
AMBATOVY MINE MADAGASCAR

PRODUCED BY:

A comprehensive guide to the largest investment project in the history of Madagascar

AMBATO VY





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Facts & figures relating to the Ambatovy mining project in Madagascar, from stakeholder involvement to community commitment.



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Ambatovy has invested US\$5.5 billion into its major nickel/cobalt mining project on the island of Madagascar, bringing with it jobs, economic benefits and infrastructure improvements.



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40 LOCAL OPPORTUNITIES

The Ambatovy project is committed to providing jobs for local people, contracts for local companies, and training them for a sustainable future.



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66 AN ENGAGING APPROACH

Ambatovy commits to operating sustainably throughout the life of the project and beyond, for the benefit of the country and its communities.



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90 RESPECTING CULTURAL HERITAGE

J.A. Rakotoarisoa and Erick Randrianasolo discuss the discoveries made by Ambatovy's archaeological programme.

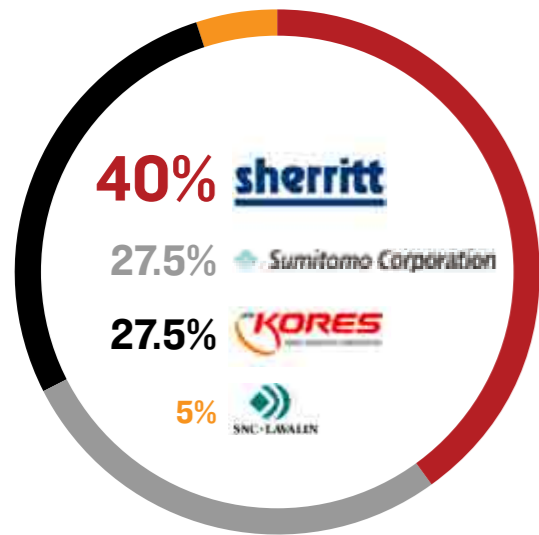
96 THE ENVIRONMENTAL IMPERATIVE

The entire Ambatovy project is located in a biodiversity hotspot in Madagascar, so the minimisation of its impact and the restoration of the mine site are interlinked.



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THE PROJECT FACT GUIDE



SHAREHOLDERS

Ambatovy is a US\$5.5 billion enterprise held by four shareholders: Sherritt International Corporation, the project’s operator, which owns 40 percent of the shares; Sumitomo Corporation and Korea Resources Corporation, each holding 27.5 percent stakes; and SNC-Lavalin Incorporated, the project’s engineering contractor, which owns 5 percent.

LENDERS

The project has required a great deal of financial traction to get off the ground. Ambatovy has received US\$2.1 billion in debt financing from 14 lenders. This consortium includes government-sponsored export credit agencies, international development banks,

and commercial banks from around the world. Ambatovy’s financing arrangement was named the “Europe, Middle-East and Africa Mining Deal of the Year” in 2007 by Project Finance International and represents the largest-ever project financing in sub-Saharan Africa.



STANDARDS

Under the terms of the lending agreement, Ambatovy is required to adhere to stringent national and international standards for environmental management, social engagement, and other business practices.

These standards include the Equator Principles and the World Bank Group’s International Finance Corporation Performance Standards. Ambatovy is audited several times per year by third-party experts who report to the lenders.

THE MINE

Ambatovy’s mine site is located near Moramanga, a city 80 kilometres east of Madagascar’s capital city, Antananarivo.

The mine is located in the central highlands of Madagascar and is connected by a 220 kilometre underground pipeline to a processing plant just outside Toamasina, the country’s main port city.

Nearly 22,000 lengths of 60 centimetre pipe were welded together to construct the pipeline, which is able to carry over 800 tonnes of slurry per hour.

When fully operational, Ambatovy will have the capacity to produce 60,000 tonnes of finished nickel, 5,600 tonnes of finished cobalt, and 210,000 tonnes of ammonium sulphate fertiliser annually over its 30 year life.



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COMMUNITY COMMITMENT

The operational phase is expected to provide long-term employment for 6,000 people, with 2,500 directly employed by Ambatovy and 3,500 by the contractors.

In 2008, Ambatovy's Local Resources Development Initiative evolved into ALBI, the Ambatovy Local Business Initiative. ALBI was created to fulfil Ambatovy's commitment to a 'buy locally, hire locally' policy.



Ambatovy had signed more than \$1.2 billion in local contracts by the end of 2010. In 2011 alone, Ambatovy spent \$220 million on local purchases. More than 500 SMMEs across 54 sectors have been awarded purchase orders by Ambatovy; meanwhile, ALBI has more than 2,000 local businesses registered in a database used by Ambatovy and its sub-contractors.

The Business Training Centre, located in Toamasina, is a collaborative effort between Ambatovy, the International Finance Corporation (IFC) and Training Management Africa (TMA).

In 2010 Ambatovy began a collaboration with UNICEF to finance the Contract for School Success programme (Contrat Programme de la Réussite Scolaire, or CPRS).

HERITAGE

Ambatovy's archaeological team has discovered 96 key archaeological sites and collected more than 4,500 artefacts. Between 2005 and 2010 in areas between Moramanga and Toamasina the team found 4,207 clay potteries and 192 imported ceramics. Among the 262 cultural heritage sites catalogued were 126 archaeological sites, remains of 22 ancient villages, 23 burial sites, 55 sacred sites and 36 sacred stones, the oldest of which date back to the 13th century and the most recent to the 19th century.



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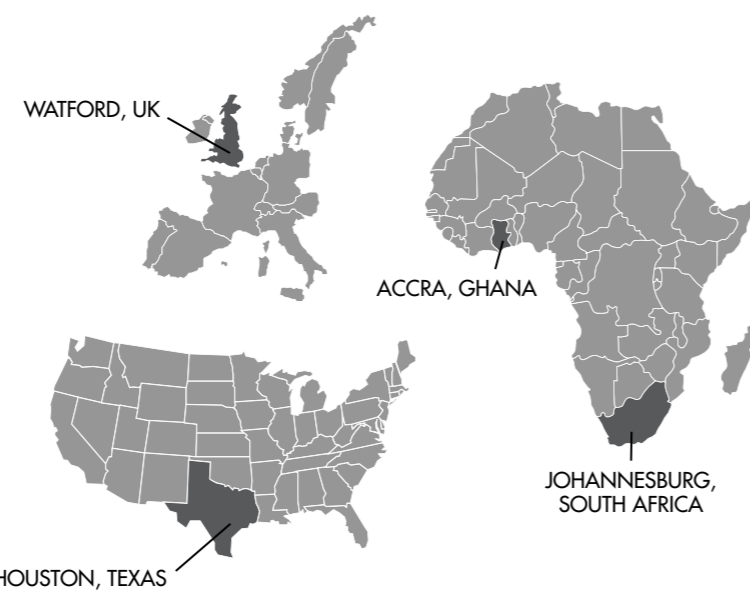
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BIODIVERSITY

Management plans have been produced in respect of water, air, noise, soil, waste, flora, fauna and aquatic resources, and are designed to preserve the environment and advance scientific knowledge.

Ambatovy works in close collaboration with the ONE (Office National pour l'Environnement), which must approve all environmental plans before implementation.

Since 2007, a total of 140 lemurs belonging to seven species living in and around the cleared forest and refuge areas have been equipped with radio collars. Since 2009, a total of 35 new-born lemurs have been observed within Ambatovy's conservation areas. Thirty three species of mammals other than lemurs are also monitored by the project.

Ambatovy's amphibian and reptile management programme carries out pre-clearance species inventories and salvages

live animals to conservation forest refuge areas. Between 2007 and 2010 the program salvaged more than 14,000 reptiles (54 species) and amphibians (55 species) and it will continue until forest clearing operations have been completed.

A specific conservation programme has been developed for the endangered frog golden mantella (*mantella aurantiaca*). Ambatovy considers *mantella aurantiaca* as a flagship species for its conservation efforts.

With the help of the Missouri Botanical Garden, Ambatovy has identified plant species known to exist only within the mine footprint and one or two other sites in Madagascar. These plants are categorized as Species of Concern (SOC). From an initial list of 173 SOCs, the number still requiring special salvaging has been reduced to eight species and is expected to descend to zero as the offsite surveys continue. **BE**





Nobody's perfect. What quality or ability do you wish you had?

There are many. However, there are strengths and weaknesses for everyone, no matter how experienced or successful. For this reason alone, a collaborative approach among a team of people to tackle various managerial issues is very effective. Each person on a team brings a unique skill set and perspective that complements the other team members, leading to a collective result that is superior to what can be accomplished individually.

What is the best business book you have ever read, and why?

Good to Great: Why Some Companies Make The Leap – And Others Don't by James Collins, which provides some good insight into some of the common practices of great companies. Also, *The Goal: A Process of Ongoing Improvement* by Eliyahu Goldratt, which is told in fictional format but creatively illustrates debottlenecking to maximise plant throughput and profitability.

Someone you would most like to have met, living or dead, and why?

Jimi Hendrix, who revolutionised electric guitar playing in just a few years, and to this day is still considered one of the best guitar players of all time.

