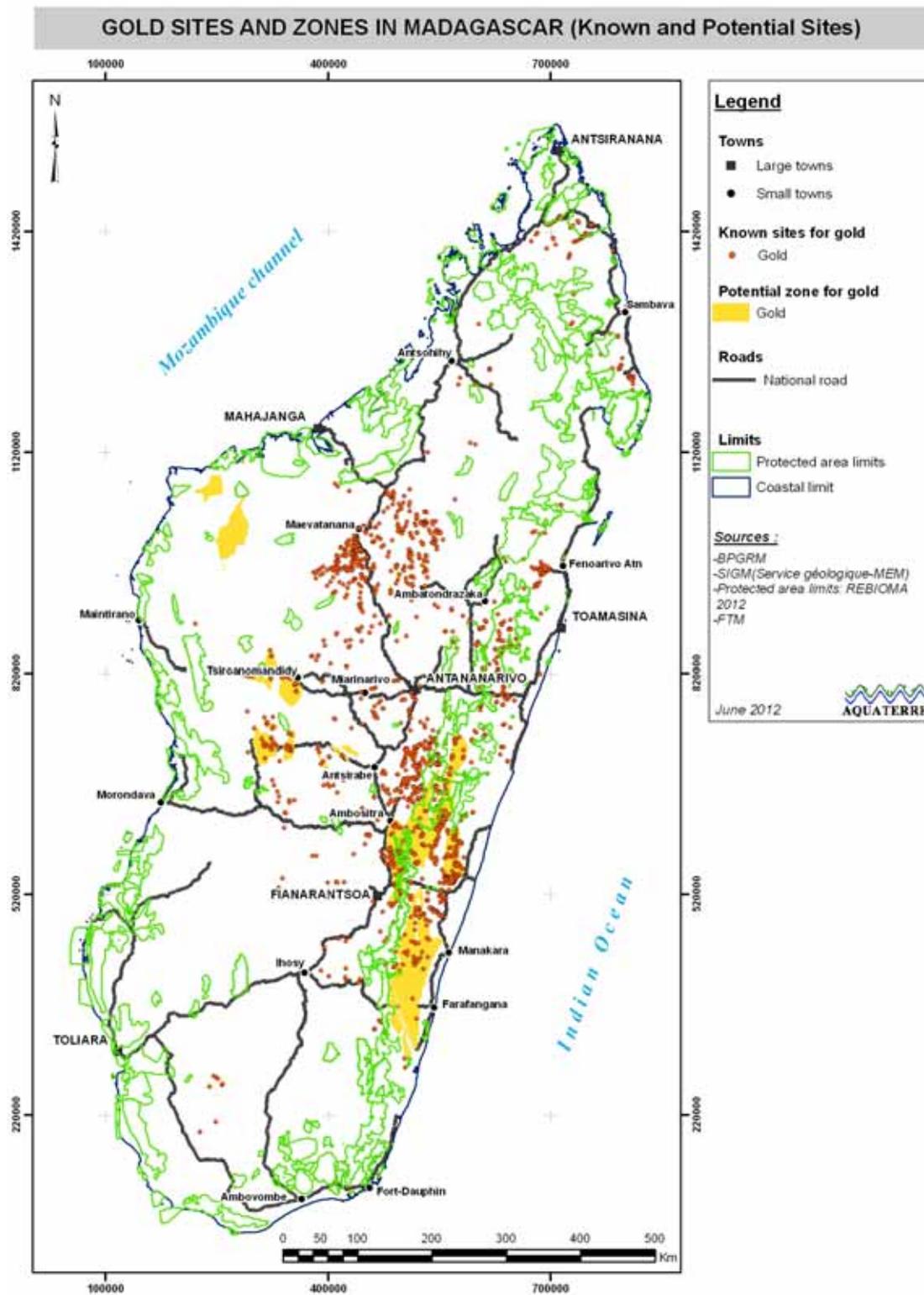


Figure 7: Gold Sites Madagascar



Moreover, in some ways the term “rush” can be misleading in that it might imply a sudden, immediate descent on a mining site, which is transient and ephemeral. However, in the Madagascar context, there behaves a much more fluid and elastic conception of a rush. While the vast majority of ASM miners may move on to the next rush location, often a very substantial residual number remain to exploit the site, sometimes for decades (as with Ilakaka, and Ankarana PA, see **Sections 6.3.2 and 6.5.2**, respectively).

In the case of sites with eluvial deposits, as perhaps in the NAP near Didy (see **Section 6.11**), this longer-term maturing of the rush would not be the case - as those deposits, which are accessible without machinery/tools currently unavailable to artisanal miners in Madagascar, would soon be exhausted.

3.5 Significant government interventions in ASM activities and rushes

Over the last twenty years, there have been two significant government interventions, which impacted severely on ASM in Madagascar, as well as on the ASM rush dynamic. Both concerned gemstones.¹⁸

The first was a ban on the issuing of new permits for sapphires and rubies from 1999-2004. The ban was intended as a means for the Madagascar government to reassert control over the gemstone sector, following the unprecedented expansion of the Ilakaka ASM rush, which saw tens of thousands of miners flocking to the area. However, the intervention was ineffective, achieving almost the opposite of its ostensible intention. By ceasing to issue new permits for sapphires and rubies, the government drove much of the market underground, which thus encouraged gem smuggling, in turn contributing to increased opportunities for corruption.¹⁹ It also created a vibrant black-market for existing laissez-passer purchased from prior permit holders, since buyers needed the laissez-passer to export the gemstones (World Bank, 2010b). Rather than the *redevance/ristorne* of 2per cent, foreign buyers were obliged to pay as much as 10per cent to holders of existing permits.²⁰ Foreign buyers consequently became among the most vociferous in their calls for the right to pay taxes.²¹ Following the repeal of the ban, sapphire exports rose to US\$30 million in 2006.²²

The second major intervention came in February 2008, with a ban on the export of raw gemstones by presidential decree. This was provoked by presidential consternation at the export to Reunion, and then on to Hong Kong, of a large rock, weighing 560kg, covered with emeralds. It was transported with a valid laissez-passer as well as having been produced from a site possessing a valid exploitation permit. While at the time there were allegations that the export had been made illegally, the grounds for such a claim are not clear-cut, since the rock received its certificate of conformity for export based upon its sample being of green beryl, rather than emerald; and it is exceedingly difficult to tell the difference between green beryl and emerald.²³ Also, on the neighbouring island of Reunion, the French expert called to testify in a court case, and its appeal, brought by the Malagasy government in an attempt to retrieve the stone, vouched that it was green beryl exported with a correct valuation, €30,000 wholesale and €100,000 retail.²⁴ Arguably the ban was precipitated, not by illicit activity on the part of miners or buyers, but by presidential frustration that the legal process of export could not be reversed by fiat. Another theory is that the ban was also intended to encourage the creation of a domestic gem cutting industry, possibly under some form of monopoly (World Bank, 2010b). Regardless of intent or cause, the ban was unsuccessful and counter-productive. It carried with it a significant political cost for the government of the day, as it impoverished tens, if not hundreds, of thousands of gemstone miners. It drove out the legitimate foreign buyers, and as with the earlier ban sent exports underground, triggering concomitant implications for the spread of corruption, with production only now perhaps beginning to return to pre-2008 levels.

¹⁸ The recent presidential fiat to ban all exportation of gold, save through the Central Bank, is discussed in Section 9.7. It remains to be seen whether that ban is enforceable.

¹⁹ “One line of argument could support that seemingly adverse effects were in fact intended consequences – with scarcity rents serving politically connected elites.” (World Bank, 2010b)

²⁰ Cushman, Tom. Founder and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal communication. 12 May 2012

²¹ Cushman, Tom. Founder and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal communication. 12 May 2012

²² Cushman, Tom. Founder and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal communication. 12 May 2012

²³ Razananirina, Henri. Inter-regional Director of Mines, Fianarantsoa, 2001-8; DG Ministry of Mines, 2008-10. Personal communication. 25 April 2012

²⁴ Cushman, Tom. Founder and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal communication 12 May 2012

3.6 History and role of PGRM

PGRM (*Projet de Gouvernance des Ressources Minérales*, or Mineral Resource Governance Project) is the successor to the Mining Sector Reform Project. PGRM's main objective has been to assist the Government of Madagascar in setting up a working strategy to accelerate the durable development of the mining sector and to reduce poverty in Madagascar, to be achieved through the reinforcement of governance in the sector and transparent mineral titles management.

PGRM's principal goals, which were intended to achieve the above objectives, have been as follows:

- improvement and application of the legal and regulatory framework
- management of critical situations and rushes in the future
- establishment of a national capacity for the certification and the quality control of gems and the improvement of their marketing through the creation of the Institute of Gemology of Madagascar
- establishment of a common sales agency and purchase of the valuable stones at a single office to facilitate the export formalities
- training and professionalization of craftsmen to improve added value in the gemstone sector
- strengthening of private entities in the sector
- continuation of the institutional reforms to improve the administration of the sector and to facilitate the management of the mineral resources
- strengthening of the decentralized management of the environment
- creation of the Agency for the Creation of the Mining Sector (APSM) so as to improve the capacity of the Government to attract private sector investment
- support of the artisanal mining sector through extension of services and a program of small funds
- update and strengthening of the geological infrastructure through the realization of surveys of airborne geophysics, geological and geochemical surveys and with studies for the evaluation of mineral resources
- establishment of a 'Database for the Promotion of the Governance of Mineral Resources', and a technical unit specialized in the exploitation of the geoscience data and development of promotional products

In terms of ASM rush management, a significant initiative launched by PGRM was the setting up of the *Bureau d'Administration Minière* (BAM). The BAM in Ilakaka operated from 2006-2008, and implemented the training of some 2600 artisanal miners, from ten communes. One positive outcome, as well as a sign of the capacity for artisanal mining entrepreneurship, was that during the 2010-11 ASM gold rush at Firavahana, at least five of the Ilakaka BAM alumni were employed as ASM consultants by local collectives/associations of ASM miners.²⁵

3.7 Volumes and values of ASM production

Given the highly informal nature of ASM activities in Madagascar, it is extremely difficult to calculate accurately the volumes and values of both gold and gemstone production.

Gold is especially problematic since such a negligible fraction of the country's production, if any at all,²⁶ passes through formal channels. The most effective means of coming up with a very broad estimate is to calculate via the expected daily production of Madagascar's estimated number of ASM gold miners (though that too is just a broad approximation; and some experts view even the lower 350,000 figure as an over-estimate).²⁷ Also, ASM gold activities, taking place as they often do in dry riverbeds, etc., tend not to take place during the three-month rainy season. Also, in many areas the months of April and May are set aside for rice cultivation. So ASM gold miners will usually be operating between seven and eight months of the year. In addition, unless involved in a particularly intense rush, ASM gold miners will probably work 4-5 days per week. It's thought that most miners

²⁵ Razafimandimby, Olivier. PGRM Rural Development Advisor. Personal communication. 26 March 2012

²⁶ In 2010, 0kg were officially declared; in 2011, 800g. Following a recent reduction in the regulatory regime's scale of costs for hallmarking, as set by the Ministry of Mines, the figure for officially declared gold for just three months of 2012 soared to 150 kilos. To put that in context, 150kg over a mere three months is higher than any annual figures for officially declared gold since 1945.

²⁷ Cushman, Tom. Founder and Director of IGM 2003-7, World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal communication 12 May 2012

won't work for less than 0.1g per day, currently equivalent to about US\$5, which might rise to as much as 0.2g/day in the event of an especially productive rush site; though the 0.2g/day site will probably be short term and soon exhausted. Thus the tentativeness of such ballpark estimates as 2-5 tons per year is very understandable (World Bank, 2010b).²⁸

3.8 ASM and LSM – Respective contributions to Madagascar's economy

The government's Madagascar Action Plan (MAP) intends to develop both the large-scale mining (LSM) and ASM sectors. However, the LSM sector is likely to become more important for the government due to its potential to increase GDP (Cartier, 2009). LSM in Madagascar makes up less than 1per cent of the annual GDP (Mbendi, 2011), and the MAP is meant to increase the productivity of the mining industry to the tune of 30per cent of the GDP (Cartier, 2009) to take advantage of the country's significant reserves of gold, copper, iron, chromite, mica, high-grade crystalline flake graphite, bauxite, lead, rock-crystal, labradorite, marble, coal and precious and semi-precious gems. The major impediments to a thriving LSM sector seem to be a lack of infrastructure, lack of investment confidence and the remote locations of many of the mineral deposits.

In recent years, the Ambatovy Project and Rio Tinto/QMM have had a very significant impact on Madagascar's economy, contributing more than US\$5 billion in direct inward investment, with more than 12,000 jobs created during the construction phases, decreasing to approximately 5,000 permanent jobs following construction (World Bank, 2010a). It's thought that this direct inward investment has been a major factor in the relative resiliency of Madagascar's currency, the Ariary.²⁹ It is much more difficult to estimate the contribution of the ASM sector, given its highly informal dynamic and the lack of reliable figures regarding volumes of production. However, the fact that as many as more than 500,000 people depend upon it as principal source of livelihood indicates its importance and its potential contribution to the formal economy if there were greater formalization of the sector.

²⁸ On the other hand, there are anecdotal reports that the Dubai gold market alone annually trades between 3 and 6 tons of gold which has been registered as originating in Madagascar. Source: Rakotondravaly, Desiré. Director Technical Support, Gold Mining and Rushes, Ministry of Mines. Personal Communication. 8 May 2012

²⁹ Razakariasa, Henri Bernard. Technical Advisor to the Governor of Madagascar Central Bank; former SG Ministry of Finance, 2002-9. Personal Communication. 29 May 2012

4. OVERVIEW OF PROTECTED AREAS, SENSITIVE HABITATS AND LANDSCAPES

4.1 Overview of protected areas

4.1.1 Debut of Protected Areas and Conservation in Madagascar

Prior to the colonial period, forests were protected from burning by a royal declaration, principally as preserves for royals (Raik, 2007) and applied using repressive top-down controls adopted subsequently by colonial powers. The declaration was later reflected in 1930 by a French colonial article prohibiting all forest fires and other forms of deforestation (Montagne, 2004). The concept of protected areas (PAs) was also initiated at this time by colonial powers from 1927 (Tyson, 2000) and represent one of the oldest PA groups in the African region. However, the French also contributed to deforestation, notably through land appropriations to develop plantations. Meanwhile forest prohibition policies and plantations encouraged local people to cultivate on higher slopes using swidden techniques (*tavy*) for principally rice cultivation. Direct colonial contribution to deforestation was also promoted through logging concessions including illicit logging due to relationships between colonial forest authorities and concession owners. In addition, government forest services at that time were under-funded and lacked political will (Raik, 2007) limiting their potential achievements. These historical contrasts of protectionist policies, conflicts of interest and natural resource degradation still remain pertinent for nature conservation in Madagascar, today.

4.1.2 Protected areas from post-colonial times towards the National Environmental Action Plan

After gaining independence from France in 1960, Madagascar continued upon the path of authoritarian control over forest management with a string of legislation governing forest resources (Montagne, 2004). However, as observed during colonial rule, corruption and lack of motivation to apply forest legislation maintained effective open access to natural resources, and the controversy over legal versus legitimate uses of resources (Healy and Ratsimbarison, 1998). The patterns of behaviour and poor interactions between the government and the governed then proceeded throughout the rest of the 1960s and 1970s (Raik, 2007).

By the mid 1980s, Madagascar began to move away from a quasi-Socialist State, which had evolved during the 2nd Republic from the mid 1970s. This change encouraged international conservation non-governmental organisations (NGOs) to revisit Madagascar, previously known for its unique biodiversity. The country was soon classified as one of 17 “mega-diverse” countries in the world with extremely high levels of biodiversity, while flora is estimated to have an endemism rate as high as 80 to 86 per cent (GEF, 2008).

By the early 1990s, numerous nature conservation NGOs had established and partnered with various bilateral and multilateral donors in a concerted effort to save biodiversity through the National Environmental Action Plan (NEAP). Phase I (1992-1997) and II (1998-2003) of NEAP focused, in part, upon existing PAs and development of new PAs for nature conservation in Madagascar. The number of PAs increased from 36³⁰ in the late 1980s (Nicoll and Langrand, 1989) to 47 during Phase II (ANGAP, 2001).³¹ However, destruction of habitats continued, with estimates from 2000 to 2005 of forest losses of 50,000 hectares per year (MEFT, 2009) due to a combination of poverty, high population growth rates and needs to acquire fertile lands for agriculture.

Phase III (2004-2008) of the NEAP aimed to mainstream the environmental agenda and also includes a major initiative to expand the PA network. In 2003, the former President of Madagascar, Marc Ravalomanana, declared the “Durban Vision” to expand the surface area of PAs from 1.7 million hectares to 6 million hectares by 2012. A principal objective was to fulfill the International Union for Conservation of Nature’s (IUCN) recommended standard of having 10 per cent of the country’s land area under some form of protection.

³⁰ These PAs include only National Parks, Integrated Nature Reserves and Special Reserves, which were and remain of principal importance for nature conservation purposes.

³¹ Martin Nicoll. WWF Senior Advisor. Personal Communication. 8 June 2012

4.1.3 Current System of Protected Areas of Madagascar in 2012

Since 2005, following “Durban Vision”, the PA network includes both pre-existing and new PAs managed under the structure known as the System of Protected Areas of Madagascar (*Système des Aires Protégées de Madagascar*, or SAPM) controlled by the Ministry of Environment and Forests (MEF). Under SAPM, the majority of new protected areas are likely to be co-managed including local communities in partnership with government through the Madagascar National Parks (MNP) authority, NGOs and in some cases the private sector incorporating local management contracts³².

SAPM comprises a president designated by the MEF, representatives from eight additional ministries, and representatives from technical and financial partners. The Commission may also cooperate with additional *ad hoc* committees such as those dealing with mines-forests interests. The roles of the Commission are to support the Director General of Forests (DGF) in attaining the Durban Vision goal by 2012, support SAPM decentralization, reconcile local and national conservation objectives, ensure communications and advise on proposed creation of new PAs. Inclusion of the additional ministries is deemed by the MEF to be critically important as it facilitates resolution of sectoral conflicts of interest such as those involving mines and PAs. The inclusion of financial and technical partners means that NGOs and financial institutions can provide support as required by MEF (World Bank, 2012).

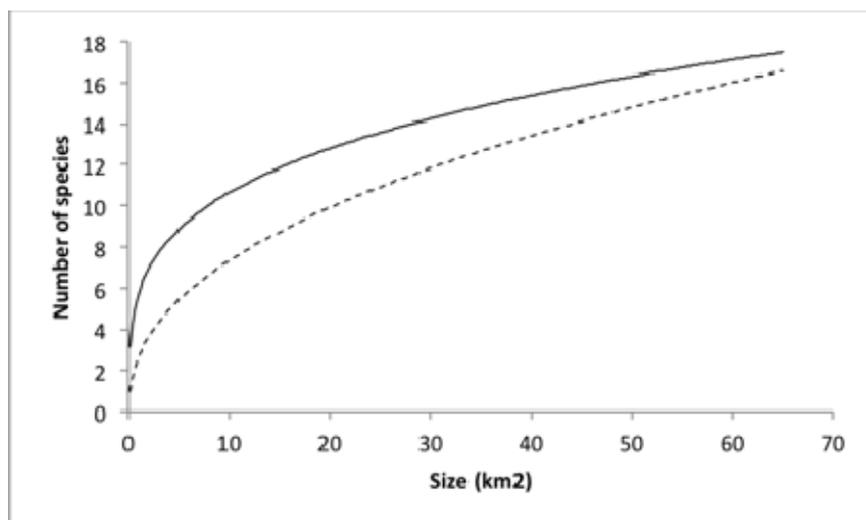
Existing PAs within SAPM are essentially managed by two distinct groups: MNP and non-governmental entities (non-MNP). MNP is responsible for all protected areas within a subset of SAPM, the National Network of Parks and Reserves. All PAs outside of this network make up the rest of the national system. The vast majority of the latter PAs are managed by environmental NGOs. While two mining companies (Rio Tinto/QMM and the Ambatovy Project) are either site promoters or contributing to the establishment of new PAs, both artisanal and small scale mining (ASM) enterprises have not until now integrated themselves into the system. All designated promoters of non-MNP PAs are bodies recognised by MEF (World Bank, 2012).

Based upon the most reliable figures recommended by MEF from the Malagasy Biodiversity Network (REBIOMA), there are 671 PAs covering 16,806,869 ha managed by both MNP and non-MNP. However, although there has been a significant increase in the number of PAs, it is important to add that the vast majority of these PAs have only a temporary PA status until now. As the surface area would greatly exceed that proposed by Durban Vision by more than 2.5 times, it is unlikely that all these temporary PAs will become fully protected SAPM PAs (World Bank, 2012), while financing to fully protect and manage these sites is an awesome and potentially unattainable task for both the authorities and partner organisations.

However, it is very important that conservation organisations aim to conserve and manage as many PAs as possible since Madagascar’s protected areas are generally rather small in size, while many are partially fragmented or irregularly shaped i.e. long and narrow. Small, irregularly shaped PAs, particularly if fragmentations have or are occurring, risk species being lost over time (such as 20-40 years) as PA capacity to sustain viable populations is reduced. Many Malagasy species are strictly dependent on natural forest habitats and some, such as larger lemurs, are subjected to hunting pressure while others are pressured by intense collection for traffic in wild species. The combined effects of smaller size and fragmentation from human activities vary considerable among species; however research on Malagasy birds and lemurs estimate that species loss can occur in PAs smaller than 4,000 ha (40km²) or even higher for animals requiring larger territorial ranges with low population densities. Virtually all, if not indeed all, Malagasy PAs are under some degree of pressure from human activities. If forest losses escalate significantly, the value of the PA in maintaining healthy, representative biodiversity may be at significant risk (see **Figure 8**). Uncontrolled small-scale mining is such a threat not only because of direct destruction and disturbance of habitats but because it is often accompanied by secondary activities such as hunting and logging for timber and/or charcoal production.

³² Local community management contracts include multiple local natural resources management including forests known as Gestion Local Securisée (GELOSE) and contracts focused on local forest management known as Gestion Contractualisée des Forêts (GCF)

Figure 8. Hypothetical species-area curve in Malagasy forests³³



Note: Upper line is healthy forest with low stress; lower dotted line is forest under significant stress.

The legal framework for SAPM is defined in the Protected Areas Code (*Code des Aires Protégées* or COAP), established in 2001. This statute was revised in 2008 to include all IUCN PA management categories and to define their respective governance regimes, which effectively provides legal and institutional protection for new categories of PAs. However, the revised COAP has not yet been passed into law due to the current political crisis. The COAP falls under the law known as the National Environment Charter (90-033 of 21 December 1990).

The COAP defines six management categories derived from IUCN guidelines. In practice MNP has restricted its national network to three (I, II and IV) (World Bank, 2012), where Category II has been the greatest trend. The categories are:

- IUCN Category Ia. **Strict nature reserve**, an area where activities are restricted to conservation management and authorized research. This type of PA can only be managed by a government agency with law enforcement powers. In reality, only MEF or MNP can manage these.
- IUCN Category II. **National park** and **Natural park**, areas managed for conservation and recreation. MNP manages all national parks while natural parks are managed by other entities.
- IUCN Category III. **Natural monument**, an area of cultural value but having significant biodiversity values. They are generally small areas and managed by local communities with support from NGOs.
- IUCN Category IV. **Special reserve**. An area historically designated to conserve a particular species or ecological community. All existing special reserves are managed by MNP.
- IUCN Category V. **Harmoniously protected landscape or seascape**. Under IUCN guidelines, this PA category is usually an area transformed by traditional activities but retaining significant biodiversity interest. In Madagascar it is translated to designate occupied areas where traditional activities and biodiversity exist within a defined land- or seascape.
- IUCN Category VI. **Natural resource reserve**. Area that is largely undisturbed or lightly so but where human activities are integrated, including natural resource use. IUCN recommends that at least 65 per cent are in a relatively undisturbed state.

Given the rapid evolution of SAPM in recent years, it is also necessary to define PAs in practical terms. In effect, there is a need to classify PAs based on: (i) whether the management agency is MNP or not; (ii) whether they have a decree providing full legal protection; and, for new and extended PAs, the means to define their progress within the creation/extension process. It should be noted that the creation process involves four step-by-step procedures leading to initial temporary protection and then to full protection status. Classification is provided by Inter-ministerial Order 52005/2010 – 20 December 2010. Nine ministries are signatories to this Order (World Bank, 2012). The classifications are as follows:

³³ Acknowledgements to Martin Nicoll of WWF for preparing the graph and supporting text

- **PA managed by MNP.** PAs with full legal protection status and managed by MNP.
- **PA Extension managed by MNP.** Territorial additions to existing MNP PAs listed under the previous class. The extension areas do not have full legal protection status at the current time.
- **PAs with Temporary Status.** A site allocated an official temporary protection status as a step towards full protection. The sites may be managed by MNP within its network or by non-MNP entities.
- **New Protected Areas.** A site that has begun the process of PA creation but has not yet completed procedures to qualify as a temporary PA (previous classification). The 2010 order does however provide protection from other sectoral interests such as mines or agriculture.
- **PA Priority Sites.** A site defined in the 2010 as a priority with regard to biodiversity. The process of creation has not yet commenced but the site benefits from the same protection afforded to the previous classification.
- **Potential PA Sites.** A terrestrial or freshwater site identified for its potential biodiversity value as a PA but not yet confirmed;
- **Potential Marine PA Sites.** As above but for sub-tidal areas.

4.2 Overview of sensitive areas

The sensitive areas or habitats of Madagascar are classified according to an Inter-ministerial Order No. 4355/97 of 1997 (GoM, 1997) and associated with the Environment and Investments Decree (*Mise en Compatibilité des Investissements avec l'Environnement* or MECIE) updated in 2004 (GoM, 2004). The order classifies areas considered to be environmentally sensitive and fragile in relation to human activities. The sensitive zones³⁴ include: coral reefs, mangroves, islets, tropical forests, erosion sensitive areas, semi-arid or arid areas prone to desertification, wetlands, nature conservation zones, perimeters of potable, mineral and subterranean water supplies, archaeological, paleological and historical sites of importance, zones with species verging on extinction and containing nature conservation zones. Specific definitions for each type of habitat are also provided in the Appendix of the Order (ONE, 2005). In addition, the SAPM Prioritization Committee added species measures giving rise to the SAPM Inter-Ministerial Order in 2010.

Effectively, sensitive zones cover a wide range of habitats across all the regions of Madagascar, where potential human activities including ASM could have negative impacts upon the environment. Prior to any land management and development activities on a site, the area must be defined as a sensitive zone or not according to definitions in the Order. If a site is classified, then the project promoter(s) must fulfil an Environmental Impact Assessment (EIA) and submit it for approval to the National Office for the Environment (ONE). However, less severe impacts from small scale ASM projects involving several people, and not mechanized, may be judged by ONE to be low impact and only require an Environmental Action Plan (*Programme d'Engagement Environnemental* or PREE) (ONE, 2005). The PREE is a less detailed EIA coordinated by respective Ministerial Environmental Units, which in the case of ASM would be the Ministry of Mines.

If there are multiple small-scale exploitations on the site, such as in the case of multiple ASM activities, then an Environmental Audit will have to be applied also during the course of a site being exploited. The audit is used to reassess the degree of impacts from multiple activities in a sensitive zone, and is referred to in the Guide for Global Evaluation of Sensitive Zones prepared by the National Office for the Environment (ONE, 2005).

4.3 Overview of WWF's ecoregions, landscapes and seascapes, and priority species

4.3.1 Preamble

Due to the fragile status of Madagascar habitats and wildlife, this study has incorporated the conservation priority targets or "critical ecosystems" for nature conservation across the country, where ASM activities may currently or in the future be in conflict with the conservation objectives of WWF in target areas. These target areas may overlap in many cases with existing protected areas and the sensitive zones described in this section.

The reason for WWF's Conservation Plan 2010-2015 targeting critical ecosystems is due to the rapidly growing pressures from population growth, climate change, and effects of pervasive poverty and governance weaknesses in

³⁴ Inter-ministerial Order No. 4355/97 of 13 May 1997 including definitions and demarcations of sensitive zones

Madagascar. Therefore, the WWF Madagascar Programme in the Western Indian Ocean (WIO) decided to focus its interventions to ensure maximum impact for conservation. Three categories of conservation targets have been chosen as the focus of this conservation strategy being ecoregions, priority conservation landscapes and seascapes (see **Section 4.3.3**), and priority species (WWF, 2010).

Priority species areas can be summarised as localised sites within the semi-arid coastal southwest and southern spiny dry forest of Madagascar, where the spider and radiated tortoises are found, respectively. In addition, WWF also targets marine turtles in the north of the country. These animals are already critically endangered and under threat from collection for meat. ASM activities in these areas including the coastline would present a severe negative impact upon the species.

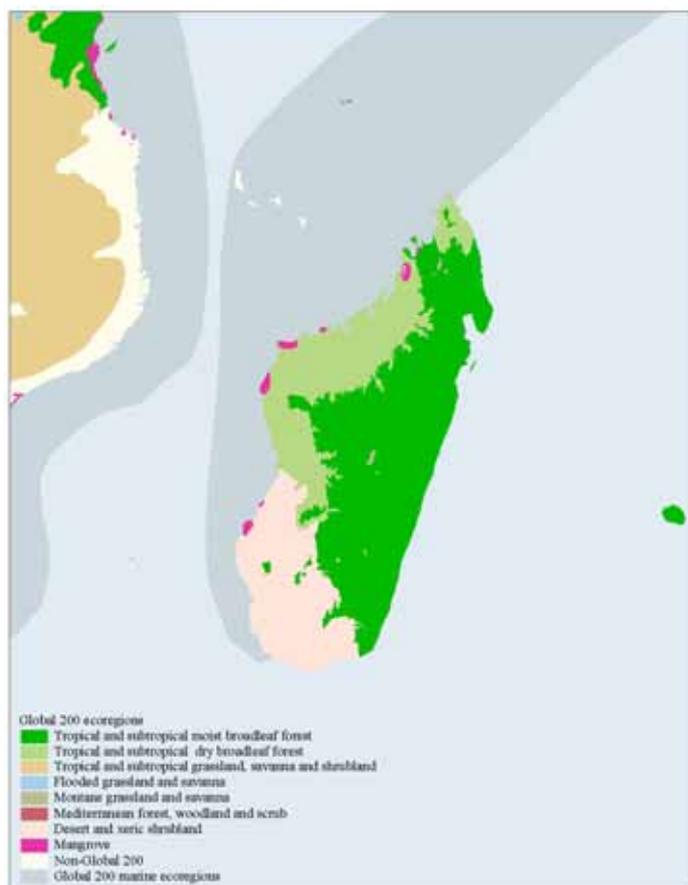
4.3.2 Ecoregions

The region has a high concentration of ecoregions, seven in total, as defined in the WWF Global 200 Ecoregions. Within these ecoregions, Madagascar hosts five terrestrial ecoregions (see **Figure 9**), which could be or have been threatened by ASM or other human activities. The ecoregion goals are principally as follows:

- ensure representation of all distinct natural communities within conservation landscapes and protected areas networks;
- maintain ecological and evolutionary processes that create and sustain biodiversity;
- ensure the maintenance of viable populations of species;
- conserve blocks of natural habitat large enough to be resilient to large-scale disturbances and long-term changes.

Due to financial constraints, WWF intends over the next five years, to continue assisting the ecoregion-wide institutional and policy frameworks that support the conservation of two critical or endangered ecoregions, being Madagascar Spiny Forests and Western Indian Ocean Marine Ecoregion (WIOMER), although only the former terrestrial site may be in conflict with potential ASM activities. In order to consolidate and sustain ecoregions, WWF will also be targeting selected conservation landscapes and seascapes in order to address the most pressing in-situ biodiversity needs as discussed in this section.

Figure 9: Global 200 ecoregions in Madagascar and WIO (WWF, 2010)



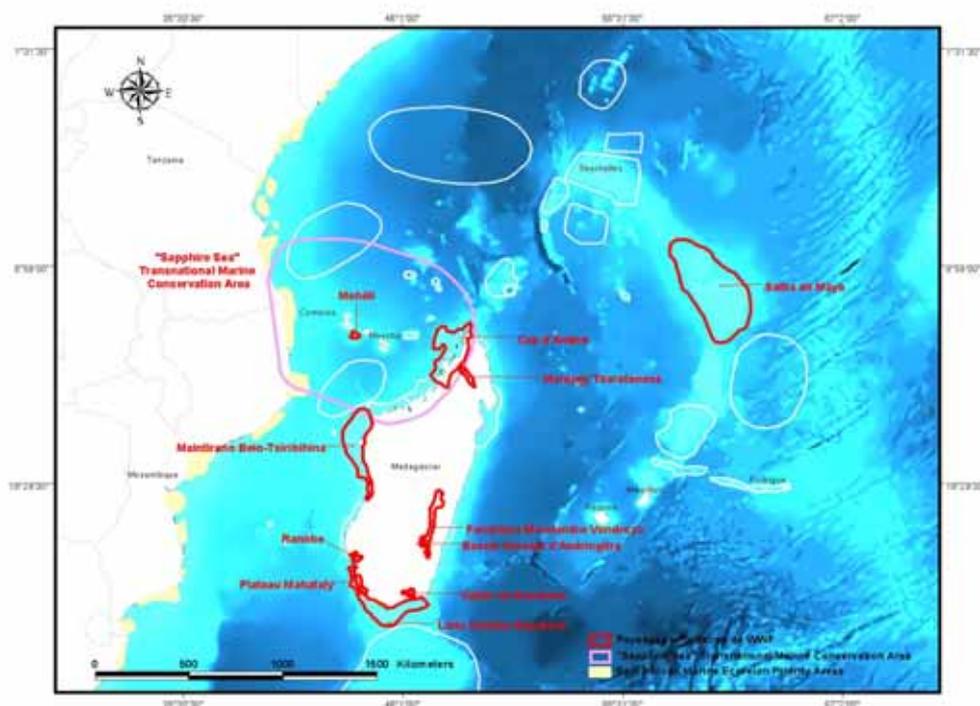
4.3.3 Landscapes and seascapes

Recent scientific analyses have identified national level biodiversity conservation priorities that are outside the boundaries of WWF's current ecoregions of interventions. This decision was made to ensure that WWF addresses the highest biodiversity conservation needs beyond historical focal ecoregions. Hence WWF is targeting areas that are most important for biodiversity and in need of support, where WWF can provide greatest added value and the highest chances of success. The selection of priority conservation land/seascapes for WWF was based on the following criteria (WWF, 2010):

- criterion 1: land/seascapes with the highest conservation values (given the highest weighting by WWF) being representative of Madagascar's ecoregions with significantly important ecosystem processes;
- criterion 2: level of threat i.e. threatened or anticipated threats, but with viable integrity to offer chances of success for conservation;
- criterion 3: WWF's added value, where there are no other conservation bodies or where WWF has significant capacity;
- criterion 4: feasibility and likelihood of success i.e. availability of adequate resources and partnerships (including political will) to ensure conservation success.

Based on the criteria above, WWF identified ten priority conservation land/seascapes presented in **Figure 10**, below:

Figure 10: WWF's ten priority land/seascapes in Madagascar and WIO (WWF, 2010)



Note: Moheli and Cap d'Ambre sites are encapsulated in the "Sapphire Sea" area.

5. LEGISLATION, POLICIES AND REFORMS FOR MINING, ENVIRONMENT AND DEVELOPMENT

5.1 Mining legislation, policies and reforms

Major mining legislation reform began with the Mining Policy Decree No. 98-394 in 1998, which aimed to liberalise the mining sector and disengage the State, whereby the role of the State would be only regulatory. Prior to this liberalisation process, the State was significantly implicated in controlling mining development, which was regarded as an obstacle for potential investors. The principal goals of the Policy were (MdM, c.2009):

- clear legal and transparent framework;
- promote the large-scale mining sector and formalise the ASM sectors;
- structure the control and monitoring of mining activities by a central unit in liaison with corresponding regional bodies;
- encourage and provide guarantees for private sector investments.

The goals focused principally on the large-scale mining sector. However, it was accepted at that time that reforms were also required in the ASM sector. During this period in the 1990s, Madagascar was experiencing some of its first significant mining rushes for gemstones.

The Mining Policy was supported by the World Bank in the form of the Mining Sector Reform Project, also known as PRSM. The accomplishments of the PRSM were as follows (MdM, c.2009):

- juridical framework forming the Mining Code (Law No.99 022 of 1999) and its decree, Mines - Environment Inter-ministerial Decree No. 12032/2000 of 2000, and the Large Scale Mining Investment Law (LGIM);
- institutional reform with the creation of the Registrar for Mining Permits (BCM) and the computerisation of the mining squares management registry;
- technical assistance for ASM in the form of the Technical Assistance Project for Small-Scale Mining known as ATPEM.

With PRSM, the emphasis was once again directed towards large-scale mining, with the aim to encourage exploration for new potential mines across the country. However, technical assistance was provided to ASM by the ATPEM project with the goals to “develop and test integrated approaches to mainstream small-scale miners and the Mining Department’s capacity to provide extension services”. This project had two principal objectives as follows:

- development of mining extension services providing integrated management of ASM with technical support in organisational, legal, institutional, and social and environmental needs
- awareness and structure development in pilot areas integrated with the objective above

Overall during a relatively short period of two years (2000 to 2002), ATPEM achieved its principal objectives and worked in three pilot regions with both the private and public sectors (ITC and Projekt-Consult, 2002). One of these included the mining rush for rubies in the Vatomandry area on the central-eastern coast. The Vatomandry case is reported to have provided a government model to manage ASM rushes at the time (ITC and Projekt-Consult, 2002), although it was not cited by numerous mining sector interlocutors during the course of this study.

