Sand Dune Stabilisation
&
Poverty Alleviation in Madagascar
Using
The Vetiver System

by

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The presentation focuses on the following:

A brief overview of Madagascar.

The Poverty Alleviation program set up to address the environmental requirements during the construction phase of the Rio Tinto Ilmenite mine.

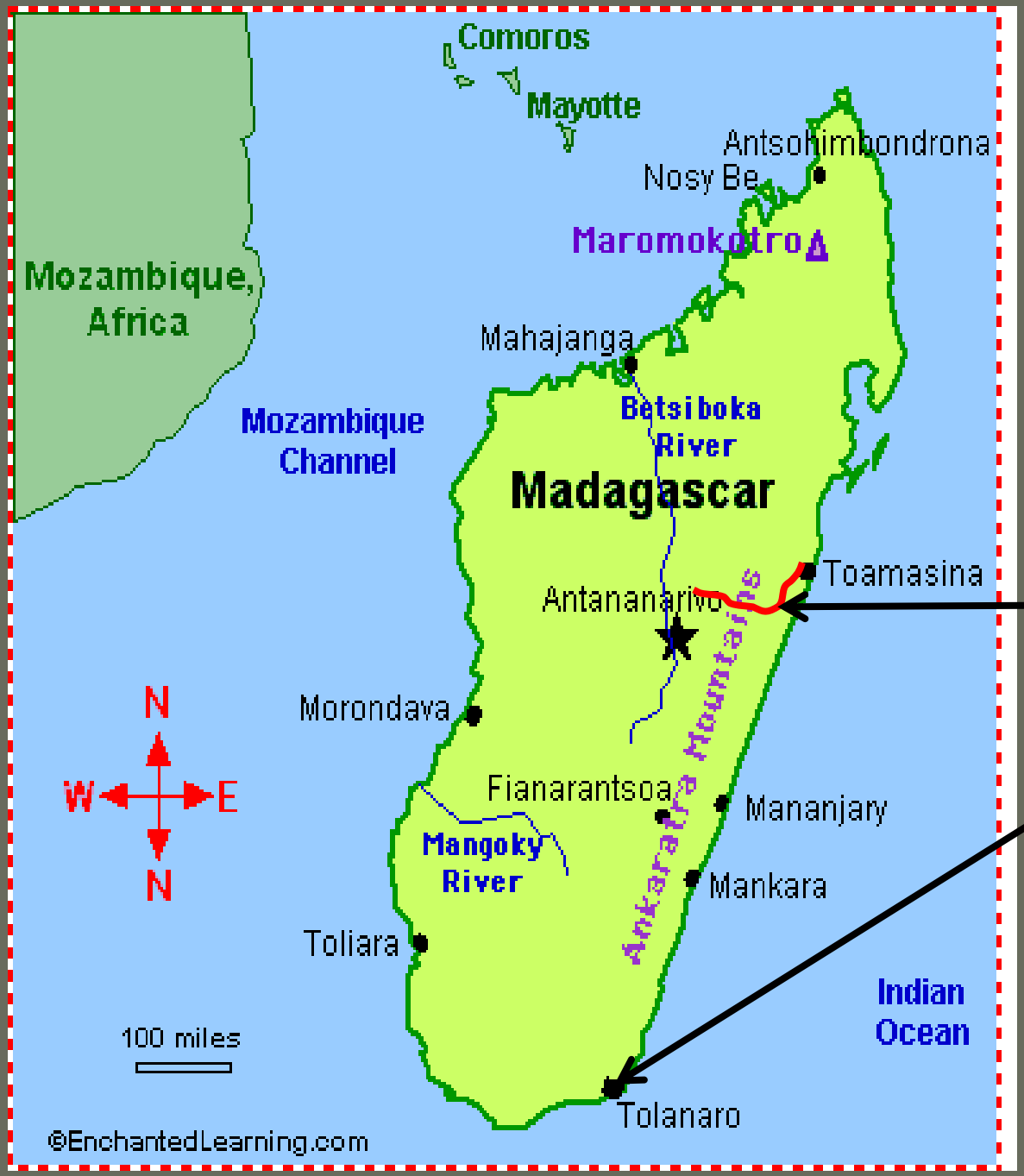
The erosion control and vegetation establishment process implemented on the project.

The expansion of the technology and community based participation concept which extended to the Ambatovy Nickel pipeline project in Madagascar.

The setting up a local company for training of communities in Vetiver propagation & poverty alleviation by Yoann Coppin of Le Plantation Bemasoandro.

Madagascar Demographics

- 4th biggest Island in the world with a population of around 20 Million.
- 80% of population live below the poverty line.
- Only 54% of population in urban areas & 4% in urban areas have access to potable water.
- Life expectancy is 52 years with 46% literacy.
- Infant Mortality is 89 per 1,000
- Economic isolation for many communities resulted from the collapse of the regional & national road network system with 80% of roads impassable for up to 12 months per year.
- Massive environmental (biodiversity) degradation.