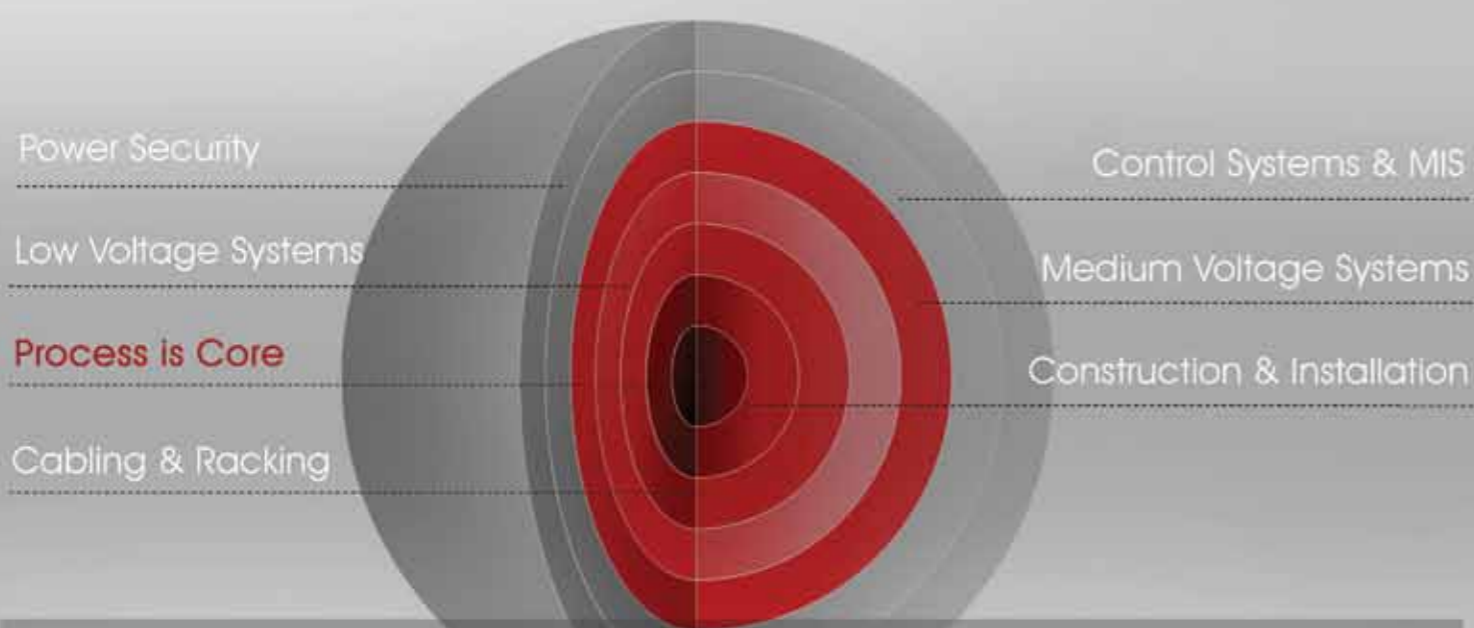
MARK PLAMONDON

PRESIDENT OF THE
AMBATOVY PROJECT



THE MISSING PIECE

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What do you consider to be your major achievement (in life or business)?

I don't have one specific achievement that stands out above all others. I have had the good fortune of working with some outstanding people throughout my career, and when a team of people is motivated and given the appropriate resources to succeed, great things can happen.

Who or what do you think is overrated?

Communication by email. This is often relied upon by employees, and although in many cases it is more efficient to communicate by email for large audiences, for sensitive or controversial discussions, it is much better to have a conversation face to face.



What mistakes have you made (professional or otherwise), and what did you learn from them?

There have been many mistakes, but this is how you grow and develop, and eventually move forward. The biggest mistake is indecisiveness, as this prevents you from learning in order to improve yourself and your business.

Which one piece of wisdom would you pass on to your successor?

Your reputation is one of your most important assets, that takes a long time to build but can be destroyed in a moment. Always strive to keep your reputation intact, by maintaining your ethics, principles and

“THE BIGGEST MISTAKE IS INDECISIVENESS, AS THIS PREVENTS YOU FROM LEARNING”

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standards in all circumstances. At times this may be very difficult, but in the long run, it will serve you well.

Who has been your inspiration professionally?

I have been inspired and encouraged by numerous leaders within Sherritt over the years, who have exemplified work ethic, creativity, and tenacity to achieve success for our company.

How would you like to be remembered after your retirement?

Retirement is a long way off... hopefully I will be viewed as a leader with integrity

and principle, who collaborated effectively with partners, colleagues and senior management teams to achieve long-term success for our company.

Do you have a quote or motto you live (or work) by?

Wherever possible, use the "KISS" Principle: Keep It Simple, Stupid. **BE**

Mark Plamondon has been president of Ambatovy since March 2012. Before coming to Madagascar he was in charge of Sherritt Coal, the largest coal producer in Canada. www.ambatovy.com

A WEALTH OF OPPORTUNITIES

With a US\$5.5 billion investment, Ambatovy brings jobs, economic benefits and infrastructure improvements to the island of Madagascar

WRITTEN BY: **BECKY DONE & MARTIN ASHCROFT**
RESEARCH BY: **ROBERT HODGSON**



An island republic off Africa's south-east coast, Madagascar is famously home to some of the world's most fascinating flora and fauna. Perhaps less well-known, however, is that it is also home to the largest lateritic finished nickel and cobalt operation in the world. First identified in 1911, the development of the deposit in the east of the country will create jobs for the local population and make a huge contribution to the island's economy.

Ambatovy's capital investment in the mining project is approximately US\$5.5 billion, representing the largest ever foreign investment in Madagascar, and one of the biggest in sub-Saharan Africa and the Indian Ocean region. Working capital and financing commitments are increasing the level of investment every day.

The mine is located in the central highlands of Madagascar and is connected by a 220 kilometre underground pipeline to a processing plant just outside Toamasina, the country's main port city.

Ambatovy began as a 'greenfield' project, with barely any infrastructure in place before construction began. Unlike some other mining operations in Africa, Ambatovy did not intend to extract and export raw ore, but planned to refine its nickel and cobalt in Madagascar. Consequently, its infrastructure needs substantial power generation, upgrades to roads and railways, port expansion and the construction of auxiliary facilities for processing and refining.



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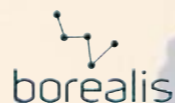


Boréal is a world leader in terms of Corporate Social Responsibility for mining and oil and gas companies, offering solutions that allow clients to attain their business objectives while meeting their sustainability commitments.

We are proud to collaborate with Sherritt, a world leader in the mining and refining of nickel, on the Ambatovy mining project in Madagascar, by implementing a Web-based Information Management System (IMS) to mitigate the social and environmental impacts of the project.

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BORÉALIS



Boréal is the world leader in terms of corporate social responsibility for companies operating in the mining and oil & gas industries.

The company offers specialised software and services that allow organisations to attain their business objectives while meeting sustainability commitments, whether social or environmental.

The Boréal is offer follows a unique approach, combining software with consulting and integration services.

Boréal is employs over 160 involved employees, installed in numerous locations to work on the company's various projects over five continents. Its head office is located in Canada, and other offices are located in Brisbane, Australia, and Ghana.

In 2010, Boréal is began collaborating with Sherritt on the Ambatovy mining project in Madagascar and implemented a web-based information management system (IMS) to mitigate the social and environmental impacts of the project. The building of various infrastructures, such as a pipeline, roads, the mine itself and the treatment plant required displacing the local population, as well as animal and vegetal species—some of which were native exclusively to Madagascar.

With the implementation of the Boréal isIMS, five core aspects were covered:

1. Boréal is helped the field Community Relations teams manage their relationship with affected people by encouraging a transparent engagement process, identifying key stakeholders and raising potential issues.
2. Boréal is supported Ambatovy Local Business Initiative (ALBI) in order to facilitate the local small businesses in assessing their actual capacity, identifying potential ameliorations and improving their skills and knowledge.
3. Since the project involved the involuntary resettlement of citizens, Boréal is helped

manage the displacement and compensation process for the surrounding communities.

4. Considering the many animal and vegetal species endemic to Madagascar, a central repository and monitoring system were implemented. This helped identify endangered and local species, inventory displaced species and track their evolution in a new habitat.
5. A monitoring performance module was also implemented to allow constant project supervision in order to ensure that it complied with regulations, whether mandatory by law—for instance, by lenders such as the IFC or by the Madagascar government—or to fulfill corporate initiatives.

Ambatovy's management team is currently considering deploying the Boréal is mobile application, which will ease stakeholder field data collection and enable teams to remotely collect information even when no internet connection is available.

Jean-Yves Saint-Pierre, supervisor SCM/ALBI, Ambatovy Project, Sherritt International, said: *"The Boréal is system is an important initiative that enables our department (Supply Change Management/Ambatovy Local Business Initiative) to obtain professional lists from companies in all fields and allows them to respond rapidly to the department's needs. The Boréal is system allows us to perform audits of these businesses in a very professional manner and above all, to compile corporate information, therefore making it easier to follow these businesses and assess their training needs. We would also like to mention the tremendous support that we have received from the Boréal is team throughout the past year."*

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Maintenance PAL I

Ambatovy has now entered the operational phase, and when fully operational, it will have the capacity to produce 60,000 tonnes of finished nickel, 5,600 tonnes of finished cobalt, and 210,000 tonnes of ammonium sulphate fertiliser annually over its 30 year life. This will place nickel among Madagascar's most important exports, which until now have relied upon textiles, fish, and its famous vanilla.