In 2003 the Mining Policy was revised with a strategy as follows (MdM, c.2009):

- improve governance and transparency in the mining sector
- support artisanal miners
- promote private mining investments and decentralised management of mining resources

From 2003 to 2008 the World Bank supported the development of the strategy above with the Governance of Mineral Resources Project (PGRM) achieving one of its most important objectives, the new Mining Code. In 2005, the law was reformed with the Mining Code Law 2005-021 (Intellect Editions, 2005).

Further development of the Mining Policy aims to reinforce social and environmental responsibility in tandem with the development of the mining sector as follows (MdM, c.2009):

- reinforce the legal framework and guidelines
- institutional reinforcement and restructuring
- integrating large-scale mining with ASM projects within regional development
- management of potential conflicts between environmental protection and all mining activities
- good governance and management in ASM

This reform encompasses all scales of mining, with special emphasis on integrating large to small-scale mining in regional planning. However, ASM management through good governance and environmental protection are ambitious objectives inherited in part from the ATPM goals, although they remain very pertinent. Decentralisation with capacity building at inter-regional levels is required before these ambitions can be attempted at a national level. Capacity in the Ministry of Mines remains low across the country, while many of their civil servants are reaching retirement age³⁵, therefore future improvement of the ASM sector in the regions appears to be blighted by significant administrative hurdles.

5.2 Environment, development and mining

5.2.1 ASM and the Environmental Legislation

Prior to conducting any mineral prospecting in Madagascar an individual or entity is required to make a declaration to the Madagascar Mining and Survey Office or BCM. The prospecting permit is then valid for one year from the date of approval. The Malagasy Environmental Charter³⁶ and the Decree for Compatibility of Investments with the Environment (MECIE)³⁷ oblige any private or public investment project to be examined by either an Environmental Impact Assessment (EIA) or simplified version known as an Environmental Engagement Plan (*Plan d'Engagement Environnemental* or PEE) before any mining activities may commence.

The PEE for ASM activities is reiterated again in the Inter-ministerial Order No. 12032/2000 (GoM, 2000), which focuses on the regulation of mining to protect the environment with specific measures for environmental protection including local populations and rehabilitation procedures. Legislation also correlates with policy statements in the updated Mining Code of 2005. The Appendix of the Inter-ministerial Order also addresses ASM specifically regarding Permits Reserved for Small-Scale Miners (*Permis réservé aux petits exploitants miniers* or PRE) and PEE known as a PEE-PRE. This procedure has been simplified into a format which is accessible for miners in ASM to complete.

Eligibility for a PEE-PRE is limited to ASM activities and specifies the following:

- mining operations are no deeper than 20 metres
- no more than 20 people working on the site
- all transformation activities must take place on site
- no chemical substance can be used, apart from gold mining when mercury can be used if regulation guidelines are followed
- no explosives can be used
- no mechanised drilling can be used

³⁵ Razafintsalama, Lalalison. Environmental Adviser at PGRM. Personal Communication. 30 March 2012.

³⁶ Law No. 90-033 of 21 December 1990 relating to the Environmental Charter changed and supplemented by laws No. 97-012 of 6 June 1997 and No. 2004-015 of 19 August 2004

³⁷ MECIE: Decree No. 99-954 of 15 December 1999 amended by Decree No. 2004-167 of 3 February 2004

- no operations can occur in an area within 500 metres of a “sensitive zone³⁸” as also described in the Inter-ministerial Order No 4355/97
- activities cannot occur at the site of a watercourse or water point
- if a concentration of ASM activities is occurring in a zone, then an ad hoc evaluation committee will determine if a full EIA is required and should be evaluated by the National Environmental Office (ONE)
- ASM applicants have completed a course on environmental protection offered by the Mines Department (from the date when courses are available)

A screening process is undertaken by ONE to determine if an ASM project extends beyond a simple PEE. A full EIA would be required, if the following is pertinent:

- developments, facilities, structures, works and activities may affect “sensitive zones”
- mining project exceeds thresholds determined in the Appendix 1 of MECIE
- activities not subject initially to an EIA, but subject to an EIA if there is changes increasing environmental damage

The PEE-PRE permit is a precondition for starting any work in an area and valid until the closure of the mine under the auspices of the Environmental Unit in the Ministry of Mines. The validity of the permit is based on having a valid Mining Permit for the specific mining area, where exploration or mining operations will take place.

PEE also allows for commercial exploration on an existing ASM permit, as defined in the Mining Code.

Currently due to the on-going political crisis both environmental permits and mining permits are in limbo until a recognised government is established following presidential elections. However, exceptional permits for large-scale mining have been granted for several foreign companies, while unclear or incomplete procedures have allowed some smaller-scale mining research to continue.³⁹ However, complete PEE-PREs are reported as not having been issued in recent times.

5.2.2 Development, ASM and environmental policies

Environmental and rural development national policies including mining are encompassed in the Madagascar Action Plan (MAP) (GoM, 2007) and cited in a recent World Bank report.⁴⁰ The report notes that many achievements have not been met until now, which would be related to the on-going political crisis (2009 to date).

The MAP document is a rapid development plan for the period 2007 to 2012 and is composed of 8 Commitments. Several commitments are important for ASM activities. Commitment 1 addresses responsible governance and Commitment 4 focuses on rural development and a green revolution with important implications for the exploitation of natural resources, including mineral resources. Commitment 6 discusses a high growth economy encouraging local and international development by the private sector with an emphasis on mining. Meanwhile Commitment 7 is the principal section of the MAP addressing environmental issues and objectives (GoM, 2007).

The MAP also integrates itself with the UN’s Millennium Development Goals by ensuring environmental sustainability through sustainable development and protection of natural resources, and provision of potable water and sanitation. The latter point opens up the term “environment” in a broader sense, rather than the more common interpretation in a country biased towards biodiversity and parks. However, many of the 13 principal goals of the MAP are focused on social and economic development of the country and its population (GoM, 2007).

Each commitment of the MAP is divided into a series of challenges with their respective goals, strategies, projects and activities, and indicators. The principal challenges are in Commitments 6 and 7 (GoM, 2007), as discussed below.

Commitment 6’s challenges for a high growth economy are summarised with comments as follows:

³⁸ Inter-ministerial Order No. 4355/97 of 13 May 1997 including definitions and demarcations of sensitive zones

³⁹ Mohamady, Bruno. Commercial Miner based in Diana Region. Personal Communication. 11 April 2012

⁴⁰ MAP is regarded as an official reference by The World Bank for Madagascar and recently referred to in “Review of Public Spending – Madagascar: Budget Policy and Public Investment during a Period of Political Instability (Revue des dépenses publiques – Madagascar: Politique budgétaire et investissement public en période d’instabilité politique) dated September 2011.

- Challenge 7: to encourage mining projects to enter the production phase as soon as possible while respecting local communities and the environment. The aim is to attract promoters through access to natural assets. The strategy includes the involvement of Malagasy citizens in the developing extractive projects, while integrating ASM into the formal economy. A priority activity for ASM includes informing, educating and training of small-scale gemstone miners

This challenge also refers to the Strategic Decision Meeting (SDM) in 2006, which focused on mining and hydrocarbon development. The key issues to improve or attenuate in ASM were raised as follows (MoM, 2006):

- uncontrolled mining rushes
- negative social and environmental impacts and mitigation of environmental damage associated with ASM activities
- decentralised management of mining authorities overlooking ASM
- implementation of commercial systems that result in a win-win situation for stakeholders associated with ASM
- development of sustainable value-added activities and net gain strategies at ASM sites

The SDM action plan also recommends the following key issues (MoM, 2006):

- tracking and mapping of ASM activities
- national register of dealers and employees with registration cards
- tracking of exports by licence number
- tracking of known or suspected traders to Nairobi, Mauritius, Sri Lanka, Thailand, Hong Kong/China, Dubai and other gold markets
- visas, registration cards, and work permit status of dealers should be checked by authorities

It is clear from MAP and SDM that many of the issues pertaining to ASM are clearly delineated; and some of the key actions proposed are orientated to both formalise and legitimise ASM activities. However, it is clear from this study that many of the issues remain and actions need to be taken, if the Government wishes ASM to develop while contributing fully to the economy of Madagascar and the protection of the environment.

Commitment 7's challenges for the environment are summarised with comments, as follows:

- Challenge 1: to increase protected areas (PAs) for conservation. 1.7m hectares to 6 million hectares from 2003 onwards, i.e. 10per cent of national territory in alignment with IUCN's international goals (as discussed in Section 3); and abide by the Kyoto climate change agreements. Development of PAs also includes an eco-tourism framework and economic/ecological harmonisation. Projects and activities focus on the steps to achieve PAs including consultations followed by indicators including tourism figures, as well as capital, efficiency and representatively of PAs.

The challenge almost met its PA coverage targets prior to the political crisis. However, funding and management of the PAs remain a major problem for MNP and various NGOs promoting new protected areas. Often the process of sustainable financing reverts to the traditional method of demanding financial support from international donors including the World Bank. However, MNP are now focusing on alternative financing including tourism concessions in parks for eco-lodges.⁴¹

- Challenge 2: Reducing natural resource degradation processes. This focuses on sustainable use of forest and wetland outside PAs to minimise vegetation clearance by fires (slash and burn). Promotes alternative energy with biofuels and firewood through reforestation programmes. It also supports these objectives by promoting private sector involvement in natural resource management. Projects and activities focus on the steps to achieve sustainable use through zoning of sites, offering management transfer agreements to communities for land and tradable species, supporting new charcoal development techniques with alternative energies, and practical environmental education programmes. These activities are measured against the number of management plans and people using alternative energies, as well as areas destroyed by fire and subsequently reforested.

⁴¹ Ramangason, Guy Suzon. Managing Director of MNP. Personal Communication. 11 May 2012

The objective of encouraging sustainable management is in principle laudable. However, the majority of the ever-growing population is very poor, and has very few alternatives with which to change its way of life. Often resources are already depleted, or offer minimum recourse for sustainable management by a larger and growing population. In addition, the increase in protected areas may impose greater pressure on natural resources outside and inside the limits of PAs as local farmers search for fertile soils to cultivate or wood products to extract. These cases include approximately 40 hectares of charcoal extractions inside the Ankarana PA (see Section 6.5.3).⁴² Alternative modes of employment in rural areas through ASM and semi-industrial or industrial agriculture may be a way forward, while the protection of PAs is maintained and integrated in sustainable livelihood strategies. It is important to add that biofuel projects are not necessarily an alternative for energy, as there are issues concerning their success until now. Equally, while urban opportunities from factories could one day be important in the future, the current political and economic crisis, with its negative impact on inward investment, has temporarily nullified any hopes for such employment from the manufacturing sector. Currently, migration to urban centers is likely to equate to increased rates of urban poverty.

- Challenge 3: Develop environmental mainstreaming at all levels. This focuses on mainstreaming environmental issues across all sectors including mining and their potential impacts on the environment. The challenge's activities include the development of policies and codes for environmental protection and development while maintaining standards. It also promotes the exchange of information between all parties: local populations, experts, businesses and government.

This challenge is possibly the most important for the population and businesses operating in the country. However, the processes are often hindered by the lack of transparency and the lack of decentralisation in the country. The current political crisis has only compounded the problems for mainstreaming environmental issues across all sectors including ASM. In addition, the situation has been undermined through the substantial illegal exports of precious rosewood timber, as well as mining proceeding without environmental permits, thus provoking local social conflicts as observed with the Chinese company Mainland Mining near Manakara (L'Express de Madagascar, 2011).

- Challenge 4: Strengthening the effectiveness of forest management. This is directed at reinforcing forest resource management through stakeholder accountability with the enforcement of laws and strengthening of forest and environmental controls. The activities include improved legislation, strengthening policy frameworks, capacity building amongst stakeholders with autonomous structures for environmental operations such as forestry commissions and ministerial environmental units. In addition, education and awareness of management and legal systems for forests, tax incentives for management and promotion of forest concessions, as well as e-governance with databases supported by monitoring and evaluation. Indicators include numbers of forest control units, tracking of forest products and corresponding revenues and e-governance of the entire Ministry.

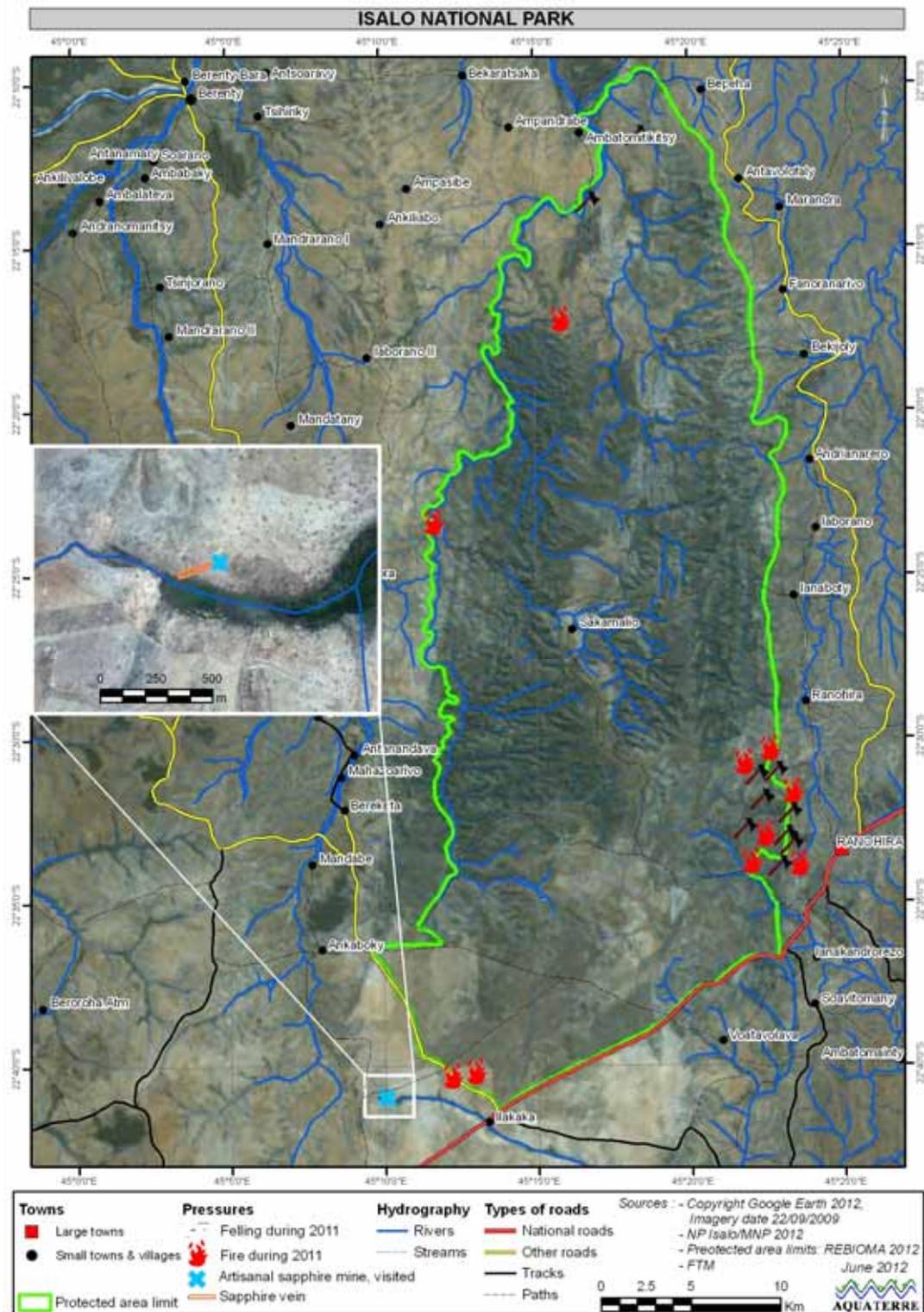
This challenge is related to transfer of management of forests to local populations. However the sustainability of the forests and its surveillance by forest authorities are often inadequate as PAs and/or "community" forests are used by local communities for subsistence agriculture needs (swidden culture or tavy) and/or are pillaged for charcoal extraction and their timber, including precious woods in some areas (see rosewood and charcoal issues above). Control remains limited as the authorities lack human and financial resources and may be compelled to ignore the issue due to local pressure and/or involvement in the exploitation of forest resources.

⁴² Salo, Nicolas. Director of Ankarana PA. Personal Communication. 14 April 2012.

6. SITE VISITS

6.1 Isalo PA

Figure 11: Isalo National Park, with indication of attempted ASM incursions



6.1.1 Socio-environmental context

Isalo National Park was established in 1962. The site has been classified as an IUCN Category II PA (ANGAP, 2001). The PA is situated 683km southwest of Antananarivo, 279km southwest of Fianarantsoa, and 243km northeast of the coastal city of Toliara. It covers an area of 81,540 hectares.

The site has consistently been the most popular of Madagascar's PAs, with 35,000 visitors in 2011, and very much a favourite on the tourist circuit. It is easily accessible, lying on the RN7, on the way to Toliara. The nearest town, or rural commune, Ranohira abuts the PA, with most of its population working in tourism activities linked to the Park. There are a considerable number of hotels located in Ranohira. It is estimated that the population of Ranohira is currently 20-25,000, while the addition of the nearby mining town of Ilakaka, brings the total population of the rural commune to about 45,000.⁴³

The area around Isalo is currently relatively sparsely populated, with the Bara people predominating in the region. Most Bara are dependent on subsistence agriculture. The raising of livestock, or zebu, is of critical economic and socio-cultural importance to the Bara. At the height of the ASM gemstone rush in around 2000, it was estimated that in the region there were up to 200,000 new immigrants as part of the rush influx. These numbers have subsided considerably, to the current figures cited above.

Isalo PA's landscape consists of eroded ruiniform sandstone formations dating to the Jurassic period, deep canyons with riparian forests, palm-lined oases, fire-resistant tapia forests, and open grasslands. The climate is dry tropical forest and savannah, with average temperatures ranging from 17°C in June to 25°C in February. The altitude varies from 514m to 1268m, with some canyons reaching 200m in depth. A number of rivers flow in the region of the PA. They include the Marandra, the Tsiombivoly, the Andriamanero, the Andranonkova, the Namaza and the Ianakandrarezo. On the western side there are also the Sambay, the Amboloando, the Anka-demoky, the Sakamalia, the Hoanga, the Vohibasias, the Andranomena, the Sambalahitsara and the Analakira.

Isalo PA contains more than 400 species of flora. Many of them are endemic to Madagascar like the *Pachypodium rosulatum*, from the Apocynaceae family, the *Catharantus ovalis* that is a medicinal plant that isn't found anywhere else in the world but in the Ihorombe and on the plain of the Zomandao. The savannah is characterized by typical palms of the region; for example, the *Bismarkia nobilis*, or "satrana", which is locally known for its fire-resistant qualities.

In terms of flora, Isalo is particularly well known for its pachypodes (*Pachypodium*), aloe and euphorbiums. Riparian forests can be found along rivers in the canyons of Isalo, while there are also scattered sclerophyll forests made up of fire-resistant Tapia (*Uapaca bojeri*) and Heza (*Astropeia micraster*). Rupicolous vegetation can be found on rocky surfaces, consisting of Pachypodiums (*Pachypodium geayi*, *Pachypodium willamarai*, *Pachypodium rosulatum*, *Pachypodium horombese*, and *Pachypodium densiflorum*); Aloes (*Aloe acutissima*, *Aloe isalensis* and *Aloe detoideodonta*); and a species of Kalanchoes.

In terms of fauna, there are 82 species of birds, such as Benson's rock thrush (*Monticola bensoni*), with Isalo its best known breeding site; 33 species of reptiles; 15 species of frog; 14 species of mammals. Among the 14 lemur species, particularly notable are the Red-fronted Lemur (*Eulemur rufus*), the Ring-tailed lemur (*Lemur catta*), and Verreaux's Sifaka (*Propithecus verreauxi*). Among the frogs, there is the Malagasy rainbow frog (*Scaphiophryne gottlebei*), which is endemic to Isalo, and currently listed as critically endangered because its extent of occurrence is less than 100km²; all individuals are in a single location; there is continuing decline in the extent and quality of its habitat around Isalo; and it is possibly subject to over-collecting for the pet trade leading to a decline in the number of mature individuals. *Scaphiophryne gottlebei* is currently listed by CITES under appendix II.

Isalo PA could be described as retaining a very significant socio-cultural, even psychological value for Madagascar. It is probably the most photographed of the national parks, adorning countless postcards, with its canyons an almost totemic image of the country's monumental landscape. Thus, while richness in biodiversity is arguably less elevated than other sites, it is the core national park in Madagascar's environmental psyche, as well as of significant economic value for both the PA manager MNP and the local/national economies, being a major draw for tourists and the most visited of the PAs.

⁴³ Mionjo, A.P. Mayor of rural commune of Ranohira, including Ilakaka. Personal communication. 4 April 2012

Figure 12: Women combine ASM (in the background) and laundry activities, at Ilakaka



6.1.2 History of ASM on site to the present

The history of ASM at or near Isalo PA is intimately bound up with the most spectacular and famous of Madagascar's gemstone rushes, that of Ilakaka, which literally borders the PAs protection zone (ZP). The name Ilakaka originates from the name of the river, which runs alongside the ZP.

Ilakaka was originally, prior to 1998, a small village of less than 100 people, on the RN7. With the discovery of sapphires in 1998, the population soared, reaching its peak in 1999-2000 of 150,000 to 200,000 people.⁴⁴ Ilakaka was particularly hard hit by a previous government's ban on sapphire exports, in 2008-9. Many of the mainly Sri Lankan and Thai foreign buyers left the country, and tens of thousands of ASM miners lost their jobs (see **Section 3.5**). Although the population has diminished to around 15,000-20,000, Ilakaka still remains the principal centre for Madagascar's sapphire mining and trade. New deposits are still being detected up to 150 kilometres east and 50 kilometres north (Tilghman, 2007). The area is reputed for its blue sapphires, metamorphic with low iron content. These can be highly valued by buyers, who will for a good example pay ten times more for an Ilakaka stone than for an equivalent balsatic blue sapphire, originating from Ankarana PA in the north of the country.⁴⁵

The mining substrate in the Ilakaka region is sandy soil. The sandy soil is relatively easy to dig; but its downside is that its tunnels are prone to collapse, increasing the degree of occupational hazard for Ilakaka miners. Local rivers and water courses are used, usually by women, to sieve the soil and rock in the search for sapphires (see **Figure 12**).

In 2001, the current boundaries of Isalo PA were definitively established. Under the Protected Areas Code (COAP) of 2003, the ZP around a PA is by law meant to be 2.5km, with some discretion allowed to extend or reduce following consultations with the local community. In the area in which the park has been affected by ASM activity a local fokontany chief requested that the ZP's limit be extended up to the river which currently borders the park. This was reportedly due to the fact that he was interested in creating a buffer to protect his rice fields, which lined the riverbanks. The authorities obliged; and thus the ZP in the area affected by ASM activities is approximately 3.5km in depth.

⁴⁴ Although it is important to note that the ASM mining area around Ilakaka and nearby Sakaraha is massive, covering thousands of square kilometers.

⁴⁵ Cushman, Tom. Personal communication. 17 June 2012

Over the years there have been a number of attempts by miners to infiltrate the PA's ZP. In June 2005, a mini-rush impacted Isalo PA's ZP. By September, following intervention from the park authorities and the forces of law and order, the miners had been evicted. In 2007, it's reported that the regional forces of law and order were actually responsible for reintroducing ASM into the PA's ZP, with a maximum number of around 1000 miners. By November 2008, the infiltration had ended, and park authorities began to patrol at night. It should be noted that these attempts to infiltrate the PA's ZP were mainly made at night. Actual mining within the PA itself has been minimal, as they only involved sampling holes. Attempts were reportedly made, again by very limited numbers of miners at night; but they soon desisted, mainly because there were no gemstones to be mined, except in the thin strip on the edge of the ZP.

In 2009, on 28 January, simultaneous with the beginning of the political crisis, ASM miners attempted to take advantage of the situation and infiltrate the PA's ZP during the day. It's thought that this attempt may have been provoked by unscrupulous buyers in the region who saw an opportunity to open up the PA to ASM activities. However, about 15-20 national police stationed in Ranohira intervened with MNP personnel, and the miners were evicted from the ZP.

Currently there is an arrangement with the national police for them to patrol at night with park authorities. The police receive payment for this service, an arrangement which has been authorized at the highest levels of MNP. A building has also been erected in the ZP, overlooking the thin stretch of land in the ZP, which is thought to be the short sapphire vein attracting the miners.

The area in the ZP targeted by the ASM miners amounts to about an hectare, it is a thin narrow strip of land, angling up from the river which borders the ZP. Currently, the situation at the site is akin to cat and mouse. There is a constant police presence, with two policemen patrolling at night, and one during the day. The numbers of ASM miners trying to ingress are minimal, five or six at any one time, only at night. The local community apparently looks amiss at immigrant miners trying to infiltrate the park, and regularly report attempts to do so to the authorities.⁴⁶ MNP personnel are regularly threatened by disgruntled miners, but till now this has been merely rhetorical.

6.1.3 Impacts (positive and negative)

Positive impacts

The most positive impact has been that attempts to undertake ASM activities in both the PA and the ZP have failed to gain traction. Isalo PA is the most significant instance when authorities have been able to repulse attempts by ASM miners to infiltrate a PA. However, although a success story in those terms, it's important to bear in mind that there has been little to protect. The area targeted is about one hectare, at the edge of an enlarged ZP. Relative to other PAs, the challenge is very limited, while small-scale infiltrations continue until now.

Nevertheless, Isalo PA can be regarded as something of a case-study in the success of robust, proactive efforts to prevent infiltration into the ZP, the breaching of which by miners is usually the precursor to ASM activities within the PA proper.

Negative impacts

It's estimated that in the narrow area of approximately one hectare, which is the sum of ASM intrusion into the ZP, there are about 100 mining holes, all of which have been filled in by PA authorities, as of early April 2012. MNP has also begun a reforestation of the area with some exotic trees and shrubs designed to have a symbolic, psychological effect in serving as a disincentive to miners.

As discussed above, the soil in and around Ilakaka and Isalo is particularly sandy, thus making mining tunnels especially prone to collapse. In March 2007, a tunnel collapsed while ASM miners were digging illicitly in the ZP. Three young men died.

The very limited area in which the ASM activities are confined means that there is very little environmental marginal impact even on the ZP. The PA itself has not been affected.

Other than that, attempts to mine in the ZP have had other negative impacts, in the form of threats to MNP personnel, particularly the park director. Also, there have in the past been cases of collusion between the forces of law and order and the ASM miners, or more likely their backers. Also to consider, as negative impacts, are the

⁴⁶ Rajaonarivo, Aro. Director of Isalo PA, MNP. Personal Communication. 3 April 2012

costs of the ongoing police operation, as well as the costs of construction for the building in the ZP, which houses the police and the MNP personnel who guard the area, all of which are paid for by MNP.

6.1.4 Prognosis

It's unlikely that the situation at Isalo will deteriorate. The area under threat is very small. Moreover, Ilakaka is a mature ASM site, with vast potential riches further south along ancient or existing riverbeds attracting miners away from the park. It has progressed from being a relatively lawless, 'wild west' ASM rush locale to being a functioning town, with a relatively strong police presence. In addition, the sister town of Ranohira, which with Ilakaka forms the rural commune, has been expanding thanks to tourism, and demographically is in the ascendant over the mining community.

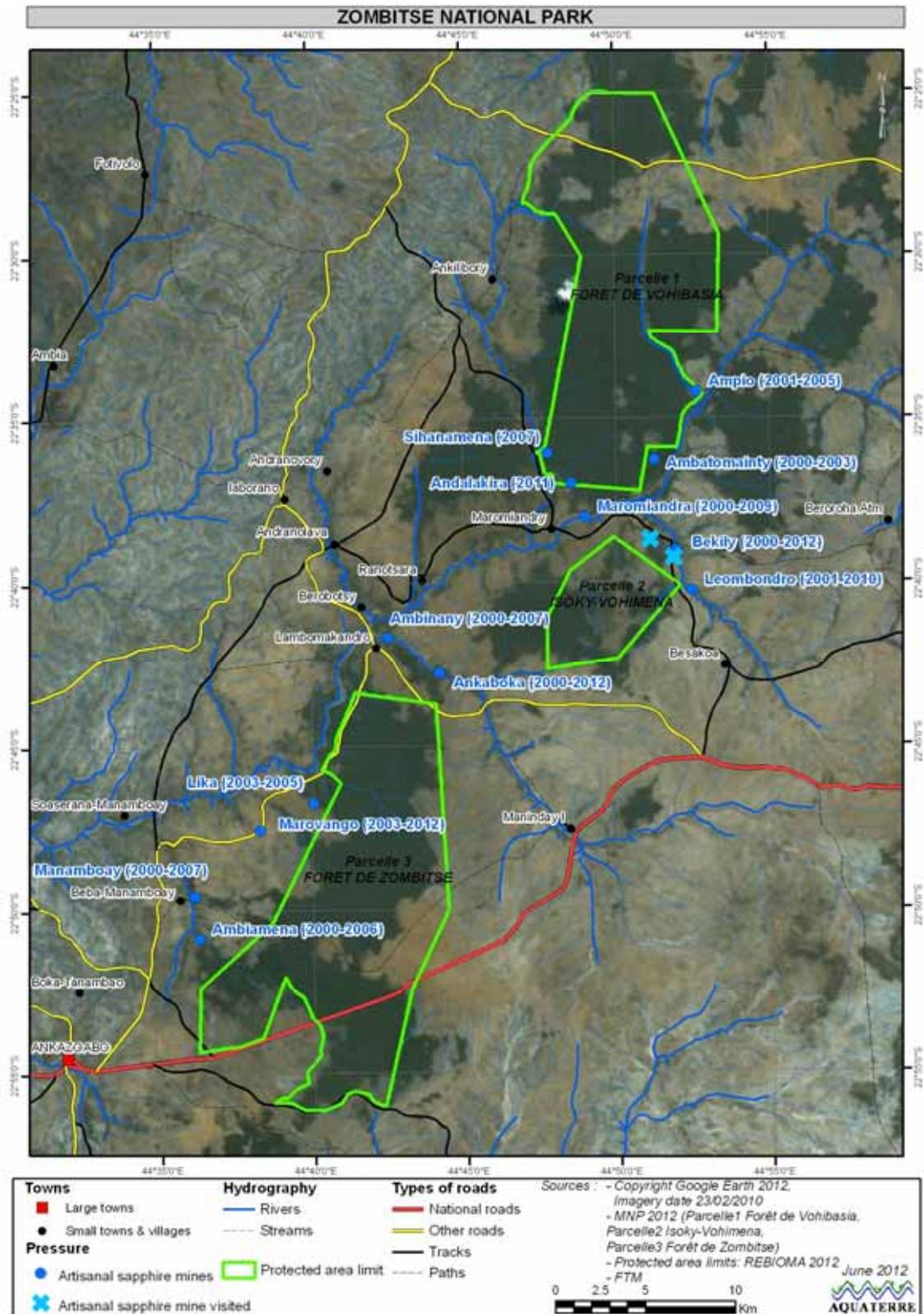
As well as being very limited in their scale, the ASM activities have also been hampered by the relatively significant resources available to MNP for protecting the PA. Isalo is a rich national park, with more visitors than any other. It is also of exceptional symbolic value. Thus more considerable resources have been allocated to its protection.

According to the head of the local fokontany, the lowest level of local government, pressure on the PA is in part attributable to the fact that mining opportunities in the region have been drying up, as the more accessible sapphire deposits have been incrementally exhausted.⁴⁷ On the other hand, it's probable that extensive ASM activities will continue in the region, particularly as large-scale mining operations open up otherwise isolated areas for exploitation of other mineral resources.

The impact of ASM on Isalo has been relatively of a very different order of magnitude due to limited forest cover, as it is dominated by rock and grassland savannahs, which are less sensitive to habitat damage. This situation stands out in stark contrast to the neighbouring Zombitse-Vohibasia PA, where ASM has had significant and long lasting ecological impacts upon the dry forest within the PA. Similarly the impacts upon forest in other areas including Ankarana PA and recently near Didy, have resulted in far more catastrophic and significant environmental degradation

⁴⁷ Paraly, Rufin. Head of Fokontany, Ilakaka & former miner. Personal Communication. 2 April 2012

Figure 13: Zombitse-Vohibasia National Park



6.2 Zombitse-Vohibasia pa

6.2.1 Socio-environmental context

Zombitse-Vohibasia was established as a National Park in 1997. MNP has managed the PA since September 28, 2002. The site is particularly noted for being an area of ecological research. It is situated in the southwest of Madagascar, 135km northeast of Toliara, 90km west of Isalo PA, and 20km northeast of Sakaraha. It covers an area of 36,030 hectares. The Park is divided into three different sections: Zombitse (168km²), Vohibasia (161km²) and Vohimena Isoky (32km²). As with Isalo, the population in the vicinity is mainly drawn from the Bara and Mahafaly peoples, who are dependent on subsistence agriculture, as well as zebu livestock.

In terms of climate, the forest of Vohibasia serves as the transition between the dry and wet forests of Madagascar. It is generally hot and dry in the region. Temperatures average between 23°C and 24°C, with 721-833mm of annual rainfall. Elevation is between 300 and 825m.

The forests of Vohibasia-Isoky have limestone rock foundation dating from the early to middle Jurassic. In other parts of the park, sandstone formations and canyons can be found.

The dry forest canopy averages 10-16m in height.

In terms of fauna, 15 small mammals, 2 carnivorous and 8 lemur species, such as Verreaux's sifaka, red-fronted brown lemur, ring-tailed lemur, pale fork-marked lemur and the Hubbard's sportive lemur can be observed in Zombitse-Vohibasia. There are 85 species of birds, with Zombitse-Vohibasia being home to 47 per cent of the endemic birds of Madagascar and a local endemic species: the Appert's tetraka *Bernieria (Xanthomixis apperti)*, which only lives in this forest and the nearby Analavelona forest. 33 reptile and 8 amphibian species have been reported in Zombitse-Vohibasia PA, such as the Standing's day gecko (*Phelsuma standingi*), which is also locally endemic to the Park.

The forests of Zombitse-Vohibasia constitute the most important remnant of dry deciduous forest in Madagascar. Zombitse-Vohibasia acts as a transition zone between dry and humid forests. Therefore the flora is especially rich within the PA. Baobabs and several orchids are particularly common.

6.2.2 History of ASM on site to the present

Zombitse-Vohibasia is very much the poor relative vis-à-vis the far more visited, richer and much larger neighbouring PA of Isalo National Park. As a PA it is more species-rich than Isalo, but does not have nearly the same degree of prominence, with only around 2500 visitors every year in 2011, although the figure has risen significantly in recent years.⁴⁸

The areas around Zombitse-Vohibasia, and indeed the PA itself, have been particularly hard hit by deforestation. Hundreds of years of slash-and-burn agriculture, tree felling and uncontrolled grassland fires have turned much of the landscape into an arid plateau. The local Bara and Mahafaly populations need more and more space to feed their zebu herds, as well as grow rice and corn.

In the PA itself, in 2001-2 there was organized illicit agricultural cultivation. 30-40 hectares of the PA were denuded for manioc cultivation, with the connivance of park agents who were bribed not to intervene.⁴⁹ This manioc was destined for the mining town of Sakaraha. While not directly linked to ASM, there are more than circumstantial connections. The massive increase in population in the region brought about by the ASM rushes affecting Ilakaka and Sakaraha created a significant rise in demand for foodstuffs. This in turn helped provoke the illicit cultivation in Zombitse-Vohibasia PA.

A major ASM sapphire rush affecting Zombitse-Vohibasia occurred in 2003, peaking in 2004-5. Forces of law and order from Toliara, as well as MNP personnel, intervened. As can be seen on the map of the PA (see **Figure 13**), the Vohibasia Forest has been especially hard hit with infiltrations into the PA itself. In late 2005, a Sri Lankan mining company announced on television that they had paid corrupt government and park officials so as to be able to mine in the PA.⁵⁰

In 2008, all the holes caused by ASM, some 2000-3000, were reportedly filled in. This was performed by the local community following a programme of sensitization. Sri Lankan buyers, based in Sakaraha, also contributed to the

⁴⁸ Ravelomjatovo, G.H. Director of Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

⁴⁹ Rajaonarivo, Aro. Director of Isalo PA, MNP. Personal Communication. 3 April 2012

⁵⁰ Cushman, Tom. World Bank consultant on gemstone education and ASM issues, founding member of National Committee of Mines. Personal communication 12 May 2012

cost of tree replantation.⁵¹ MNP is continuing its attempts to sensitise the local population in and around the ZP, focusing on heads of fokontany and other local community leaders. In general, the ASM miners will cease mining in a particular area when they have exhausted the supply of accessible sapphires.

Also in 2008, the government intervention against gemstone mining,⁵² led to a major exodus of foreign buyers from nearby Sakaraha and Ilakaka. This in turn meant that demand dried up for the gems being mined around Zombitse-Vohibasia PA. This served to ease pressure on the PA.⁵³

Figure 14: mining holes, in village within ZP of Zombitse-Vohibasia PA



The ZP around Zombitse-Vohibasia PA has been essentially given up by the relevant authority, the Ministry of Environment and Forests (MEF). It is anomalous that while the PA is the responsibility of the managing agency, in this case MNP, the buffer zone or ZP, which is intended to protect the PA remains the remit of another agency, being MEF. In the case of Zombitse-Vohibasia, it was reported that a previous Minister of MEF had told the Park Director that it was no longer possible to maintain the integrity of the ZP, and that ASM activities therein would not be the subject of intervention.⁵⁴

In the ZP around the Soky-Vohimena zone of the PA, ASM activity has rendered the surrounding area akin to a lunar landscape, with holes and piles of excavated earth proliferating everywhere. Nearby villages are not immune, with ASM excavations going on right up to the very walls of houses (see **Figure 14**, above). The mining has now almost exhausted the ZP, and ASM activities are taking place at the very edge of the PA.

According to MNP personnel, 60per cent of the ASM miners are from the Antandroy and Mahafely groups, from the south of the country, with their migration to the ASM site being mainly due to pressures from repeated droughts and desertification around their villages of origin.⁵⁵ The mining villages in the ZP are also home to Malagasy “businessmen”, the generic term for smaller-scale collectors or buyers, who in turn sell to the foreign buyers based in Ilakaka or Sakaraha. Most of these local buyers are reportedly from the Toliara region.⁵⁶

⁵¹ Rasamimanana, H. Head Conservation and Research, Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

⁵² Rasamimanana, H. Head Conservation and Research, Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

⁵³ Rasamimanana, H. Head Conservation and Research, Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

⁵⁴ Ravelomjatovo, G.H. Director of Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

⁵⁵ Rasamimanana, H. Head Conservation and Research, Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

⁵⁶ Rasamimanana, H. Head Conservation and Research, Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

Figure 15: ASM miner, in ZP of Zombitse-Vohibasia PA



6.2.3 Impacts (positive and negative)

Positive impacts

The major positive impact is socio-economic. ASM activities have provided miners with considerably enhanced cash incomes. One miner from our focus group had succeeded over eight years in amassing a herd of 20 zebu, as well as a gun with which to guard his assets, as a result of his mining activities.⁵⁷

While the soil around Zombitse-Vohibasia PA is generally sandy, it is less so than in Ilakaka, and thus less prone to collapse, which will have a positive impact on occupational health and safety issues. The miner focus group seemed to be of the phlegmatic view that if injuries or worse were to happen it was a matter of destiny.

Negative impacts

The most significant negative impact is that mining has now penetrated into the PA itself. The population living around the PA has increased significantly as a result of ASM activities, with approximately 74 mining-linked villages within the ZP. This in turn has increased pressure on the PA's biodiversity. Mining in the ZP has caused considerable environmental damage through major tree clearance. The resulting timber is used for supports and internal scaffolding in the workings of the mines, as well as for fires to illuminate night mining and for general firewood.

Within the ZP, and those areas within the PA affected by ASM infiltration, there has been a major loss of habitat, with the almost total tree clearance at ASM sites also contributing to soil degradation and erosion in the event of strong rains. The zone is prone to natural erosion. This has been significantly exacerbated by sedimentation caused by ASM activities, with miners sifting excavated earth in search of gemstones in local water sources. This in turn impacts downstream on local rivers providing drinking water for villages in the region.

While holes created by ASM were filled in by park authorities in 2008, since then many more have been created. The ZP around the Soky-Vohimena zone is a desolate landscape.

6.2.4 Prognosis

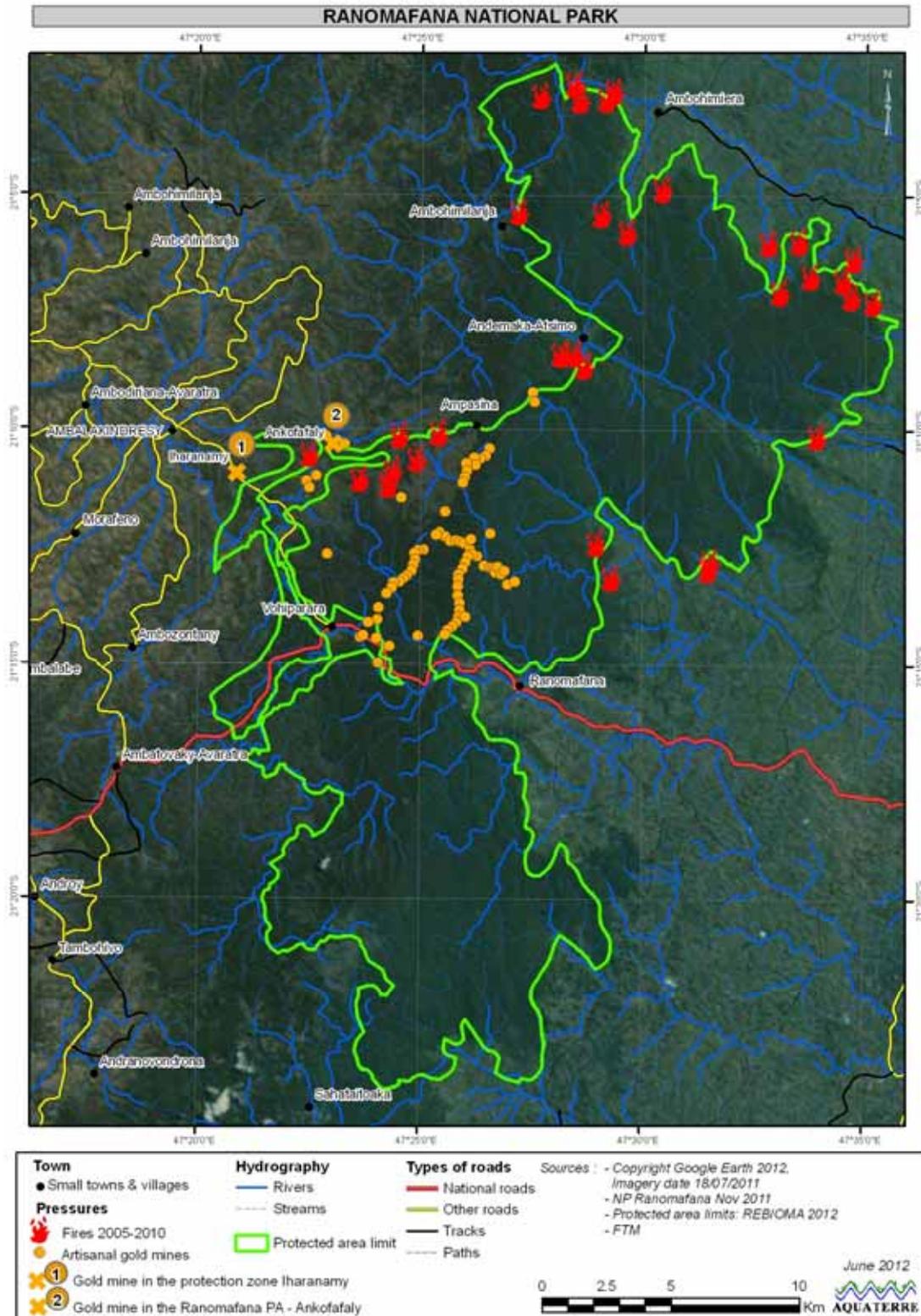
ASM activities are likely to continue within the ZP around Zombitse-Vohibasia PA. As opportunities in the ZP are gradually exhausted, miners will probably expand their infiltration into the PA, unless concerted and determined action is taken by the authorities. According to MNP personnel, the majority of miners are nomadic, going from one ASM rush site to another, and have little interest in durable development. Their primary motivation is ASM exploitation. Thus a strategy of offering alternative livelihoods is unlikely to be effective.

MNP personnel were of the opinion that, given increasing levels of the poverty in the region, ASM activities would increase and pressure grow on the PA. There was a perception that there has been a laxity in the application of relevant laws, such as the mining code; and that the onus was on central and regional government to fulfil its responsibilities if damage to the PA was to be mitigated.⁵⁸

⁵⁷ Mr Jean. ASM Miner. Personal Communication. 3 April 2012

⁵⁸ Ravelomjatovo, G.H. Director of Zombitse-Vohibasia PA, MNP. Personal Communication. 3 April 2012

Figure 16: Ranomafana National Park, with gold ASM sites, as well as incidence of fire



6.3 Ranomafana PA

6.3.1 Socio-environmental context

Ranomafana was established as a national park in 1991. In 2007, it was among six national parks in eastern Madagascar which were collectively listed as a UNESCO World Heritage Site, the Rainforests of the Atsinanana. The park is situated 394km south of Antananarivo, 65km north-east of Fianarantsoa, and 139km west of Mananjary, in the regions of Haute Matsiatra and Vatovavy-Fitovinany. Located close to the RN7, it is one of the most visited national parks in Madagascar. The village of Ranomafana has relatively extensive tourist facilities, as well as a popular spa.

Ranomafana National Park covers an area of 41,601 hectares. Its climate is generally one of montane rainforest, with average temperatures between 14°C and 20°C, and an elevation of 400-1417m. It is mostly mountainous and consists of low altitude rainforests (much of this degraded), mid-altitude forests, and montane rainforests. The local peoples are Tanala and Betsileo.

In terms of fauna, the PA is exceptionally rich. The park contains twelve lemur species. Aside from the golden bamboo lemur (*Hapalemur aureus*), there are also eastern grey bamboo lemur (*H. griseus*), greater bamboo lemur (*H. simus*), eastern woolly lemur, red bellied lemur (*Eulemur rubriventer*), red-fronted brown lemur (*E. rubriventer*), black-and-white ruffed lemur (*Varevia viaregata*), Milne-Edward's sifaka (*Propithecus edwardsi*), Small-toothed sportive lemur (*Lepilemur microdon*), greater dwarf lemur (*Cheirogaleus major*) and brown mouse lemur (*Microcebus rufus*) and the rarely encountered aye-aye (*Daubentonia madagascariensis*). Both the golden and the greater bamboo lemur are classified as endangered by IUCN. Other mammals include at least 7 species of tenrecs, 8 bats and 6 carnivores, like the Malagasy striped civet (*Fossa fossana*).

There are at least 115 species of birds, of which 30 are locally endemic, among them the Henst's goshawk, Rufous-headed ground-roller, velvet asity, mesites or the threatened crested ibis. There are 62 species of reptiles (chameleons, snakes and fringed and satanic leaf-tailed geckos being particularly common), 98 frogs, at least 90 butterflies and 350 spiders, and several endemic fishes and crayfishes.

There are precious wood and palm trees, many orchids and carnivorous plants. The PA is notable for its numerous small streams, which feed the Namorona River. The latter bisects the park and produces electricity at the hydroelectric power station of Ranomafana, which provides 18.7MW of electricity for regions around Fianarantsoa, Ambalavao, and Mananjary.

6.3.2 History of ASM on site to the present

Ranomafana PA has a relatively long history of ASM gold activities. Miners were first detected by MNP as significantly active within and in the environs of the PA in 1996, following which there was a campaign by MNP and local authorities to remove them. By 2006, ASM activities had largely ceased in the PA. However, they recommenced in 2009, with at least 20 families living within the interior of the PA and engaging in ASM of gold. In November 2011, park authorities mounted a major operation with the support of local gendarmes and military to evict the ASM miners. While this had proved generally successful by December 2011, so that the mining families were no longer living in the PA, there remains significant ASM activity in the ZP, and regular incursions into the interior of the PA by ASM gold miners.⁵⁹

In the course of the site visit, ASM gold miners were visibly working at the Iharanamy site within the ZP, as shown on the map (see **Figure 16**). They moved away from the site as soon as they were aware of our presence. The Ankofafaly site within the PA proper (see **Figure 17**) had evidently been very recently worked. ASM miners within the vicinity eventually returned to the Ankofafaly site, where we were able to talk to them. This and other miner focus groups in the area confirmed that the ASM miners working in the ZP were almost all drawn from the near vicinity of the PA. They practiced ASM as a means to generate cash income, in addition to their traditional agricultural cultivation.

⁵⁹ Rakotoarijaona Andrianarisoa, Mamy. Director of Ranomafana PA. Personal Communication. 6 April 2012

Figure 17: Ankofafaly ASM site within Ranomafana PA



The situation at Ranomafana PA has reportedly been complicated by the nature of the park's delimitation in 1991. The park boundaries were allegedly drawn up rather precipitously, in the months prior to the major political crisis of 1991, and in places in a seemingly arbitrary manner.⁶⁰ This resulted in certain local communities feeling dispossessed through the creation of the PA. The resentment continues till this day. In 2005, one of the boundary stones was shattered by perpetrators unknown; but it is likely they originated from within the local community. MNP personnel view this as an expression of local discontent with the PA. More seriously, in October 2010, 20 hectares of the PA were burnt down in an act of deliberate arson. Apparently, intentional setting fire to the forest remains a significant problem, and is attributable to local resentment.

It's estimated that annual gold production, in 2010, in and around the PA amounted to approximately 22kg (Rakotoarijaona, 2011). Since 2009, ASM miners in the vicinity have been working on gold production for an average eight months of the year (ibid.). Gold mining provides a significant contribution to the livelihoods of the local community, living in five communes close to the park. It was estimated, in 2010, that 517 people from the five nearby communes were engaged in ASM gold activities (ibid.).

⁶⁰ Rakotoarijaona Andrianarisoa, Mamy. Director of Ranomafana PA. Personal Communication. 6 April 2012

Figure 18: ASM miner focus group, at gold mine site, within Ranomafana PA



6.3.3 Impacts (positive and negative)

Positive impacts

ASM miner focus groups from the Ranomafana area all asserted that their ASM activities were a vital supplement to their main income from subsistence agriculture. It's thought that each miner manages to produce approximately 0.2g of gold per day (Rakotoarijaona, 2011). This would provide a relatively significant cash income.

Due to the usually very localised nature of ASM gold activities, the influx of miners into the PA has not been overwhelming. The number of miners has been relatively limited. Among them, there is a recognition that aspects of the PA's biodiversity are important to conserve, as it provides the local community with traditional medicine.

Negative impacts

In and around the Ranomafana PA, artisanal miners mainly exploit the current or former riverbeds of the Namorona and Ranomena rivers. In this area, miners tend to work in teams of 3-4 people. It's thought that on average a three-person team will clear a surface area of approximately 6m² per day, with an average daily excavation of 4m³. While numbers of miners at any one time are relatively low, the cumulative effect of such activities on the PA and ZP will be significant, in terms of environmental degradation. No rehabilitation activities are carried out by the ASM miners, resulting in numerous mining holes dotting the riverbanks (Rakotoarijaona, 2011).

ASM gold activities in the PA and ZP have led to loss of riparian vegetation and neighbouring rainforest, particularly in areas with proven deposits along significant stretches of land within the PA (see **Figure 17**). Sedimentation in streams and water-courses, following panning activities as well as excavation, will also have a

negative impact on the aquatic biodiversity of Ranomafana PA. Important aquatic life in Ranomafana includes 98 species of amphibians, six species of crustaceans, and six species of fish, many of which are endemic to Madagascar.

6.3.4 Prognosis

Current management of Ranomafana PA deploys a policy of robust intervention against ASM mining in the PA, combined with attempts to sensitise the local population. As with Zombitse-Vohibasia PA, mining with relative impunity within the ZP means that the PA's buffer zone is being incrementally exhausted of its ASM gold opportunities, thus making it more likely that there will be increased pressure on the PA itself in the future.

On the other hand, given the history of Ranomafana PA's inception, with continuing resentment on the part of local communities towards the historical delimitation of the park boundaries, there is the risk that aggressive policing of ASM activities in the ZP and PA might well lead to increased incidence of arson targeting the PA's forest.

6.4 Soamahamanina, near Arivonimamo

Figure 19: Soamahamanina, near Arivonimamo



6.4.1 Socio-environmental context

Soamahamanina is an urban commune in the region of Itasy, close to the district town of Arivonimamo in central Madagascar, approximately 68km from the capital Antananarivo. It is easily accessible on the RN1, and could be said to be located on the margins of Antananarivo's urban agglomeration. The population is mainly drawn from the Merina people.

The region of Itasy has a population of 703,252. It's estimated that 88per cent of the population make a living from subsistence agriculture, despite the fact that in many areas the soil is of low quality. There has also been significant deforestation and soil erosion throughout much of the region.

The environs of Soamahamanina can be characterized as denuded savannah grasslands, located near several habitations. The grasslands are used for low-intensity grazing. The biodiversity is low to insignificant for both

terrestrial and aquatic habitats. It lies on red lateritic soils, which are prone to erosion, known as “lavaka”, or gully erosion. Soamahamanina and the ASM site itself are situated close to a river, with small water-courses running less than 500m from the ASM site.

The site is situated on a hill, subject to downhill erosion towards lower-lying water-courses. In the lower lying areas below the hill, there is extensive rice cultivation. Besides the lowland rice production, there are also rain-fed crops, principally manioc.

Figure 20: Main ASM site at Soamahamanina, near Arivonimamo



6.4.2 History of ASM on site to the present

The ASM gold rush at Soamahamanina began in early March 2012. Reportedly, it followed on from the activities of an Australian junior exploration company, which had been doing prospecting in the area, but had subsequently let its official permits lapse. The local community subsequently moved in and began the ASM exploitation of the site. In March it was estimated that there were 1000 ASM miners taking part in the rush, with 10-15 Malagasy collectors regularly visiting the site from their base in Antananarivo. Due to the seasonal exigencies of rice cultivation, the number of miners in late May had decreased to approximately 750, with 10 Malagasy collectors regularly visiting the site.

The ASM rush site at Soamahamanina covers approximately two hectares of land. Besides the relatively deep principal mine (see **Figure 20**), there are also a number of smaller peripheral mines, as well as an area in the lower-lying rice field where a small water source is used for the panning of some of the earth excavated from the mine above; while a river located several kilometres from the site is also used. In addition, an impromptu main street has sprung up along the track approaching the ASM site. Shopkeepers, from as far afield as Antananarivo, have relocated to the site and set up stalls serving the needs of the miners (see **Figure 21**).

Figure 21: “main street” at Soamahamanina, near Arivonimamo



While the collectors originate from Antananarivo, the miners are generally local to the region of Itasy. In fact, the regional authorities have installed a number of measures designed to semi-formalise the ASM mining activities (see **Section 8.6**). These measures include a covered area which is used as a *comptoir* for the collectors and the miners (see **Figure 22**); while a very prominent notice board on which are affixed photocopies of a handbook in the Malagasy language, setting out the principles of best practice at the ASM site, including such issues as sanitation and occupational health and safety (see **Figure 23**). Following the death of three miners in a tunnel collapse during the night, the regional authorities banned night-time mining. Representatives from the communal authorities are present on site, monitoring the mining and payment of the local tax or *ristorne* to the local government. The local authorities have also constructed a clearly marked temporary structure housing a number of pit latrines in a designated area (see **Figure 24**).

Figure 22: *Comptoir*, Soamahamanina, near Arivonimamo



Figure 23: ASM best practice noticeboard, Soamahamanina, near Arivonimamo



Figure 24: Pit latrines, Soamahamanina, near Arivonimamo



site, the bulk of the panning takes place in a larger river, situated approximately 2km from the site. A lorry regularly ferries the excavated earth between the site and the nearby river (see **Figure 25**).

Figure 25: Lorry for transport of earth to river, Soamahamanina, near Arivonimamo



It remains unclear exactly how much is currently being produced at the site, with conflicting estimates from both the commune and the collectors. However, it is possible to arrive at a conservative estimate of approximately 6kg per month for the period at the height of the rush.⁶¹

6.4.3 Impacts (positive and negative)

Positive impacts

The ASM activities are providing an important source of cash income to a relatively large number of people involved in the rush.

The intervention of the regional authorities to semi-formalise the ASM activities have resulted in an exceptionally well-managed ASM site. The dissemination of ASM best practices through the notice board, the presence of officials from the commune, the installation of latrines, the banning of night-time mining, the construction of the *comptoir*, the insistence on payment of the *ristorne*, and the general order exhibited at the ASM site are all relatively exemplary indicators of how formalisation, or semi-formalisation (see **Section 8.6**), can radically improve conditions at an ASM site.

In terms of the environment as well as sanitation, some thought has evidently gone into the location of the latrines. Effluent will inevitably go downhill, but the water sources are several hundred meters away from the designated latrine area, so minimizing risk of aquifer pollution

Negative impacts

Panning occurs in a small water-course in the lowland rice field just below the ASM site. This will contribute to sedimentation and silting in rivers. Moreover, the transport by truck of larger quantities for earth for panning in a nearby river will have a similarly negative effect in terms of sedimentation.

Not all the attempts by the regional authorities to formalise the ASM site have been successful. Officially, the sale of alcohol is banned, in an attempt to consolidate security on site as well as improve occupational health and safety among the miners. However, on the site visit it was clear that alcohol was visibly for sale at a number of stalls along the temporary main street.

It was very evident at the site that a significant number of school-age children were involved in the mining activities (see **Figure 26**). A focus group of children on site explained that they were not attending school in order that they could participate in the ASM mining with their families. While the children were not apparently engaged

⁶¹ One can calculate this on the basis of 1000 miners producing on average 0.2g/day.

in any significantly heavy or dangerous work, their continuing absence from education is undoubtedly a negative impact.



Figure 26: Children working at Soamahamanina, near Arivonimamo

6.4.4 Prognosis

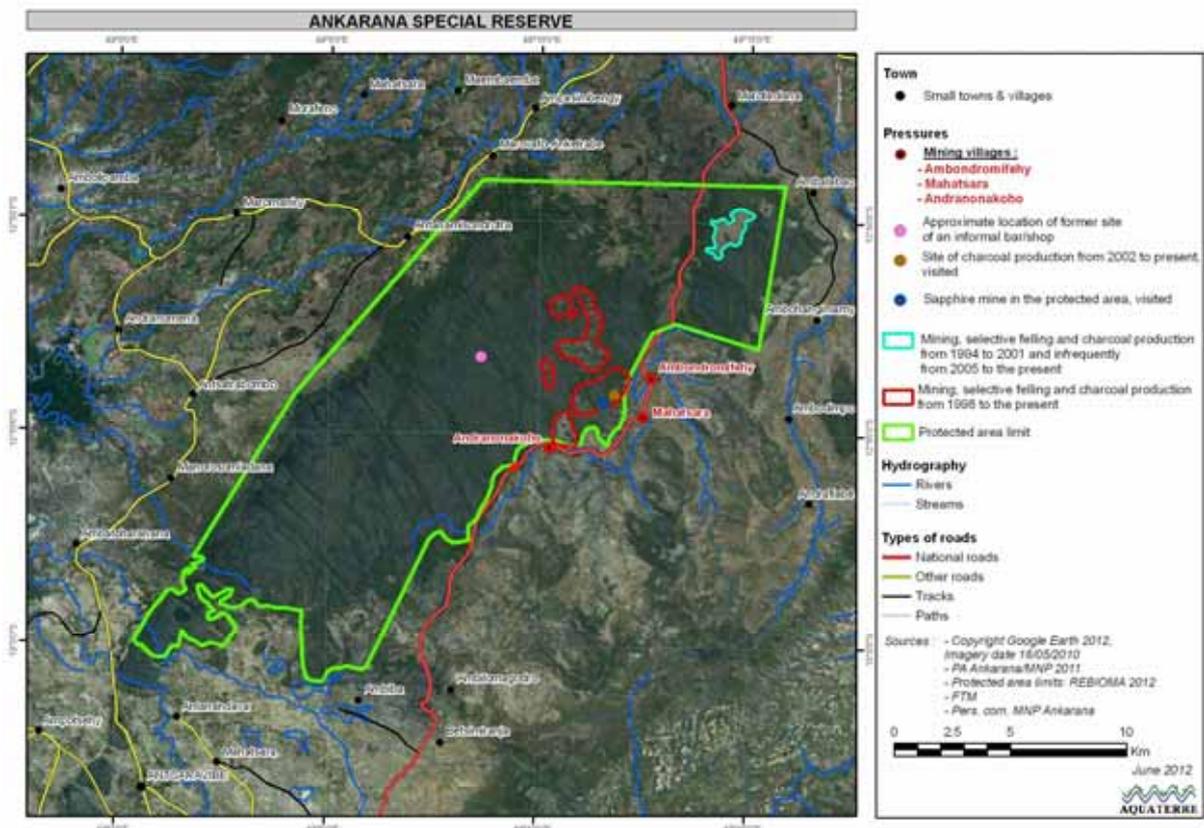
The ASM gold rush at Soamahamanina is almost a case-study in some of the benefits accrued through semi-formalisation. Due to the capacity constraints faced by the Ministry of Mines, there had been no opportunity for the Ministry of Mines to make a prior on-site visit to ensure formal formalisation of the ASM activities at Soamahamanina. Thus the region had stepped in, and certainly mitigated potentially negative impacts, with some exceptions as noted above.

Tax is collected locally at commune and regional level, although it is unclear exactly where this goes and how this is spent, as the Ministry of Mines is not involved at present. Effectively the mine has been informally, or semi-formalised, although the regional authorities' formalisation is not fully compliant with current legislation.

In this case, the fact that Soamahamanina is not located in or near a PA or critical ecosystem is a crucial factor, which allows the process of semi-formalisation to be relatively harmless, in that it does not serve to legitimise illegal mining in a PA. If the management of the ASM site by the regional authorities continues with the same degree of oversight and attention to detail, this site could be a benchmark for other locations.

6.5 Ankarana PA

Figure 27: Ankarana Special Reserve, with indication of ASM activities within the PA



6.5.1 Socio-environmental context

The Ankarana Special Reserve (Réserve Spéciale or RS) was created in 1956 by the colonial authorities and has full legal protection (Nicoll and Langrand, 1989). The site has also been classified as an IUCN IV (II) category PA (ANGAP, 2001), which means it is a category IV, but practically perceived as a Class II PA. The PA is situated in the Diana Region, District of Ambilobe and Commune Rural of Anivorana Avartra being in the far northwestern corner of Madagascar, and located on the escarpment of the Ankarana plateau. Prior to the political crisis (2009-2012), Ankarana was ranked as the 5th most popular PA in the country for MNP with almost 10,000 visitors in 2007 (MNP, 2008). The site is easily accessible along a small path of a few kilometres leading from the 3 surrounding mining villages, including the principal village called Ambondromifehy. These villages are located along the axis of the RN6 national highway, which is a relatively good paved road leading to both Antananarivo and Diego Suarez.

The PA's surroundings have relatively low populations due in part to limited access and the history of migration in the north. The dominant people of the area are known as the Antankarana group and are associated with the far northern Sakalava dynasty, which expanded along the west coast of Madagascar in the seventeenth and eighteenth centuries. The Antankarana arose as internal disputes threatened political cohesion, when some branches of the Sakalava royal family moved north to establish their own political sovereignty. In this area, the royal family, along with the local people, called themselves Antankarana, meaning 'People of the Rocks', referring to the Ankarana limestone massif (Gezon, 1997).

Political conflict over resources in this area, principally forest resources, has long been an issue that has roiled the region. Currently, royal families from the Antankarana people accept MNP and NGOs working in the south of the park where ecotourism is deemed attractive for them. Meanwhile, there is disregard for the park in the northern sector where they condone mining activities.⁶²

⁶² Befourouack, Julien. Head of Regional Office, MNP, Antsiranana. Personal Communication. 10 April 2012.

The PA sits on a calcareous massif traversed by several gorges aligned south-east/north-west. Limestone karst pinnacles formed from the calcareous rock are known as *tsingy* and found throughout the PA. Subterranean systems include extensive cave systems and network of underground rivers. The soils are a combination of calcareous soils with richer volcanic and organic soils in the forest, although all are relatively thin soils overlying rock. Due to the topography and geology, cases of soil erosion are limited in the area.

The Ankarana Special Reserve is one of the northernmost reaches of the Madagascar dry deciduous forests and found across the majority of the PA with a canopy culminating rarely at no more than 20 metres, where underground water sources and richer soils are combined. At least 330 plant species are known in Ankarana. Several endemic species of the far north are located in Ankarana and include principally *Pachypodium baronia*, *Adansonia perrieri*, *Delonyx velutina*, and *Hildegardia erythosyphon*. There are various deciduous plant formations within the PA, as well as xerophytic vegetation found on the dry karst limestone *tsingy*. The deciduous forests in the gorge are the richest in species diversity, while the most common trees include the Ficuses, *Adansonia* and *Pandanus* species (MNP, 2012).

The biological inventories for the area give 50 herpetofauna species composed of 40 reptiles and 10 amphibians. Several species are endemic to this region, while a few are classified as threatened species with limited distribution ranges. Among these particular species are the rock dwelling frog *Tsingymantis antitra*, the ground boa *Acrantophis madagascariensis*, snakes including *Alluaudina mocquardi* and *Heteroliodon lava* (known only from Ankarana). The biological inventories also reported 96 species of birds, 50 species of molluscs including large numbers found on the *tsingy*. Of the 14 species of bats found in the PA, many are living in the caves and grottos. Amongst them are the large and small bats known as Megachiroptere and Microchiroptere, respectively. The underground rivers are also home to many crocodiles. Other discoveries in the caves include sub-fossil remains of large extinct lemurs and recently unknown species of blind fish and shrimps and other invertebrates living in the underground watercourses (Banister, 1994, Wilson, 1996, Gurney, 1984). In the forest, there are 11 species of lemurs, and the PA is also a well known and important refuge for significant populations of Crowned lemur, Sanford's brown lemur, and other mammal species including the Fossa (MNP, 2012).

Figure 28: Woman in search of sapphires, at stream, just outside Ankarana PA



6.5.2 History of ASM on site to the present

The history of sapphire mining in the Ankarana area began in 1994 when several private foreign small mining companies started mechanised mining for sapphires, in permits squares outside the northern sector of the Ankarana PA. Later in 1998, some of these companies started to abandon their sites as returns from mining in their squares outside of the PA were not sufficiently significant. During the mechanised mining, local artisanal miners also arrived, but soon discovered that the neighbouring PA was rich in sapphires.⁶³ By 1996 foreign buyers were also in the area and started to attract thousands of artisanal miners to the area (Walsh, 2004) and the village of Ambondromifehy, and thus the ASM rush began. News also spread by word of mouth and national media, attracting people from across the country (Tilghman et al., 2007).

By 1998 the rush peaked with an estimated 14,000 miners in the area (Tilghman et al., 2007). Many of the miners came from the Diana region, its capital Antsiranana and elsewhere in Madagascar.⁶⁴ However, a significant number of migrant miners originating from across the country arrived from an ASM site in the far south of Madagascar called Andranondambo in 1998. The rush in Andranondambo began in 1993 when sapphires were discovered, then peaked to 10,000 miners in 1994. Miners gradually moved to a new site nearby called Antsiernene (10km north of Andranondambo), then onto Ankarana in 1998. Subsequently, part of this rush went on to Ilakaka in 1999 (Aquaterre, 2004).

Figure 29: ASM miner, with village security guard, displaying sapphires from Ankarana PA



⁶³ Salo, Nicolas. Director of Ankarana PA. Personal Communication. 14 April 2012.

⁶⁴ Salo, Nicolas. Director of Ankarana PA. Personal Communication. 14 April 2012.

Before the sapphire rush began, Ambondromifehy was a small village of about 400 farmers growing rice and cash crops. Its population remained significantly higher after the rush of 1998 and was estimated at approximately 3000 in 2007 (Tilghman et al., 2007). Similar demographic shifts have occurred at two other villages located a little further south and known as Mahatsara and Andranonakoho. The population increases were principally due to migrating miners, Malagasy traders and foreign buyers, or service providers, such as hotel and restaurant owners and shopkeepers. Meanwhile other rural villages in the area, such as Maromakotra, Maventibao, Amboangimamy, Andasoa, Besaboba, and Antserasera, are predominantly the homes of miners, who are either locals or now settled migrants, often combining digging for sapphires with agricultural life throughout the year.

The villages in the area are home to approximately 2000 artisanal miners and 400 transient Malagasy traders in 2012 based on a recent MNP survey.⁶⁵ Although since the peak of the rush in 1998, the number of miners has slowly subsided as sapphire stones on or near the surface of rock in the PA became more rare. Subsequently miners have had to dig much deeper underground. Other gemstone rushes around the country, notably in Ilakaka, and currently at the Ikalamavony tourmaline ASM located south of Fianarantsoa, have attracted miners from Ankarana. In addition, regional rushes have been associated with green garnet in Antetazambato (2009 to present), north of Ambanja. Also recent smaller rushes (2011 to present) to sapphire mines in Antokita (Andampy) and Antsirabe, both located south of Ambanja, involve transient miners traveling along the the vector of the RN6 and building huts serving as temporary accommodation, as they move from their permanent home to a mine, or from site to site.

Foreign traders at the beginning of the rush came from around the world and were notably Thai or West Africans, as well as some Europeans and North Americans. Meanwhile the majority of these stones eventually arrive in Bangkok (Walsh, 2004; and Tilghman et al., 2007), a city renowned for the cutting of gemstones. To regulate the buyers, the Inter-regional Office of the Ministry of Mines has and still contemplates the possibility of creating an official trading office, or *comptoir*, for the stones.⁶⁶ However, this has not yet materialised; it poses the difficult issue whereby formalisation would legitimise the sale of inherently illicit stones from a PA. Today, foreign buyers from Ankarana still include small numbers of Thais and West Africans, but also Sri Lankans, many of whom are associated with the larger rushes in the Ilakaka region and elsewhere.

Figure 30: Gemstone *comptoir*, on RN6, in village of Ambondromifehy, close to Ankarana PA



⁶⁵ Befourouack, Julien. Head of Regional Office, MNP, Antsiranana. Personal Communication. 10 April 2012.

⁶⁶ Tiandraza, Jean. Inter-regional Director of Mines, Antsiranana. Personal Communication. 16 April 2012.

6.5.3 Impacts (positive and negative)

Positive impacts

The economy of the region and the villages located adjacent to Ankarana PA have benefited significantly for almost 20 years from artisanal mining and the sale of sapphire stones to Malagasy traders and/or foreign buyers. Local miners stated that they can get on average MGA 45,000 or approximately USD20 per day and may work four or five times per week in the PA.⁶⁷

Often local people living and working in the area today will mine in relation to their daily or current needs, as the stones are immediately exchanged for cash and not banked. The sale of sapphires can be used to supplement inhabitants' income to buy food and in some cases to educate their children at local schools.⁶⁸

Mining has allowed the village to grow and develop its service and trade sectors including shops, schools, private doctors and other businesses. Effectively, migrants and local people have formed a larger rural town population in an area composed of either small and/or isolated villages.

The town of Ambondromifehy developed its own fokontany (village authority) and official village security guards, who patrol the small town.⁶⁹ These services evolved as the town grew during the rush and exist today. These systems provide the village with a degree of security, which is advantageous for its inhabitants.

Negative impacts

Sanitation is often neglected in towns and villages across Madagascar as observed in Ambondromifehy, where toilets and waste storage are often interspersed amongst the large number of habitations. Health issues associated with poor sanitation in the villages near Ankarana PA lead to increased cases of diarrhoea, which can also be associated with poor personal hygiene. The medical services have found that the miners are often uneducated and do not necessarily understand the importance of vaccinating their young children against preventable diseases during annual campaigns. Originally there were no potable water supplies in 1998, which also provoked the spread of cholera.⁷⁰

Miners working in dust and low quality air conditions in mining shafts suffer from respiratory conditions.⁷¹ In addition, accidents from shaft collapses (up to 30m deep holes and over 100m of tunnels combined with natural caves), the use of sledgehammers, spikes, and long metal bars, and the lighting of underground fires to develop fissures in rock, lead to regular injuries and some fatalities (reportedly, two per annum on average) in the Ankarana mining area.⁷²

Sexually transmittable diseases (STDs) also increase significantly during a rush. Prostitution was associated with the influx of girls from principally Antsiranana and the town of Ambilobe, as well as elsewhere. Often the prostitutes from Antsiranana were aware of the dangers of STDs and used contraceptives, whereas girls and newer recruits from Ambilobe were less aware of the risks, and caught and/or spread STDs. In response, local clinics attached to the Commune Anivorana Avartra worked with the PSI/Marie Stopes' STD prevention and awareness programme to address this problem.⁷³

The biodiversity of mainly underground watercourses, in the limestone karst systems of Ankarana, will be impacted by sediments cascading down through the caves where miners work to access the sapphires. At present, it is unknown what impact this may have upon rare and potentially fragile ecosystems supporting unique varieties of subterranean blind fish and shrimp, and many other exclusive species. Mining in the grottos may also lead to theft of sub-fossils, which were previously the source of revenue from the park in the 1980s (Nicoll and Langrand, 1989). In addition sediment pollutes the surface rivers, when the contents of bags of soil are carried to the rivers then sieved to separate the rough stones.

Significant vegetation and forest loss has occurred since the 1980s in many sectors of the PA and was associated with illicit forestry and uncontrolled burning. In addition, during the 1980s, there was limited hunting of animals, although significant numbers of crocodiles were illicitly trapped for their skins (Nicoll and Langrand, 1989). This

⁶⁷ Miner focus group in Ankarana PA. Personal Communication. 15 April 2012.

⁶⁸ Miner focus group in Ankarana PA. Personal Communication. 15 April 2012.

⁶⁹ Messieurs Jeannot & Meva. Village security guards, Ambondromifehy. Personal Communication. 15 April 2012.

⁷⁰ Dr Jaoroby, Josia, Head of Ambilobe Central Hospital. Personal Communication. 14 April 2012.

⁷¹ Dr Jaoroby, Josia, Head of Ambilobe Central Hospital. Personal Communication. 14 April 2012.

⁷² M. Feliva. MNP's Ankarana PA Warden. Personal Communication. 15 April 2012.