Ambatovy's mine site is located near Moramanga, a city 80 kilometres east of Madagascar's capital city, Antananarivo. The ore body consists of two large deposits approximately three kilometres apart (the Ambatovy Deposit and the Analamay Deposit). The laterite ore is combined with water to produce a slurry, which is then pumped into the pipeline linking the mine to the plant site.

**800
TONNES**

.....
Amount of slurried ore
carried per hour

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Nearly 22,000 lengths of 60 centimetre pipe were welded together to construct the pipeline, which is able to carry over 800 tonnes of slurry per hour. The need for energy-intensive pumping facilities is minimal, as much of the energy needed to move the ore through the pipeline is readily provided by gravity, thanks to the 1,000 metre difference in elevation between the mine and plant site. The pipeline is buried to an average depth



Ambatovy has now entered the operational phase

of 1.5 metres for almost all of its length.

When it emerges from the pipeline, the slurry reaches the processing plant and refinery where it is processed and refined to produce high-grade nickel and cobalt briquettes for shipping to Ambatovy's customers from the port of Toamasina.

Ambatovy is a partnership of four companies—Sherritt International Corporation and SNC-Lavalin Inc. from

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Processing plant

“AN INDUSTRIAL ENTERPRISE OF THIS SIGNIFICANCE AND MAGNITUDE HAS REQUIRED A GREAT DEAL OF FINANCIAL TRACTION TO GET OFF THE GROUND”

Canada, Sumitomo Corporation from Japan, and Korea Resources Corporation. Sherritt is the project’s operator, with 40 percent of the shareholding, while SNC-Lavalin is Ambatovy’s engineering contractor, with five percent. Sumitomo and Korea Resources each hold 27.5 percent.

An industrial enterprise of this significance and magnitude has required a great deal of financial traction to get off the ground. Ambatovy has received US\$2.1 billion in debt financing from 14 lenders, a consortium that includes government-sponsored export credit



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agencies, international development banks, and commercial banks from around the world. Ambatovy's financing arrangement was named the Europe, Middle East and Africa Mining Deal of the Year in 2007 by Project Finance International, and represents the largest ever project financing in sub-Saharan Africa.



Skilled workers

international standards for environmental management, social engagement and other business practices. These standards include the Equator Principles and the World Bank Group's International Finance Corporation Performance Standards. Ambatovy is audited several times a year by third-party experts

The consortium has extremely high accountability standards. As part of Ambatovy's lending agreement, it is required to adhere to stringent national and

who report to the lenders. The transition from construction to operations has been sensitively handled by Ambatovy, which has voluntarily

MADAGASCAR AUTOMOBILE



Madagascar Automobile has been founded in Madagascar since 1928. Specialized in car sales, after sales, car rental (Budget Rent a car) and vehicle fleet management, this long experience has helped the company in developing his presence and competence in the motoring industry in the country. As of today, Madagascar Automobile covers a large sector of the market in Madagascar, with its passenger ranges as well as commercial and 4WD vehicles. Relying on the worldwide brands such as Nissan, Renault, Renault Trucks, Lada, UD trucks, Bluebird busses and Cummins, our firm has gain its reputation for quality of product, superior driving experience and quality of service.

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developed a comprehensive demobilisation programme to assist its Malagasy workforce through this period of change. The Assistance Initiative for Demobilized Workers (AIDE), created in November 2010, provides former construction workers with a modest monthly allowance depending on length of service, as they search for new jobs. Among the many challenges faced

22,000

.....
Lengths of 60 centimetre pipe welded together to construct the pipeline

by AIDE was determining which employees would be eligible. By the time AIDE was announced, some contractors had already completed their work and information about whom they had hired was no longer easily available. Building the comprehensive employee database took two years and approximately four man-years of effort. This is understandable when you consider

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*Congratulations
Ambatovy!*



that between 2007 and 2012, more than 30,000 people worked on the construction of Ambatovy facilities—the largest private sector labour mobilisation in the history of Madagascar. From a small workforce at the beginning of construction, the numbers grew to over 10,000 workers by mid-2008, peaking at 18,500 in 2010.



Aerial view of processing plant

phase could not be kept on, which is almost always the case in new mining projects where many more builders are required than operators. This meant that the rapid engagement of thousands of workers in 2007 was followed just a few years later by a steady reduction as construction wound down and preparation for operations began.

While the operations will create employment for 6,000 people, the majority of people engaged during the construction

Demobilisation presented many challenges and risks, including the possibility of strikes, slowdowns and the destruction of

NORTH WEST TECHNOLOGY



North West Technology congratulates Ambatovy on the completion of its plant and mine construction project in Madagascar. North West Technology has provided extensive communications infrastructure to this project throughout the five-year construction phase. Our work included the installation of the very first satellite dish through to the installation and commissioning of the site-wide fibre optic network. We also supplied and installed the data network, telephone, access control, CCTV, process control and fire alarm systems. It has been a pleasure to work with the Ambatovy partners on this project. North West Technology specialises in leading edge industrial technology infrastructure. We design, supply and install solutions

for the mining, oil and gas, and forestry industries, as well as smaller industrial applications and larger commercial projects. We have clients all over the world, many in quite remote locations. Our Canadian projects have been in Northern BC, Northern Alberta, Saskatchewan, Labrador and Baffin Island. Some of our international project locations have been in Nevada, USA, Venezuela, Panama and Madagascar. Members of our team have also worked on projects in Africa, the Middle East and Asia. North West Technology Inc. was formed in Edmonton, Alberta, Canada in 2003. Our head office is now located in Summerland, British Columbia, Canada.

www.northwesttech.ca



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The Ambatovy project, one of the world's largest lateritic nickel mines located in Madagascar, chose the experience of Canadian Flyers World Aviation Services to provide for their specialized aviation requirements. We imported, manage and operate Sherritt's DHC-6 STOL aircraft providing quick, hassle free, dependable regular daily scheduled service between the capital city Antananarivo, their runway at the mine site near Moramanga and 220km down the slurry pipeline, to their new runway at the Ambatovy refinery and headquarters located next to the port city of Toamasina. We organized and provided approved GPS instrument approaches into the private runways for assured access and for the ability to provide on call medical evacuation services.

Our experienced management and pilots represent unquestionably the highest calibre of the aviation world and operate your aircraft as such. Take safety to the next level with the Canadian Flyers World Aviation Services team.

Contact details:
Dario Matrondola

Telephone: +1 905-642-2774

Mobile: +1 416-995-9464

Email: dmatrondola@rogers.com



Excavation work

property, all of which could threaten the company's reputation.

In 2008, Ambatovy's Local Resources Development Initiative evolved into ALBI, the Ambatovy Local Business Initiative. One of ALBI's objectives was

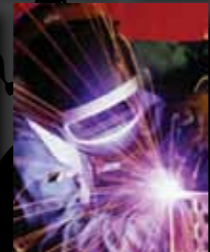
to assist in the creation and growth of local businesses so the company could source more of its supplies in Madagascar, generate local employment opportunities, and help former construction workers find new jobs.

“ONE OF ALBI'S OBJECTIVES WAS TO ASSIST IN THE CREATION AND GROWTH OF LOCAL BUSINESSES SO THE COMPANY COULD SOURCE MORE OF ITS SUPPLIES IN MADAGASCAR”



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In 2010, ALBI created a farm school to train former construction workers who might decide to return to or embark upon agricultural activities. Over 3,000 have already undertaken the training, and many thousands more have registered for future classes. The courses help demobilised workers and others to improve their skills and knowledge in agriculture, livestock, accounting and business administration. A network of model farms helps with technical assistance.

EUROASIA PHILIPPINES, INC (EPI)

Established in 1986 in Manila, by French and Filipino shareholders, EPI has proven track records of excellent services, tailored to each requirement, ranging from standard Human Resources to more complex options for the management of Filipino workers. Since 2009, on Ambatovy project alone, EPI has already deployed more than 500 qualified Filipinos in more than 60 expertise fields for the construction and operation of the DMSA nickel processing plant and related facilities. EPI's manpower recruitment capacity, management expertise and continued strong partnership with its client contribute to the success of its venture in Madagascar. www.euroasia.com.ph

Ambatovy has also contributed to the creation of three bulk purchasing centres, two in Toamasina and one in Moramanga. These centres buy fruit, vegetables, and dried goods from local farmers and resell them to customers, including Ambatovy. An estimated 5,000 farmers from the regions of Atsinanana and Alaotra Mangoro and 3,000 farmers from other regions of the country supply these centres with up to 125 tonnes of fruit and vegetables per month.



Anjoma market Tamatave

“IN 2010, ALBI CREATED A FARM SCHOOL TO TRAIN FORMER CONSTRUCTION WORKERS WHO MIGHT DECIDE TO RETURN TO OR EMBARK UPON AGRICULTURAL ACTIVITIES”

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Local producers also supply Ambatovy with eggs and poultry. At the height of construction, Ambatovy was purchasing 80,000 eggs and 6,000 chickens per week.