⁷³ Dr Jaoroby, Josia. Head of Ambilobe Central Hospital. Personal Communication. 14 April 2012.

issue was likely to be linked to the conflict between the Antankarana dynasty and conservation organisations, as discussed earlier in this section. Similarly, during the rush until now, the open access approach for the northern sector of Ankarana PA has been adopted and informally accepted by the authorities, as they have been powerless to intervene effectively.⁷⁴

Another mining-linked impact has been the creation of many holes on the surface with some loss of vegetation, which was addressed by WWF during the rush by paying miners to fill in the holes at a pilot site (WWF, 1999). This scheme does not appear to have succeeded; and it could be described as counter-productive, with NGOs effectively paying the people originally digging the holes to fill the same holes. However, it is recognised by MNP that these mining activities, then and now, are and were less significant than tree felling and charcoal production by local people and migrants from southern Madagascar.

Figure 31: three day old, working sapphire mine, within Ankarana PA



Today, the political crisis (2009 to 2012) combined with mining have encouraged influential people in the region also to orchestrate more felling and charcoal production, estimated to have had an impact on up to 40 hectares of the PA in recent times.⁷⁵ These areas are accessible, while local MNP agents are often ineffective to stop the exploitation. Both mining and cutting of trees have a significant impact on wildlife, which are forced to migrate elsewhere into the PA⁷⁶.

6.5.4 Prognosis

Mining in the Ambondromifehy area is particularly contentious, since most of it occurs within the Ankarana Special Reserve boundaries and the protective buffer zone. Estimates of the area affected by sapphire mining vary from between 1 to 10 per cent according to MNP (Tilghman et al., 2007); and it is clearly visible from satellite maps (see **Figure 27**). Some environmentalists⁷⁷ in Madagascar stated in 2007 that damage to the park is so

⁷⁴ Salo, Nicolas. Director of Ankarana PA. MNP. Personal Communication. 14 April 2012.

⁷⁵ Salo, Nicolas. Director of Ankarana PA. MNP. Personal Communication. 14 April 2012.

⁷⁶ M. Feliva. MNP Ankarana PA Warden. Personal Communication. 15 April 2012.

⁷⁷ Steve Goodman from the environmental NGO Varatra (cited in Tilghman et al., 2007)

severe that consideration was being given to degazetting some areas of their current protected status (Tilghman, 2007).

It appears that MNP has accepted the compromise of a fully protected PA in the south providing significant tourism revenue, while the north is informally known as the 'mining sector'.⁷⁸ In addition, wood extraction in the northern sector continues to benefit regional personalities, as well as local or migrant artisanal miners. Reduced numbers of miners in the PA today, compared to the rush of 1998, will contribute to a lower impact than in the past. However, in time the existing number of miners will broaden their impact on the PA pushing populations of wildlife to dwindling, rare or non-existent alternative niches. Equally, an impunity to mine may reinforce and exacerbate charcoal and timber exploitation, which would have immediate and major impacts upon the PA's habitats and wildlife.

6.6 Antetetzambato

6.6.1 Socio-environmental context

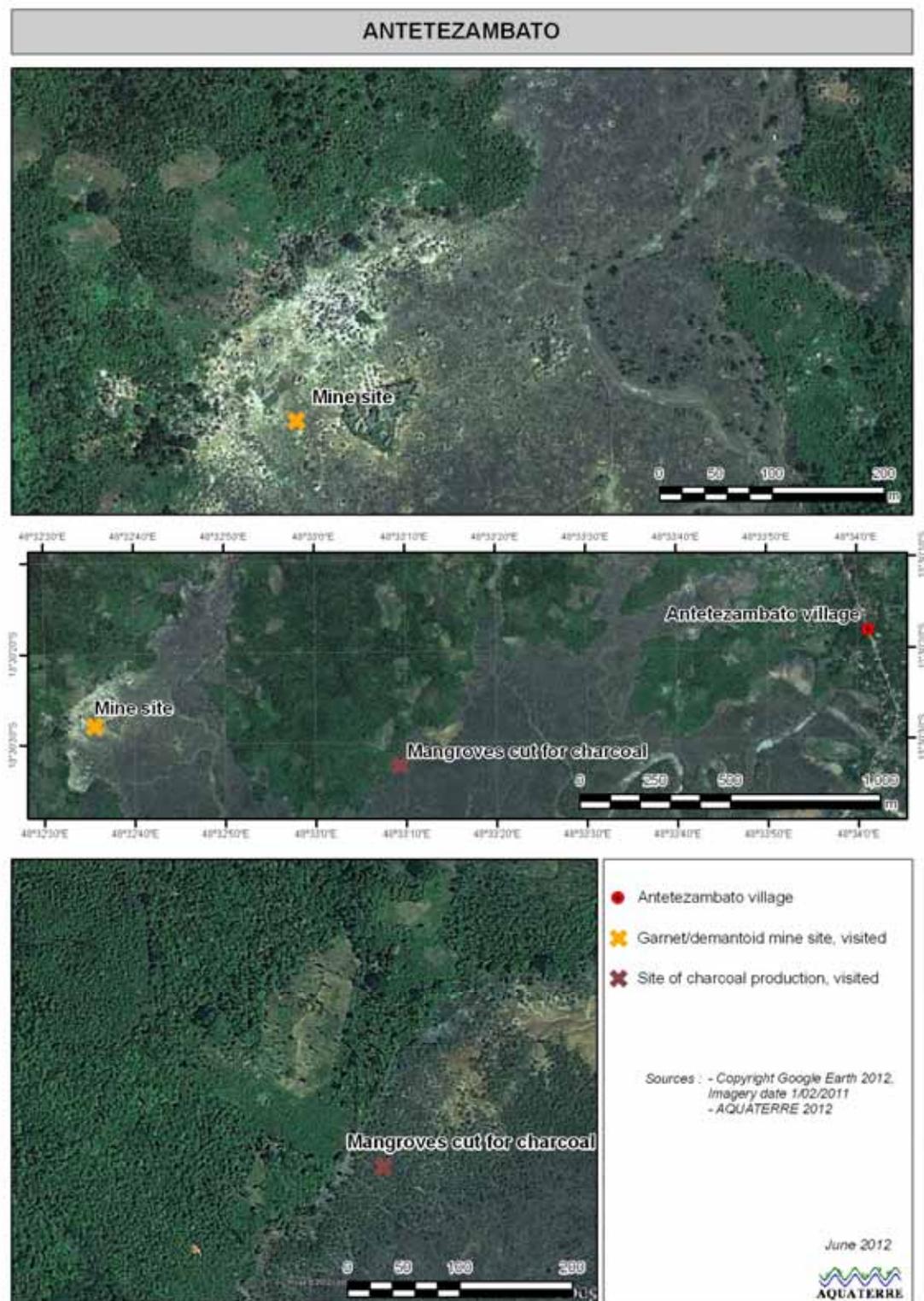
The ASM site is known as Antetetzambato and named after the nearest village located 2.5km east of the mine site. The village is located in the Rural Commune of Ampapamena, within the District of Ambanja and Region of Diana. The site is located on the western coast of north-west Madagascar and approximately 30km from the nearest large town of Ambanja. The site is relatively easy to access along several paths of a few kilometres from the village of Antetetzambato, although high tides limit accessibility across the mangroves near the mine site. The village is located near a secondary road leading to the RN6, which is a relatively good paved road providing immediate access to Ambanja and Antananarivo to the south, and Diego Suarez to the north.

The PA is in an area which has a relatively low population composed of some crop and livestock farmers, charcoal producers (stimulated by the ASM rush and sold to Nosy Be), collectors of Ravinala (leaf material sold to Nosy Be for housing), and significant numbers of fishermen using the mangrove areas and immediate coastline for fishing in traditional pirogues. It is important to add that more charcoal producers now operate in the area, since former miners found work supplying charcoal for local demand and exports to Nosy Be. The dominant people of the area are from the Sakalava dynasty of the northwest, although there are also significant numbers of Tsimihety and other groups from across the country (MAEP, 2003).

The principal ASM site is located on the edge of the high tide mark and stretches several hundred metres across embankments of tidal mud flats, mangroves and watercourses flowing to the sea during low tides. Meanwhile, the entire mine site is flooded by seawater during high tides. The green garnets, or demantoids, of Antetetzambato occur in metasomatised Jurassic sedimentary rocks composed of marls and limestones located under the mud flats. The mineralized zone is about 0.5 m thick and situated about 6-13 metres below the surface. Demantoids occur with quartz in small rock cavities and reach up to 20 cm in size, but more commonly are a few centimetres in size (Spiriferminerals, 2012). As the area is inter-tidal, disturbed mud and silts combined with the deforestation of mangroves from ASM activities promote coastal erosion leading to sediment loading of nearby estuarine rivers.

⁷⁸ Salo, Nicolas. Director of Ankarana PA. MNP Personal Communication. 14 April 2012.

Figure 32: Antetezambato green garnet ASM rush site

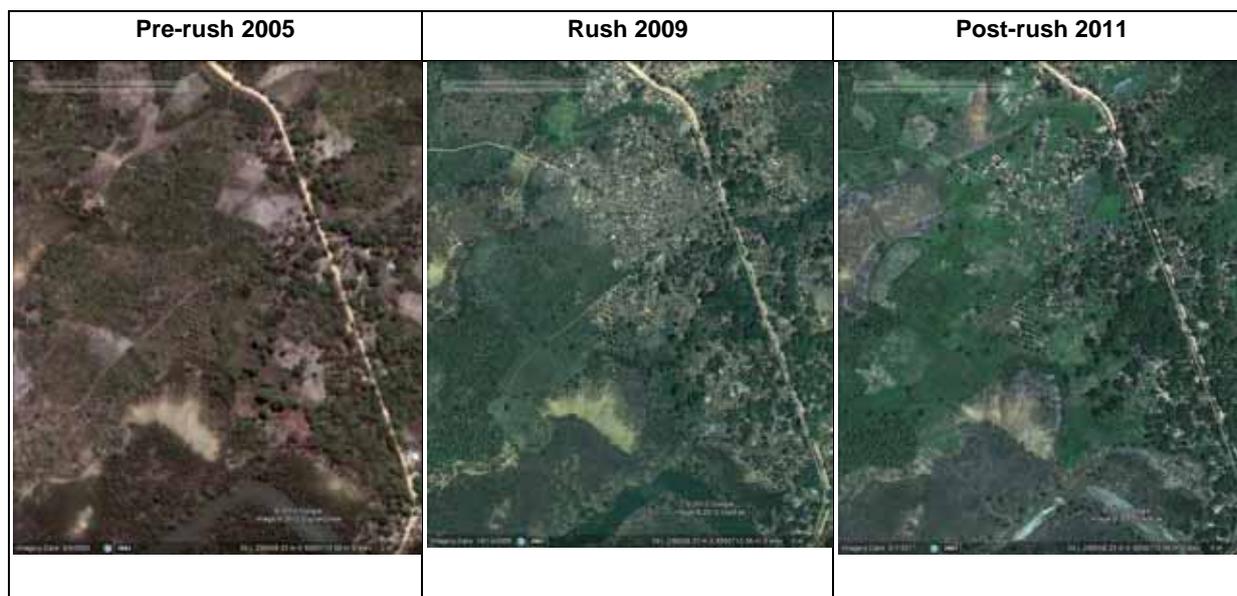


The mine site is composed of mangrove trees surrounded by degraded deciduous woodland and woody savannah. The mangroves along the north-west coast contain up to 8 species of mangrove trees, although they are mainly *Rhizophora mucronata*, Black Mangrove (*Bruguiera gymnorrhiza*) and (*Ceriops tagal*), White Mangrove (*Avicennia marina*), Sonneratias (*Sonneratia alba*) and (*Lumnitzera racemosa*). The mangrove trees are host to other plants such as ferns and mosses including several endemic plant species (Ramsar, 2012).

Mangroves are an important habitat providing breeding grounds for many species of commercial fish and crustaceans, as well as feeding grounds for resident and migratory birds. The waters of the Madagascar mangroves are thus rich in fish and other creatures such as molluscs, crabs, which in turn are food to waterbirds. Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*), and dugongs are known to frequent these regions. Birds include waterbirds such as African Spoonbill, Great Egret, and Grey Heron, and birds of the forest such as Olive Bee-eaters. The many fish found in the waters include mullet, Serranidae, Carangidae, Halfbeak, Plectorhinchus and *Elops machnata*. Most of the fauna of Madagascar in the mangrove areas is also endemic to the country (Birdlife International, 2012).

The mangroves of Madagascar are classified as “sensitive zones” and protected by Inter-ministerial Order No. 4355/97 requiring a full EIA to be completed prior to any potential development activities including mining in the zone. In addition, this coast lies within one of WWF’s top ten land/seascapes known as the Sapphire Sea incorporating Cap d’Ambre land/seascape (see **Section 4.4.3**).

Figure 33: Evolution of number of houses at the garnet/demantoid village of Antetetzambato for the years pre-rush 2005, rush 2009, and post-rush 2011



6.6.2 History of ASM on site to the present

The discovery of demantoids/green garnet was made by a local man in December 2008. The local, who had no understanding of stones, passed his finds to an experienced artisanal miner (Bruno Mohamady), reasonably well known in the region. Later the samples were sent to Mohamady’s French mining partner in France for analysis by experts.⁷⁹ In January 2009, there was a positive identification of the stones with an acknowledgement of their value and the potential importance of the deposit. Then Mohamady decided to opt for the first time to apply for a mining permit, or PRE, for small-scale mining, in March 2009. Due to the political crisis, there was a delay. The permit was finally received in July 2009⁸⁰ for 16 mining squares, each covering an area of 625m². During the period 2009 to 2012, no PREs were normally authorized.⁸¹ However, there may have been exceptions, although it remains unclear if a rapid environmental study (PEE) was completed. As the area is in a mangrove, the habitat is classified as a ‘sensitive zone’ by law and would normally require a full EIA orchestrated by ONE, prior to a mining permit being potentially endorsed to allow the commencement of ASM operations. However, this issue appears to have been misinterpreted, as the site was declared as not being a sensitive zone by mining authorities in Antsiranana.⁸²

⁷⁹ Mohamady, Bruno. Commercial Miner from Diana Region. Personal Communication. 11 April 2012

⁸⁰ Mohamady, Bruno. Commercial Miner from Diana Region. Personal Communication. 11 April 2012

⁸¹ Rakotodravaly, Désiré. Director, Technical Support, Gold Mining and Rushes, Ministry of Mines. Personal Communication. 14 April 2012.

⁸² Mohamady, Bruno. Commercial Miner from Diana Region. Personal Communication. 11 April 2012

Due to leaks of information regarding the stones at Antetazambato from various unknown sources in the region, the first artisanal miners started to arrive in March 2009 (Spiriferminerals, 2012). By April 2009 the mining fever had begun, as foreign buyers (Thai, Sri Lankans, Brazilians, Europeans and Africans) and Malagasy traders and miners from various mining localities including Ankarana, and even as far away as Ilakaka, arrived in search of stones from this new deposit. Soon after, the number of migrant miners was reported to be in the order of 10,000 on the site (Spiriferminerals, 2012).

During the initial rush, Mr Mohamady tried to negotiate with a new, informal association of miners on the site. But it was too late, and the leader of this informal grouping refused to give up the association's squatters' rights; and Mr Mohamady was even threatened by some miners.⁸³ Later in October 2009, a court case went in favour of Mr Mohamady; but the ASM miners persisted in their occupation of the site. Effectively, the rush of a vast number of miners proved to be uncontrollable, and unworkable within the context of site management under the auspices of a mining permit. Eventually, at the beginning of 2010, Mr Mohamady had to be content to work alongside other miners on the site, although he was better equipped with large water pumps and the means to finance local miners from the site.⁸⁴

At this time the Inter-regional mines office also set up a *comptoir* in an attempt to formalise the rush. However, this only existed for several months, and is reported not to have been a success.⁸⁵ The head of the Antetazambato Fokontany supported this initiative, although the mayor of the commune stated that he was never aware of the *comptoir*, while also referring to a conflict with the neighbouring commune, which claimed that the mine site was within their boundary.⁸⁶ The mayor cited this conflict between communes as a reason why the commune could not have collected taxes at a *comptoir*; although the *comptoir* did exist for a short period of time. This poses the question of how the commune benefited, or whether a populist approach was adopted vis-à-vis the miners and the eventual closure of the official *comptoir*.

Later in the year, by October 2009, the numbers dropped to 5000 miners (Spiriferminerals, 2012), although this is likely to be due to the beginning of the wet season bringing difficult conditions on site, with the requirement to pump rainwater in addition to inter-tidal seawater from mine shafts. By 2010, the message had spread about the mine around the country and numbers rose to 20,000 residents in Antetazambato including miners and approximately 100 Malagasy traders, during the dry season from May to October, which was the most expansive phase of the rush. Most of the miners were single young men seeking their fortunes, and, as noted in the same region by Walsh in 2004, yearning for "hot money" to spend at will.

Since 2010, the number of miners on site has dropped significantly with approximately 600 residents in the village during the wet season of 2012, estimated to rise to potentially 2000 people including miners during the dry season.⁸⁷ The reason for this drop in numbers is principally linked to the fact that stones near the surface have diminished due to earlier mining activities, leaving potentially deeper deposits at 25 metres beneath the surface requiring expensive generator-driven water pumps to access shafts. In addition, some miners have moved to smaller sapphire rushes located at two nearby villages, south of Ambanja, existing sites in Ilakaka and Ankakara, the gold rush near Daraina, and new sites including the tourmaline rush at Ikalamavony near Fianarantsoa. This displays the vector effect of rushes and mining throughout the region and across the country.

The evolution of the rush created an enormous increase in the local population from approximately 100 people living in 45 small homes in the village, prior to the ASM rush. The changes to the village is illustrated by the sheer number of new dwellings, as well as some small hotels, restaurants and shops.⁸⁸ The rise and fall in the number of buildings in Antetazambato can be seen in a sequence of satellite images during the pre-rush (2005), rush (2009) and eventual post-rush (2011) phases (see **Figure 33**).

Effectively, the site and the village of Antetazambato have joined the list of post-rush sites, with potential for future mining mainly in the hands of those with pumps, while miners will need to work with the five wealthier mining enterprises in situ owning the large pumps.⁸⁹ According to Mr Mohamady, there is a neighbouring mining permit in the area used by some enterprises, as well as others authorised to work on his plot. However, this information is unclear, as it appears that access is determined by those with the means to invest in pumps and labourers. Prior to this scenario developing, foreign or Malagasy buyers would pay for rice for labourers who

⁸³ Mohamady, Bruno. Commercial Miner from Diana Region. Personal Communication. 11 April 2012

⁸⁴ Mohamady, Bruno. Commercial Miner from Diana Region. Personal Communication. 11 April 2012

⁸⁵ Tiandraza, Jean. Inter-regional Director of Mines, Antsiranana. Personal Communication. 16 April 2012.

⁸⁶ Sidy, Joseph. Mayor of Ampamena. Personal Communication. 14 April 2012.

⁸⁷ Mr Mohamed. Head of Village, Antetazambato. Personal Communication. 13 April 2012.

⁸⁸ Mr Mohamed. Head of Village, Antetazambato. Personal Communication. 13 April 2012.

⁸⁹ Georlin, A. Mahaso. Assistant of Mr Mohamady. Personal Communication. 14 April 2012.

worked in their own shallower shafts with manual pumping via buckets at depths of up to 10 metres, in 2009, on the basis that finds would be exclusively offered to the buyers. This system would provide cash for stones balanced against the cost of pre-invested rice for the miners, although the miners did not benefit significantly from this arrangement.⁹⁰ Effectively some miners became tithe workers for the buyers until they gave up mining and returned home, or moved on as independent miners to other existing or new ASM sites in the country.

Figure 34: Antetezambato green garnet/demantoids



6.6.3 Impacts (positive and negative)

Positive impacts

The site stimulated the economy of the villages in the vicinity and also provided an alternative ASM site for miners to make a living from the region and across the country. Amongst the miners, an estimated 15 per cent were judged as becoming wealthy, while several became very rich.⁹¹ The rush also attracted buyers with money, while competition for stones throughout the evolution of the rush led to rising prices for stones and more satisfied miners.

Income gained from mining at the site has also stimulated other business in the area such as agriculture and demand for principally manioc and bananas. This demand has increased the areas planted for these crops in recent years.⁹² In addition, the mining is seasonal at this site, which allows established residents to occupy themselves with other activities throughout the year.

⁹⁰ Mr Mohamed. Head of Village, Antetezambato. Personal Communication. 13 April 2012

⁹¹ Mr Mohamed. Head of Village, Antetezambato. Personal Communication. 13 April 2012

⁹² Mr Mohamed. Head of Village, Antetezambato. Personal Communication. 13 April 2012

Other services and trades have developed in the village since it has grown in size, and include shops, schools, private doctors, and regular public transport services. In addition, local entertainment in the village boomed during the rush with a discotheque, and two casinos, which still function.

The village of Antetезambato evolved into a fokontany, thus a village with official recognition and authority, in 2009. This status provided a political means to lobby the commune and request support from local authorities. Benefits included the establishment of a *gendarme* (local police) station in the village, which remained throughout the principal rush from 2009 to 2010 and provided security for the local population and migrant miners.

Negative impacts

The mining rush attracted prostitution to the village from towns, with the proliferation of discotheques and bars. Many prostitutes still live in the village, although they do not appear to have influenced the commercial activities of other women in the village.⁹³

Private schools had developed, although there is a much higher demand now for state schools (EPP) in the village from people who cannot afford private schools. The reason is due to the significant number of families with young children and the nearest state schools being several kilometres away.

The number of deaths and injuries from mining activities is significant and accounted for 11 deaths from 2009 to 2010, which is approximately one person per month for the dry seasons. In addition during this period, there were over 50 cases of serious mining injuries.⁹⁴

Sanitation was a serious problem at the height of the rush as many miners defecated liberally around the village. This situation provoked a significant increase in diarrhoea amongst the population. In addition, many miners suffered from dermatological problems associated with poor personal hygiene⁹⁵.

The cost of living rose significantly, impacting the prices of basic foods such as rice, manioc and chicken, as supply against demand was insufficient during the rush. This predicament led to the importation of goods from towns such as Ambanja. Initially, inflation of costs for goods had a severe impact on local villagers, who were not benefiting directly or indirectly from mining activities. The situation has since improved with more agricultural production in the area and lower demand from the reduced number of miners.

Security was provided by the *gendarmes* based at their station in the village during the rush. However, thieves and conmen from major towns such as Antananarivo and Antsiranana, as well as Ambanja, descended on the village and were responsible for serious crime issues during the rush.⁹⁶

On the mining site large areas of mangroves covering approximately 100 hectares have been removed provoking coastal erosion and sediment load in the nearby rivers. This impact will also have an effect on the biodiversity and natural production of these habitats, including commercial collection of wild crab and shrimp stocks. In addition, former miners have turned to more stable employment as charcoal producers cutting other areas of mangroves along the coast for local sales and exports to Nosy Be.

⁹³ Mr Mohamed. Head of Village, Antetезambato. Personal Communication. 13 April 2012

⁹⁴ Mr Mohamed. Head of Village, Antetезambato. Personal Communication. 13 April 2012

⁹⁵ Dr Jaoroby, Josia. Head of the Central Hospital of Ambilobe. Personal Communication. 14 April 2012.

⁹⁶ Mr Mohamed. Head of Village, Antetезambato. Personal Communication. 13 April 2012.

Figure 35: Antetetzambato ASM green garnet/demantoid rush site, mangrove ecosystem



6.6.4 Prognosis

The Antetetzambato discovery has reinvigorated the global demantoid market, as many specimens of high quality from the site have already reached Western markets (Spiriferminerals, 2012). Effectively, Madagascar is now on the international map for demantoids, which will stimulate interest in the site and potential new areas in the region in the future.

Due to the constraints of using expensive water pumps on the site it appears that the site is more organised and less anarchic in comparison to the principal mining rush years. However, environmental studies and application of the permit system have not been applied, while there is no official *comptoir*. Effectively, mining remains informal with no immediate benefits for the state or local authorities.

Current mining efforts will continue to have a severe impact on mangrove habitats, while the potential of further discoveries in the region would likely produce the same socio-environmental impacts and anarchic behaviour. Meanwhile, alternative income generation from charcoal production has expanded and could pose a threat to other mangrove areas along this coastline, given the Antetetzambato precedent.

6.7 Ankotika (Andampy) and Antsirabe

6.7.1 Socio-environmental context

Antokita and Antsirabe are two small rush ASM sites located approximately 17km and 50km (including 5km of track) south of Ambanja. Both sites have good access on or near to the RN6 national highway.

The populations in these villages are principally Sakalava people and numerous immigrants who arrived recently during the rush. The village of Antokita could be described as a small village, which grew to more than 1000 people with the rush.⁹⁷ Meanwhile, Antsirabe is the capital of the commune with more than 5000 residents, which increased recently to 7000 when migrant miners arrived.⁹⁸

Figure 36: ASM rush site at Ankotika (Andampy)



The ASM site of Antokita is located principally in rice fields, marshland and adjacent fields on mainly red lateritic and some hydromorphous soils. Vegetation is limited to grasses and some small bushes as it is agricultural land neighbouring the village. The site is relatively flat and not subject to overt risks of erosion. Meanwhile, the numerous ASM sites in Antsirabe are found principally in watercourses and riverbanks surrounding the village. The vegetation is degraded woody savannah dominated by invasive Bamboo plants and Ravinala trees. The mine sites are dominated by hydromorphous soils in and near the watercourses and lateritic soils on the banks. The topography of the area is undulating and prone to localised erosion, due to the fragility of the lateritic soils.

The areas are composed of agricultural land and degraded woodland and savannah. Therefore, the biodiversity at both ASM sites can be classified as low, while watercourses would have only limited diversities of aquatic life near the sites.

6.7.2 History of ASM on site to the present

At the beginning of 2011 a local farmer discovered a sapphire in his field while tilling the land. He recognised the stones as he had had previous experiences in Ankarana. Soon after this discovery, the rush at Antokita began in

⁹⁷ Ms Vohitra. Wife of Head of the Village, Antokita. Personal Communication. 12 April 2012.

⁹⁸ Mr Razafimanantsoa. Deputy Mayor of Antsirabe. Personal Communication. 12 April 2012.

May 2011. Similarly in Antsirabe, a local farmer identified a sapphire, and benefited from the advice of geologists on site at the time exploring for commercial rare earth deposits in the region.

The rush at Antokita continued for a relatively short period until October 2011, when the majority of the migrants and some local people departed from the site to exploit the new rush at Antsirabe. In addition, the size of the Antokita site is relatively small, while many rice farmers do not want to vacate their fields to miners.⁹⁹

Most of the migrant miners are young single men who arrive in small groups. Before the rush the local populations were principally rice farmers with some livestock.

Many of the migrant miners in Antokita had originated from the Antetazambato site, north of Ambanja. In addition to Malagasy traders, several foreign buyers including Thais based in the region had visited the sites regularly, and continue to frequent the areas during the dry seasons.¹⁰⁰

6.7.3 Impacts (positive and negative)

Positive impacts

Approximately 20 per cent of the villagers at Antsirabe have gained an alternative source of income generation with the sapphire mine. Meanwhile, owners of land where sapphires exist can charge up to 5000 Ariary or approximately US\$2.50 per hole dug by the miners.

The rush has brought relative wealth to the villagers who sell goods and agricultural produce to miners with notable increase in cropland producing manioc and maize.

Meanwhile, the relative size of the rush has not provoked security or prostitution issues for the community.¹⁰¹

Negative impacts

The state and the commune do not receive any tax benefits from the buyers during the current rush. The mayor stated that he would like to install an official *comptoir* for stones in front of his office in the centre of town,¹⁰² although that would require cooperation with the Ministry of Mines before it could be established. The mayor believes that the stones could be beneficial in the long-term, if he is allowed to manage the resource for the commune.

Some land-owners complain that they are never paid any compensation for mining on their land, despite agreements with the miners.

Miners often work in wet weather and catch fevers such as flu, which are transmitted around the village.

Sediments produced from mining activities in the watercourses could destroy or deteriorate ecosystems for aquatic life. This may not have a significant impact upon biodiversity, as the area is already relatively degraded, although some minor fish stocks used by local people could be affected.

The cost of living has increased in the village for basic foods and furniture for homes. This is a direct result of the surplus of cash and demand for goods and produce from miners.

⁹⁹ Ms Vohitra, Wife of Head of the Village, Antokita. Personal Communication. 12 April 2012.

¹⁰⁰ Messieurs Romel & Rafanomezatsoa. Stone Traders from Diego & Fianarantsoa. Personal Communication. 12 April 2012.

¹⁰¹ Mr Razafimanantsoa. Deputy Mayor of Antsirabe. Personal Communication. 12 April 2012.

¹⁰² Mr Razafimanantsoa. Deputy Mayor of Antsirabe. Personal Communication. 12 April 2012.

Figure 37: ASM sapphire rush site at Antsirabe



6.7.4 Prognosis

These ASM mines are a symptomatic result of the vector effect of mining in the region, though some members of the migrant mining community come from elsewhere in the country. Huts constructed by miners remain at sites which they move to and from according to opportunities and needs. Effectively, groups of transient miners move across the region and country with mining skills. However some single miners will decide to settle and have a family in some of the villages. Many of them have developed their skills at various ASM sites since the earlier gemstone rushes.

The scale of the ASM sites in Antokita and Antsirabe do not appear to have destabilised the villages, which continue to gain from sapphire discoveries. It is likely that miners will continue to profit in the short term from the site at Antsirabe, although it is not clear if the vein of sapphires will provide sufficient stones to sustain for a longer period the 2000 migrant miners currently based in the village. Based on the history of these sites, it is likely that new discoveries will be made elsewhere. Miners will move between larger ASM sites, new sites and/or established smaller ASM sites across the country, which may include gold deposits such as Daraina in the north.

Social conflicts associated with damage to land without payments may provoke more disputes in the future. Meanwhile, the commune does not receive any direct benefits in the form of taxes to support community needs e.g. repairs of building and water supplies. Lobbying by the mayor may encourage the Ministry of Mines to consider an official *comptoir* for stones in the future.

Impacts on vegetation and wildlife in the area are limited at present although there are risks to watercourses and limited local aquatic life.

6.8 Loky-manambato new protected area - daraina

Loky-Manabato is a large New Protected Area (NAP) covering 250,000 hectares and located in the northeast of Madagascar within the SAVA Region and District of Vohemar. ASM of gold deposits in the area touches the communes of Daraina and Nosibe. The site is found in a relatively isolated area of rainforest, approximately 15km from Daraina, while the nearest main road is the RN5, although this is in a very poor condition. The majority of people from the district are associated with Sakalava and Tsimihety groups, who practice rice production and swidden agriculture in the forests, as well as hunting and illegal logging (Fanamby, 2011). The landscape in the NAP is composed of a mosaic of habitats typified by grasslands and fragments of a range of natural forest types ranging in size from a few to several thousand hectares, as well as degraded areas subject to erosion (Fanamby, 2011). The NAP is very important for biodiversity and the forests are habitats for the rare Golden Crowned Lemur (*Propithecus tattersalli*) and Aye Aye (*Daubentonia madagascariensis*).

The region has been recognized for its gold deposits since colonial period, especially at a well known site known as Betsiaka, located approximately 50km due west of Daraina (Aquerre, 2008). This site is still occupied by many resident artisanal miners, who have provoked significant soil erosion over many years. Meanwhile, the rush near Daraina began in 2001, when approximately 2000 people descended upon the site in search of gold within an area of approximately 5km by 8km. Local people were aware of the potential to find gold at the site, as several private companies had, prior to the rush, been exploring their mining squares for gold deposits. The rush continued until 2004, when initial steps to develop the NAP commenced with the assistance of the national NGO Fanamby. Then, the NGO with assistance from regional gendarmes gradually moved the miners out of the forest and developed a mining association with the resident community composed of approximately 60 artisanal miners from 2004 to 2009. With the onset of the political crisis in 2009, the miners returned to the site with estimates of 1000 miners in 2011 (Fanamby, 2011) digging for gold and crystals in the forest and establishing new villages at four sites. The current situation at the site remains chaotic and unmanageable, as miners take advantage of on-going political instability and populism.¹⁰³

The advantages for some local miners are clearly financial; and they claim to have a better lifestyle now with increased purchasing power, for example to furnish their homes with household appliances.¹⁰⁴ However, there are negative impacts associated with mining holes of up to 15m in diameter and 15m deep, with potential environmental risks linked to erosion, sedimentation of rivers and degradation of agricultural land. In addition, there are health issues such as polluted drinking water and increased exposure to STDs for miners and local communities, from prostitutes who moved into the area (Fanamby, 2011).

The NGO Fanamby improved the situation enormously for the local community through the initiation of entrepreneurial development projects and an organised mining association, during the period 2004-2009.¹⁰⁵ However, it is clear that financing, technical assistance from Fanamby and a localised rush were advantageous for the creation of a small association of local miners and the management of their mining activities in the NAP. However, to achieve the same impact at a national level would require significant human and financial resources, which do not exist at present. Meanwhile, the political crisis appears to have served as a catalyst for renewed unmanaged ASM activities, thus aggravating the situation.

6.9 Andranondambo

The ASM site of Andranondambo is located in a remote part of southern Madagascar in the Anosy Region, in the district of Amboasary Sud and in the rural commune of Maromby. The site is located next to the village of Andranondambo on the plain of a large valley. Access to the site is via a secondary dirt road, part of which is in poor condition. The population in the area is dominated by Antanosy and Antandroy followed mainly by the Antesaka group. Most people are farmers cultivating principally manioc, maize, rice and peanuts, followed by livestock farmers with significant numbers of cattle, goats and sheep. The semi-arid landscape is composed of prime and degraded dry forest, riparian forests and secondary savannah grasslands. Most of the surface vegetation at the mine site was left in a highly degraded state following the rush, although biodiversity associated with dry forests remains rich in nearby intact woodlands (Aquerre, 2004).

Originally the area was exploited by a colonial family from 1936 until the 1960s for mica only, although the family was also aware of the presence of garnets and sapphires in pockets of the hard metamorphic calcareous rock. In addition, France's Commission for Atomic Energy (CEA) and Madagascar's OMNIS also explored the area for

¹⁰³ Wohlhauser, Sébastien. Former advisor to Fanamby NGO. Personal Communication. 24 April 2012.

¹⁰⁴ Wohlhauser, Sébastien. Former advisor to Fanamby NGO. Personal Communication. 24 April 2012.

¹⁰⁵ Rajaobelina, Serge. Executive Secretary Fanamby NGO. Personal Communication. 10 May 2012

uranium in the 1950s to 60s and 1970s, respectively. Later in 1992, a small consignment of sapphires arrived in Antananarivo, then soon after in 1993, thousands of migrant miners descended onto the site in search of sapphires. By 1994, the number of miners had peaked at approximately 10,000, although by 1995 the number had dropped to 3000, and then stabilised to approximately 1000 people in the Commune during the early 2000s. The reason for the decline in the number of miners was principally due to the difficulty in accessing the sapphires, requiring 20 to 30m holes being dug through relatively hard rock. In addition a new sapphire discovery appeared at a site called Antsiermene located only 10km north of Andranondambo (Aquaterre, 2004). Many of these miners also moved on subsequently to sites in Anakarana and Ilakaka. In 2001, a foreign-owned company, SIAM, bought the rights to mine several mining squares on and in the vicinity of the former site exploited during the rush. Later, the commercial mine began exploitation of the site, although it is currently on standby. Many local villagers still continue to mine small surface holes in search of sapphires and use a local river to wash the dirt (Tilghman et al., 2007). However, mining is only regarded as a supplementary pursuit integrated with other rural income generation activities.

The rush brought riches for some during the boom period of 1993-94, although the difficulties of the site led many to leave. However, local people continue to benefit on a small scale, while some Thai buyers now live and are married to local women in the town. At the height of the rush, the growing economy also brought positive impacts in the form of entertainment and services from bars to shops, as several remain today. However, 10,000 people digging on the site would also have had significant negative impacts upon watercourses, although this would have been localised and rivers appear to have recovered as these are not prone to or at risk of continuous erosion.

The most significant impact from the rush was the enlightenment of several thousand people about the value of gemstones. Many of these miners moved on to new rushes with their acquired skills, as shown in the case of the successful Malagasy miner, Mr Mohamady, working the Antetezambato mine, who began his career in Andranondambo. However, it is clear that certain sites require significant investment to mine, particularly when stones are located deep in hard rock. If the commercial mine starts again it would offer local employment and a potential *comptoir* for people to sell their finds.

6.10 Onilahy

The Onilahy River is the central water-course running through the Sept Lacs wetland site in the Toliara region in south west Madagascar. Twenty five mammal species, 56 reptile species, 6 amphibian species and 79 bird species have been identified within the Sept Lacs region, with many classified as vulnerable by IUCN, such as the Humblot's Heron (*Ardeola humbloti*), the Madagascar Pond Heron (*Ardeola idae*), and the Madagascar Harrier Hawk (*Circus macrorosces*) (IUCN, 2012). Many rare, endemic and vulnerable species rely on the wetlands. In order to preserve the gallery forest in the Sept Lacs region a locally managed conservation strategy, GELOSE, was initiated in the area in 2000, as well as a WWF-sponsored NAP. The Onilahy River meets the sea at its mouth at St Augustin, south of Toliara.

Ifanato is one five villages in the Sept Lacs region. It lies 45km south east of Toliara. The population is mainly made up of the Mahafaly and Masikoro ethnic groups. Economic activity is mainly subsistence farming and the herding of zebu. The wetlands forming the flood plain of the Onilahy river are an important regional center for the cultivation of many crops, which otherwise cannot grow in the generally arid south west of Madagascar. However, the area is environmentally vulnerable, with a history of high-intensity vegetation clearing.¹⁰⁶ Deforestation caused by cultivation and charcoal production has caused soil erosion, leading to sedimentation in the lake and river-systems (Frontier, 2003).