“Our latest initiative is to work with farmers to form them into associations,” says CSR program service

manager Jennifer Burt Davis. “They can then receive subsidies, about \$5,000 per association, from a World Bank Project, but in order to qualify they need to have a market for their goods.”

The farmers living in the mine’s project zone enjoy a direct benefit from Ambatovy’s presence. “That’s really critical for us,” says Burt Davis. “Through the produce they are growing and the animals they’re raising, they have a connection with our employees and our catering service, and we can assist them to create higher quality products.”

Thousands of farmers now supply the bulk purchasing centres, which buy agricultural produce directly from them, and the farmers benefit from having access to a stable market. **BE**



ALBI farm school, Toamasina

Mining & Construction

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Light Engineering

TRIUMPH PETRO

Triumph International & Petro Contracting Madagascar are two companies under one roof sharing common management and resources that operate in the four business lines. On the Ambatovy project, Triumph has supplied Metso equipment and parts, warehouse material handling equipment and racking, and is also an approved sourcing specialist for miscellaneous parts and accessories. Ambatovy’s centralised fuel management system is managed by the FuelLog system, supplied and maintained by Petro Contracting

Reliability & Innovation

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6,000

Number of chickens purchased per week at the height of construction

LOCAL OPPORTUNITIES

The Ambatovy project in Madagascar is committed to providing jobs for local people, contracts for local companies, and training them for a sustainable future

WRITTEN BY: BECKY DONE & MARTIN ASHCROFT
RESEARCH BY: ROBERT HODGSON



A major benefit from Ambatovy’s mission in Madagascar has been the creation of direct and indirect jobs, which has provided a major boost to the local economy. The operational phase is expected to provide long-term employment for 6,000 people, with 2,500 directly employed by Ambatovy and 3,500 by the contractors. A vast range of additional indirect opportunities will also be created in sectors such as food production, transport and waste management. A sign of how welcome these opportunities are among surrounding communities is that more than 28,000 job seekers have already been registered.

Ambatovy is committed to hiring as many local people as possible, and thousands of Malagasy employees have received construction, technical, and administrative training to enable them to assume positions during the operations phase. Providing vocational training for local communities has been a priority, with candidates who meet the necessary requirements being given priority to fill long-term skilled positions in operational areas including plant operations, engineering, health and safety, environment, finance, administration, external relations, maintenance and logistics, and potentially others.

The approach of the company’s training department has been to combine self-taught training, computer-based learning, and instructor-led classes,



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WHEN YOU NEED TO BE SURE



ENVIRONMENTAL SERVICES



As the world's leading inspection, verification, testing, and certification company, SGS is an expert in monitoring and supporting the mining environment. Using a combination of global resources and full-time local specialists, our projects ensure that clients are free to focus on their core businesses while we help them to create a sustainable environment.

One such project involves the air monitoring station set up by SGS Environmental at the Ambatovy nickel mine near the city of Moramanga, 80 km east of Antananarivo, the capital of Madagascar. The Ambatovy plant processes nickel and cobalt from mine slurry. The process of separating the nickel and cobalt from the raw material mined from the ground gives rise to air pollution, which can be damaging to the surrounding environment and community. While Madagascar is a biodiversity-rich country, it is one of the poorest countries in the world, in which the local people are highly dependent on natural resources for their livelihood. These factors combine to create a challenging context for a large mining operation like Ambatovy.

As a responsible mining enterprise, Ambatovy adheres to stringent environmental standards including the Equator Principles, the World Bank Group's IFC Performance Standards, and the principles of the Business and Biodiversity Offsets Program (BBOP). Where possible, all efforts have been made to remove pollutants before emitting to the atmosphere and ensure the surrounding community benefits from mining activities. A key element of Ambatovy's Environmental Management Plan involves the appropriate mitigation and monitoring of any

issues identified during their Environmental and Social Impact Assessment.

This is where SGS Environmental Services comes in. In compliance with Ambatovy's environmental policy, SGS Environmental has installed an air monitoring station to monitor the ambient air conditions in and around the Ambatovy plant. The station's protocols are the result of world-class equipment imported from the US and SGS Environmental's extensive experience in the mining industry in Africa. In March 2011, the station was shipped via sea from Durban Port to Tamatave, Madagascar. After clearing customs, the container unit arrived at the plant in April 2011. Special gases had to be shipped separately afterwards, as per maritime law. These arrived in May and June 2011. Expert SGS staff arrived at the plant in August 2011 to install, commission, and calibrate all the equipment, as well as to train the Ambatovy staff in the operation of the air quality monitoring station. The station is currently monitoring a number of pollutants including SO₂, NO_x, NH₃, H₂S, and PM₁₀. It provides Ambatovy with valuable information so that, as mining activities progress, the surrounding environment is carefully monitored to ensure long-term sustainability. SGS Environmental's competitive advantage lies in its key offerings – experienced ambient air experts working with local staff who specialise in designing, installing, and running air projects in African countries, through the use of global resources. For operations like Ambatovy, SGS Environmental is the perfect partner in environmental sustainability.

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enabling employees to develop skills on the job and paving the way for professional growth. The training department comprises a team of 35 professionals, including trainers, sector-training coordinators and training advisors.

The Ambatovy Training Centre in Toamasina has a fully equipped workshop for operations and maintenance training. All operators are instructed by



Maintenance training

Malagasy engineers, who learned their craft from Ambatovy's expatriate technicians, while maintenance subjects are taught by technical experts from Canada. These courses help to transfer skilled trades to the local workforce, equipping employees with the knowledge to become electricians, millwrights, pipefitters, welders, instrument technicians, boilermakers and

COMPLIANT DOCUMENT AND RECORDS MANAGEMENT



Being compliant with different standards, such as ISO9001, poses a challenge to any organisation that needs to implement standards in order to do business. i-Kno helped Ambatovy in regards to EDRMS to do just that.

The challenge was not to implement and be compliant, but to what extent to automate the process. ISO9001 does not dictate how you should implement or what should be automated; but rather what should be measurable. Implementing a compliant EDRMS could amount to millions of dollars if approached in the wrong way.

By selecting key components to automate and properly designing those components without going into analysis paralysis, costs can be kept to a minimum and the right compliance achieved.

Only by implementing a single approval process, excellent revision numbering according to organisation policies and ensuring documents present such information accurately, could the right information be presented to the right people at the right time.

Finding the right document is a key component of the EDRMS, as the wrong information can lead to disaster. Implementing simple, yet accurate, searching capabilities ensures that users at all levels can find the right document, regardless of where the document is located.

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planners. Courses consist of six to eight months of technical training, followed by additional courses related to health and safety, language skills, IT, and on-the-job learning.

Early last year Ambatovy launched its Technical Excellence Program, a training initiative created for graduates aged 17 to 22 from technical colleges in the region of Atsinanana. The 18 month course, followed by a two-month

internship, is designed to help new graduates to develop industrial operating skills for future employment at Ambatovy or elsewhere. A similar initiative is under development in the Moramanga area. Between 2011 and 2015, Ambatovy is aiming to train around 200 operators for work at the plant site.

Ambatovy is committed to skills development to help foster a self-sustaining, well-equipped community that will be able to flourish long after



Laboratory

17 TO 22

Age of graduates from Ambatovy's Technical Excellence Program



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the mine closes in thirty years, and this effort also extends to local businesses contracted to supply services to the company.

Other measures to help smooth the transition period include the establishment of the Ambatovy Redeployment Centre (Bureaux de Redéploiement de la Main d'Oeuvre—BRMO), which

assists demobilised Malagasy workers with accessing new jobs, training, or other income-generating activities through the Ambatovy Local Business Initiative (ALBI), active in Moramanga,



Local workers

Toamasina and Antananarivo.

ALBI was created to fulfil Ambatovy's commitment to a 'buy locally, hire locally' policy, so the focus is on creating a business relationship with

VIZIYA

Ambatovy knows that a well-run maintenance organisation makes the difference between success and failure. That's why Ambatovy uses VIZIYA's WorkAlign® Scheduler to manage its maintenance resources.

"The Scheduler's intuitive user interface and advanced features helps planners get the job done quickly and easily," says Dean Comand, VP Operations. "With an implementation measured in days, we immediately started to see the benefits."

With the ability to edit and schedule multiple work orders at a time, and real-time staff utilisation reports, the Scheduler enables dramatic increases in craftsperson productivity. More productivity means more work gets done—while also reducing overtime



and use of contractors. Most importantly, better control and improved personnel utilisation means that the assets are better maintained. Well-maintained assets fail less often, and all of these savings go directly to your bottom line.

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Mining profit is the difference between two very large numbers

Mining is hard. It takes a huge investment in capital and personnel. While revenue can be high, expenses always threaten to be higher. In the past, as the economy flourished, mining companies increased their profitability through production expansion. There wasn't always time to fully optimise operational spending. In today's uncertain economy, profit growth requires careful attention to finding new operational efficiencies.

Mining is no longer armies of workers with picks and shovels, but rather it is automated machinery, and people to maintain that machinery. More than any other industry, mining draws a straight line between good maintenance, and operational profitability. At VIZIYA, we have the pleasure of working with many of the world's largest and best mining companies. Below are some common threads among these world-class maintenance operations.