In September 2004, the village of Ifanato became the fulcrum for a major sapphire rush in the region. Prior to the rush the population of Ifanato had been approximately 280 people. Following the discovery of sapphires by some itinerant miners, the population soared by several thousand. Migrant miners from Ilakaka made the relatively short trip south to Onilahy, although transport links between the Sept Lacs region and Toliara are not nearly as developed as those along the RN7 which connects Ilakaka to the neighbouring mining town of Sakahara, with travel arduous and of indeterminate duration, depending upon the state of the road.

Unlike the sandy soil conditions around Ilakaka, the substrate in the Ifanato area is mainly hard limestone, and thus more akin to Andranodambo and Ankarana PA. Digging relies heavily on breaking off rock with spikes and hammers once the thin layer of topsoil has been removed with a shovel. Rock pieces and any accompanying dirt or pebbles are carried to the riverbank to be sieved (Tilghman et al, 2007).

¹⁰⁶ Nicoll, Martin. WWF Senior Advisor. Personal Communication. 30 May 2012

Currently, the area around Ifanato and the Sept Lacs is no longer considered a major site for gemstone ASM. More generally, in the region sites seem to present a brief and transient burst of ASM activity, as some valuable stones are found, and then are quickly exhausted.¹⁰⁷

6.11 Didy

During the course of this project, a very significant ASM gemstone rush developed in the east of Madagascar, in the Ankeniheny – Zahamena Corridor (CAZ), where it is thought that up to 80 per cent of Madagascar's endemic species can be found. The rush is ongoing and is centred around an area of a CI-sponsored NAP, in the heart of the forest, and in the heart of the PA. The nearest commune is Didy, hence it being communally known as the rush near Didy. The nearest town is the regional capital of Ambatondrazaka, in the province of Tamatave.

In many ways, the rush near Didy is an extraordinary case-study, with which one can gauge the capacity, or lack thereof, of both government, central and local, and environmental NGOs to handle such challenges. It will possibly prove to have been the most significant ASM rush since Ilakaka, which began in 1998. Unlike the Ilakaka rush it is occurring in the centre of a PA, in this case a NAP.

The ASM gemstone rush near Didy could be likened to a 'perfect storm'.¹⁰⁸ The first major influx of miners came over the Easter holiday period, at the beginning of April 2012,¹⁰⁹ when the authorities' capacity both to monitor and prevent any infiltration into the NAP would have been a particularly low level of preparedness. There seems to be a general consensus that the rush was at least in part organised.¹¹⁰ Mainly Sri Lankan foreign buyers arrived en masse at the very beginning of the rush. It's thought that these buyers had the support of certain influential regional figures and elements within the forces of law and order. Local police attempted to expel the miners, but were heavily outnumbered, and the attempt did not succeed.

Figure 38: ASM rush site in NAP, near Didy, taken from the air



(Credit: Cushman, Tom)

¹⁰⁷ Jobin Marc. Professional specialist in African rough and gem materials. Personal Communication. 26 April 2012

¹⁰⁸ Rajaobelina, Leon. Country Representative, Conservation International. Personal Communication. 11 May 2012

¹⁰⁹ Although there are reports that a much smaller initial infiltration of about 200 miners occurred in late March. They were reportedly expelled by local gendarmes. Source: Rabemanantsoa, Jean-Claude. DG, MEF. Personal Communication. 16 May 2012

¹¹⁰ Rabemanantsoa, Jean-Claude. DG, MEF. Personal Communication. 16 May 2012; Rajaobelina, Leon. Country Representative, Conservation International. Personal Communication. 11 May 2012; Ramangason, Guy Suzon, DG MNP. Personal Communication. 11 May 2012

Figure 39: ASM rush site in NAP, near Didy, taken from the air



(Credit: Cushman, Tom)

Within the first week to 10 days, it was estimated, by conservation NGOs, civil society groups and the media, that there were up to 15,000 miners within the NAP congregating at the ASM site. By the beginning of May, it was estimated that there were 20-30,000 miners on site (L'Express, 2012a). While the locally based *Vondron'olona ifotony* (VOI), the local community partners for the conservation agencies, quickly alerted the NAP sponsor, CI, by the middle of the following month it was reported that members of the VOI had themselves become involved in ASM activities at the site.¹¹¹ By the middle of May, it was thought that numbers had increased to 40-50,000 ASM miners. Currently, estimates vary, with some hazarding that the influx could have risen to 70,000. However, it is important to note that these estimates are notoriously inaccurate, and may involve as much guesswork as empirical-based calculation. There are others who maintain that numbers have remained at no more than 10-15,000 ASM miners on site.¹¹²

The rush is focused on the mining of sapphires and rubies. The latter are reported to be of a quality that matches those found anywhere else in the world, while the sapphires are also said to be of high quality. Within the space of weeks, rubies from the rush near Didy were appearing in the major gemstone markets of Bangkok and Hong Kong.¹¹³ This in turn served to attract more international buyers to Ambatondrazaka, the regional centre where the foreign buyers based themselves. In mid-May, it was thought that there were more than 100 Sri Lankan and about 15 Thai buyers based in Ambatondrazaka. The town has reportedly been totally transformed, with many shops mutating into informal *comptoirs*, and the price of foodstuffs and accommodation soaring.¹¹⁴

Regardless of the debate concerning the exact, though probably fluctuating, number of miners, even the lower estimate of 10-15,000 ASM miners working in the heart of a biodiversity rich, relatively pristine environment would suggest very considerable environmental degradation in the area of the ASM site. The civil society group, Voahary Gasy, estimated that during the first 30 days of the rush 20-30 hectares of forest had been destroyed (Courier, 2012). From an aerial overview, it was estimated that the site was approximately one kilometre in length by 200 metres in width (see **Figures 38 and 39**). In addition, it has been reported that there have been impacts on the health of the ASM miners, with outbreaks of diarrhoea at the site. Insecurity in the area has also increased (L'Express, 2012b), and representatives of the Ministry of Environment and Forests have been threatened.¹¹⁵

¹¹¹ Rabemanantsoa, Jean-Claude. DG, MEF. Personal Communication. 16 May 2012

¹¹² Cushman, Tom. WB consultant – ASM issues: mining investment consultant. Personal communication. 24 May 2012

¹¹³ Cushman, Tom. WB consultant – ASM issues: mining investment consultant. Personal communication. 24 May 2012

¹¹⁴ Cushman, Tom. WB consultant – ASM issues: mining investment consultant. Personal communication. 24 May 2012

¹¹⁵ Rabemanantsoa, Jean-Claude. DG, MEF. Personal Communication. 16 May 2012

Figure 40: The ASM rush site near Didy, within the forest in the NAP



(Credit: PGRM)

By the middle of May, there were reports that there had been some incursions into the neighbouring UNESCO World Heritage Site, the Zahamena National Park.¹¹⁶ It was also reported at around the same time that the ASM miners were finding that it was becoming increasingly difficult to extract high quality gemstones. This leads some to surmise that the deposits may well be eluvial as opposed to alluvial. If this were to be the case, the rush may soon exhaust itself, as miners would not have the technical resources to continue. On the other hand, it could also pose more significant challenges for the protection of the NAP and the CAZ, as miners would also be more likely to migrate along the eluvial vein in search of accessible deposits.

At this stage, it is impossible to predict the progression or longevity of the rush near Didy. As of publication, it continues. However, the response of the authorities and non-governmental actors is of particular interest. Local forces of law and order were unable to prevent the ASM rush. By the time the central government had become sufficiently alarmed to mobilise towards taking action, the rush had reached a critical mass with reports of tens of thousands of miners on site, making physical expulsion problematic if not impossible. This underlines the need for prompt and robust intervention at the earliest stages of a rush. Moreover, the longer the delay before intervention, the more costly such intervention will be; and the government's current financial constraints mean that further time is lost as it must fundraise from non-governmental partners. It is possible that at this point in the rush's progression, targeting of buyers in nearby Ambatondrazaka may have a better possibility of success.¹¹⁷ However, such attempts have been made, without any noticeable diminution of the rush.

¹¹⁶ Rabemanantsoa, Jean-Claude. DG, MEF. Personal Communication. 16 May 2012

¹¹⁷ Manganirina, Pierre. SG, MEF. Personal Communication. 25 May 2012

7. ENVIRONMENTAL IMPACT ISSUES

7.1 Environmental damage directly arising from ASM activities

7.1.1 Introduction

The environmental damage arising from ASM can sometimes be higher than that observed for large-scale mining, which equates to its negative impacts being higher per unit of output for ASM than other scales of mining. In addition, large numbers of individual miners will have concentrated impacts upon a particular site during a rush or multiplier effects over time, as large groups of individuals do not have the onus of corporate social responsibility (CSR) associated with some larger mining corporations. Equally some larger foreign mining companies in Madagascar are accountable to shareholders and aware of bad press if they pursue unethical and errant mining procedures and processes. In Madagascar it is clear that it is difficult to control and monitor environmental violations associated with ASM or enforce environmental regulations, due to a lack of human and financial resources combined with the complexity of ASM activities and the lack of political will to act.

ASM for both gold and gemstones often have similar negative impacts upon the environment, although there can be differences according to the environmental characteristics of the site and approaches used to mine mineral resources. Empirical observations from case studies analysed in this study are used to both define and differentiate the environmental issues associated with various ASM sites and activities. However, it is critical to note that many areas in Madagascar support highly localized, naturally rare unique ecological communities including endemic species. It is therefore possible that some mining, especially on highly mineralized substrates, *may* cause significant threat to these communities and species.

Damage directly arising from ASM is discussed in this section and can be summarised as follows:

- deforestation
- disturbance of terrestrial biodiversity
- soil erosion, sedimentation and siltation
- disturbance of aquatic biodiversity

7.1.2 Deforestation and disturbance of vegetation

The amount of mining-induced deforestation is generally small relative to the impact of other illicit activities such as logging, subsistence farming, or charcoal production. However, the vulnerability of seasonal dry forests would be higher than for mangroves. In addition 'protest fires' against PAs, as observed in Ranomafana PA, have a far more devastating impact on the surface area of forest cover.

Deforestation due to mining often has a less significant impact upon forest cover within PAs compared to illegal agricultural activities and wood exploitation. However, the repeated soil turnover and complete removal of roots that accompany mining impede regeneration and favour invasive species. After several decades of activity, as observed in Ankarana PA, vegetation cover in areas where mining has been regular and concentrated remains qualitatively different from neighbouring largely intact forest found to the west of Ankarana's mining sector and to the south, where it is frequented by tourists. Satellite images reveal relatively large areas of either bare ground or patchy and degraded forest, which is unlikely to recover if mining subsists. Ankarana also appears to be particularly vulnerable to colonization by the exotic and aggressively invasive *Lantana camara*.

The environmental impacts on forest will vary according to mining techniques and site, where tunnelling as observed at the sapphire mine in Ankarana and gold mining near Soamahamanina (west of Antananarivo) has less immediate impacts upon vegetation as the activities are underground. However, tunnels near the surface of 1 metre in diameter and over 100 metres in length, as observed near Zombitse-Vohibasia PA, can damage roots and change the drainage patterns of the soils leading to die back of plants and trees. However pit and tunnel constructions in the mangrove areas of Antetetzambato have also encouraged mass surface clearance of mangroves to allow access for people and equipment.

Open cast or surface pit mining associated with gold exploitation near Daraina, the pits at Soamahamanina and working near the riparian vegetation and forests of Isalo, Ranomafana, as well as sapphire digs near Antokita and Antsirabe, have immediate impacts upon the environment. In the case of Isalo PA, the impacts are less significant upon savannah flora within a park known for its geology and vast grassy plains, although remnant strips of

riparian forest are present nearby. In other areas such as Antokita and Antsirabe, the vegetation is denuded by anthropogenic activities and not a significant loss for biodiversity in these areas.

Often trees can be removed for tunnelling and pit mining as the roots of the tree offer access to the ground where the ground is less compacted due to the presence of softer soils. Miners also have to remove trees and vegetation to access gold or gemstones located directly beneath the flora.

Timber is also used to construct wood shaft support and crank and pulley systems for artisanal mines as observed in Zombitse-Vohibasia and Ankarana PAs. The wood may be gathered from trees removed for mining access, although some trees may also be selectively felled for mining purposes.

Wood is also used for fires by miners for a range of purposes: such as to cook at the surface, or to generate heat to crack rocks in underground workings. The amount of wood being exploited may be limited, although the combined impact over a long period of time has had a severe impact on trees in Ankarana PA. In addition, unattended fires can lead to forest fires, which is a common problem linked to illicit agriculture in parks such as Ranomafana PA. Similarly the establishment of mining villages in the vicinity of PAs where wood supplies are dispersed and/or scarce will increase the demand on wood supplies for cooking and construction. This issue is noteworthy in the seasonally dry south near Isalo and Zombitse-Vohibasia PAs.

7.1.3 Disturbance of terrestrial fauna

The disturbance of terrestrial fauna is often linked with deforestation and disturbance of natural vegetation discussed above. The impact is progressive, as mining activities develop from temporary to permanent features on a site including the arrival of invasive species such as rats in degraded habitats. Habitat loss is the principal cause of loss of fauna, but also intrusive factors such as noise and smells from mining activities will provoke the temporary emigration of species from a site. In addition, the direct impact of hunting has a severe impact on numbers of some species.

In the case of Ankarana, there is still a presence of lemurs in heavily mined areas of degraded forest, and included a calling Crowned Lemur during the site visit. However, the numbers and diversity of lemurs have been severely reduced in the mining area of the PA,¹¹⁸ as populations die out due to increasing pressure on food reserves and territories for these animals and other species.

Overall, the impact of mining upon biodiversity in PAs is a highly controversial issue and counter productive to the principal objectives of nature conservation in fully protected parks and reserves.

7.1.4 Soil erosion, sedimentation and siltation

Water-courses in gold and sapphire mining areas suffer from the processes required to separate gemstones and fine particles of gold. Rocks, pebbles, and soil can enter rivers and lakes in relatively large amounts during mining. Activities such as sieving processes in water bodies, as observed at most sites visited, as well as open cast mining on the banks of watercourses, as seen at Ranomafana PA and Antsirabe, lead to in-situ soil erosion and suspended solids in water. This can lead to the clogging of waterways as rocks and soil build up in the watercourse, which will disturb the dynamics of streams and rivers.

ASM is also of significant concern for agriculture since it can block traditional irrigation systems and distributes silt over rice fields. Direct impacts were observed at Antokita, where mining occurs in former rice fields posing potential damage to those neighbouring fields which have been conserved by their owners for agriculture. Meanwhile, high risks of sedimentation and siltation are likely to occur in Soamahamanina, where the owner of a rice field has allowed the local community to flood the field and use it for the sieving of gold from earth collected at the main ASM site. Therefore, it is evident that further research is required to evaluate the scale of impacts from different types of ASM activity across the country.

Sedimentation may also harm underground water systems. Potential risk of damage to mineral formations like stalagmites and stalactites may have already occurred in Ankarana's subterranean limestone karst systems. Again, impacts of ASM, as well as larger scale mining and oil explorations, need to be studied in detail, in order to evaluate the real risks posed to subterranean ecosystems.

Sediment loads in rivers eventually reach estuaries and the marine ecosystems. The Onilahy River catchment area has multiple rivers used to mine sapphires and sieve dirt. However, it is important to note in this case that anthropogenic-induced bush fires in the water catchment provoke enormous and significantly higher levels of sediment load in the rivers, due to soil and gully erosion (see **Figure 41**) The catchment empties into the Bay of

¹¹⁸. Mr. Feliva. MNP warden for the northern sector of Ankarana PA. Personal communication. 14 April 2012.

Saint Augustin, where the Toliara barrier reef is located. Sedimentation of coral may cause die-off adding further stress to the system caused by existing acidification and bleaching of corals. In addition, the barrier reef is already highly degraded and affected by often much higher levels of soil and gully erosion¹¹⁹ and sedimentation from deforestation and grass fires for agriculture, as well as the cutting of dry forests to produce charcoal. The impacts of erosion from mining activities will be determined by the fragility of soils, topography and periods of heavy rainfall at the site.

Figure 41: Gully erosion and sediment load in rivers near Ilakaka



Sapphire mining does not require the use of chemicals to separate or prepare the gemstones; therefore very little chemical pollution enters the watercourses. However, artisanal mining of gold could involve the use of mercury if regulatory guidelines are applied (GoM, 2000). As ASM and rushes are often quite anarchic, the risk of mercury pollution within the environment and food chains would be high, although use of mercury in ASM has not been recorded in Madagascar since the colonial period.¹²⁰

7.1.5 Disturbance of freshwater aquatic biodiversity

Mining affects the overall quality of the aquatic ecosystem when tailings of ASM operations are discharged into rivers and smaller watercourses. The combined affects of anarchic rushes and/or ongoing mining activities could effectively add cubic meters of sediments into watercourses for each gram of gold extracted or gemstone recovered.

¹¹⁹ Gully erosion of hillsides in Madagascar is internationally and locally termed as *lavaka*.

¹²⁰ Rakotodravaly, Désiré. Director Technical Support, Gold mining and Rushes, Ministry of Mines. Personal Communication. 28 May 2012.

Figure 42: Gold mining activities in the Nosivolo riverbed



(Credit: Roger Bills/SAIAB)

The limnology and ecology of rivers in Madagascar has been poorly studied to date; meanwhile, Madagascar's endemic freshwater fishes likely represent some of the most, if not the most, endangered vertebrates on the island (Sparks and Stiassy, 2003). IUCN findings in a freshwater fish study (IUCN, 2004) presented a level of threat (54per cent threatened and 4per cent already extinct) for fish, which was considered extremely high when compared with the global levels known for other groups such as birds (12per cent threatened) and mammals (24per cent threatened). The report noted that some of the key causes linked to environmental damage include soil erosion and sedimentation of rivers provoked by deforestation. Mining would only add an insignificant amount of sedimentation compared to deforestation. However, mining on riverbanks and in the rivers themselves could have severe impacts on specific local habitats and aquatic species including rare endemic fish found in the Nosivolo water catchment and elsewhere¹²¹. Isolated rivers in forested regions of eastern and northern Madagascar are or could be threatened. The Nosivolo catchment is currently affected by many local miners from several villages searching for alluvial gold. Miners not only dig the edges of riverbanks, but also excavate the riverbed using spades (see **Figure 42**), and even descend to depths of several metres using ladders fixed into rivers. The situation has intensified in recent years due to the rising spot price for gold.

Many aquatic ecosystems in Madagascar have been under-researched; therefore it is difficult to predict the net effects of sedimentation upon these aquatic communities. However, sedimentation generally disrupts water ecosystems, as it inhibits sunlight from reaching plants and photosynthetic organisms and can clog the filters that other organisms use for feeding or respiration. Therefore, the possible effects may include the destruction of fish breeding grounds and habitat, the reduction of oxygen levels, and the inhibition of fish foraging strategies. Increased river turbidity also threatens food chain from invertebrates to crayfish, fish, amphibians and other forms of aquatic life. Overall, the impact could be significant for key ecological niches within the river network.

¹²¹ Lewis, Richard. Country Representative; B. Ramahefasoa. Nosivolo Project Team Member. Durrell Wildlife Trust. Personal Communication. 9 May 2012

7.2 Secondary environmental impacts linked to mining

The secondary environmental impacts derive from the vector effect of ASM activities in or near PAs or critical ecosystems. Damage indirectly arising from ASM is discussed in this section and can be summarised as follows:

- charcoal production
- selective tree-felling
- subsistence/swidden agriculture
- hunting within protected areas or critical ecosystems

7.2.1 Charcoal production

Charcoal production can be a subsistence and commercial activity. In this review of damage stimulated by or in conjunction with ASM, the field visits identified commercial charcoal production as the major threat to PAs and critical ecosystems.

The case of the mangrove critical ecosystem near Antetazambato shows a marked increase in charcoal production following the ASM rush. Mining in the mangroves provoked the clearance of vast areas of mangroves covering the deposit. These trees were initially used as firewood and construction materials for mine shaft and homes. As the mining of stones became more difficult due to the depth of deposits and the need to use expensive water pumps, many migrant miners found themselves without a means to generate income. The majority of miners left the site to return home or try their luck at other sites in the region or elsewhere in the country. However, some unemployed miners chose to become charcoal producers selling to local clients, principally to meet the demand on the nearby island Nosy Be.

Charcoal producers have now settled in areas near the deposit and exploit areas of mangroves which are relative close to small river channels leading to the sea. The mangroves are cut in-situ then carried to the land, where charcoal pits are constructed. Once the charcoal is ready, the majority of the sacks of charcoal are embarked on small sailing pirogues and exported to Nosy Be.

Figure 43: Charcoal production in mangrove critical ecosystem near Antetazambato



The destruction of mangroves is damaging for this critical ecosystem as the trees protect the coast from erosion. Denuded areas of mud will provoke sedimentation in surrounding mangroves and significantly harm marine habitats including sites important for the reproduction of marine life.

Inland commercial charcoal production was observed in the Ankarana PA. Charcoal activities have been on-going in the northern sector of the PA since the 1980s (WWF, 1989). However, the ASM rush from 1998 in Ankarana and continuous exploitation of sapphires has provided a mutual rationale for both illicit activities to persist.

Recently, miners have returned to forbidden areas of the park or opened new sites under the cover of instability during the political crisis (2009 to present). Effectively this action has been a vector for charcoal producers to enter areas of Ankarana, with reports of military involvement transporting charcoal to Diego Suarez in private or military trucks.¹²²

The impact of charcoal production upon the habitat is far more damaging than sapphire mining, as production often involves clear felling of an area. The impact on the biodiversity is immediate and very damaging. In addition, clearance of tree cover will expose mining areas and provoke soil erosion, although fortunately the soils of Ankarana are less fragile, and erosion is not a major issue. However, charcoal production in other PAs with fragile soils and undulating topography could provoke serious soil erosion. Probably the highest risk emanating from charcoal production involves long-term establishment by non-native invasive species, notably *Lantana camara*, which prevents the reestablishment of native ecological communities.

7.2.2 Selective tree-felling

Selective tree felling was only reported during the site visits in the Ankarana PA and has been provoked by the political crisis and the exploitation of rosewood across the country. This form of damage can be associated with mining in Ankarana or independently linked to political opportunism during the crisis. The trees selected are hardwoods, excluding rosewood, which are used for construction purposes in Antsiranana. As is the case with charcoal, the timber is cut by labourers and transported by private or military trucks.

Figure 44: Timber from illicit selective felling in Ankarana PA



¹²² Salo, Nicolas. Madagascar National Park's Director of Ankarana PA. Personal Communication. 10 April 2012.

Selective felling has a lower impact on the environment; however, it has coincided with charcoal production in several areas of the park with devastating results.

7.2.3 Subsistence/swidden agriculture

Agricultural activities in PAs and critical ecosystems have been a source of conflict with conservationists for many years. The main causes for this conflict of interests are poverty, population growth rates and lack of improved farming methods and technology in rural areas, combined with the need to find fertile soils to grow crops. In the case of Ranomafana PA, there are numerous fires throughout the park each year. One can begin with the premise that some people are willing to use the park with the knowledge that it is illegal.

Mining in and at the edges of PAs will increase the risk of more widespread ingress into PAs, as the open access paradigm applied by the miners themselves is adopted by local villagers in search of land to grow crops. Effectively, subsistence/swidden agriculture and/or mining in PAs are mutually complementary conduits for ingress into PAs.

Agriculture activities conducted by several people will often open up a relatively large area compared to mining. However, fertile soils for agriculture may not necessarily be appropriate sites to find either eluvial or alluvial deposits of gold or gemstones.

7.2.4 Hunting within protected areas and critical ecosystems

Hunting is an activity, which can frequently be associated with artisanal mining. PAs or critical ecosystems often contain high numbers of animals compared to sites outside PAs or critical ecosystems, i.e. they present opportunities for miners to hunt.

Hunting is mainly used to supplement the meagre diets of miners, particularly if miners are working far from towns and villages, where food is not readily available. Lemurs, especially nocturnal species, are the main concern, though birds, rodents, fish and small invertebrates are also eaten. In addition, tenrecs are hunted, but less affected by hunting due to their high reproduction rates (Tilghman et al., 2007), although excessive hunting pressures on any species will have significant impacts.

Based on a recent survey (Jenkins et al., 2011), there is a growing body of evidence showing that wild animals in Madagascar are subject to locally high hunting pressures and that, whilst the bushmeat provides valuable protein, illegal hunting of protected species is becoming a major conservation issue. Recent publicity in Madagascar associated with seizures of lemur and tortoise bushmeat, or arrests of people involved in the bushmeat trade, has brought unprecedented attention to this issue.

Local taboos such as not killing the largest lemur in Madagascar, the Indri (*Indri indri*) or not touching endemic tortoises, are rapidly eroding, due to the economic pressures for people to survive. Combined with mining in forests, this will only aggravate the impact of hunting on wild animals, particularly in the case of migrant miners, who may have no respect for local customs. However, sites such as Isalo PA will often be exempt from this pressure, as wild animals are far scarcer and more difficult to trap.

Finally, it was also reported that there have been a number of incidents involving shooting of lemurs for sport in some sectors of Ankarana PA, involving local personalities from the region. The meat from these hunts is usually consumed privately in bars, and it is not sold for income generation on the open market as a meat product.¹²³

7.3 Protection zone/buffer zone – expendable, or not?

The protection zone around PAs is effectively a buffer zone between the PA boundaries and external activities. The protection zone was defined in the first Protected Areas Code or COAP in 2003, and has since been updated in 2008, although it has not been endorsed due to delays associated with the political crisis. The protected zone is normally the responsibility of the Ministry of Environment and Forests; although around PAs, MNP is effectively given the task of policing the protection zone without official jurisdiction.

Most buffer zones based upon COAP 2003 were not inaugurated until the late 2000s. The code states that the protection zone should be 2.5km from the PA boundary, although it allows for public consultation in the process. Exceptions to the distance of 2.5km include Isalo PA, the protection zone of which extends beyond the

¹²³ Salo, Nicolas. Madagascar National Park's Director of Ankarana PA. Personal Communication. 10 April 2012.

southeastern sector of the park to approximately 3.5km. This decision was made in order to limit potential invasion of the park by local ASM miners from Ilakaka,¹²⁴ as well as having been requested by the chief of the neighbouring fokontany who wanted to protect his nearby fields. Due to the importance of the limit for Isalo PA, several markers can be seen along the southern section delimiting the boundary between the park and several mine workings on the edge of the protection zone limit.

In other protected zones including those at Zombitse-Vohibasia, Ankarana and Ranomafana, the protection zones are effectively mere apparitions for MNP, as they are often unworkable since people live in the areas. Mining may be officially illegal in areas around these villages, but locals are entitled to dig the ground for agriculture. Meanwhile in 2009, a former Minister of Environment and Forests instructed MNP's Director of Zombitse-Vohibasia PA to cease trying to stop sapphire miners from digging in the protected zone. This statement came after years of successes and failures in MNP's attempts to sensitise the local population following on from the initial rush in 1999. The same situation applies to other parks, while in Ankarana the protection zone limits are regarded more as a phantom boundary.¹²⁵

In addition to the problems of the protection zones, it appears that the official limits¹²⁶ for several PAs do not correspond with existing forest cover, when overlaid with recent satellite imagery, which may point to errors in the boundary limits with regard to potential PA coverage.¹²⁷ Similarly, the boundaries of the PA in Ranomafana include many villages and agricultural lands, as the boundaries were defectively marked out in 1991, as those responsible were in haste to delimit the park. New boundaries drawn up by the PA authorities are formally accepted and applied by Ranomafana PA, although they are not yet official at a national level.¹²⁸

Based upon discussions with PA management during this study, it is clear that the protected zones are not viable at present due to lack of resources and inadequate enforcement of their protection on the part of the responsible agency, namely the Ministry of Environment and Forests (MEF), save symbolic gestures from MNP near Isalo PA to send a message to the Ilakaka miners. However, the object of a buffer zone around PA boundaries remains valid, as it is important to have planning regulations near PAs to deter unaesthetic developments such as the construction of large factories on PA limits. However, ASM activities are also classified as illegal in protection zones according to COAP, although the legislation may need to concede the reality and opportunities for local people from mining. Currently, MNP either modestly intervenes (apart from Isalo PA) or does nothing in response to ASM in these areas, as it does not have an official mandate to manage the protected zone.

¹²⁴ Ramangason, Guy Suzon. Director General of Madagascar National Parks. Personal Communication. 11 May 2012.

¹²⁵ Salo, Nicolas. Director of Ankarana PA, MNP. Personal Communication. 10 April 2012.

¹²⁶ Downloaded from REBIOMA website in 2012. See: www.rebioma.net

¹²⁷ Google Earth satellite imagery

¹²⁸ Rakotoarijaona Andrianarisoa, Mamy. Director of Ranomafana PA, MNP. Personal Communication. 7 April 2012.

8. SOCIO-ECONOMIC IMPACT ISSUES

8.1 Health and safety of miners

The issue of health and safety (H&S) for artisanal miners can be serious due to the very nature of ASM, which is informal and often conducted by untrained miners. Miners will often take risks, or be unaware of the risks they may be taking each day. Mining activities in surface pits is less hazardous to the H&S of miners in comparison to risks associated with shaft and tunnel mining.

The key H&S issues observed in Madagascar for artisanal miners can be categorised as follows:

- Accidents
- Physical issues
- Ergonomic concerns
- Psychosocial problems
- Biological hazards

8.1.1 Accidents

Accidents are often caused by rocks and soils collapsing on miners. This problem can occur in a large open pit, although it is more prevalent in shaft and tunnel mining, being a common technique used to access gemstones. Deep shafts and tunnels were seen in Zombitse-Vohibasia, Ilakaka and Ankarana. The soils in the south of the country are generally less compact, particularly around Ilakaka, and were subject before mining to erosion, provoked by bushfires denuding vegetation cover and leading to erosion. In comparison, stronger structures of rock and soil in Ankarana PA are less prone to erosion. Meanwhile, the lateritic soils of the Central Highlands are well known for their susceptibility to gully erosion.

At a small site near Ilakaka, within the Isalo ZP, three young male miners were buried in 2007, when a shaft tunnel in alluvial deposits collapsed on top of miners working inside. By the time the bodies were recovered, the miners were already dead.¹²⁹ The Ilakaka and surrounding sapphire deposits are vast, where thousands of miners have and still work each day, in dangerous working conditions. However, there are no statistics on the number of deaths or accidents, from principally shafts and tunnels collapsing, since the rush began in 1998. In a short period from March 2012 until the beginning of June at the Soamahamanina gold mine, there have been 3 deaths from collapsing mines at night,¹³⁰ due partially to the fact that the vast majority of the miners are local to the area and have limited or no mining experience.

Often the collapses are caused by rock falls, flooding, or badly propped-up or weak pit wall and pillar supports. In addition, irregular pumping of water from pits and the storing of waste material from mines near entrances or next to the pits can provoke severe accidents. When mines collapse the tunnel diameter of 1 metre is often insufficient space to allow miners to escape.

In Ankarana PA, approximately 2 people on average have reportedly died each year due to collapsing mines since the beginning of the rush, while there are many corporal injuries annually,¹³¹ some of which can be disabling. In addition, there are fire accidents including an incident the week before the site visit at Ankarana, when one miner was burnt to death while trying to crack rock with heat from a fire in an underground tunnel.¹³²

Accidents, leading to corporal injuries, are also caused by the mishandling of tools, such as knives, crowbars and spikes. Common injuries include cuts, scratches, and various other wounds to principally fingers, arms and legs. Often the miners do not have sufficient money to treat these injuries properly, which can lead to infections.

¹²⁹ Rajaonarivo, Aro. Director of Isalo PA, MNP. Personal Communication. 2 April 2012.

¹³⁰ D.R. Ravoson. Deputy Mayor of Soamahamanina Rural Commune. Personal Communication. 23 May 2012

¹³¹ Dr Jaoroby, Josia. Head of the Central Hospital of Ambilobe District. Personal Communication. 14 April 2012

¹³² Mr Feliva. Madagascar National Park's Warden for the northern sector of Ankarana PA. Personal Communication. 14 April 2012.

8.1.2 Physical issues

Miners are often working in very wet conditions either underground, in pits, or panning the material in rivers and ponds to search for gold or stones. During wet and colder seasons, these working conditions often provoke illness such as common colds and flu as the miners do not take a rest, and thus the diseases spread among their peers.¹³³

Miners working in holes deeper than 20 metres, which is often the case for shafts and tunnels in Madagascar, are prone to suffer from poor air supplies, as carbon monoxide builds up in the enclosed spaces deep below the ground. This issue can cause death or provoke serious accidents. The air also contains high levels of dust, which can cause pulmonary diseases.¹³⁴

8.1.3 Ergonomic concerns

Lifting and carrying of heavy objects such as sacks of dirt, often in a constrained environment such as shaft and tunnels, can provoke fatigue leading to back injuries and severe back pain.

Repetitive stress disorders can also become a serious problem due to the frequent stretching and flexing of arms and wrists during the digging for gold or gemstones. The result is strains and sprains in hands, arms, shoulders and legs due to tendon distortions and can lead to Carpel Tunnel Syndrome (Adnan, c.2005).

8.1.4 Psycho-social problems

Many young and single men follow mining rushes in search of affluence from gemstone mining. However, the dream can come at a cost for many artisanal miners, who work for many days without a find, only to discover something and suddenly have money in their hands.

The money is often misspent and often known as “hot money” in Madagascar (Walsh, 2004). This can lead to gambling and debt at casinos, such as the Joker Casino established in Ambilobe and Ilakaka attracting miners with money from regional mine sites.

Money is also spent on excessive alcohol and cigarettes with potential health disorders and addictions. In addition, prostitutes are used with potential risks of catching STDs and the costs of treating these diseases.

Overall, many miners may become either destitute and/or migrant miners in constant search of their fortune with potential long-term psychosocial problems. Although, given the alternative sources of income generation in the context of an increasingly impoverished society, this risk seems to be accepted by many with a degree of fatalistic insouciance.

8.1.5 Biological hazards

Miners working in hot and humid conditions in rainforests or mangroves will be more prone to insect bites throughout the day. Malaria is already a major disease in Madagascar and more likely to proliferate amongst tired miners working and living at sites with numerous mosquitoes. In the northwest of Madagascar, dengue fever is also prevalent and can be caught from mosquitoes, when there is an outbreak of this disease.

Cuts and other open skin injuries can also lead to a high risk of tetanus infection, precipitated by working in dirty conditions with soil (Adnan, c.2005).

Humid and warm conditions in unhygienic circumstances are also ideal for the spread of dermatological diseases. At the Antetzambato mine site a fungal skin disease similar to thrush was observed during the rush.¹³⁵ Similarly, bacteria-borne diseases such as diarrhoea are easily spread amongst miners.

8.2 Health and sanitation in mining rush communities

During a rush, the living conditions for entire mining communities at an ASM rush site can be parlous. Often during, and notably at the start of a new rush, the miners are frequently cut off from all public services, including those of health. People are often housed in temporary settlements, which quickly become overpopulated and filthy. In addition, malnutrition amongst miners is a serious risk for those who do not find gold or stones. This situation can be more perilous for migrant miners, than is the case for the majority of rural populations living at home, as these miners often have no means to subsist from their land when they are far from their homesteads.

¹³³ Mr Razafimanantsoa. Deputy Mayor of Antsirabe. Personal Communication. 12 April 2012.

¹³⁴ Dr Jaoroby, Josia. Head of the Central Hospital of Ambilobe District. Personnal Communication. 14 April 2012

¹³⁵ Dr Jaoroby, Josia. Head of the Central Hospital of Ambilobe District. Personnal Communication. 14 April 2012

Meanwhile, precarious and unsanitary housing, lack of clean drinking water, and the absence of sufficient sanitary installations, favour the development of epidemics including diarrhoea, cholera and dengue fever.

During the rushes in both Ilakaka and Ankarana, there were several cholera outbreaks, which spread from polluted drinking water sources. Since that time, water points have been developed to supply populations at these sites. However, it illustrates the health and sanitation dangers linked to recent large rushes in remote areas, such as near Didy, as well as rushes in the future.

Most sites do not have any form of sanitation in their initial stages, although a good exception includes the gold mine at Soamahamanina, where authorities from the Itasy Region provided site-planning advice leading to the installation of toilets and showers.

8.3 Impact on the miners' family unit

8.3.1 Impact on women and children

In the currently available research on the phenomenon of ASM rushes in Madagascar, there is frequent reference to increased levels of prostitution at the rush sites, with the relatively cash-rich miners serving as a magnet for prostitutes from further afield, such as regional centres and major cities (Duffy, 2005). This would be as one might expect, considering that professional prostitution is based upon the exchange of sex for cash, and that sex workers will inevitably migrate to areas where the supply of potential clients with disposable cash is most available.¹³⁶ However, the fact that sex workers will migrate to rush sites should not be confused with the postulation that ASM rushes lead to a quantitative increase in prostitution. Rather, there may be a displacement of sex workers from one location to another.

Perhaps more significant is the observation that an influx of single, sometimes relatively successful men from elsewhere into the vicinity of often previously isolated communities leads to the likelihood of opportunities for earlier sexual activity among young girls of the indigenous community.¹³⁷ Besides being potentially socially destabilizing, such earlier sexual activity can have other negative impacts, such as loss of educational opportunities on account of pregnancy, health consequences as a result of earlier exposure to STDs, etc.

Another frequently cited issue conjecturally linked to ASM rushes is the potential for higher incidence of STDs, especially HIV/AIDS (Hayes, 2008). Inevitably, given the relatively high prevalence of STDs in Madagascar, mass concentrations of sexually active individuals, some of whom are cash rich, and away from their wives or long-term partners for extended periods, will probably lead to increased rates of STD infection. However, in the context of Madagascar, there is limited evidence for any correlation between ASM rushes and increased HIV/AIDS prevalence. According to health professionals in Ambilobe, a regional medical centre close to both the Ankarana and Antetazambato rush sites, the hospital has witnessed rates of HIV infection, which are significant in the overall Malagasy context,¹³⁸ but also comparable to other towns and regional centres.¹³⁹ It's also important to note that towns with regional health centres, where patients will present with HIV/AIDS, tend to be located on significant transportation routes (as with Ambilobe on the RN6), which historically tend to be major vectors in HIV/AIDS (and other STD) transmission.

In fact, almost counter-intuitively, it may be that the perceived risk of increased HIV/AIDS transmission at ASM rush sites could be a catalyst for preventative measures, which will ultimately lower rates of infection for all STDs. The most effective measures to lower STD prevalence is through raising awareness of the risks of unprotected sex, and advocacy for the use of barrier prophylactics such as condoms. Government and NGO anxiety that ASM sites are high risk could lead to increased interventions on the ground, thus raising awareness among populations which wouldn't have been otherwise exposed to such sensitization if were not for their migration to the ASM rush site.

However, it should be noted that, after 20 or more years of extensive HIV/AIDS awareness-raising among high-risk groups, such as professional sex workers, the latter tend to be relatively aware of the risks involved in

¹³⁶ Mr Mohamed. Fokontany chief, Antetazambato. Personal Communication. 13 April 2012; Paraly, Rufin. Fokontany chief, Ilakaka. Personal Communication. 2 April 2012

¹³⁷ Razafimanantsoa, P. Deputy Mayor, Antsirabe. Personal Communication. 12 April 2012

¹³⁸ The prevalence of HIV/AIDS in Madagascar has been noted as anomalously low, at an estimated 0.2% of adults, according to UNAIDS. Given the relatively high incidence of STDs, in both rural and urban areas, it is surprising that the prevalence is not significantly higher. While its relatively isolated status as an island has probably provided a degree of geographical insulation from the epidemic, the low infection rate has been a subject of vigorous debate for at least the last 15 years.

¹³⁹ Dr Jaoroby, Josia. Head of the Central Hospital of Ambilobe District. Personal Communication. 14 April 2012

unprotected sex. Much less aware, and so potentially more vulnerable to STD transmission, would be the non-professional young girls who become precociously or more sexually active as a result of their exposure to ASM rushes.¹⁴⁰

The mayor of Ranohira, and thus also the elected mayor for Ilakaka, cited a number of cases of sexual tourism in which foreign buyers, Sri Lankans and Thais, were known to be sexually exploiting under-age girls. In one case, the parents of a 16 year-old girl were recently arrested for selling, or pimping, their daughter to a foreign gemstone buyer.¹⁴¹

8.3.2 Impact on educational opportunities for children

The experience of children, in terms of impact on their educational opportunities, differs according to the type of ASM rush to which they are linked. Gemstone ASM rushes tend to involve single young men at the earlier stages, after which families will arrive en masse as the rush stabilizes. This consolidation of the rush is usually accompanied by an influx of migrants providing services, one of which being the setting up of private schools (as at Ilakaka, and Antetazambato). Children are far less likely to be involved in the gemstone ASM activities. In fact, one of the artisanal miner focus groups, in Ankarana PA, was emphatic on two education-related points. The first was that they hoped that their children would not become artisanal miners when they grew up. This was, they said, one of the reasons that motivated them to continue mining – so that they could continue generating the cash income, which allowed them to send their children to private schools in the nearby mining village of Ambondromifehy.¹⁴²

However, the situation is very different in the case of ASM gold rushes. Children, as part of the family unit, tend to be more involved in the ASM activity. This may be due to the facts that the mine site is usually more closely located to their home, and that gold ASM is less intensive, more intermittent, with the miners combining ASM with subsistence agriculture. At the ASM gold rush in Soamahamanina, near Arivonimamo, a focus group made up of children present on site explained they were not attending school so that they could work at the rush site (see **Figure 26**). Even if ASM gold activity is intermittent, and their absence from school temporary, it will undoubtedly have deleterious effects on their education (Ecoex, 2003).

8.4 Rush-linked insecurity

Insecurity during a rush is a serious problem for local people, miners and authorities. For local people, the reality of living with several thousand migrant miners is a dramatic change and challenge for them.

Often insecurity in a small village and/or temporary mining settlement is not necessarily provoked by miners, but is conducted by thieves and conmen from national or regional town centres. These malign individuals merge into the rush, as they did in Antetazambato, and burgle local and migrant miners' homes.¹⁴³

Serious crimes can also occur as large sums of money and valuable finds are often kept in simple dwellings, which are frequently quite insecure. Raids into homes and/or attacks can lead to deaths and serious injuries amongst the population. Such events have been regularly reported from the recent ASM rush near Didy, including 3 attacks during the early phase of the rush in May, which led to the hospitalization of the victims (L'Express de Madagascar, 2012a). Until now no significant policing operations have occurred at the site, leaving it open to insecurity.

Insecurity can also be accentuated by disorder provoked through excessive consumption of alcohol, fuelled by the relative novelty of easily disposable income.

8.5 Economic benefits linked to ASM rushes

It is important not to discount the impact of economic benefits linked to ASM and rushes. Besides the personal economic gains for individual miners and their families, there are other longer-term advantages. In the case of

¹⁴⁰ Dr Jaoroby, Josia. Head of the Central Hospital of Ambilobe District. Personal Communication. 14 April 2012

¹⁴¹ Mionjo A.P. Mayor of rural commune of Ranohira. Personal Communication. 4 April 2012

¹⁴² Miner focus group, Ankarana PA. Personal Communication. 15 April 2012

¹⁴³ Mr Mohamed. Head of the Village of Antetazambato. Personal Communication. 13 April 2012

Ilakaka, it was literally the creation of a thriving and increasingly developed town, which would not have existed otherwise.¹⁴⁴ Other positive factors include¹⁴⁵

- The collection of risonne, if properly operated, benefits the commune, through revenue
- Distribution of rice and other sources of nutrition to miners and their families via ‘shopmen’/buyers
- Ilakaka has become the commercial center for surrounding local communities, with transport to Ilakaka less expensive than to the previous nearest commercial center, Ihosy
- Foreign gemstone buyers (Thai) have provided local infrastructure, including a school and hospital in Ilakaka

In addition, Ilakaka benefits from a functioning electricity system, privately run.

8.5.1 Income opportunities for pre-existing local communities

There are also significant potential economic benefits for local pre-existing local communities, at or near an ASM rush site. On the one hand, the influx of miners and their families provides additional commercial opportunities, in the form of a much larger and sometimes cash-rich clientele, for local merchants and shopkeepers. In turn, the considerable augmentation in population and increase in disposable income as a result of the rush will also be the rationale for existing or immigrant shopkeepers to expand the range of their stock, thus providing the local community with a wider selection of goods for sale.

In communities which have some form of property claim to the rush site, there is also an added benefit whereby artisanal miners will pay rent for the exploitation of a certain area. In the case of the rush site near Antsirabe, rent was set at MGA 5000 per mining hole.¹⁴⁶ Cumulatively, in a rush site with hundreds or thousands of holes, this can amount to a significant source of revenue for the indigenous community.

8.5.2 Socio-economic mobility opportunities for miners

As has been discussed above, ASM rushes can bring otherwise unavailable economic and infrastructure benefits to both existing and new immigrant communities. However, the primary reason for artisanal miners to descend en masse to a rush site is their hope that they will, if not make a fortune, at least significantly increase their cash income.

In focus groups at both Ankarana PA and within the ‘zone de protection’ adjoining Zombitse-Vohibasia PA, artisanal miners asserted that their ASM activities were considerably more lucrative than their previous occupations, and provided them with significantly increased cash income (at Ankarana PA, approximately MGA 45,000 per day). At Zombitse-Vohibasia PA, this had allowed one miner, over a period of eight years, to acquire a herd of 20 zebu and a gun with which to protect his herd and himself.¹⁴⁷ He intends his next major purchase to be a car. As has already been noted, this relative enrichment of the artisanal miners has tangible socio-economic benefits for both the miner and the family unit, with increased access to education for their children, in the hope that they will have better professional opportunities as adults, and the accumulation of assets, such as the zebu herd, the gun, and perhaps one day the car. However, these examples may not be representative of the overall ASM rush experience, as the interviews were conducted at mature ASM rush sites, with miners who had already amassed many years of ASM experience. Presumably, there is a significant churn rate in the early days of ASM rushes, when novices or the unlucky are disappointed in their ambitions. Indeed at the Antetzebato rush site, it was estimated that of the 20,000 miners who worked at the peak of the rush, only about 15 per cent were significantly successful.¹⁴⁸

There is also the phenomenon of “hot money”, the often all too easily disposable cash income which is quickly dissipated by the profligate miner. There is an apposite Malagasy proverb:

“Variana toy ilay andevo lahy mahita fotsimbary tsy mahalala afa tsy ny anio”

Literally – “Like the male slave finding rice and only sees as far as today”

¹⁴⁴ Ranoroosa, Nadine. Director Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

¹⁴⁵ Mionjo, A.P. Mayor of rural commune of Ranohira, including Ilakaka. Personal Communication. 4 April 2012

¹⁴⁶ Razafimanantsoa, P. Deputy Mayor, Antsirabe. Personal Communication. 12 April 2012.

¹⁴⁷ Mr Jean. ASM miner, Zombitse-Vohibasia PA. Personal Communication. 3 April 2012

¹⁴⁸ M. Mohamed. Head of Fokontany, Antetzebato. Personal Communication. 13 April 2012

There is a certain discourse in ASM research which identifies these spendthrift ways as a negative aspect in the ASM rush dynamic, so much better if the miner could husband his income generated from ASM and put it to better, longer-term uses. While the latter is undoubtedly the case, and doubtless the once again impoverished miner would in retrospect agree, “hot money” is far from unique to Madagascar or to ASM rushes. Indeed, there is a sub-genre of Schadenfreude journalism which charts the curve of bust-boom-bust among lottery winners in Europe and the US. In any society, the novelty of sudden and relatively immense wealth will probably confound the best intentions of most recipients. Moreover, as Tilghman (2007) observes, in the more mature rush sites such as Ambondromifehy and Andranodambo, conspicuous consumption of “hot money” is much less visible. Just as the attrition of years whittles down the miners on site to a core of those most competent and able to make a living from ASM, so too does experience tend to temper profligacy.

8.5.3 Negative economic impacts linked to ASM rushes

The most significant negative economic impact, cited by a range of focus group interviewees at a number of sites, is a sometimes dramatic increase in the price of basic foodstuffs.¹⁴⁹ This can be caused by the fact that many of the local farmers may well temporarily give up their agricultural activities so as to try their luck in the rush. This in turn will lead to decreased agricultural production in the area, requiring imported foodstuffs from elsewhere, which are inevitably more expensive than local produce. However, as the rush stabilizes there tends to be a degree of local agricultural entrepreneurship, whereby farmers will increase production in order to meet demand.¹⁵⁰

In the case of Ilakaka, sedimentation in the river, which irrigates the nearby rice fields, led to food shortages, and the need for further imports of higher-priced foodstuffs, thus a negative economic impact (Duffy, 2005). Also, in the region of Ilakaka, the local mayor cited as a negative economic impact the lack of sufficient enforcement of the *redevance/ristorne*, and the degree to which foreign buyers were able to smuggle out their high-value stones, with apparent impunity. This was depriving the commune of its rightful share of the applicable royalties.¹⁵¹ There was also significant concern that when buyers paid royalties centrally to the Ministry of Mines, as is usually the case, the *ristorne* did not benefit the commune or region.¹⁵²

8.6 Informal formalization’ of ASM rush communities

As has been noted above (see **Sections 6.4 and 6.5**, regarding Soamahamanina, near Arivonimamo, and Ankarana respectively), in the absence of effective intervention from the central government, local authorities, especially at the commune level, are often prepared to informally formalize, or semi-formalize, ASM activities or rushes.

On the one hand, ‘informal formalization’ offers considerable advantages – such as security for miners and their families (as at the mining village of Ambondromifehy, near Ankarana); significant improvements in terms of health and sanitation (as at Soamahamanina, near Arivonimamo); regulations which positively impact health and safety at the site (as at Soamahamanina); increased revenues for the commune through the establishment of *comptoirs* and the implementation of a local equivalent of *redevance/ristorne*. Moreover, informal formalization at the decentralized level also addresses a frequent complaint made by local government interlocutors, namely that when the royalty taxes are paid at the export stage, to central government, they are frequently not channelled back to the region or commune.

However, such proactive interventions can also pose problems. Firstly, formalization at a local level is frequently carried out wholly independently of the nominal central and inter-regional ministerial authority, the Ministry of Mines (as at Soamahamanina, near Arivonimamo). Besides creating tensions between central and local government, this sidelining of the designated regulatory authority sets a precedent, which undermines the current regulatory regime, already weakened by a lack of resources and capacity. Indeed, the vicious circle is reinforced through that same lack of ministerial capacity to monitor and regulate the vast number of ASM sites around the country being the catalyst for the local authority’s autonomous intervention. When the commune, and most

¹⁴⁹ Razafimanantsoa, P. Deputy mayor, Antsirabe. Personal Communication. 12 April 2012

¹⁵⁰ M. Mohamed. Fokontany chief, Antetetzambato. Personal Communication. 13 April 2012; Mionjo, A.P. Mayor, rural commune of Ranohira. Personal Communication. 4 April 2012

¹⁵¹ M. Mohamed. Fokontany chief, Antetetzambato. Personal Communication. 13 April 2012; Mionjo, A.P. Mayor, rural commune of Ranohira. Personal Communication. 4 April 2012

¹⁵² M. Mohamed. Fokontany chief, Antetetzambato. Personal Communication. 13 April 2012; Mionjo, A.P. Mayor, rural commune of Ranohira. Personal Communication. 4 April 2012

importantly its political constituency, sees no action from the ministry or regional government to put an end to the rush, or even at least to regulate it, the local authority is under pressure to formalize so that the community can benefit from the ASM activities, besides mitigating through regulation whatever potential for negative impacts (as at Soamahamanina, with the attempt, albeit unsuccessful, to ban alcohol sales at the site). In the case of rushes taking place in PAs (as in Ankarana), the commune's intention to semi-formalize with a *comptoir* at Ambondromifehy and local imposition of *redevance/ristorne* is understandable, given the apparent current impunity for ASM activity in Ankarana PA, dating back 18 years. Yet, if the *comptoir* and the local taxation were to go ahead, it would serve to legitimize an illicit activity, and further normalize ASM activities in PAs.

The issue of informal formalization, or semi-formalization, begs the question: what is formalization? The latter is often cited as a potential way of resolving the anarchic and negative aspects of ASM rushes. In the context of Madagascar, is semi-formal, informal formalization better than no formalization at all? Most acutely, in the case of a commune's proximity to a PA, is a local-level initiative of informal formalization worse than the stasis of doing nothing?

The paradox of formalization was raised by the Minister of Mines at the close of a small mines workshop during the '*Journée des Mines*' with regard to the ASM rush in the PA near Didy.¹⁵³ To paraphrase – the vicious circle is that, on the one hand, there is a need to regulate and formalize the rush; yet, it is impossible to formalize the rush situation without degazetting, which is – at least, currently—inconceivable.

¹⁵³ Held in Antananarivo, on 16 May 2012

9. MINING AND ECONOMIC ISSUES – KEY CHALLENGES IN MINING GOVERNANCE

9.1 Lack of reliable data regarding ASM gold and gemstone production

One of the major challenges facing the respective governmental authorities, key stakeholders and researchers in addressing the problem of ASM rushes is the lack of reliable data relating to the scale and scope of gold and gemstone ASM production. As has been established, Madagascar's geological history indicates that great swathes of the country could be potential sites for ASM. Given the informal nature of ASM, it is very difficult to estimate accurately the volumes and values of what is being mined, whether on an annual or regional basis.

Besides a lack of capacity, it has been suggested that there might have been historically an institutional inertia towards the accurate collation of figures for gold production/exportation.¹⁵⁴ Given the potential vested interests involved in the illicit exportation of gold, with it being one of the easiest ways to channel funds abroad below the radar of fiscal authorities (see **Section 9.12**, below), it may not be a high priority for the country's economic and political elites to shine a bright light on the volume of Madagascar's gold production.

A similar problem is encountered when trying to assess Madagascar's annual volume and value of gemstone production.

9.2 Absence of regional or centralized system for mining rush surveillance

Critical to prevention and mitigation of ASM rush impacts on PAs and other biodiversity-rich areas is a competent and fast-reacting system for the surveillance of ASM rush activities. Without such a system, whether operating from within the Ministry of Mines or the Ministry of Environment and Forests, or in a tandem of the two, it is almost impossible for the state authorities to mobilise sufficient resources to intervene decisively before a critical mass of ASM miners have gathered at the site, whether PA or otherwise. Most key stakeholders agreed that once the number of miners involved in a rush reaches the tens of thousands there is little the government can do to evacuate them from the PA, besides targeting the collectors and buyers, as perhaps will be the case with the rush near Didy.¹⁵⁵

Currently, it can often take 3-4 weeks for initial news of an ASM rush to filter back to the Ministry of Mines in Antananarivo.¹⁵⁶

The need for immediate and rapid intervention has been borne out, *ex negativo*, by the delays which have so impeded an adequate response to the rush near Didy. The argument for a fast-reacting ASM monitoring system is also more positively underlined by the relative successes at Isalo PA, albeit faced by a much more limited threat, and Montagne d'Ambre PA, where attempts to exploit reported ruby deposits were thwarted by concerted and prompt reaction from the authorities.¹⁵⁷

While the Mines-Forests Committee does exist in part to monitor and coordinate responses to ASM rushes, it requires a process for its convocation; and there is as yet no dedicated unit in either ministry for countrywide rush surveillance/monitoring. For the Ministry of Mines, lack of capacity in terms of number of personnel at the various inter-regional offices makes rush surveillance particularly difficult.¹⁵⁸

In the case of ASM gold rushes, the problem of receiving adequate and timely information is particularly acute. While the smaller scale gold rushes may not be as environmentally intrusive or destructive as the larger gemstone rushes, they tend to be more dispersed – in the words of the Ministry of Mines official responsible for managing rushes, “it is difficult to know where to begin... there are rushes everywhere.”¹⁵⁹

¹⁵⁴ Razakariasa, Henri Bernard. Technical Advisor to the Governor of Madagascar Central Bank; former SG Ministry of Finance, 2002-9. Personal Communication. 29 May 2012

¹⁵⁵ Manganirina, Pierre. Secretary General, Ministry of Environment and Forests. Personal Communication. 25 May 2012; Rakotoary, Jean Chrysostome. DG, ONE. Personal communication. 10 May 2012

¹⁵⁶ Rakototafika, Gérard, DG Ministry of Mines. Personal Communication. 28 March 2012

¹⁵⁷ Befourouack, Julien, Head of the Regional Office, MNP. Personal Communication. 10 April 2012

¹⁵⁸ Tiandraza, Jean. Inter-regional Director of Mines, Diana-Sava-Sofia. Personal Communication. 16 April 2012

¹⁵⁹ Rakotondraly, Désiré. Director, Technical Support, Gold mining and Rushes, Ministry of Mines. Personal Communication. 8 May 2012

9.3 The laissez-passer

The laissez-passer is intended to enable the traceability of gemstones,¹⁶⁰ as well as being the basis for paying the appropriate royalty of *redevance/ristorne* (World Bank, 2010b). Thus it should be one of the instruments by which authorities can regulate and ensure formalization of the ASM sector. In an ideal world, the requirement for a laissez-passer would prevent the illicit market of gemstones originating in PAs. However, it currently seems to serve the opposite function.

As has been discussed above, the government interdiction of 1999-2004 against the issuing of new permits for sapphires and rubies fuelled the black market in laissez-passers, and did little to control the illicit trade. A similar situation applies today, such that permit holders “make profit not by selling gemstones, but by selling laissez-passers to exporters – i.e. by selling “formality”” (World Bank, 2010b).¹⁶¹ This also impacts negatively on the tax returns due to the central government and to the commune:

“The market for laissez-passers thus undermines the tracking function of the laissez-passer system, as untracked gemstones only get matched with laissez-passers at the point of export. Consequently, tax redistribution to the true communes of origin becomes impossible. In addition, the taxation function of the laissez-passer system is ineffective due to poor tax enforcement on Malagasy permit holders.” (ibid.)

In mid-May 2012, it was estimated that 50per cent of sapphires and rubies being exported from Madagascar originated from the illicit ASM rush impacting the PA near Didy.¹⁶²

It was thought that many exporters were using laissez-passers originally obtained from Ilakaka. At the time of the Ilakaka rush from 1999 onwards, especially following the government ban, exporters used laissez-passers from other locations to enable their stones to go abroad (see **Figure 45**). In an iteration of history the same process is going on, but with laissez-passers originating in Ilakaka where the rubies are lower quality than those at Didy, to facilitate the export of stones from ASM rush activities in threatened PAs.

In the current situation, the system of laissez-passer effectively enables the laundering of illicit stones.¹⁶³ This begs the question whether the laissez-passer serves any positive purpose. Or is it rather another symptom of a perhaps over-onerous regulatory system, which currently serves a purpose in direct opposition to that for which it was originally intended? Several key stakeholders questioned the continued utility of the laissez-passer system, arguing that as it did not work, and arguably had never achieved its objective, it was futile to continue with its implementation.¹⁶⁴

¹⁶⁰ Ranorosoa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

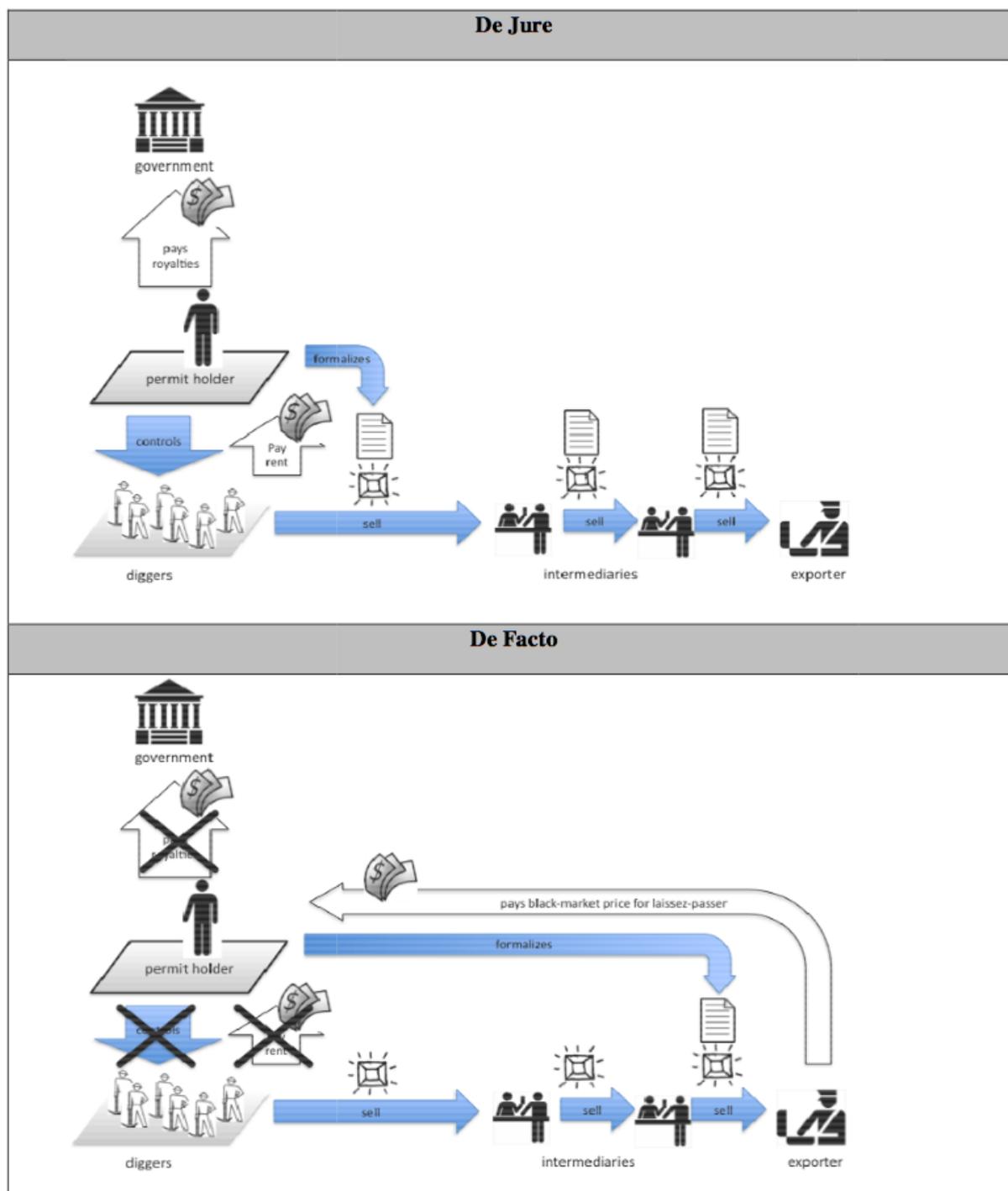
¹⁶¹ Indeed, it was illuminating that at the small mines workshop held during the Journée des Mines, on 16 May 2012, the main request from a number of participants was for an increase in the number of laissez-passer forms in the respective booklet.

¹⁶² Ranorosoa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

¹⁶³ Ranorosoa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

¹⁶⁴ Ranorosoa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012 & Manharlal, Razik. President of the jewellers' association FIRAVAKA. Personal Communication & Cushman, Tom. Personal communication. 25 May 2012

Figure 45: Discrepancy between formal (de jure) and informal (de facto) gem supply chain



Source: excerpted from World Bank, 2010b

9.4 The formal comptoir

Among both the ASM miner interviewees and figures from local government, there were several who called for PGRM, or its successor entity, or the Ministry of Mines, to install a system of formal *comptoirs*.¹⁶⁵ It was thought that this would provide miners with a more equitable transaction, as well as allow the commune and government authorities to monitor more efficiently the payment of royalties.

¹⁶⁵ Mionjo A.P. Mayor of the rural commune of Ranohira, including Ilakaka. Personal Communication. 4 April 2012

There is a degree of nostalgia for the previous *comptoir* at Ilakaka. A local association, known as FELAPAISO, was a partner with the Ministry of Mines in running the *comptoir*, only for it to be shut down in 2002 following mismanagement.

Some interlocutors claimed that the current unregulated practice of informal *comptoirs*, aside from facilitating illicit and undeclared sales, was also a factor allowing the mainly foreign buyers to obtain a lower price. It was suggested that the existing, currently unused Ilakaka BAM building could be converted into a *comptoir*, with a laboratory for analysis and valuation of stones, managed by PGRM/Ministry of Mines.¹⁶⁶ It was explained that the mainly Sri Lankan buyers in Ilakaka had organized a system whereby if a miner/seller refused an offer made by one buyer, and then went to other buyers in the hope of obtaining a better price, the other buyers would offer a lower price, thus ensuring no inflation in the price paid by buyers.¹⁶⁷ While this apparent cartel system is undeniably frustrating for the miners, it remains doubtful that a *comptoir* would provide an immediate solution. Unlike gold, the value of raw gemstones is not aligned with an external, international spot price. Their value is market-driven, with a very limited number of potential buyers, as virtually all Madagascar-produced gems are exported abroad for sale elsewhere.¹⁶⁸ Besides the logistical and budgetary challenges of creating a *comptoir* with the technical expertise needed for a laboratory, it is also probably unrealistic to expect the buyers to accept such a restriction of the free market.

The installation of a gold *comptoir* system in Antanimbary, a major market for gold produced in the Maevatanana region, was a success, with the officially declared volume of gold from Antanimbary increasing exponentially to 32kg between August 2005 and October 2006.¹⁶⁹ However, as an integral part of the programme, the NGO Green, supported by PGRM, conducted two years of training and awareness-raising for members of local government in the region. This participative approach, similar to the model advocated by the NGO Fanamby, brought benefits to local communities.¹⁷⁰ When an attempt was made to deploy the same model across the country, but without the same degree of intensive sensitization and training, it met with significantly less success.¹⁷¹ This highlights a dilemma facing stakeholders: while participative, sensitizing programmes aimed at formalizing ASM can be very successful, they also require considerable investment of budget and resources. In the current, tightened circumstances of political crisis and economic malaise, this is almost certainly unrealistic on a national level. Indeed, since 2009 the formalized *comptoir* system has ceased to operate in Antanimbary. Large quantities of gold continue to be traded, but are undeclared. Insecurity has worsened significantly, with reports that in the first five months of 2012 three gold collectors in the region were killed in armed robberies.¹⁷²

9.5 Capacity shortfall in the Ministry of Mines

Interviewees from within the Ministry of Mines and PGRM frequently noted the lack of capacity on the part of regulatory authorities.¹⁷³ This is most clearly the case in terms of human resources, with missing generational cohorts. Cuts in personnel and recruitment following the ongoing political and economic crises since 2009 have meant that former employees have moved into the private sector. It is considered unlikely that they will return to the public sector.¹⁷⁴ The situation will become even more acute as current senior management figures take retirement, which is relatively imminent for many.

This shortfall in experienced personnel does not bode well for the ministry's performance in its regulatory role. It will exacerbate and compound existing capacity issues re: monitoring and surveillance of ASM rushes.

¹⁶⁶ Paraly, Rufin. Head of Fokontany & former miner, Ilakaka, Personal Communication. 3 April 2012

¹⁶⁷ Rakotonirina, Jean Népomucène. Inter-regional Director of Mines, Fianarantsoa. Personal Communication. 5 April 2012

¹⁶⁸ Ranoroso, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

¹⁶⁹ To put the increase in context, in 2003 a mere 10kg was officially declared nationally.

¹⁷⁰ "The financial return from fees and levies have been invested into actions such as social infrastructure development and the optimization of livelihood conditions of artisanal miners" (CASM, 2006)

¹⁷¹ Cushman, Tom. Personal Communication. 24 May 2012

¹⁷² Cushman, Tom. Personal Communication. 24 May 2012

¹⁷³ Rakototafika, Gerard. DG, Ministry of Mines. Personal Communication. 28 April 2012; Rakotonirina, Jean Népomucène. Inter-regional Director of Mines, Fianarantsoa. Personal Communication. 2 April 2012; Tiandraza, Jean. Inter-regional Director of Mines, Diana-Sava-Sofia. Personal Communication. 16 April 2012

¹⁷⁴ Cushman, Tom. Personal Communication. 12 May 2012; Razananirina, Henri. Inter-regional Director of Mines, Fianarantsoa, 2001-8; DG Ministry of Mines, 2008-10. Personal Communication. 25 April 2012

9.6 Enforcement/application of relevant laws

Madagascar's laws proscribing mining in PAs are rigorous and strict, on paper. The Mining Code stipulates that mining activities in PAs are a criminal offence. However, these theoretical penalties bear little connection to the reality on the ground.

When the forces of law and order do on occasion intervene against illicit mining in PAs, they sometimes detain a number of artisanal miners. The most common scenario is that the arrested miners will have to endure a short-term imprisonment (weeks, or 1-2 months) before being transferred to the remit of the courts and judicial authorities.¹⁷⁵ At that point, the cases tend to disappear from the judicial system. There was a perception that many magistrates and judges generally do not consider mining in a PA to be a criminal offence, rather a civil case.¹⁷⁶

There was also a call for specially trained environmental magistrates and judges who would be adequately sensitized to deal with such cases.¹⁷⁷

In the course of our research, a recurring theme from interlocutors was that the relevant laws were almost never enforced.¹⁷⁸ However, it was also observed by others that an enforcement of the law, with the application of penalties and the imprisonment of miners, would almost certainly prove counter-productive. Prison sentences would probably lead to a higher incidence of deliberately lit fires in PAs¹⁷⁹ (see **Section 6.3**, Ranomafana). Another important aspect relevant to the non-application of existing laws is that visible impunity to transgress already existing laws undermines not just the specific law in question, but also in general the very rule of law, the juridical system which should serve both to anchor and cohere society.

9.7 The presidential ban on exports of gold

Recent media coverage of gold seizures and speculation regarding the volumes being illegally exported may have contributed to a significant recent intervention from the current transitional Presidency. In April a presidential edict proscribed all exportation of gold, while at the same time delegating the Madagascar Central Bank to be the central purchaser and the only avenue for gold exports. While this could be an attempt to formalise gold production by deploying the credibility and authority of the Central Bank, it might pose a number of problems. Firstly, there is no in-country capacity for refining the gold mined in Madagascar into the monetary gold which central banks customarily hold. In order for Madagascar Central Bank gold holdings to have any monetary utility, for example to sustain the strength of the Ariary as the net inflows of foreign direct investment decrease following the end of the Ambatovy Project and QMM construction phases, the Bank would need to have accumulated much more significant reserves over a long-term period, as well as there being the need for the refined monetary gold which would denote liquidity. Secondly, there is the logistical problem of there being no technical capacity in the Central Bank to value the gold as part of any putative buying process. In addition, it is not clear whether or not the Central Bank will have to set up regional offices for the acquisition of the gold. Thus the situation remains in something of a limbo, in that the Central bank is not currently buying gold, though preparing to buy gold, but has capacity issues. Meanwhile, if the limbo were to continue, it remains highly likely that the exportation of gold will revert to the situation typified by 2010/2011, when 0kg was legally exported in 2010 and 800g in 2011.

Although it's still unclear what consequences might ensue from this recent ban, there are echoes of past bans effecting gemstone exports (see **Section 3.5**). Given that the last ban on gemstone exports, in 2008, had a catastrophic impact on the livelihoods of tens of thousands of artisanal miners (World Bank, 2010b), as well as probably exacerbating the problem of illicit exports, this could be an alarming prospect.¹⁸⁰ However, it is important to note that a fundamental difference between gold and gemstones, in terms of the value dynamic, lies

¹⁷⁵ Andriatsitohaina, R.M. Police Inspector, & Deputy Head of Police, Ranohira. Personal Communication. 4 April 2012

¹⁷⁶ Andriamananjara Nirina, Marlin. WWF Officer, Fianarantsoa Region & COFAV. Personal Communication. 4 April 2012

¹⁷⁷ Rakotoarijaona Andrianarisoa, Mamy. Director of Ranomafana PA, MNP. Personal Communication. 7 April 2012

¹⁷⁸ Rakotonirina, Jean Népomucène. Inter-regional Director of Mines, Fianarantsoa. Personal Communication. 5 April 2012; Razananirina, Henri. Inter-regional Director of Mines, Fianarantsoa, 2001-8; DG Ministry of Mines, 2008-10. Personal Communication. 25 April 2012; Tiandraza, Jean. Inter-regional Director of Mines, Diana-Sava-Sofia. Personal Communication. 16 April 2012; Ranoroaso, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012; Salo, Nicolas. Director of Ankarana PA, MNP. Personal Communication. 14 April 2012

¹⁷⁹ Henri Razananirina. Inter-regional Director of Mines, Fianarantsoa, 2001-8; DG Ministry of Mines, 2008-10. Personal Communication. 25 April 2012

¹⁸⁰ A worry might also be that networks with links to export authorities might take advantage of the limbo ensuing from the export ban, and so monopolize the illicit exportation of gold, thus rendering the sector yet more opaque and less amenable to regulation and formalization.

in the fact that gold has a ready and historically constant market within the Malagasy economy, as well as being ingrained within Madagascar's index of socio-cultural value. As in many other countries, it is considered a highly liquid asset, with immediate and relatively predictable returns, based upon an easily accessible international spot price. Essentially, there is a vibrant internal market for gold in Madagascar. Gemstones are different, in that there is no widespread market in the country for their internal consumption, with the vast majority of gemstones mined in Madagascar destined for overseas export and sale (SDM, 2006). Their value as a liquid asset is much more conditional on value-added processes which currently take place overseas.

9.8 Opportunities for corruption arising from mining rushes

The available literature on ASM in Madagascar clearly emphasizes the problem of corruption bedeviling the sector (Duffy, 2005; USAID, 2005; Tilghman, 2007; Phillips, 2007).

In late 2005, a Sri Lankan company announced on television that they had paid corrupt park and government officials so as to be able to mine unimpeded in the Zombitse-Vohibasia National Park (Tilghman, 2007).¹⁸¹

A number of key stakeholders expressed their concern that corruption was one of the most critical challenges in terms of preventing, or at least limiting, the damage wrought by ASM rushes on PACE.¹⁸² Over-onerous regulation was also observed as a catalyst for corruption: while virtually all those higher up the value chain were aware of the central tenets of the law, they were driven to operate informally, illicitly, since it was virtually impossible to follow the letter of the law, due to its severity. This in turn gives rise to the perverse paradox whereby it becomes normative for the law, designed to combat the illicit, and the agents of the law, to become the panderers and conduits of illegality.