Reporting

It all starts with reporting. If you don't know where you are, and you can't track how you are improving, you are not going to get results. While it sounds easy, in practice, reporting is hard. Your maintenance data is spread far and wide across your ERP system's database, and finding the right information involves specialised knowledge about maintenance reporting needs, a detailed understanding of the database layout, and a full mastery of the automated toolsets required to create a reporting system. It turns out that this collection of skills is rare, and it is much easier and more effective to work with a partner to help you create your solution. Building a reporting system is not for the faint-hearted. Do not compromise: good reporting is a necessary element for any successful maintenance operation.

Labour utilisation

After you have succeeded in building an excellent maintenance reporting system, the first thing you will likely see is that substantial improvements are

possible with the effective planning and scheduling of the maintenance craftspeople. How many times has the maintenance team started a job only to find out that not all of the required parts were on-hand, or how often has the maintenance person arrived at the equipment, only to find out that it is in use and unavailable for maintenance?

Unfortunately, maintenance systems are notoriously deficient when it comes to maintenance planning and scheduling. While this is not an issue if you have a small maintenance team, and only a few work orders each day, mining operations are big—with maintenance staff measured in the hundreds, and work orders in the thousands. Planning and scheduling success requires effective tools. Do not compromise: investment in maintenance planning and scheduling is a strategic necessity.

Vendor management

A critical area that is often neglected is vendor management.

Use your reporting system to create a vendor report card. Which vendors give you the fewest early life failures? Which vendor's equipment costs the least to maintain? Are vendor part shortages consistently prolonging equipment outages? Are the vendor's recommendations for preventative maintenance effective? You'd be surprised at how willing your vendors are to work with you on the areas that are important to your business.

Finally, a special note about warranties. Our products are in use at over 550 sites across six continents, and we have yet to find a maintenance organisation that is happy with their warranty claims efforts. This is a sad state of affairs. Warranty claims are like money lying around on the floor. Don't wait. Get out there and build a warranty claims process to send someone out there and pick it up. The project payback can be measured in hours.

Sean Licata
Sean Licata is VP of Business Development at VIZIYA Corp.



“THERE IS NO PROJECT OF THIS SIZE ANYWHERE IN THE COUNTRY”

the surrounding community. In 2008, however, the business community was somewhat unprepared for the opportunities this project would provide. “When we started, this was truly a greenfield operation,” says Gerald Perina, head of Ambatovy’s Business

Improvement Programme. “Although there is a smaller mining operation in the south operated by Rio Tinto, there is no project of this size anywhere in the country. So finding contractors was difficult because there were limited businesses within the country that had

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- Industrial surface coating
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- Pharmaceutical product manufacturing
- Pulp and paper
- Solid waste management

Areas of Technical Expertise:

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- Regulatory Compliance Issues
- Industrial Permitting
- Air Pollution Control Technology Strategies and Selection
- Continuous Emission Monitoring System Selection
- Ambient Air Monitoring and Source Sampling Techniques



D.H. Lyons was part of the environmental design team, working with SNC-Lavalin Inc. and Sherritt International Corporation

- Developed a revised air emission inventory for all major air emissions sources from the main plant
- Used air dispersion modelling as a design tool to help refine the size, height and location of various exhaust stacks around the facility to ensure their proper performance and ability to meet the required environmental air quality and occupational health and safety standards for the following areas of the project:
 - Diesel generator power plants for the project main site, mine site and pumphouse
 - Ammonia storage and hydrogen plant startup
 - Slurry neutralization tanks
 - Sulphide precipitator flare
 - Hydrogen sulphide scrubber
 - Material loading and transfer operations at the port of Toamasina



Maintenance at the refinery

the necessary experience.”

ALBI offers small, medium, and micro enterprises (SMMEs) training and capacity building aimed at improving the quality of their products and services, which will help make them more competitive in the marketplace.

Now one of the largest consumers of products and services in Madagascar, Ambatovy works hard to identify local companies capable of responding to company and market needs. This approach

has provided a much-needed boost to Madagascar’s economy and entrepreneurs. Ambatovy had signed more than \$1.2 billion in local contracts by the end of 2010. In 2011 alone, Ambatovy spent \$220 million on local purchases. More than 500 SMMEs across 54 sectors have been awarded purchase orders by Ambatovy; meanwhile, ALBI has more than 2,000 local businesses registered in a database used by Ambatovy and its sub-contractors.

ALBI has already assisted

**\$1.2
BILLION**

.....

Amount signed in local contracts by 2010

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employment-generating enterprises engaged in the manufacture of uniforms, drum and pallet fabrication, egg production, and agricultural produce marketing. Ambatovy provides uniforms to each employee, consisting of two shirts, two pairs of trousers, and two coveralls. Rather than selecting a large industrial supplier, Ambatovy decided to award an annual contract for 4,000 uniforms to two



Uniform manufacture

small sewing companies based in Toamasina which each employ 40 people. ALBI helped to select these contractors and provides them with ongoing technical and administrative support.

Another example of maximising local opportunities relates to the manufacture of pallets. Using wood from a pine forest near Moramanga, Ambatovy uses methods consistent with eco-certification

INTERNATIONAL SOS



With a strong presence in Africa and over 25 years' experience in the industry, International SOS plays an integral part in the health and safety operations of many energy, oil and mining companies worldwide. The Ambatovy mining operation in Madagascar has been a client of International SOS for the past 5 years. International SOS provides approximately 8,000 Ambatovy employees with access to international standard healthcare services, through two clinics on site with a staff complement of 30 nationals and 14 expatriate medical employees. Services include site health reviews at remote sites; health impact assessments; and community health projects, as well as first aid and advanced training and medical evacuations. On-site healthcare facilities include the set-up and management of

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Smart Line Integration security system integrator has been appointed by Ambatovy to design and provide integrated solutions for Ambatovy Plant in Madagascar. The offered solution is a combination of access cards with fingerprints, PDA-mobile identification anywhere on the plant and integration between HR and access control system.

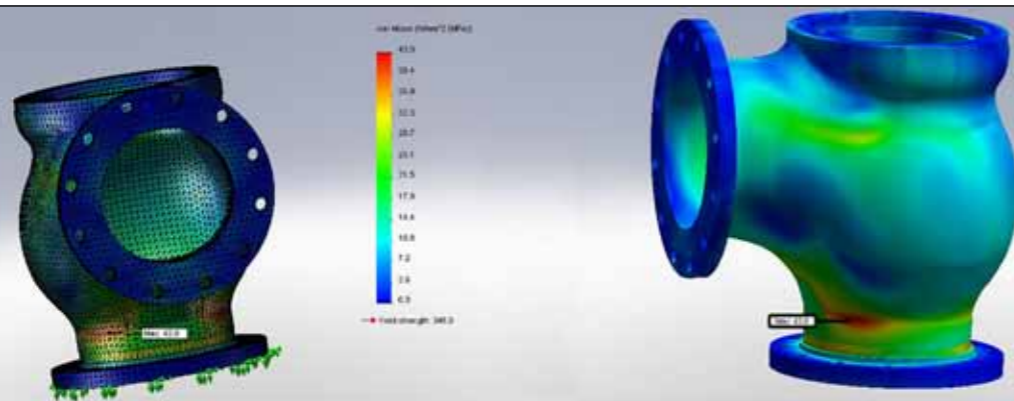
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Madagascar has been supporting Ambatovy in the management, maintenance, servicing and diagnostics of valves, actuators, and instrumentation, specialized welding and coating solutions. Callidus provides employment, training and workshop facilities locally.

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Local companies manufacture the uniforms

standards to harvest the wood required for the manufacture of up to 140,000 pallets per year at full plant capacity. The pallets are fabricated in Toamasina and used for the shipment of Ambatovy products. A total of 950 jobs have been created by this initiative; 800 in forestry and factory work and 150 in transportation and handling. In addition to creating stable employment, this approach has other advantages including improved environmental management,

4,000 UNIFORMS

.....
Contract awarded to two local companies

efficient use of natural resources, and sustainable forestry stewardship.

Since 2008, the company provided local SMMEs with more than 4,000 hours of mentoring and 5,700 hours of technical training in accounting, project management, leadership, quality control,

contract administration, procurement, environment, health and safety, industrial relations, change and growth management.

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necessary to give potential local suppliers a chance to win business. Early on in the project it was found that when local businesses were invited to bid for work, they failed to get the contracts, either because they lacked quality control, were unaware how to prepare a response to a bid, or weren't set up properly as a business. A new initiative has been implemented this year to add emphasis to this effort. "This is why we set up the Business Training Centre (BTC)," says Perina, "primarily to train the staff in



Practical training

these businesses."

The BTC, located in Toamasina, offers courses on financial accounting, how to prepare a tender, quality control, and

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Training centre

health and safety; and there are classes and seminars free of charge with follow-ups that go hand-in-hand with quality audits. An audit is carried out within the local business, weaknesses and strengths are identified, and then further courses are recommended which are followed by

further audits in due course. Companies which have made improvements as a result of these courses are then in a better position to be awarded contracts, which fulfils Ambatovy's policy to procure as much as possible within the country, and ensures that the companies concerned

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are both qualified and able to do the work.