9.9 Political crises, political will and the challenge of populist politics

The cycle, over the last two decades, of protracted political crisis and uncertainty, with its attendant attrition on the economy, has contributed to the enfeeblement of Madagascar's governmental institutions and structures. This undermining of the governmental and political system has opened the door to populist "movements that appeal directly to the populace, mobilizing their discontent to effectuate change outside the electoral system" (USAID, 2010). Also, "weak governance and political institutions in turn undermine the legitimacy and authority of the Malagasy state itself. The state can only govern authoritatively and with minimal coercion if its citizens accord it legitimacy" (World Bank, 2010b). The vicious circle of a legitimacy deficit in terms of governance amplifies the temptation for populism and short-term political opportunism (World Bank, 2010a). This can also intersect with the business interests of "opportunistic and highly organized forces, sometimes with government linkages" (USAID, 2010). The negative impact on the environment is potentially catastrophic:

"Madagascar's political crises invariably involve long periods of confusion where government systems falter, salaries are not paid, and there are few attempts to enforce the law. When, as now, donor projects are put on hold, there is a near total vacuum in terms of monitoring and control. The result is a free-for-all, open access situation where pent up demand for resources is liberated and massive amounts of irreversible damage can be done in a very short time." (USAID, 2010)

A lack of political will, and the issue of political populism, are significant factors in at least two aspects of authorities' responses to ASM rushes, whether in PAs or elsewhere. Firstly, there is the absence of a robust and prompt response to the initial indications of a rush. As already noted, once an ASM rush achieves a critical mass in the thousands or tens of thousands it becomes logistically problematic for the central and regional government to intervene decisively, given the limited resources at its disposal. On a more local level, it is sometimes difficult for the local inter-regional representatives of the respective ministries, as well as the local forces of law and order, to intervene. On occasion, this is due to threats and intimidation, as in the case of the Didy rush (see **Section 6.11**, above).¹⁸³ Secondly, political will for intervention against ASM in PAs on the part of local authorities is potentially weakened by the context of the current "free-for-all" exploitation of Madagascar's other natural

¹⁸¹ Cushman, Tom. Personal Communication. 26 May 2012.

¹⁸² Ramangason, Guy Suzon. DG MNP. Personal Communication. 11 May 2012; Rabemanantsoa, Jean-Claude. DG Forests, Ministry of Environment and Forests. Personal Communication. 16 May 2012

¹⁸³ Rabemanantsoa, Jean-Claude. DG Forests, Ministry of Environment and Forests. Personal Communication. 16 May 2012

resources. The ongoing and widely publicized despoliation of, for example, rosewood and the widespread perception of impunity connected with the trade make it more difficult for local authorities to justify robust action against ASM in PAs.

Another aspect contributing to the lack of political will, is the degree of personal benefit being accrued by certain political actors and other state functionaries, more often on a local and/or regional level, and reportedly sometimes benefiting from every level of the value-chain.¹⁸⁴ Moreover, as has been noted earlier in the report, in certain ASM rushes, elements among the forces of law and order have benefited financially from the ASM rush dynamic, whether from payments for turning a blind eye to illicit mining activities, providing security (USAID, 2005), or involvement in secondary illicit activities, linked to the opening up of the PA by ASM, such as the charcoal trade.

9.10 Tax avoidance/money laundering indirectly linked to ASM

Some interlocutors made the argument that tax avoidance and money laundering by economic elites are significant factors in the context of ASM in Madagascar. One hypothesis is that Madagascar-based economic elites who do not want to declare all their income to the fiscal authorities make an arrangement to lend local Ariary to foreign gemstone buyers in a transaction that will then see them repaid in overseas foreign currency accounts. This echoes the modus operandi of certain south Asian trust-bonded Informal Value Transfer Systems (IVTS), such as Hundi or Hawala (Passas, 1999). Besides avoiding tax, this also has the added advantage that the local currency is converted into foreign currency. In turn, the same foreign currency can either remain overseas, or then be used to reimport goods for the money launderer's Madagascar-based businesses.¹⁸⁵

Parallel to this process is one concerning gold. The gold price in Madagascar is consistently higher than the international spot price, with it sometimes being cheaper to import refined gold from abroad than to export Madagascar-produced unrefined gold. One reason for this could be the effect of the parallel economy adding value to gold as a means of laundering/avoiding tax, as well as retaining a highly liquid asset, which can easily be transferred into cash. If, say, the international spot price were US\$40/g, and Madagascar's local gold price were the Ariary equivalent of US\$45/g, the upside of buying the gold in Madagascar for the Madagascar-based, cash-rich economic elite is that the legal purchase of the gold (with appropriate payments of the respective taxes) allows one to cross from the informal or parallel economy into the formal, so being able to bank the proceeds from the sale of the gold as legitimate.¹⁸⁶ Moreover, illicit exports of gold are relatively reliable and effective means of expatriating profits without attracting the attention of the tax authorities.¹⁸⁷

The potential efficacy of these money laundering processes could make it difficult to generate sufficient political will to change the ASM sector's status quo, whether through increased scrutiny of the sector or by simplification of sometimes impossibly onerous regulations, which in turn tend to breed opportunities for circumvention and corruption.

9.11 Value-added in Madagascar

One of PGRM's core objectives has been to enable improved generation of added value in Madagascar. To that end, the Institute of Gemology of Madagascar (IGM) was set up as a training centre for gemologists, lapidary artists and cutters of stones.

Currently, almost all the value-added for gemstones is done overseas, benefiting neither Malagasy artisans nor the state. Adding value in Madagascar could create significant employment opportunities, generate wealth, as well as increased tax revenues from successful value-adding businesses. However, a frequent refrain from interlocutors was that while the advantages of adding value in Madagascar, rather than overseas, may be self-evident, the statutory regime does nothing to encourage its taking root. Most students at IGM study gemology, which enables them relatively easily to find work with businesses operating in locations like Ilakaka. The students who specialize in the key value-added subjects, like lapidary cutting, apparently tend not to stay in the gem sector. They are also in a minority: if ten students were to study gemology, only 2-3 would be studying value-adding subjects. There

¹⁸⁴ Tiandraza, Jean. Inter-regional Director of Mines, Diana-Sava-Sofia. Personal Communication. 16 April 2012

¹⁸⁵ Anonymous sources. Personal Communication. April 2012

¹⁸⁶ Razananirina, Henri. Inter-regional Director of Mines, Fianarantsoa, 2001-8; DG Ministry of Mines, 2008-10. Personal Communication. 25 April 2012

¹⁸⁷ Razakariasa, Henri Bernard. Technical Advisor to the Governor of Madagascar Central Bank; former SG Ministry of Finance, 2002-9. Personal Communication. 29 May 2012

has been no concerted government action to encourage in-country added value. In fact exactly the opposite, as it is currently more economical to export raw gemstones than cut stones. This results in an anomalous situation whereby, in the markets of Antananarivo, it is cheaper to buy Madagascar-mined, China-cut precious and semi-precious stones than those which are Madagascar-mined, and Madagascar-cut.¹⁸⁸

A number of interviewees suggested that one would be able to attract inward investment if stones, which had had their value-added done in Madagascar, were exempted from the *redevance/ristorne*. This would serve as an incentive for foreign buyers to invest in Madagascar's domestic stone processing industry. Currently it's a vicious circle: quality of the processed product is partly dependent upon investment in good machines and tools. But, due to an absence of fiscal support for the home-grown cutting, there is a lack of incentive to invest in such machines and tools. Others suggest more aggressive action to favour value-added in Madagascar: royalties for exported raw gemstones could be increased to 5per cent or 10per cent, while it should be cheaper to export cut stones than to export raw stones.¹⁸⁹ If the fiscal authorities were proactively to encourage the development of indigenous stone processing, it would also obviate the need for *laissez-passers*; as all raw stones exiting the country would require payment of royalties regardless of origin.¹⁹⁰

It is important to note that the promotion of value-added in Madagascar is not going to mean that the country becomes competitive with the great cutting centres of Asia. Economies of scale, cost of labour, lack of skilled capacity, lack of infrastructure, geographical location, lack of transport links, political instability – all are significant factors which militate against Madagascar's emergence as a centre for stone processing. However, promotion of added value in-country could potentially attract inward investment as buyers would see the cost effectiveness of adding value in Madagascar; create employment for those working in the added-value sector; generate tax revenues from a reinvigorated sector; consolidate IGM, through lessening its dependency on donors so as to be eventually self-financing. Transparency for sellers/artisanal miners would increase, thus alleviating the concerns of many miners that they are being exploited by the buyers. The addition of a value-adding cutting sector to the Malagasy economy could also potentially have a positive, indirect impact on ASM rushes in PAs, through its function in the process of the ASM sector's formalization, sensitization and professionalization.

¹⁸⁸ Ranoroosa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

¹⁸⁹ Manharlal, Razik. President of Jewelers Association FIRAVAKA. Personal Communication. 25 May 2012.

¹⁹⁰ The argument for an increase in royalties is also clearly set out in a previous study for the Ministry of Mines/PGRM (Phillips, 2007). The current 2% rate is described as "excessively low"; and a 4-5% rate for exported raw gemstones is recommended as more in accord with international norms, with a lower tax for stones which have had added value in-country.

10. WHAT CAN BE DONE?

The following is a discussion of a number of potential future scenarios involving the management of ASM gold and gemstone rushes and their impact on PAs and critical ecosystems (PACE). None are intended as recommendations. They are principally derived from an analysis of interviews with key stakeholders.

- **Maintaining the status quo.** A number of interlocutors characterized the current situation as one of cat and mouse.¹⁹¹ The authorities react to ASM rushes effecting PAs and sensitive zones, ideally displacing the miners, whether temporarily or to other sites for ASM exploitation. Another analogy could be the balloon effect, whereby pressure of finger and thumb at any point on the balloon pushes the air to another area within the balloon; when the pressure is released the air returns to from where it was displaced, as in the case of Daraina.

The problem with this scenario is that the status quo is currently inadequate in dealing with the problem. Given the effects of political crisis, weak governance, and lack of capacity, the situation seems likely to deteriorate, as signalled by the continuing absence of a definitive and effective response to the ASM rush near Didy, as well as ongoing and continued exploitation of Ankarana PA. The cat is currently impotent.

- **Maintaining the status quo, with heightened enforcement.** This would aim to maintain the legal framework underlying the current system of protected areas. There would be no concession to ASM pressure. The paradigm of cat and mouse would continue. But the campaign would need to be prosecuted with new vigour, involving more rigorous enforcement of applicable laws; enhanced monitoring of ASM activities; greater attempts to formalize the ASM sector; increased coordination between the respective ministries concerned, etc.¹⁹²

The challenge with this scenario is that, given the current conditions of crisis, combined with the retreat of donors, the issues of weak governance and lack of capacity would still apply. Also, a vigorous enforcement of current legislation could be counter productive, especially in the context of deteriorating standards of living, with a possible backlash against conservation interests.

On the other hand, empirical evidence from our research indicates that between 2002 and 2008 there was a relative diminution in ASM rush-linked pressure on PAs, with a corresponding, opportunistic resurgence immediately following the onset of the political crisis in 2009. This seems to reinforce the assumption that political stability with stronger governance could be a critical factor for a reinvigorated commitment to protecting PAs, provided whatever incumbent government shared the same goals.

- **Limited degazetting.** Arguably in an objective and judicial context this has already in part been conceded, in that the laws forbidding ASM in ZPs have been de facto suspended, with the exception of Isalo, thus setting a precedent. Historically, limited degazetting has been suggested as an option, as in the case of Ankarana PA.¹⁹³ One could argue that limited degazetting would liberate stakeholder resources, from areas which have already been irretrievably degraded as a result of ASM rush activities, sometimes over almost two decades, so as to focus on still pristine environments, and combat the even greater threats posed to PAs by charcoal production, tree felling, and agricultural cultivation. Limited degazetting, formalized and backed up by legislation, could also help to redress the negative impacts brought about by the current informal, de facto abrogation of existing laws (through non-application), which contributes to a culture of impunity and potentially undermines the whole edifice of environmental legislation.

However, this approach could be problematic for a number of reasons. If carried out in isolation, without a coordinated and concerted drive by the relevant authorities to formalize the ASM sector, one might end up with a situation, which merely intensified the attrition of PAs by illicit activities. Establishing the precedent of degazetting might also expose PAs to increased attempts at encroachment and other environmental degradations, such as charcoal production, agricultural cultivation, and tree felling. Although miner focus groups made the claim that they would be prepared to undertake rehabilitation of areas impacted by ASM activities, the consensus from all key stakeholder interlocutors, whether Ministry

¹⁹¹ Ramangason, Guy Suzon, DG MNP. Personal Communication. 11 May 2012

¹⁹² Ramangason, Guy Suzon, DG MNP. Personal Communication. 11 May 2012

¹⁹³ Steve Goodman from the environmental NGO Varatra (cited in Tilghman, 2007)

of Mines or the various governmental and non-governmental environmental agencies, was that this was unrealistic, and that the somewhat anarchic short-termism characteristic of ASM rushes would prevail.

- **Managed mining within PAs.** This scenario recognizes the inadvisability of expectations that ASM miners could self-police their activities.¹⁹⁴ It envisages that the respective environmental agencies responsible for PAs would contract out the management of PA mining concessions to third party entities or agencies. A strictly stipulated condition for the award of such mining rights would be a participative role for local communities.¹⁹⁵ Essentially, this would be managed ASM. It would need to be accompanied by rigorous enforcement of rules delimiting the extent of mining operations within the PA. A tangential precedent for this scenario might be the current plans for the establishment of ecotourism partnerships within MNP PAs. Management of the ASM activities would also entail a legal obligation to conduct rolling rehabilitation of areas effected by ASM. While this paradigm would have similar advantages to the limited degazetting scenario, likewise with a necessity for change in legislation permitting the activity, the commercial self-interest of whatever entity managing the mining concern might be a more robust means of restricting ASM encroachment into the PAs pristine environment. This scenario's participative integration of local communities and ASM miners could also contribute to a sensitizing process which would highlight the marriage of the miners' self-interest with the conservation of PAs.

Drawbacks would again be the risks in setting a precedent for degazetting, although in some cases that would not be necessary as IUCN Categories V and VI PAs would arguably not require degazetting.¹⁹⁶ Moreover, obviously the ideal circumstances for such managed ASM would be in locations which were on the margins of the respective PA, so as to minimise impact of ingress and maximize the management and mitigation capabilities. Also, there would be a similar need for reinforced efforts towards general formalization of the ASM sector, as well as enforcement of applicable laws.

- **Never the twain shall meet.** The most radical and provocative of the scenarios, this proposes that Madagascar has to choose between environmental conservation and the exploitation of potential mining resources.¹⁹⁷ It holds that, in the context of Madagascar's weak governance, the pressures of population growth particularly in rural areas, increasing levels of poverty, and the potential for ASM-generated income benefiting hundreds of thousands of miners and their dependents, continued proscription of mining activities in PAs is unrealistic and unsustainable. While probably inconceivable for most of those working in the conservation sector, this scenario would doubtless be supported by a considerable constituency, not least among the ASM miners themselves. This school of thought perceives that, considering Madagascar's prominence as a reservoir of biodiversity, albeit threatened, a principal aim for the donor community is environmental conservation. It is politically and economically unpalatable for the Madagascar government to rock the boat.¹⁹⁸ Thus a nominal adherence to donor-driven agreements is maintained, but enforcement of the requisite legislation is weak, also opening the door to corruption. A strategic prioritizing of mineral resource exploitation, at the expense of PA conservation, would arguably be merely a codification of the "free-for-all" ascribed by some commentators to the current situation (USAID, 2010).

This would be catastrophic for Madagascar's PACE, resulting in irreversible damage, and it would deprive future generations of the country's ecological patrimony. It would also in itself be relatively short-term, as Madagascar's mineral resources are non-renewable.

¹⁹⁴ Rakotoarijaona Andrianarisoa, Mamy. Director of Ranomafana PA, MNP. Personal Communication. 7 April 2012

¹⁹⁵ Rajaobelina, Serge. Executive Secretary, Fanamby NGO. Personal Communication. 10 May 2012

¹⁹⁶ Martin Nicoll. WWF Senior Advisor. Personal Communication. 8 June 2012

¹⁹⁷ Nadine Ranorofoa. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

¹⁹⁸ It is conservatively estimated that environmental-linked donor inputs to Madagascar GDP amount to at least US\$30 million per annum. Source: Nicoll, Martin. WWF Senior Advisor. Personal Communication. 30 May 2012

11. CONCLUSION

“C’est toujours la même erreur. On recommence, on recommence...”¹⁹⁹

“It’s always the same mistake. We start over again, we start over again...”

One of the main findings from the research undertaken for this report has been the relative historical continuity in the ebb and flow of ASM cycles in Madagascar, whether pertaining to the oscillating levels of declared gold production; the counter-productive inefficacy of intermittent interdictions against production/export of gemstones; the system of laissez-passer seemingly confounding itself and facilitating illicit mining; over-onerous regulation contributing to the lack of transparency inherent to Madagascar’s informal ASM economy; or the spikes in illicit ASM activity in PAs corresponding with the cycles of political crisis. Over the course of the study, it became increasingly clear that so many aspects of Madagascar’s ASM rush history have tended to repeat themselves in iterative fashion, with similar policy dilemmas and challenges recurring over the last 20 years. This underlines another point; namely, that, while the current political instability certainly exacerbates the challenges, in many ways it is merely accentuating pre-existing systemic fault-lines. Arguably, ever since the first ASM rushes targeting Ankarana PA in 1994, the institutional response, whether from the perspective of mining or environmental conservation, has been inadequate.

A principal objective in this project’s TOR is to highlight the lessons learned from past experiences. Perhaps one of the most crucial lessons learned has been that two decades’ experience of ASM rush history virtually repeating itself, with parallel missteps in institutional responses, has not been translated into changes of praxis. A major challenge for decision-makers will be to convert those lessons learned from aspiration into application.

While the environmental damage wrought on PACE by ASM rush activities is often arguably lesser than other illicit activities, such as charcoal, tree felling and agricultural cultivation, the impact should not be measured in simple terms of hectares degraded. Experience over the last two decades illustrates that ASM activities in PAs are frequently the precursor and vanguard for other, even more destructive impacts, so serving to open up the whole area for illicit exploitation. In addition, the flouting of laws and legislation aimed at preventing ASM in PAs effectively creates a climate of impunity, and runs the risk of normalizing environmental destruction. Moreover, in the current climate of political crisis and economic decline, compounded by acute pressure of population growth particularly in rural areas, another challenge for environmental agencies and conservation NGOs is that both the Madagascar government and population might not accord the same degree of priority to PACE conservation. One dilemma is that the longer the crisis continues, the more critical it will become to protect PACE from ASM rushes; yet, at the same time the more difficult it will become to implement substantive change.

As per the TOR, the second part of this project, in the form of a draft methodological toolkit, will present a number of policy recommendations and a systematic methodological framework for stakeholders dealing with ASM rushes in PACE in Madagascar.

¹⁹⁹ Ranoroosa, Nadine. Director, Institute of Gemology of Madagascar. Personal Communication. 29 May 2012

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APPENDIX: LIST OF CONTACTS

Name	Title	Location	Date
Nicoll, Martin	WWF Senior Advisor	Antananarivo	23, 28 March, 25 April & 2 & 30 May 2012
Rasoanandrianina, Lalanarina	WWF, extractive industries program officer	Antananarivo	23 March & 2 May 2012
Pelon, Remi	Mining Specialist, World Bank, PGRM Project	Antananarivo	26 March 2012
Vasse, Dorian	Consultant, World Bank, PGRM Project	Antananarivo	26 March 2012
Razafintsalama, Lalalison	PGRM, Mining-Environment Adviser	Antananarivo	26, 30 March & 8 May 2012
Razafimandimby, Olivier	PGRM, Rural Development Advisor	Antananarivo	28 March & 26 April 2012
Rakototafika, Gerard	Director General, Ministry of Mines	Antananarivo	28 March & 26 April 2012
Rakotondravalay, Désiré	Director Technical Support, Gold Mining and Rushes, Ministry of Mines	Antananarivo	28 March & 8 May 2012
Rakotonirina, Jean Népomucène	Inter-regional Director of Mines	Fianarantsoa	2 & 5 April 2012
Rajaonarivo, Aro	Director of Isalo PA, Madagascar National Parks (MNP)	Ranohira	2, 3 & 4 April 2012
Paraly, Rufin	Head of Fokontany (one of several)	Ranohira/Ilakaka	2 April 2012
Randrianarivo, J.M.	Head of west sector of Isalo PA, Madagascar National Parks (MNP)	Sakaraha	3 April 2012
Ravelomjatovo, G.H.	Director of Zombitse-Vohibasia PA, Madagascar National Parks (MNP)	Sakaraha	3 April 2012
Rasamimanana H.	Head of Conservation and Research Zombitse-Vohibasia PA, Madagascar National Parks (MNP)	Sakaraha	3 April 2012
Jean	Male miner	Sakaraha	3 April 2012
Andriatsitohaina, R.M	Deputy Head of Police and Police Inspector in Ranohira	Ranohira	4 April 2012
Mionjo A.P.	Mayor of Rural Commune of Ranohira	Ranohira	4 April 2012
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Name	Title	Location	Date
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**ANNEX A: ARTISANAL & SMALL SCALE MINING RUSH
MANAGEMENT TOOLKIT FOR MALAGASY
AUTHORITIES AND CONSERVATION
STAKEHOLDERS**

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1. INTRODUCTION

1.1 Objective

The objective of this draft Madagascar ASM Rush Management Policy Recommendations and Toolkit is to provide a range of policy recommendations following on from the research and analysis developed in the first part of this project, the Madagascar ASM Rushes in PACE National Overview Report. Its aim is to enable coordination with the government and local stakeholders in analysing the situation and facilitating the prevention, monitoring and impact mitigation of ASM in and around protected area and critical ecosystem (PACE) sites.

1.2 Framework

The Policy Recommendations and Toolkit is composed of two main sections. The first discusses an array of policy recommendations, which have been foregrounded following research undertaken in the Madagascar ASM Rushes in PACE National Overview Report. The second section comprises a range of more programmatic responses to issues arising from an ASM rush in a sensitive zone, to be undertaken by the respective key stakeholders.

1.3 Important caveats

1.3.1 Current crisis – the context for the policy recommendations and toolkit

It was the original intention of this project to complement the Madagascar ASM Rushes in PACE National Overview Report simply with a methodological toolkit for the systematic prevention, monitoring and impact mitigation of ASM in and around protected area and critical ecosystem sites. However, it became increasingly clear during the writing of the report that current circumstances in Madagascar are far from ideal for a systematic methodological toolkit, given the increasing informalization of the ASM gold and gemstone sectors in recent years. As has been underlined in the report, Madagascar is currently in the third year of a prolonged political and economic crisis. This has enfeebled an already fragile state, and contributed to the problems of weak governance and lack of capacity. Gold and gemstone ASM has increasingly operated in an informal, parallel shadow economy which militates against the efficacy of a methodological toolkit intended for key stakeholders. The combination of weak governance, lack of capacity, lack of transparency and increasing informalization is inherently inhospitable for a systematic methodology of responses to ASM in PACE, requiring instead a much more pragmatic, ad-hoc approach.

As a result, there has been a shift in emphasis, with the project foregrounding policy recommendations, which are intended to contribute to a greater degree of formalisation of the sector, the prerequisite context for the successful implementation of a methodological toolkit. The second section of this document contains a toolkit of programmatic responses to possible impacts arising from an ASM rush.

Some of the policy recommendations are undoubtedly ambitious. They would require political will and resources to implement. Indeed, the successful implementation of some of the policy recommendations will inevitably be partly subject to the eventuality of an end to the political and economic crisis. In acknowledgement of the constraints posed by the current political and economic crisis, the detailed policy recommendations note that in certain cases best practice may be contingent on political stability and increased available resources. However, a considerable number of the policy recommendations could be applied with a relatively limited investment of time, effort and resources; and could significantly contribute to the prevention, monitoring and impact mitigation of ASM in PACE, as well as greater formalisation of the sector as a whole.

1.3.2 Licit vs. illicit

Arguably all ASM gold and gemstone rushes, on account of their unregulated, informal and extempore development, are de facto illicit, especially in terms of environmental impact. Since ASM activity is so contingent upon access to water, inevitably the rush will have a negative impact on nearby water resources, which are sensitive zones, and thus will breach any one of a number of pieces of legislation – including the *Arrêté interministériel n°4355 /97 Portant définition et délimitation des zones sensibles*; the *Loi No 98-029 portant Code de l'Eau du 19 décembre 1998*; the *Loi No 99-021 sur la politique de gestion et de contrôle des pollutions industrielles*; and the *Annexe E to the Arrêté interministériel n°12032 /2000 sur la réglementation du secteur minier en matière de protection de l'environnement*.

However, the reality on the ground is very different. The state does not currently have the capacity or the political will to intervene in the case of most ASM rushes, especially those taking place outside PAs. Nor would it probably be wise to, even if there were the resources available, since for hundreds of thousands of miners and their families this would mean disenfranchisement from their livelihood and impoverishment. As a result, for the purposes of this toolkit, unless otherwise indicated, we do not apply the strict definition of illicit to those rushes, which affect non-PA areas.

Yet, some ASM rushes are more egregiously illicit than others, in that they take place in or near PAs, the exploitation of which is absolutely proscribed. In the case of protection zones (ZPs) bordering PAs, ASM activity therein is by law also illicit, but often currently tolerated by the respective ministerial authority, the Ministry of Environment and Forests (see **Section 2.23**, below).

Under current legislation, all ASM activities in PAs with IUCN Categories I-IV are strictly forbidden, and thus absolutely illicit.

2. SECTION ONE: POLICY RECOMMENDATIONS

While most of the following individual recommendations will bring benefits to both the conservation and the ASM sectors irrespective of the implementation, or not, of the other recommendations, and thus could be implemented incrementally, they have been conceived holistically, so that they will complement and reinforce each other when implemented together:

- *Convene an in-depth meeting of key stakeholders to address future policy re: ASM in PACE*
- *Create an early-warning ASM rush monitoring entity*
- *A permanent liaison committee – ministries and non-governmental actors*
- *Need for early, robust intervention*
- *Produce and update accurate figures for volumes, values of ASM production*
- *Reinforce and resource efforts to combat smuggling*
- *Abolish the laissez-passer system*
- *Promote and nurture value-added in Madagascar*
- *Sensitise local government at regional and communal levels*
- *Encourage the development of ASM miner associations*
- *Make use of former BAM offices, with professional advisors*
- *Formalisation – informal/semi-formal at local level*
- *Finance and support rolling environmental rehabilitation programmes*
- *Promote gold comptoirs*
- *Ready resources for early deployment of forces of law and order*
- *Ensure that the resource benefits the local community*
- *Reinforce efforts to formalise networks of collectors/buyers*
- *Review and streamline over-onerous legislation*
- *Create and distribute a short version of Mining Code*
- *Explore possibility of environmental judges/magistrates*
- *Further integrate ASM into policies for sustainable development, such as poverty reduction papers, strategic rural development schemes, etc.*
- *Environmental monitoring of existing ASM in PACE*
- *Under current juridical dispensation, enforcement of ban on ASM in ZPs*
- *Create alternative livelihood strategies for miners undertaking existing ASM in PAs*

There follows below a more in-depth discussion of each policy recommendation.

2.1.1 Convene an in-depth meeting of stakeholders to address future policy re: ASM in PACE

The current situation regarding ASM in PACE in Madagascar is far from ideal. There are relatively widespread ASM activities in PAs. While ASM activity is not as environmentally calamitous to the PA as charcoal production, tree felling or agricultural cultivation, it does have a significant environmental impact, and most importantly it tends to be the initial vector by which other illicit activities come to infiltrate the PA.

If key stakeholders, whether governmental or non-governmental, do not take concerted, preemptive action, the situation is only likely to deteriorate, with increased pressure on PAs. While the challenges involved in addressing these issues are considerable, especially at a time of political crisis and reduced donor support, the risk is that such challenges will only be amplified in the future. For this reason, a principal recommendation of this toolkit is that key stakeholders should meet to develop a unified policy response to the problem.

Drawing on interviews with more than 60 key stakeholders, the Madagascar ASM Rush in PACE National Overview Report identified five potential and/or likely scenarios for the future, as follows:

- **Maintaining the status quo**
- **Maintaining the status quo, with heightened enforcement**
- **Limited degazetting**
- **Managed ASM mining within PAs**
- **Never the twain shall meet – incompatibility of ASM and conservation**

All of the above scenarios are relatively unpalatable to most stakeholders, and come with varying degrees of severe risk to PAs. However, the authors' opinion is that, given the past 20 years' history of ASM in PAs, and increasing pressure on PAs from ASM activities, the option most likely to preserve the 'ecological resiliency' of PAs, as per the overall objective of this project according to the TOR, is the managed ASM mining scenario.

This scenario envisages that the respective environmental agencies responsible for PAs would contract out the management of PA mining concessions to third party entities or agencies. A strictly stipulated condition for the award of such mining rights would be a participative role for local communities. Essentially, this would be managed ASM within PAs. A precedent for this scenario might be the current plans for the establishment of eco-tourism partnerships within MNP PAs. Management of the ASM activities would also entail a legal obligation to conduct rolling rehabilitation of areas affected by ASM. While this scenario would probably entail a necessity for change in legislation permitting the activity,¹ the commercial self-interest of whatever entity managing the mining concern would be a more robust means of restricting ASM encroachment into the PAs' pristine environment. Moreover, this paradigm's participative integration of local communities and ASM miners (who often come from all over the country) could also contribute to a sensitisation process which would highlight the marriage of the miners' self-interest with the conservation of PAs. In addition, one could argue that limited degazetting of zones which have already been targeted by ASM activities, as in some areas in the north of Ankarana PA, for example, would liberate stakeholder resources from areas that have already been irretrievably degraded as a result of ASM rush activities, sometimes over almost two decades, so as to focus on still pristine environments, and combat the even greater threats posed to PAs by charcoal production, tree felling, and agricultural cultivation. Moreover, obviously the ideal circumstances for such managed ASM activity would be locations, which were on the margins of the respective PA, so as to minimise impact of ingress and maximize the management and mitigation capabilities. Limited degazetting, formalized and backed up by legislation, could also help to redress the negative impacts brought about by the current informal, de facto abrogation of existing laws (through non-application), which contributes to a culture of impunity and potentially undermines the whole edifice of environmental legislation.

The introduction of managed ASM within declassified sectors of PAs could be viewed as a progressive, path-finding step taken by the government of Madagascar, supported by other stakeholder groups such as non-governmental actors and donors. Besides potentially ensuring the 'ecological resiliency' of the threatened PAs remaining pristine environments, this scenario could also deploy biodiversity offsets, thus adhering to BBOPs "mitigation hierarchy", whereby the offsets are implemented as a last resort. Given the last two decades attrition of PAs by ASM rushes, managed ASM in very clearly defined and delimited areas of the respective PAs would clearly be a last resort measure.²

It is important to note that this will only be feasible within the context of rigorous enforcement of rules delimiting the extent of mining operations within the PA, as well as augmented policing actions against illegal export (see **Section 2.6**). Deregulation of current rules governing export, e.g. the laissez-passer system (see **Section 2.7**), as well as promotion of value-added in Madagascar (see **Section 2.8**), and further streamlining of the regulatory system, could contribute to a much more formalised ASM sector, which would in turn do much to redress the current climate of impunity.

¹ Although PAs and NAPs corresponding to IUCN categories V & VI could arguably be opened to managed ASM without degazetting.

² Other benchmarks could be similar best practice systems for harmonization of biodiversity and extractive industries as developed by ICMM and IPIECA.

2.1.2 Create an early-warning ASM rush monitoring entity

A major impediment to successful intervention in the case of an ASM rush in PACE is the lack of capacity for relatively real-time surveillance of developing or ongoing rushes. At any one time in Madagascar, there are probably numerous ASM rushes, both ongoing and developing, taking place across the country, often in remote areas. Intelligence regarding the onset of an ASM rush can take weeks to filter back to the respective ministries in Antananarivo. This inevitably leads to a staggered response to the ASM rush. As noted below (**Section 2.4**), intervention at the beginning of a rush is critical if there is any hope to deflect or prevent a larger influx of ASM miners. Thus, there needs to be a dedicated and resourced entity which monitors and tracks rushes around the country, in close collaboration with local authorities at the level of region and commune, as well as non-governmental actors managing the respective PAs, NAPs, etc.

2.1.3 A permanent liaison committee – ministries and non-governmental actors

While the Mines-Forests Committee serves as an interface between the Ministry of Mines and the Ministry of Environment and Forests, it does not sit permanently and requires a process for its convocation. This inevitably takes time; and time is of the essence when reacting to a fast-developing ASM rush situation.

Moreover, most operators of PAs and NAPs are non-governmental actors, whether MNP, conservation NGO's, etc. Currently there is a lack of a forum for formal liaison regarding ASM rushes between the ministries and non-governmental stakeholders. Thus, it is recommended that there be a formal liaison committee between the ministries and the NGOs, PA and NAP promoters.³ This would be a sitting committee, meeting regularly at relatively short intervals, serving to coordinate a unified and transparent response to ASM in PACE from central government and the respective managers of PAs.

2.1.4 Need for early, robust intervention

Early intervention against an ASM rush is a major factor in determining its success. As has been underlined in the Madagascar ASM Rush in PACE National Overview Report,⁴ intervention becomes highly problematic when the number of on-site ASM miners, with families and service providers, reaches a critical mass. This recommendation, in tandem with the early-warning ASM surveillance entity and the sitting ASM rush liaison committee (see above), entails a clear policy commitment on the part of all stakeholders to intervene robustly at the earliest possible stages of an ASM rush, with the option of delegating earliest intervention – through sensitization of local authorities (see **Section 2.9**, below) – to local government at the level of region or commune. This would also have a positive impact on scarce resources, since prompt and early action, before the influx of thousands of ASM miners, would inevitably require a smaller-scale response and so drastically reduce the costs of intervention. Moreover, it should be noted that early intervention does not just involve police action to evict miners from the PA. It also requires a continuing police presence, though much diminished, on site to prevent repeat ingress into the PA by ASM miners hoping that the authorities' attention has moved on elsewhere.

2.1.5 Produce and update accurate figures for volumes, values of ASM production

Lack of information regarding both incidence of ASM rushes and volumes/values of ASM production is a major factor hindering efforts to prevent and mitigate the impact of rushes on PAs. While the creation of an early-warning ASM rush monitoring entity would significantly improve knowledge of the scale of ASM activity throughout the country, there also needs to be a concerted effort to determine volumes and values of production, both of gold and gems. Currently, there is very limited knowledge regarding the respective contribution of the ASM sector to the Malagasy economy, whether formal or informal. A study to determine volumes and values of production is absolutely crucial if efforts to reduce illicit export of gold and gems are to be successful, and for the ASM sector to be integrated into the formal economy.

2.1.6 Reinforce and resource efforts to combat smuggling

It is currently suspected that organized networks are responsible for the illicit export of a large proportion, by value, of the gems produced in Madagascar and most of the gold produced. This parallel, unregulated and illegal economy undermines attempts to formalise ASM activity in the country. It deprives the government, and the people of Madagascar, of significant tax revenues, which in turn contributes to the problem of a shortfall in resources and capacity. It also contributes to the spread of corruption.

Reinforced efforts to combat smuggling would involve sensitization of the respective export authorities, as well as the forces of law and order. Given the relative dearth of transport links from Madagascar, and the known

³ Perhaps under the umbrella of the SAPM commission or the recently formed Extractive Industries advisory group.

⁴ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 9.2

smuggling conduits (e.g. Dubai, Bangkok, Hong Kong, often via Nairobi), as well as general knowledge of smuggler profiles,⁵ enhanced enforcement of export regulations, with strict application of the appropriate penalties, could bring swift results. While reinforced efforts to combat smuggling would be highly beneficial for the formalisation of ASM activity, it is possible that it will be unachievable during the current crisis.

2.1.7 Abolish the laissez-passer system

The system of laissez-passer exists to ensure traceability. However, as has been noted in the Madagascar ASM Rush in PACE National Overview Report,⁶ the laissez-passer system is in fact contributing to exactly the opposite of its original intention; namely it facilitates illicit export, often of gems illegally mined in PACE. As part of a move to slim-line overly onerous and counterproductive legislation, the laissez-passer system could be abolished. In concert with reinforced efforts to combat smuggling, a system of taxation at point of export could be put in its place instead. If correctly applied, taxation at point of export would effectively offer a transparent means of ensuring that the gemstones had been legitimately acquired, and all appropriate taxes paid, with a proportion of the royalties returning to the local community in the form of the *ristorne*. The latter point, the return of the *ristorne* to the local community, is particularly important. During the course of the report, a number of local government interlocutors observed that when the *ristorne* was paid at the export stage, so to central government, the local community often did not benefit from the royalty tax. This indicates the need for a study to envisage an effective means of channelling the *ristorne* back to the local community. This would have the added advantage of providing external buyers with a greater degree of traceability, which is becoming increasingly important for supply chains.

2.1.8 Promote and nurture value-added in Madagascar

Efforts to develop an added-value sector have been an integral component of PGRM's mission. These should be intensified, perhaps with moves by government to actively promote value-added in Madagascar through changes in the statutory regime, such as suspending or abolishing royalties payable (*redevance/ristorne*), or export tax, in the case of gems which have value added in country; and possibly increasing the *redevance/ristorne*, or export tax, payable at the point of export on raw gemstones.⁷ This would serve to develop the whole ASM sector: potentially attract inward investment as buyers would see the cost effectiveness of adding value in Madagascar; create employment for those working in the added-value sector; generate tax revenues from a reinvigorated sector; consolidate IGM, through lessening its dependency on donors so as to be eventually self-financing; and contribute to the general formalization of ASM through added transparency pertaining to the value chain.

2.1.9 Sensitise local government at regional and communal

Given the relative lack of resources at the level of central government and the push for decentralization, local authorities at the regional and communal levels are crucial for the successful prevention and/or mitigation of ASM rushes in PACE. They are the first conduits for information regarding a developing rush. They can play a decisive role in preventing a rush at its earliest stages, as well as in sensitizing ASM miners regarding negative environmental impacts. Informal or semi-formal formalisation, while problematic in the case of illicit ASM rushes in PACE (see section 2.12, below), can have dramatic, positive impacts on health and safety, child welfare, security, sanitation, etc. Some local authorities have proven to be more adept at semi-formal formalisation than others. As part of central government's support for local authorities and the push for decentralization, there should be a component focusing on ASM rushes and how local governments can prevent or manage them.