The BTC is a collaborative effort between Ambatovy, the International Finance Corporation (IFC) and Training Management Africa (TMA). Introductory sessions were held in August in Toamasina, Antananarivo and Moramanga by officials from the Supply Chain Management Department (SCM/ALBI) of Ambatovy, during which the Centre received over 500 applications: 315 in Toamasina, 150 in Antananarivo and 54 in Moramanga.



ALBI supported local business

Ambatovy has also partnered local contractors with foreign nationals, ensuring that the foreign nationals are passing on training to the locals.

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"Their contract renewals are based on how well they carry out internal training of nationals: most companies are pretty successful," adds Perina.

Ambatovy has also established continuous improvement targets for its contractors over the next two years. "We need to encourage the development of sustainable businesses," says Perina, "not businesses that are only doing business with

us, but with other companies as well." Eventually, for all these initiatives to be successful, the objective has to be that businesses can be self-supporting even after the mine has closed.

"All of our business development has to be on a self-supporting basis, so that when we're not here, the businesses will continue," Perina confirms. The challenge is to create a business plan that gets them off the ground, but while Ambatovy might be the biggest customer at the moment, others will emerge when Ambatovy is no longer around. ■



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AN ENGAGING APPROACH

Ambatovy is committed to operating sustainably throughout the life of the project and beyond, for the benefit of the country, its communities and wildlife

WRITTEN BY: **BECKY DONE & MARTIN ASHCROFT**
RESEARCH BY: **ROBERT HODGSON**



Poised to become one of the world's largest lateritic nickel mines by 2013-2014, Ambatovy is likely the most ambitious industrial undertaking in the history of Madagascar. Aiming to produce 60,000 tonnes of refined nickel and 5,600 tonnes of refined cobalt every year over its thirty year life, there has never been a mining project of this scale in Madagascar before, and the project partners (Sherritt International

Corporation, Sumitomo Corporation, Korea Resources Corporation and SNC-Lavalin Incorporated) are committed to managing it responsibly.

Ambatovy's far-reaching corporate social responsibility (CSR) programme therefore has three main strategic objectives, explains CSR program service manager Jennifer Burt Davis. "The first looks at meaningful stakeholder engagement and relationship building; the second looks at the mitigation

of, and compensation for, potential impacts; and the third is around demonstrating and contributing to socio-economic benefits in our operation zones."

This strategy reflects the company's core values, which include creating and maintaining an organizational culture where health and safety is a top priority, along with respect for the social and cultural values of its stakeholders, sustainable economic development, and protection of

the natural environment. Inherent in these values are high ethical standards and a spirit of transparency, teamwork based on mutual respect, trust, and constructive relationships, and a commitment to continuous improvement. Also central to Ambatovy's policy of good corporate governance is the objective to foster credibility and trust by complying with principles developed to protect investors, employees, and the general public.



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Companies in the mining industries face the complex challenge of conducting their operations in a manner that not only respects national and international laws, but also observes voluntary standards and industry guidelines concerning social and environmental issues. This challenge is exacerbated by the fact that exploration and extractive activities around the world present increasing legal and reputational risks in the areas of human rights, labor rights, security practices, and the rule of law.

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Foley Hoag Senior Advisor John Ruggie, Former U.N. Special Representative on Business and Human Rights, helps mining companies implement the U.N. Guiding Principles, which he developed, and which enable companies to meet international best practices while mitigating risk. Foley Hoag also serves as thought leaders on the issues of indigenous peoples. We advise clients on international law and national standards, and how to implement consultation and consent processes.

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- Creates legal strategies and business policies that incorporate respect for human rights, comply with existing laws and voluntary codes, and "close the gap" between a company's commitment and its business activities
- Conducts periodic monitoring of extractive projects to ensure compliance with the local and national laws, company standards, and fundamental human rights, especially with regard to workers, local communities, and the nexus of security concerns and human rights protection
- Undertakes human rights risk assessments and corporate social responsibility due diligence reviews of current and potential projects to evaluate legal and reputational risks
- Analyzes conflicts with local communities, and designs plans and programs to minimize risks and maximize mutual benefits
- Helps to incorporate key corporate social responsibility standards into the prevailing legal regimes and related contracts used in extractive projects



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Prior to construction, Ambatovy conducted a thorough environmental and social impact assessment, which involved a comprehensive analysis of all of the project's impacts. A wide range of Malagasy stakeholders were consulted in order to gain an insight into how negative impacts could be avoided, managed or mitigated, and how positive impacts could be maximised. Ambatovy has since worked to create and implement a wide range of policies and programmes covering job creation, capacity-building and



School equipment donation, Moramanga

training, local procurement, environmental protection and biodiversity offsetting.

Community relations are crucial to the success of an operation with far-reaching implications for the local population, so Ambatovy works particularly hard to recognize its stakeholders, communicate with them proactively and effectively, and manage stakeholder-

related risks as a means of cultivating a broad level of active support from everyone. Affected stakeholders are afforded a real influence on project activities and the

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creation of community support, with ongoing engagement activities ranging from the provision of information to involvement in joint decision-making.

Ambatovy has conducted substantial training with its social agents on how to conduct meaningful dialogue, in an attempt to build genuine, long-lasting relationships with governments, local authorities and communities.

“We have about 60 social agents, supervisors and co-ordinators on the ground,” says Burt Davis, “and we look upon them as our ‘nervous system.’” If something happens within the community that affects a stakeholder’s livelihood or the project itself, the social agent reports back up the chain of command so the appropriate response can be made.

Ambatovy’s engagement activities are both proactive and responsive. The company initiates weekly, monthly or quarterly meetings with stakeholders who fall within its scope of engagement. The *tangalamena* (local elders) are consulted

GALANA GROUP

Since the beginning of this project in 2008, Galana has developed a significant expertise in the mining sector and particularly with Ambatovy.

A tight co-operation between Ambatovy and Galana has been established with the supply of Naphtha for its factory in Tamatave as well as the supply of diesel at the mine site in Moramanga (see photo on the opposite page).

This scale of project was new in Madagascar, Ambatovy and Galana learned from each other and brought their expertise and knowledge together to optimize operations.

Galana expresses its endeavour to be continuously linked with Ambatovy and be recognized as a key player and supplier for the mining sector.

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Clean water

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on a quarterly basis and meetings are regularly held with government ministries and agencies, such as the National Environment Office (Office National pour l’Environnement, ONE) and the Ministry of Mines.

No mining operation of this size can avoid impacting communities with its activities, so Ambatovy has a robust grievance mechanism for reporting, assessing, and addressing all complaints. Ambatovy



Book donation

defines a complaint as “a claim or grievance filed by an individual or a group within the communities affected by the operations of the company.” Grievances can include allegations of physical or financial damage; health, safety, and environmental concerns; harassment; and improper or immoral behaviour. Any individual or community that feels negatively affected by Ambatovy’s activities can file a complaint.

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HK Group consists of **twelve** companies performing a range of services involving the establishment of companies and their ongoing activities in Madagascar. For instance:

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- Intellectual property services

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- Local implementation offices for companies under subletting contracts
- Management contracts
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mobilization of more than 5000 expatriate workers of different citizenship

HK-Interface:

- Payroll process
- Salary income tax payment
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Public consultation

Grievances within communities may be filed with any field worker or through the leading local authority, or affected parties can email or call a toll-free number. Forms can also be filed at Ambatovy offices in Antananarivo, Moramanga, or Toamasina. The process thereafter is structured and aims to be prompt in its response with a receipt or a comprehensive reply sent within 30 days of registration. Where necessary, an investigation will take place and a solution be proposed, with further action considered

if the complainant does not agree with the outcome at this stage. Solutions may be in the form of compensation or rectification.

SOCIAL INVESTMENT

Ambatovy carries out its social investment activities in two ways. "One is quick-impact donations in infrastructure and development; and the second is longer-term programmes around health, education and livelihoods," explains Burt Davis.

Education is a major issue in Madagascar, with two-thirds of the

60

Number of social agents, supervisors and co-ordinators



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population living in severe poverty and many children, particularly in rural areas, not attending school. In 2010 Ambatovy began a collaboration with UNICEF to finance the Contract for School Success programme (Contrat Programme de la Réussite Scolaire, or CPRS). The programme has significantly contributed to improved access to primary school education, retention rates and parent/community participation in education. Its aim is



School equipment donation, Toamasina

to encourage administrators, teachers, parents and students through community contracts and action plans to drive their own local educational goals and activities.

ROCKWELL AUTOMATION FLEXES ITS MV MUSCLE WITH DRIVE CONTROL FOR MADAGASCAR NICKEL MINE



Over the past year, Rockwell Automation in South Africa has been using its internal medium voltage (MV) resources, consisting of certified MV engineers, to commission 26 Allen-Bradley PowerFlex 7000 MV variable speed drives (VSDs) for the Ambatovy large-tonnage, long-life nickel and cobalt mining enterprise in Madagascar. Rockwell Automation in France, supplied the mine with 12 and 14 Allen-Bradley PowerFlex 7000 VSDs, which are fitted on either side of a 220 km pipeline that conveys nickel slurry from the open pit mine in the hills, to the processing plant below. Nearly 22 000 lengths of 60 cm pipes were welded together to form the pipeline that connects the mine with the processing plant. The pipeline has a proven design, similar to pipelines operating elsewhere in the world, and is capable of transporting 826 tonnes of slurried ore per hour. The MV VSDs from Rockwell Automation control pipeline flow and pressure throughout the 1 000-metre elevation difference.