2.1.10 Encourage the development of ASM miner associations

While attempts to unionise ASM miners have been largely unsuccessful, many rushes are marked by the evolution of ASM miner associations, local to the rush. Formal encouragement, recognition and support for these associations would assist in the management of ASM rush situations, with the associations potentially being a vehicle for building positive relations between conservation authorities and/or government and the miners, as well as for the sensitisation of miners as to best practices in ASM activities, especially as pertaining to the environment.

⁵ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 3.2.2

⁶ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 9.3

⁷ As noted in Madagascar ASM Rush in PACE Overview Report, Section 9.11, a relatively recent, previous study on the ASM sector in Madagascar makes a clear argument for an increase in royalties tax due for exports of raw stones, combined with a lower tax for gemstones which have had added value in country (Cf. Phillips, Lucie C. 2007. "International Business Initiatives: Rapport de Mission, 2 au 26 juillet, 2007.")

ASM miner associations, based upon regional origin, may be inevitable.⁸ However, efforts should be made to encourage the subsuming of region-based associations under a more representative ASM miner grouping, which could interface with communal, regional and central government authorities. Association representatives, and indirectly thence their constituents, would be apprised of both their rights and their responsibilities, relevant to the ASM rush impacts, one of which could be rolling environmental rehabilitation (see **Section 2.13**, below).

2.1.11 Make use of former BAM offices, with professional advisors

Under the aegis of PGRM, the now-defunct BAM⁹ office in Ilakaka played a role in training some 2600 ASM miners. Some of these miners, at their own initiative, went on to train further groups of miners at other rushes.¹⁰ This trickle-down effect in the transmission of best practices should be encouraged. Moreover, among ASM miner interlocutors in Ilakaka, there was a noted degree of relative good will expressed towards the BAM. By making use of the currently defunct BAM office in Ilakaka, and once again providing training of ASM miners at Ilakaka and other sites with BAM offices, there would be positive impacts regarding occupational health and safety, ASM miner production and income, the rights and responsibilities of miners, as well as raising awareness about environmental issues. This recommendation is not proposing a reincarnation of the BAM. Rather it suggests a means by which one could capitalize on an existing asset and the relative good will among ASM miners towards the BAM, so as to sensitize, train and reach out to the ASM miner community.

2.1.12 Formalisation – informal/semi-formal at local level

Given the lack of capacity in the Ministry of Mines, as well as the need to intervene early, it is advisable to welcome early-stage formalization at the regional level, as at the gold mine at Soamahamanina, near Arivonimamo in the province of Tananarive.¹¹

While early-stage semi-formal formalization, often conducted independently of the Ministry of Mines, can lead to tensions with the Ministry, and is effectively condoning illicit ASM activities, it brings with it tangible benefits which can positively impact issues such as food prices and availability in the event of a rush, education of children, security on site, health and safety, sanitation, and governmental revenue from the ASM activity in the form of royalty payments. Thus it should be encouraged as part of a two-stage process, involving immediate moves to informally formalise on the part of the region or commune, in the event of a developing rush, followed by the subsequent process of formal formalisation as undertaken by the Ministry of Mines and central government. Encouragement of semi-formal formalisation should involve the widespread dissemination among local authorities of very detailed Malagasy-language toolkits, which would encompass best practices with regard to ASM activities and rushes.

In the case of ASM rushes or activities in PAs, these are currently illicit, and strictly proscribed by law. Informal or semi-formal formalisation at the regional or communal level would serve to legitimise an illegitimate activity, and should therefore not be encouraged. Concomitant with the emphasis on the need for early local intervention in the case of ASM in PAs, efforts should be made to sensitise local authorities that such formalisation is not acceptable. However, this must be accompanied by a robust commitment to evict existing ASM activities from PAs. Otherwise, it will be viewed as hypocrisy; and, in the context of understandable pressure from neighbouring communities on local authorities for there to be benefits via locally implemented *redevance/ristorne* from apparently condoned illicit ASM in PAs, it will become politically unsustainable for local governments to continue resisting informal/semi-formal formalisation of ASM activities in PAs.

2.1.13 Finance and support rolling environmental rehabilitation programmes

As part of the process of formalisation, at the regional and communal levels, and in tandem with efforts to sensitise miners as to environmental impacts, there should be a programme of rolling environmental rehabilitation of the mining site, conducted in collaboration with the ASM miner association on site. Its continuous and rolling nature would serve to make normative the need for environmental rehabilitation, as part of the ASM process, and foregrounded as a responsibility for the ASM miners. This would be one of the responsibilities of the ASM miner association (see **Section 2.10**, above).

While ASM miner-implemented environmental rehabilitation has proven unsuccessful until now, it is possible that encouragement, and *formal recognition*, of local associations may well inculcate in them and their constituents an awareness of their own self-interest being imbricated in attempts to mitigate environmental

⁸ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 3.3.2

⁹ *Bureau d'Administration Minière*, or Mining Administration Office

¹⁰ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 3.6

¹¹ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 6.4

degradation as a result of ASM activities. Also, there are successful precedents from elsewhere in the ASM world, which could be drawn upon as potential bench-marks for the implementation of such a rolling environmental rehabilitation programme. One is the Oro Verde, or Green Gold, Certification Initiative in the Chocó bioregion of Colombia; this program incentivizes miners to employ environmental-friendly practices, while also disincentivising illegal mining.¹²

Moreover, there could be further research focusing on whether international gem or traders/jewellers might be interested in a form of indirect “offsetting” through financially supporting such rehabilitation efforts. Such a programme would have the benefit of improving the sustainability of supply chains and sourcing from Madagascar, and also contribute to the traceability of gemstones originating in the country.

2.1.14 Promote gold *comptoirs*

Comptoirs have a credible, proven track-record as a progressive vector of formalisation, especially with regard to ASM of gold, as at Antanambary and Daraina.¹³ However, such *comptoirs* also require a significant investment of time and resources prior to their successful creation. Most crucial is a participative approach, as employed by the NGOs Green and Fanamby. In the context of the current lack of resources, this may well be too cost-intensive to be considered as an immediate, countrywide step. However, with the return of political and economic stability, suitably planned and resourced *comptoirs* could play a significant role towards promoting formalisation.

2.1.15 Ready resources for early deployment of forces of law and order

Considering the current budgetary constraints, there is a need for a pre-allocation of financial resources to fund early intervention by the forces of law and order in the event of an ASM rush in PAs. Otherwise, as with the case of the rush near Didy, the relevant governmental authorities are obliged to fundraise from key stakeholder groups.¹⁴ This takes valuable time, thus delaying the police operation, and so increasing its necessary scale as well as the eventual cost of the intervention. Management of these pre-allocated funds could be the responsibility of the permanent liaison committee between key ministries and non-governmental stakeholders (see **Section 2.3**, above). Moreover, such pre-allocated funds would also need to be sufficient to cover not only the initial intervention, but also a continuing, albeit much lighter, police presence to prevent miners’ attempts to return to the PA following the initial operation (see **Section 2.4**, above).

2.1.16 Ensure that the *ristorne* benefits the local community

A frequent complaint by local government interlocutors, particularly at the commune level, was that the royalty tax destined for local communities, the *ristorne*, did not find its way back to the intended beneficiaries when paid centrally, so at the point of export. There needs to be devised a transparent and accountable means of *ristorne* payment at the local level and/or a means of channelling the *ristorne*, if paid at export, back to the local community. With an effective apparatus to ensure royalty payments to decentralised local authorities, it might then be possible to incentivise buyers, perhaps through a reduced rate of *ristorne* if paid locally and/or an increased rate if paid centrally. This would in turn encourage traceability of gemstones to their point of origin.

2.1.17 Reinforce efforts to formalise networks of collectors/buyers

As part of the process of combating smuggling, there should be an increased targeting of informal buyers/collectors, with the former often operating illicitly in Madagascar on tourist visas. In the event of an ASM rush in PACE, when the scale of the rush precludes evacuation of the mining site, transparent police intervention against buyers and collectors is the most effective means of ending or at least lessening the intensity of the rush. This will need to be conducted by mining police or forces of law and order drawn from the national level, as opposed to the regional, in order to limit potential for conflicts of interest or pressures from local populations and/or regional personalities. This targeting of buyers may become increasingly important, as the recent rush deep within the NAP near Didy is thought by some to have been a rush organized and orchestrated in its initial stages by unscrupulous buyers.¹⁵ If this trend were to continue, a police focus on the role of buyers in the rush would be a strong disincentive to their continued presence. Strict enforcement of the law, with criminal prosecutions against malefactors, targeting transgressions by the relatively limited number of buyers, would be less politically sensitive than whole-scale enforcement against ASM miners. In the case of ASM in PAs, law

¹² Cf. http://www.greengold-oroverde.org/ingles/oroverde_ing.html & <http://www.communitymining.org/index.php/en/colombia/oro-verde-green-gold>.

¹³ Cf. Madagascar ASM Rush in PACE National Overview Report, Sections 9.4 & 6.8 respectively.

¹⁴ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 6.11.

¹⁵ Cf. Madagascar ASM Rush in PACE National Overview Report, Section 6.11.

enforcement concentrating on buyers and collectors would serve to reduce, if not cut off, demand, which would in turn lessen ASM pressures on PAs.

Unofficial, often negotiable, on-the-spot fines levied by the forces of law and order should be strictly discouraged, especially given that they usually merely lead to a temporary turning of a blind eye to illicit activities, as these would only be absorbed as operating expenses by illicit buyers. Rather, the full brunt of the letter of the law should be applied.

Buyers and collectors operating licitly should be encouraged to report cases of corruption to the appropriate authorities, as well as instances of buyers operating informally. It is in the interests of most legitimate and formal buyers/collectors that there be a transparent value chain and export system, free of corruption.

2.1.18 Review and streamline of over-onerous legislation

Besides increased transparency and the streamlining of the export process brought about by the abolition of the laissez-passer system, other legislation or edicts pertaining to ASM should also be reviewed. An overly onerous statutory regime can be the catalyst for corruption and encourages illicit circumvention of respective regulations. Moreover, stricter enforcement of legislation against illegal export, as advocated in these policy recommendations, brings with it a commensurate onus on the authorities to provide a transparent, simplified and efficient statutory regime.

2.1.19 Create and distribute a short version of the Mining Code

The complete mining code was published in 2005. It is a lengthy and comprehensive document. However, an abbreviated and accessible version (as used to exist with the previous mining code) would be of considerable utility, to be disseminated in booklet form among registered buyers/collectors, local authorities, etc. This would contribute to greater transparency, through highlighting both the rights and the responsibilities of those involved in ASM activities.

2.1.20 Explore possibility of environmental judges/magistrates

Although the mining code clearly stipulates that mining in PAs is a criminal offence, many in the juridical system consider it more of a civil offence. During our research, some interlocutors called for the sensitization of a cadre of judges and magistrates who would be specially competent to deal with cases pertaining to transgressions of the law impacting on PACE.

2.1.21 Further integrate ASM into policies for sustainable development

ASM miners and their families make up a considerable constituency in the population of Madagascar, with the sector being in terms of employment second only to subsistence agriculture. As the relative dearth of available information suggests, ASM in Madagascar has historically operated if not below the radar, certainly without adequate supervision, given the size of its contribution to the Malagasy economy, albeit mainly to the parallel economy. Augmented supervision and formalisation of the sector has as its correlative a need to further integrate ASM, and its practitioners, into national policies for sustainable development. There needs to be a mainstreaming of ASM within poverty and development strategies, including identification of how properly collected revenues will be used to support poverty reduction.

2.1.22 Environmental monitoring of existing ASM in PACE

In the context of the current political crisis, and the current lack of resources, it is probable that a number of PAs will continue to be negatively affected by ASM activities, whether in the form of new rushes or residual situations with ASM miners continuing their activities following the maturing of past rushes, as at Ankarana PA, where ASM miners even 18 years after the first rush still number in the thousands.

If central and local government are temporarily unable to intervene against the ongoing rush, it is nevertheless important to maintain a system of on-site surveillance which enables the respective stakeholders, whether governmental or non-governmental as managers and sponsors of PAs, to follow closely the evolutionary environmental impact of the rush on the PA. This would allow the collation of information, which could contribute to effective lobbying for higher prioritization of intervention against the ASM rush or activities.

2.1.23 Under current juridical dispensation, enforcement of ban on ASM in ZPs

The law, according to the Protected Areas Code (COAP) of 2003, currently proscribes mining activities in both PAs and ZPs (Protection Zones), which are the buffer protection zones of approximately 2.5km bordering PAs. Currently, with the exception of Isalo PA, this law is generally not enforced. In part this is due to a dysfunctional ascription of responsibility: while the PA is the responsibility of MNP, the ZP comes under the remit of the

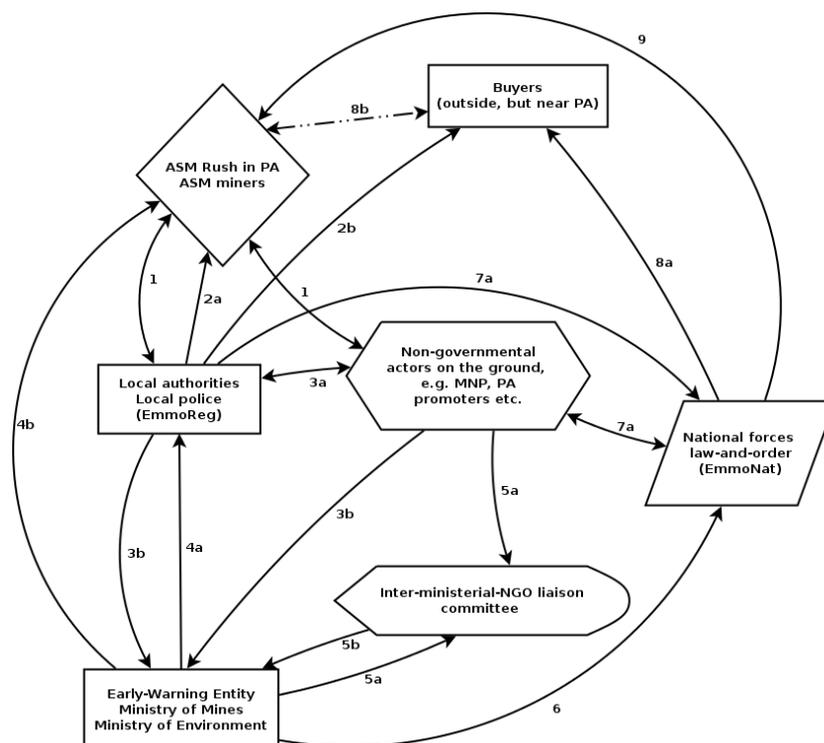
Ministry of Environment and Forests. Given that the ZP is designed to protect the MNP-managed PA, it would be more logical and effective if MNP were also responsible for the ZP.

However, the critical issue is that, as the situation currently stands with ASM miners largely free to mine within ZPs, toleration of mining within the ZP creates a climate of impunity, and undermines legislation protecting the adjoining PA. Also, ASM activities will in practice inevitably cross the border into the PA, as the relatively thin strip of the ZP is soon exhausted. In order for the ZP to return to its original purpose, namely as buffer protection for the PA, the law banning mining activities in ZPs needs to be enforced.

2.1.24 Create alternative livelihood strategies for miners undertaking existing ASM in PAs

In the case of existing and mature ASM rush sites in PAs, a strategy of offering miners alternative livelihoods could be deployed, as part of moves to eliminate ASM in the respective PA. Unlike the miners at early-stage ASM rushes, many of those at mature rush sites will have put down roots in neighbouring villages, as with the mining villages outside Ankarana PA. Thus these miners would be more likely to contemplate some form of reorientation into an alternative livelihood in the surrounding area outside the PA. However, considering the very mobile and migratory characteristics of ASM gem miners in Madagascar, as well as a certain proportion of the ASM gold miners, there would always be considerable risk that ASM miners would prefer to try their luck at the next rush, rather than adopt a more sedentary and potentially less remunerative alternative livelihood. In addition, many of the miners at the mature rush sites will have accumulated years of ASM experience, and a significant ASM skill-set, perhaps as well as a cultural affinity for the migratory ASM lifestyle. This would necessitate that the potential income from the alternative livelihood proposed to the miner at least corresponded to the higher than average remuneration he might expect from continued ASM activities.

Figure 1: Flow-chart for proposed intervention against ASM rush in PA, following policy recommendations in 'Draft Madagascar ASM Rush in PACE Methodological Toolkit'



Legend: the numerical sequence of the flow-chart parallels the chronology of the process

#	Action
1	Local authorities & police, NGOs managing PA become aware of developing rush in PA
2a	Local authorities & police immediately intervene to end rush, attempt to displace ASM miners from PA
2b	Local authorities and local police immediately target buyers in nearby town, checking visas, etc.
3a	Liaison between local authorities & non-governmental actors managing PA
3b	Liaison between local authorities, NGOs and early-warning entity, MoM & MoEF
4a	Early-warning entity, MoM & MoEF supports & advises local authorities on next steps
4b	Ministries deploy on-site to ascertain scale of rush, interact with ASM miners
5a	Early-warning entity informs inter-ministerial-NGO liaison committee of situation
5b	Inter-ministerial-NGO liaison committee issues unified response to rush, calls for intervention by national forces of law and order, releases pre-allocated funds.
6	Ministries liaise with national forces of law and order
7a	National forces of law and order liaise with local authorities and PA managers
8a	National forces of law and order robustly & transparently target buyers
8b	Link between buyers and ASM rush being broken, demand for stones dries up
9	National forces of law and order dispel residual presence of miners

3. SECTION TWO: POTENTIAL IMPACTS AND PROPOSED RESPONSES

3.1 Introduction

Section two of the 'Draft Madagascar ASM Rush in PACE Methodological Toolkit' focuses on possible impacts and proposed responses in the case of rushes occurring anywhere but PAs, NAPs, etc. As discussed earlier, ASM rushes will almost inevitably touch upon critical ecosystems, or sensitive zones. Thus, while such ASM rushes are formally against the letter of the law (see **Section 1.3.2**), in practice they are informally licit, due to the near impossibility of countrywide intervention and the process of local informal, semi-formal formalisation. In the tables below, in the first column, potential impacts are linked to whether the rush is high and/or low in intensity. The proposed recommendations to deal with socio-environmental impacts may be regarded as unworkable at present. However, they have been drafted for this report as a means to open a conduit towards best practice in the future. Opportunities to implement this toolkit and these recommendations will be determined inevitably by both good will and good governance from incumbent governments in the future. Moreover, these recommendations, while optimal if implemented in a concerted and holistic fashion, can also be selectively deployed as capacity and resources permit.

3.2 Physical impacts

3.2.1 Negative physical impacts

Table 1: Negative physical impacts

#	Impacts	Mitigation/compensation	Monitoring	Indicators
1 High and Low	Occupation of land and creating bare soils for housing, access, etc (non-mining activities)	ASM should only use base land on previously cleared areas in PACE areas or areas and at a distance from the hamlet. Select exact campsite with Mayor and Head of Fokontany. Only use existing access tracks or areas demarcated for access.	Site work reports. Verification by social liaison officer. Independent socio-environmental site visits	Survey of land cover at campsite and comparison with aerial photos and oblique photos.
2 High and Low	Compaction of soil	Decompaction of soil at the end ASM activities to allow aeration of topsoil layers using simple hand tools such as spades.	Ibid & soil surveys	Soil structure evaluation.
3 High and Low	Dust in air (mine shafts and tunnels)	Use of masks	Site health reports. Verification by health liaison officer.	Complaints, number, type, reason for issue and independent observations
4 High and Low	Dust in air (surface areas)	Regularly dampen dusty areas with water dowsing.	Ibid. Independent socio-environmental site visits	Ibid
5 High and Low	Poor air quality including carbon monoxide (mine shafts and tunnels – particularly for those >20m deep)	Use of pumps to encourage the flow of air	Site health reports. Verification by health liaison officer.	Ibid

#	Impacts	Mitigation/compensation	Monitoring	Indicators
6 High and Low	Pollution of soils and local water by vehicles and pumps	Parking for vehicles should not be in the PACE area and all vehicles should be maintained to avoid leaks. Collect all old fuel/oils from vehicles and pumps for recycling at nearest fuel station e.g. Total Madagascar recycling service. Cover the soils of parking area and fuel/oil dumps to avoid leaks to soil and surround with drainage and sump to collect potential leaks. Do not wash vehicles in PACE areas. Store oils and fuels in appropriate steel drums in PACE sites.	Vehicle and pump maintenance reports. Community complaints book. Verification by social liaison officer. Independent socio-environmental site visits. Regular water sampling	Site survey checklist of infrastructures and their condition. Water quality test analysis
7 High and Low	Pollution of soils and local water from human waste.	Use of septic tank for all human wastes and grey water. Locate the latrine at least 110m from water points; and below the level of the water point's aquifer, if situated on a slope.	Community complaints book. Verification by social liaison officer. Independent socio-environmental site visits.	Ibid.
8 High and Low	Pollution of soils and local water from domestic waste.	Collect and bury/or burn waste materials at least 100m from water sources. Keep kitchen waste in compost heap for land rehabilitation uses.	Ibid	Ibid.
9 High and Low	Pollution of potable water aquifers from mine shafts and tunnels.	Do not mine next to wells or other water points or within 80m of them.	Ibid	Ibid.
10 High and Low	Noise pollution	Make sure that all vehicles' exhaust systems are working correctly and only work during daylight hours, particularly near campsites. Control level of noise on camp from radios and pumps etc.	Ibid.	Complaints, number, type, reason for issue and independent observations
11 High and Low	Reduced surface flow in natural watercourses	Minimise extraction for mine site and conserve/recycle water. Water off-take permit need to be organised between authorities managing ASM and Ministry of Water/ANDEA. Flow should not be below 10% of original water flows and ideally not less than 20% for the driest season.	Independent socio-environmental visits and ANDEA.	Watercourse off-take and monthly natural flow tests.

#	Impacts	Mitigation/compensation	Monitoring	Indicators
12 High and Low	Soil erosion and deposition in watercourses during wet season	Stop mining activities during wet season, when severe environmental damage may occur. Operate only during the drier seasons. Do not allow mining in highly sensitive erosion areas i.e. steep slopes and fragile soils. Slopes to shafts and pits should be no more than 15 % to minimise erosion. Use anti-erosive barriers/fences or live hedges to stabilise soil on slopes.	Independent socio-environmental visits.	Survey of land cover and water quality tests in watercourses.
14 High and Low	Air pollution from fires (waste and woody materials)	Fires on the mine site will be controlled at all times and be placed at specific sites for the burning of waste and woody materials. Fires in campsites will be restricted to areas which do not impose undue impacts of smoke flowing into people's homes.	Health and safety officer with support from local health services.	Complaints, number, type, reason for issue and independent observations on site.
15 High and Low	Lowering of water table due to excess extraction for mining or potable water supplies.	Water pumping from mine sites will be channeled to a settlement area for infiltration and recharging of local aquifers. Additional water points will be dug for potable water. To minimise waterborne diseases, water points should be hand-pumps and not wells with buckets. Work with Ministry of Water and regional humanitarian NGOs.	Ibid.	Water quality and quantity tests.
16 High and Low	Pollution of watercourses during washing and panning for gold and stones.	Management authorities of ASM will have dedicated sites for washing/panning with settlement holes or tanks to reduce waste water flowing into watercourses with high sediment loads.	Independent socio-environmental visits.	Water quality tests at outfall.
17 High and Low	Damage to soil structure and fertility.	During excavation of ASM pits and shafts, the miners will separate fertile soils. These soils will be protected and used to assist rehabilitation of the sites when mining of each hole is completed. Also stock sands and gravels from shafts and pits for refilling these holes after mining is completed.	Ibid.	Land and flora surveys.

#	Impacts	Mitigation/compensation	Monitoring	Indicators
18 High and Low	Construction of building and homes on the site.	All building or homes will be built in a fashion whereby they can be easily removed from the site after mining	Ibid.	Land survey of the site.
19 High and Low	Risks of mercury or other chemical pollution in the environment.	Ban all use of mercury ¹⁶ or similar poisonous products at all ASM sites i.e. do not accept any use including regulated use, as ASM activities using mercury are too hazardous for the environment. This recommendation is particularly pertinent given the rising global spot prices for gold and potential increase of gold ASM throughout the country. As mercury has not been recorded as being used at present (although it was used during colonial times), this is an opportune moment to stop potential development of the practice in the future, rather than have to manage the situation when it becomes the norm.	Ibid.	Water and soil quality tests.

¹⁶ This is the opinion of the authors and not of the ASM-PACE Programme.

3.3 Biological impacts

3.3.1 Negative biological impacts

Table 2: Negative biological impacts

#	Impacts	Mitigation/compensation	Monitoring	Indicators
1 High and Low	Pollution of ecosystems from leaks from vehicles, washing of vehicles and oil waste. Spillage from oil/fuel dumps.	Idem: Pollution of soils and local water (in negative physical impacts)	Ibid.	Flora and fauna surveys.
2 High and Low	Loss of forest/woodland/ bush from local collection for firewood, timber or charcoal.	Ban all collection of wood collection. Only buy local supplies of firewood, timber or charcoal from certified ASM suppliers, i.e other areas where wood is grown commercially and sustainably. Bring all wood supplies needed to construct camp with camp supplies.	Verification by social liaison officer.	List of approximate quantity of wood products used on the site. Discussion with local sellers and monitoring of sources.
3 High and Low	Burning of habitat from camp accidents	Safety measures for naked flames and fires in particular near fuels/oils and provision of fire extinguishers and buckets of sand.	Ibid. Health and Safety Officer visits.	Safety procedures and fire equipment checklist is monitored. Complaints, number, type, reason for issue and independent observations.
4 High and low	Hunting of animals and collection of wild plants.	Ban on all hunting of wild animals in the area, while encouraging access to competitive meat markets in the region. Also provide support for small scale livestock development e.g. poultry production in neighbouring villages. Limit collection of wild plants to medicinal plants only within strict area and in limited quantities.	Independent socio-environmental site visits.	Flora and fauna surveys.

#	Impacts	Mitigation/compensation	Monitoring	Indicators
5 High and Low	Clearance of forest for mining purposes.	<p>Only specific sites will be classified as open for mining with limits. Rehabilitation of sites with local plants (see Table 4) to at least assist the stabilisation of soils. Limited numbers of natural plants, turf and seeds can be collected from nearby i.e. local resources, but should not be over exploited. This process will also require the combined support from NGOs or specialists to encourage the reestablishment of a diversity of plants species to encourage the restoration of habitats.</p> <p>Only miners with mining identification cards for the specific site can clear vegetation to mine.</p>	Ibid	Flora and fauna surveys of sites open for mining and subsequent rehabilitation.
6 High and Low	Mining in riverbeds and riverbanks	Mining in riverbeds or riverbanks will only be accepted after a thorough evaluation of endemic aquatic biodiversity and identification of potentially important aquatic habitats. This would accompany statutory environmental studies in PACE sites. Advisable not to mine in rivers as difficult to control sedimentation, although riverbank exploitation may be acceptable, if obligatory sediment barrages are used e.g. geotextiles, and managed by ASM authorities.	Ibid. Ministry of Water/ANDEA	<p>Flora and fauna surveys of aquatic environments.</p> <p>Water quality tests at sites and downstream of ASM activities.</p>
7 High and Low	Disturbance to neighbouring natural habitats and sensitive biodiversity.	Create a cordon sanitaire or buffer zone (minimum 500m) between the PACE and the ASM, which need to be clearly marked, recognised and respected by the miners and the ASM management authorities.	Ibid. Conservation bodies associated with PACE.	Flora and fauna surveys.

3.4 Socio-economic impacts

3.4.1 Negative socio-economic impacts

Table 3a: Negative socio-economic impacts

	Impacts	Mitigation/compensation	Monitoring	Indicators
1. High and Low	Accidents on campsite and access road Vehicles, machines, fuel/oils, & camp activities.	Slow vehicular speeds ~ 5km/hr. Fencing off access to campsite. Banning access to campsite to non-mining residents (use of mining identification cards). All miners who want access to the ASM site have to have proper clothing, safety boots, hats and goggles when and where necessary.	Health and Safety Officer visits.	Complaints, number, type, reason for issue and independent observations (spot checks).
2.High and Low	Pollution risks from waste water and human waste on local water supplies (particularly downstream on watercourses) due to a concentration of people on campsite.	Idem. : physical pollution risks. Feed all toilets and grey water into septic tank. Placing the septic tanks at more than 110 metres from local wells and surface waters.	Social liaison officer and Health and Safety Officer	Site survey checklist of infrastructures and their condition. Water quality test analysis
3. High and Low	Risk of increase of sexually transmitted diseases in nearby villages for miners on campsite and mine.	Sensitisation for ASM miners and other workers re: condom use, combined with other sex education services. Collaborative programme with district health services and local clinics. Establishment of a private or public clinic on site. No local people have access to the campsite or mine without mining identification cards. All workers encouraged to go to their respective home villages/towns during their free-time.	Sickness reports. Verification by social liaison officer and Health and Safety Officer with local clinics	Awareness checks with miners. Reported diseases with Officer and clinics.

	Impacts	Mitigation/compensation	Monitoring	Indicators
4.High and Low	Uncertainty amongst the local community about the mine and their rights related to neighbouring agricultural lands and natural resources, due to mining exploitation or damages.	Diffusion of information through Village Leaders, Heads of Fokontany/Villages and Mayors of Communes. Information and clear messages provided to all miners and local populations. Demand assistance from the Mine Rush Officer in Antananarivo and Inter-regional mines office staff. Delimitation of areas classified with the community as off-limits. Local adult miners will be encouraged to register as miners on sites. Compensation payments will be organised, as required, by authorities managing ASM sites.	Social liaison officer in cooperation with ASM authorities including Head of Mine Rushes at the Ministry of Mines and Inter-regional Mines staff.	Complaints, number, type, reason for issue and independent observations.
5.High and Low	Pressure on local social services (roads, education and health)	Migrant miners and their families will add pressure on to existing services, if present. Authorities managing ASM need to support the development of new or expanded services for roads, education and health near sites.	Verification by social liaison officer and Health and Safety Officer with District and local (public and private) public works, health and education services.	Facilities, materials and services from education and health services correspond with local demands during the course of mining activities on site. Access infrastructures are regularly assessed e.g. high, low, and poor quality ratings.
6.High and Low	Deaths and injuries to miners	All appropriate health and safety procedures for ASM must be followed to avoid accidents. In addition all miners must have appropriate equipment: helmets goggles, boots, etc. to have access to ASM sites.	Verifications by Health and Safety Officer	Facilities, materials and services from health services correspond with local demands during the course of mining activities on site.
7. High and Low	Prostitution develops in the area.	Only allow individuals and families with mining authorisation card into campsites. Provide constant awareness and education programmes for both professional migrant prostitutes and in particular young local girls who may be attracted to miners with money to pay for sexual services. Work in collaboration with health services, local village leader and authorities managing the mine.	Verification by social liaison officer and Health and Safety Officer with District and local (public and private) health services.	STD cases in the vicinity from local clinics' statistics.

	Impacts	Mitigation/compensation	Monitoring	Indicators
8.High	Non respect for local cultures and social taboos	Constant awareness programmes for all migrant miners at the site. The issues will address tombs and other sacred sites, local taboos or <i>fady</i> including sacred animals (Idem: hunting issues), and respect for local people and their lifestyles. Incorporate appropriate Malagasy ceremonies throughout the life of ASM in the area.	Verification by social liaison officer with independent socio-environmental site visits.	Complaints, number, type, reason for issue and independent observations.

3.4.2 Positive socio-economic impacts

Table 3b: Positive socio-economic impacts

	Impacts	Optimisation	Monitoring	Indicators
1. High and Low	Local employment through establishment of managed ASM activities.	Encourage local adult miners to be integrated into managed ASM activities in their area. This process should also ensure that no child labour is used at the ASM site conforming to Malagasy labour Laws.	Verification by social liaison officer.	Numbers of miners from nearby villages.
2. High	Buying goods and services through establishment of managed ASM activities.	Use local suppliers where possible, but initially avoid buying local (village) basic food necessities such as rice, to avoid local inflation. Assist the development of agricultural production (small livestock and crops) where possible, to encourage eventual local production and sales.	Verification by social liaison officer with support from agricultural/rural development advisors.	Prices for goods and services. Quantity of local and imported goods to the area.
3.High	Water provision from new water points in the area.	Provide a hand pump and foundation with drainage to sink hole, which will protect the water aquifer from human pollution.	Verification by social liaison officer.	Water quality analysis. Reported waterborne diseases at local clinics, e.g. diarrhoea and cholera.

	Impacts	Optimisation	Monitoring	Indicators
4.High	Improved access for public and private transport into area if potential road rehabilitation is fulfilled for ASM development with public transport options.	Encourage public transport to work within the times required for children to depart to schools in the Commune or District and to return home.	Ibid.	Number of children attending schools outside the local villages.
5.High	Improved economy due to sale of gold or stones from ASM.	Encourage the development of rural bank in the District or Commune (National Savings agencies or rural banks e.g. Bank of Africa – Madagascar). Promote the use of moving money in cooperation with banks and mobile telephone companies e.g. Airtel Money instead of working on a cash basis. These initiatives should aim to reduce money being banked in homes and minimise the risk of thefts.	Ibid	Number of banks or saving agencies. Number of miners using banking/saving services. Number of transactions made by miners using services such as Airtel Money etc.
6. High	Education services develop initially from private schools	Work with local education services to encourage good quality schooling meeting the needs of the Malagasy curricula. Request the assistance of NGOs working in the education sector in collaboration with local educational authorities.	Ibid. Local education authorities.	Number of local children in school. Success rates with national exams. Facilities and services in schools, e.g. books, furniture and equipment.

Table 4: List of common plants for site rehabilitation of ASM sites across Madagascar

Extreme North & Massif of Tsaratanana habitats			
	Forest	Degraded lands	Savannah
Arbustes	Varongy	Andrarezina	Radriaka
	Hazomainty	Voaroy	Dingadingana
	Tsiahianiamposa	Dingadingana	Harongana
Herbes	Benja	Somorona	Ahikongona
	Karankarantoloho	Apanganamalona	Horona
	Belohalika	Selazinela	Ahilava
Eastern escarpment & East coast habitats			
	Forest	Degraded lands	Savannah
Arbustes	Antavaratra	Dingadingana	Dingadingana
	Hazondrano	Andrarezina	Tsijiajia
	Hazomby	Voaroy	Somorona
Herbes	Mokonakanga	Kifafa	Fandrotrarana
	Kiforombato	Felamanga	Ahilava
		Fandrotrarana	Ahikongona
Highlands habitats			
	Forest	Degraded lands	Savannah
Arbustes	Voaramontsina	Harongana	Dingadingana
	Lalona	Radriaka	Mazambody
		Voaroy	Somorona
Herbes	Somorona	Tsijiajia	Ahitromby
	Benja	Mazambody	Vero
		Dingadingana	Ahimpisaka
West habitats			
	Forest	Degraded lands	Savannah
Arbustes	Taindalitra	Andrarezina	Dingadingana
	Menahihindrano	Radriaka	Tsijiajia
	Antavaratra	Dingadingana	Apanga
Herbes	Belohalika	Solila	Ahitromby
	Apangavolamena	Vendrana	Ahilava
	Apanganamalona	Kiverovato	Horompotsy
South and South-west habitats			
	Forest	Degraded lands	Savannah
Arbustes	Tsilaitra	Radriaka	Dingadingana
	Maimbovitsika	Andrarezina	Andrarezina
	Voantsilana	Dingadingana	Voaroy
Herbes	Belohalika	Horona	Ahimpisaka
	Apanganamalona	Vetiver	Vero
		Vendrana	Solila

Source: Aquerterre. 2002. Les normes environnementales dans les mines. ATPM/PRSM/MEM.

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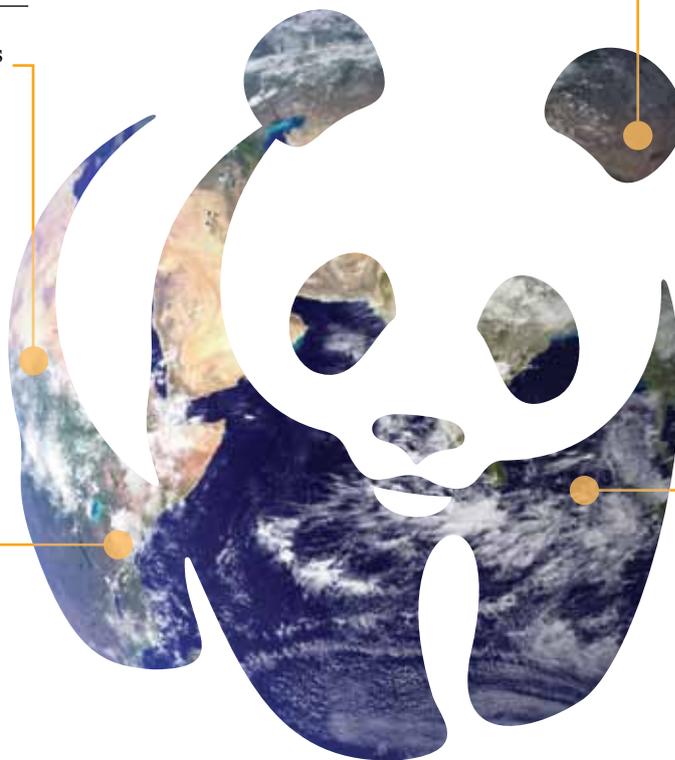


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