“The pipeline’s length and the heavy nature of the slurry require that very large 3,2 MW motors are installed. The customer further required flow control to assist with a smoother hydraulic profile and help with greater energy efficiency,” says Colin Morris, Branch Manager, Sub-Sahara Export, Rockwell Automation. The PowerFlex 7000 VSD, which operates at 6,6 kV with ‘Direct to Drive’ technology, was chosen as it could connect directly to the customer’s reticulation without the use of transformers. This further contributes to energy efficiency, and by using ‘true’ MV components, also allows for excellent reliability. The VSD communicates directly to the customer’s control system, which enables optimal process control.

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Table donation at Ambodisaina School, Tamatave

Meetings take place at the start of the school year in which the interested parties discuss school results and learning conditions with a view to improving the school in general, and retention rates, in particular. Action points might include anything from improving the school environment to setting up a school canteen, or addressing students' attitudes towards

attendance. The actions required are then integrated into the school's action plan. Progress is reviewed once during the school year and again at the end of the year.

Ambatovy also runs donation and sponsoring programmes in response to requests it receives for donations. It has also worked with a US-based NGO, CURE, which receives donations of medical equipment

“EDUCATION IS A MAJOR ISSUE IN MADAGASCAR, WITH TWO-THIRDS OF THE POPULATION LIVING IN SEVERE POVERTY AND MANY CHILDREN, NOT ATTENDING SCHOOL”



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in the United States. Following a government study on the needs of hospitals in the country, Ambatovy funded the transport of ten containers of medical equipment from the US to Madagascar. It also carries out work in education, HIV awareness and child protection, working with several local NGOs who are assisting with the implementation of selected programmes. One local NGO called

ODDIT, which is attached to the Catholic Church, is carrying out water and sanitation work in schools.

CULTURAL HERITAGE

Madagascar's cultural heritage is a crucial part of its national identity, and Ambatovy is therefore committed to making sure that any cultural heritage sites, archaeological artefacts or remains are respected in accordance with local customs, scientific procedures, and International Finance



Information kiosk, Moramanga

2010

Ambatovy began a collaboration with UNICEF to finance the Contract for School Success programme

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Archaeological surveys were carried out at cultural heritage sites

Corporation (IFC) Performance Standards on cultural heritage.

Prior to the construction phase of the project, archaeological surveys were carried out at cultural heritage sites and with the help of community members, rigorously documented and mapped. In locations where remains or artefacts were found, Ambatovy followed cultural practices, local traditions, and scientific protocols to ensure minimal disruption during their relocation. All of the work during the construction phase, which was led by Professor Jean Aimé

96

Archaeological sites discovered by Ambatovy

Rakotoarisoa, was regularly monitored by national experts appointed by the Malagasy government. During construction of the pipeline, all sites were reassessed for any previously undiscovered items of archaeological interest or

value and in some cases the pipeline was then re-routed to avoid particular sites.

The archaeological team works closely with the Universities of Antananarivo and Toamasina and other institutes such as the Museum of Art and Archaeology, and a partnership agreement has been signed with the Centre for Ethnological and Linguistic



Studies and Research in Toamasina for the conservation and treatment of new archaeological discoveries. An academic book commissioned by Ambatovy will document the work and findings, which are authenticated by two Malagasy archaeologists appointed by the government of Madagascar.



Sacred stone discovery

brought tangible benefits to the area's heritage. Ambatovy's archaeological team has discovered 96 key archaeological sites and collected more than 4,500 artefacts. Between 2005 and 2010 in areas between Moramanga and Toamasina the team found 4,207 clay potteries and 192 imported ceramics. Among the 262

As there had been few previous archaeological studies and historical data linked to the region, the mine project has

cultural heritage sites catalogued were 126 archaeological sites, remains of 22 ancient villages, 23 burial sites, 55 sacred sites and

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With a history that dates back to the late 1950s, Senmin International of South Africa is a mining chemicals manufacturer and services provider. Senmin maintains headquarters in Johannesburg and a state-of-the-art manufacturing facility in Sasolburg. The company currently services Namibia, Zimbabwe, Zambia, DRC and Botswana in addition to South Africa, and is branching out into Ghana, Tanzania, Madagascar, Morocco and Egypt.

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Apart from flocculant for tailings treatment, Senmin's flotation products aid in the beneficiation of platinum, diamonds, coal, gold, uranium, nickel and copper. Senmin upholds ISO9000:2003 and 9001:2000 certifications for quality management systems, five-star accreditation with a NOSCAR award for safety in 2011 and ISO1400 and I401 accreditation for environmental management.

The company maintains internal oversight of its supply chain with all purchasing and logistics management taking place in Sasolburg.

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“INTERNALLY WE’RE TAKING ON THE ROLE OF ENSURING SOCIAL RESPONSIBILITY RIGHT ACROSS THE PROJECT”

36 sacred stones, the oldest of which date back to the 13th century and the most recent to the 19th century.

Ambatovy aims to contribute to a broader understanding of history by sharing the results of its work and submitting them for discussion. In 2011, an international conference and workshop entitled *Sociocultural Archaeology and Anthropology from the Mangoro to the Ivondro* presented the discoveries made between Toamasina and Moramanga by Ambatovy during the construction phase to an audience at

the Malagasy Academy in Tsimbazaza, with the aim of also initiating a debate on excavation strategies and improving archaeology in eastern Madagascar.

In conclusion, Burt Davis comments that corporate social responsibility is relevant to everyone in the organisation, not just the CSR department. “In Ambatovy it is everyone’s business—it’s not just down to one department, and this is something that we’re trying to press home to everyone. Internally we’re taking on the role of ensuring social responsibility right across the project.”

Even before the start of the construction phase, a major concern of the Ambatovy Project was the preservation of the cultural heritage of Madagascar, one of the components to be considered in obtaining the environmental permit.

The population showed its deep attachment to ancestral values during Ambatovy's surveys and public consultations. Ambatovy did everything during this stage to honour the trust of the population. Cultural and religious sites and archaeological remains have been spared from any form of degradation. In addition, in order to safeguard the integrity of the cultural heritage, Ambatovy decided to preserve them during construction. Without this precaution some sites of enormous value, in terms of understanding Madagascar's past, would have been lost forever.

Today, Ambatovy has not only fulfilled its mission of preservation but has also contributed significantly to improving the knowledge of the history of Madagascar and in particular the eastern region between the mine in Moramanga and the plant in Tamatave. Hundreds of archaeological sites covering the period from the ninth to the nineteenth century were updated. The archaeological team was able to collect over 4,000 relics, most of which are composed of local pottery shreds, imported pottery, glass and bones.

A first analysis of these remains showed physical evidence of the importance



RESPECTING CULTURAL HERITAGE

Ambatovy has contributed significantly to improving the knowledge of the history of Madagascar

**WRITTEN BY: J.A. RAKOTOARISOA
AND ERICK RANDRIANASOLO**

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of trade between the highlands of the hinterland with the east coast. These findings are currently being temporarily stored in a small area of CEREL (Centre for Ethnology and Linguistics Studies and Research) at the University of Toamasina.

Finally, for 2013, Ambatovy plans to construct a building to house the museum collection and make it available to researchers and the general public. These substantial findings were made through the implementation of a specific methodology at each stage of construction. Two major imperatives had to be addressed: avoid site spoliation without delay to construction. To this end, the archaeological team informed the local population about the imminence of the work and verified that all sociocultural barriers were lifted. For sensitive monuments such as burial sites, expiatory rituals were organized to ask for the ancestors’ blessing and protection.

The arrival of earthmoving equipment

RAJONSON RAKOTOMENA NOROSOA

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A selection of relics collected by the archaeological team

“AMBATOVY PLANS TO CONSTRUCT A BUILDING TO HOUSE THE MUSEUM COLLECTION AND MAKE IT AVAILABLE TO RESEARCHERS AND THE GENERAL PUBLIC”



4,000+

Number of relics the archaeological team was able to collect

to involved areas was always preceded by the archaeological team to report the monuments to those responsible for construction. A permanent dialogue between the Ambatovy team and that of SNC-Lavalin and its contractors helped to establish a climate of trust.

Site valorisation work and archaeological investigation must be pursued in order to obtain the social and cultural license from the population to whom the company is accountable. It is important and urgent to show them that we have fully complied with all their requirements. All cultural and sacred sites have been identified and inventoried. The Ministry of Culture and Heritage is expecting concrete action for the protection and valorisation of the sites, the most important of which will be subject to rehabilitation or even a development project with the involved communities.

The results of the archaeological works will be the subject of a scientific publication which is being developed by Professor Jean-Aimé Rakotoarisoa who created and led Ambatovy's archaeological team between 2005 and 2009. **BE**

The results of the archaeological works will be the subject of a scientific publication

THE ENVIRONMENTAL IMPERATIVE

The entire Ambatovy project is located in a biodiversity hotspot in Madagascar, so the minimisation of its impact and the restoration of the mine site are interlinked

WRITTEN BY: BECKY DONE & MARTIN ASHCROFT
RESEARCH BY: ROBERT HODGSON

To approach the inevitable environmental issues that accompany a project of this size and scale, Ambatovy is employing two strategies.

The first is to mitigate impacts through responsible engineering and technology; and the second is to offset residual impacts with conservation efforts.

Management plans have been produced in respect of water, air, noise, soil, waste, flora, fauna and aquatic resources, and are designed to preserve the environment and advance scientific knowledge. The organisation has committed to implement adaptive, environmental management plans to ensure compliance with national and international standards throughout construction, operations and closure; to minimise all residual impacts through the implementation of a best-practice mitigation hierarchy and offsets programme; to manage environmental risks by enhancing stakeholder involvement through transparency, continuous consultation and timely feedback with the public on emerging environmental issues; and to track operational performance and emissions to ensure that compliance levels are met and that operational control systems are functioning optimally.

Ambatovy works in close collaboration with the ONE (Office National pour l'Environnement), which must approve all environmental plans before implementation. ONE reviews Ambatovy's performance on a regular basis through intensive field verification, making recommendations

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for improved compliance and imposing sanctions if warranted.

“The entire project is located in a biodiversity hotspot in Madagascar, so the minimisation of our impact and restoration of the mine site are interlinked,” explains environment manager Andrew Cooke. “The fundamental point to note is that we apply a tool called the ‘mitigation hierarchy’ which is the standard approach required of projects funded by the World Bank, for example. This means that firstly,



Orchid

we do our best to avoid impacts—and that includes the project design; then we try to minimise any impacts from our construction and operations; and finally we will restore any impacted sites.”

Ambatovy’s Biodiversity Management Plan (BMP) encompasses scientific conservation actions for targeted flora, fauna and aquatic resources, using

the following key objectives: no net loss of biodiversity and preferably a net gain; no loss of species and no net reduction in

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“ONE EXAMPLE OF AMBATOVY’S WORK TO PRESERVE BIODIVERSITY IS ITS LEMUR MANAGEMENT PROGRAMME”

the population of any endangered species; minimised impacts on flora, fauna and aquatic resources; increased conservation of rare habitats; priority habitat viability assured by maintaining or increasing ecosystem connectivity; and close links between Ambatovy’s biodiversity activities and regional initiatives.

One example of Ambatovy’s work

to preserve biodiversity is its lemur management programme, which is designed to maintain population viability of Madagascar’s most famous inhabitants within the mining area. To do this, Ambatovy has been employing the capture, mark and radio-track technique. Since 2007, a total of 140 lemurs belonging to seven species living in and around the cleared forest

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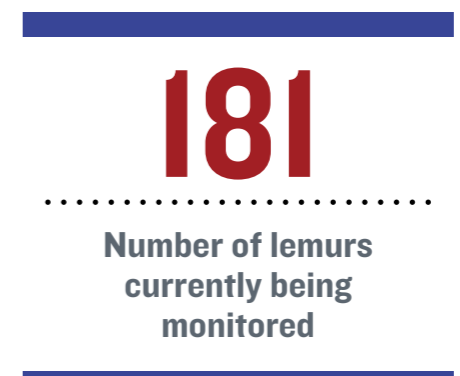


Technician tracking lemurs

and refuge areas have been equipped with radio collars. This has enabled technicians to follow and monitor 181 individual lemurs (carriers of radio collars and members of the groups without collars) from 48 groups. This radio-tracking methodology enables the monitoring of lemur movement and behaviour and determines whether they are able to adapt to a new home range over time. Tree-top bridges were installed to maintain

habitat connectivity, allowing lemurs to cross trails and roads cut by mining activity. A community-level assessment also helped evaluate local hunting pressure on wildlife and design suitable refuge areas.

Since 2009, a total of 35 new-born lemurs have been observed within Ambatovy's conservation areas. Of these, 16 came from groups that were displaced to special refuge areas. The relatively high





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number of recent offspring indicates that these lemurs have successfully adapted to their new environment. Ambatovy has also developed biomedical health monitoring systems to help ensure the long-term survival of lemur populations affected by the project.

Thirty three species of mammals other than lemurs are also monitored by the project, including endemic rodent and carnivore species. A conservation



The mouse lemur, *microcebus*

strategy for the endangered northern shrew tenrec is also being developed.

To ensure the continued viability of amphibian and reptile species affected by the project, Ambatovy's amphibian and reptile management programme carries out pre-clearance species inventories and salvages live animals to conservation forest refuge areas. Between 2007 and 2010 the program salvaged more than 14,000 reptiles

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The endangered mantella aurantiaca

(54 species) and amphibians (55 species) and it will continue until forest clearing operations have been completed.

In particular, a specific conservation programme has been developed for the endangered frog golden mantella (mantella aurantiaca). Ambatovy has supported regional surveys to identify the distribution of the frog and its critical habitats and is

working with experts to identify the steps required to maintain viable populations in the mine area. Ambatovy considers mantella aurantiaca as a flagship species for its conservation efforts.

As well as its animals, Madagascar is also home to some rare or unique species of plants, so Ambatovy also has a flora management programme, too. Excavating

“A SPECIFIC CONSERVATION PROGRAMME HAS BEEN DEVELOPED FOR THE ENDANGERED FROG GOLDEN MANTELLA (MANTELLA AURANTIACA)”

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the ore requires forest clearing, so, with the help of the Missouri Botanical Garden, Ambatovy has identified plant species known to exist only within the mine footprint and one or two other sites in Madagascar. These plants are categorized as Species of Concern (SOC).

For these SOCs, Ambatovy has developed a comprehensive ex-situ conservation program including whole-plant salvaging, seed collection, plant propagation, and the development of living collections for progressive rehabilitation of the mine footprint. Searches for viable populations of SOCs are also being conducted in the mine conservation forests. This search effort is ongoing and has resulted in the progressive reduction in the number of species requiring ex-situ conservation. From an initial list of 173 SOCs, the number still requiring special salvaging has been reduced to eight species and is expected to descend to zero as the offsite surveys continue.

Another area of environmental concern for Ambatovy is waste minimisation and recycling. Where recycling options aren't

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“AS WELL AS ITS ANIMALS, MADAGASCAR IS ALSO HOME TO SOME RARE OR UNIQUE SPECIES OF PLANTS”



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Plant conservation

available, the responsible disposal of waste is carried out. The project complies with all the international regulations relating to hazardous waste, which is treated appropriately—sometimes by incineration, sometimes by export. On the whole, however, the project isn't a great generator of hazardous waste: essentially earth is being extracted from the land and processed into nickel, and the project is not generally dealing with complex organic pollutants.

173
.....
Species of Concern (SOC) identified within the mine footprint

Waste at the plant site is mainly mineral pollutants ranging from acids to alkalines. Like all mining projects, the operation generates tailings, the sterile material remaining after the nickel has been extracted. These materials are neutralised so they're no longer acidic, and then they are pumped to a secure tailings lake which will eventually be replanted and covered over with vegetation at the end of the project life.

Ambatovy does generate water waste,



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“AFTER THE MINE CLOSES ALL AREAS WILL BE RESTORED AND REPLANTED IN ORDER TO BLEND IN WITH THE SURROUNDING FOREST AS FAR AS POSSIBLE”

which is enriched by a number of different minerals because of the extraction process. This is discharged into the ocean using a diffusion mechanism, or outfall. By this means a high dilution factor is achieved, which means Ambatovy has a relatively small zone of impact from the outfall—only a matter of tens of metres—and outside that zone, levels of minerals are potentially reduced to the ambient levels of seawater.

“This way we avoid impact in coral reefs and fisheries,” confirms Cooke.

Mine closure, of course, is always a major concern in terms of aesthetics and functionality. “We have a mine footprint of about 1,500 hectares which is a series of pits, roads and other areas,” says Cooke. “After the mine closes these will all be restored and replanted in order to blend in with the surrounding forest areas as far as possible.”

There are a lot of technical challenges involved in this process, however. Ambatovy is working on an ultramafic site where the soils are very alkaline, so it is taking special measures to restore soil and then re-plant it with native species on an ongoing basis.

Ambatovy also has in place a comprehensive community-based restoration plan which looks closely at the restoration of the mine site in terms of benefits to the region. The south end will consist of community forest and production forest, and the north end will be biodiversity forest, designed to replace loss of ecological function—in other words, it will be habitat for lemurs and other wildlife. The mine site is surrounded by an area of forest that is around three times the size of the mine site footprint itself, and this forest is unoccupied. “It’s near-primary forest and it will be maintained as a conservation area,” says Cooke. “The fact that we have a green ring around the footprint will help restoration over time, and this is an important part of our restoration strategy.”

Ambatovy is open to visitors, so if you want to see the operation for yourself, you can. Welcoming visitors helps to consolidate the process of transparency. Before setting out on a guided tour, visitors are briefed on Ambatovy’s activities as well as its commitment to social and environmental stewardship. **BE**

For more information about
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Frog, mantella crocea



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