Location of Projects in Madagascar

Ambatovy Nickel Slurry Pipeline Project

Rio Tinto/QMM Ilmenite Project

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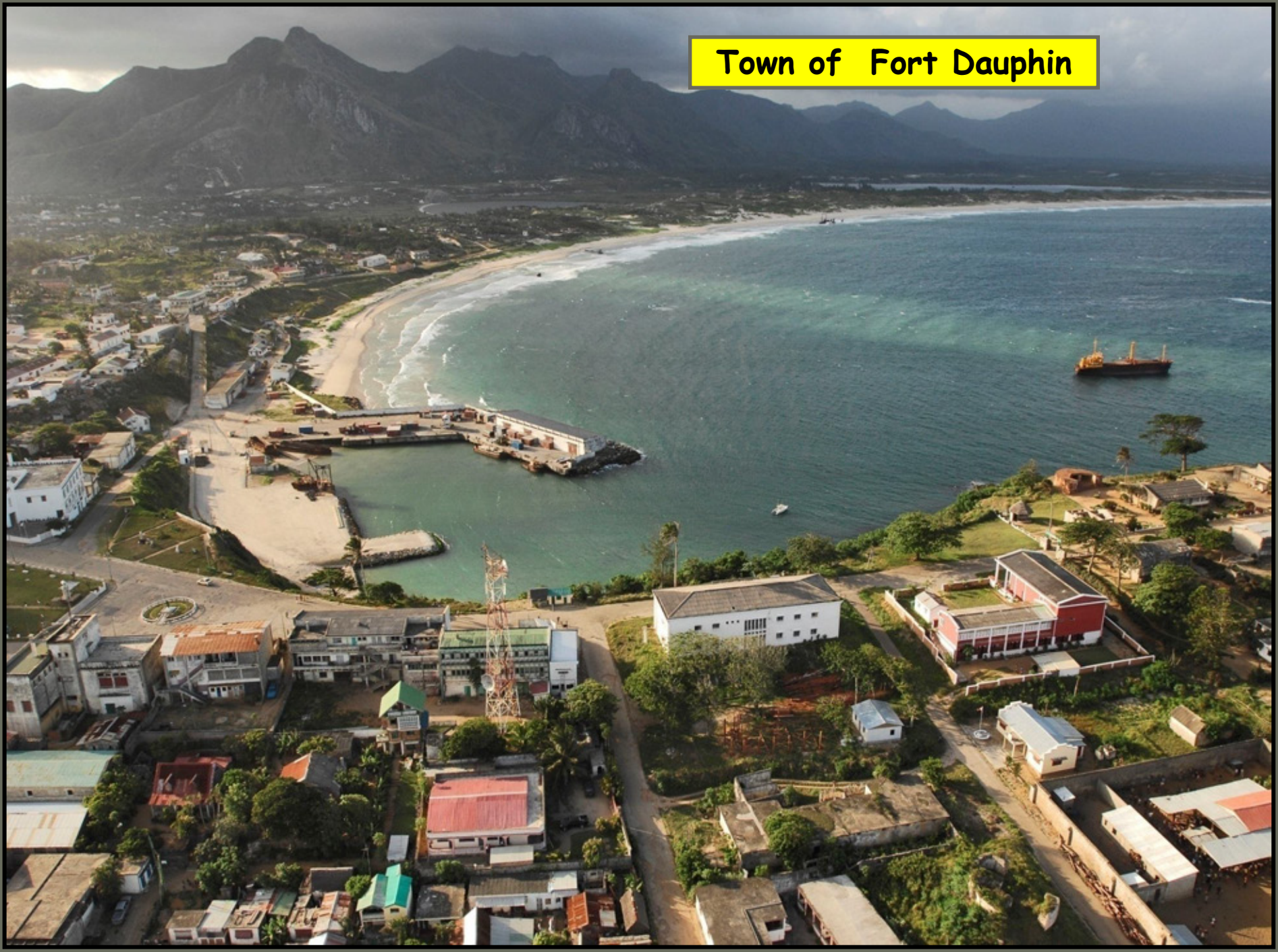
Town of Fort Dauphin

One of Local Community Groups in Fort Dauphin-Fishing Village

Typical Fort Dauphin Mode of Transport

26 February 2008

Ilmenite Wet Plant

26 Febriuary 2008

Ilmenite Processing Plant

Excavation through the Ehoala dune cutting

Restoration Objectives

- Restore the natural coastal dune vegetation on all construction areas.
- Applied Vetiver & other Bio-Engineering techniques as an intermediate erosion control mechanism.
- Set up nurseries and provide training to the surrounding local communities.
- Apply a hydroseeding mixture to the Vetiver areas.
- Interplant with native dune vegetation – Scaevola spp.

The Project

- Started in 2006 with 15 communities.
- Expanded to 32 communities by 2008
- Involved 168 families from the 32 communities over the project period (QMM Statistics).
- 40 hectares were stabilised and re-vegetated.
- 4,000,000 plants were propagated & supplied.
- All Vetiver material sourced locally.
- Applied a hydroseeding mixture to all areas
- Commercial and locally harvested native grass seed species used in mixture
- Interplanted Vetiver areas with native dune vegetation – Scaevola spp.

Vetiver Sources

Vetiver plant material was sourced from surrounding areas within a 50 km radius and no planting material was imported or introduced from outside areas.

Vetiver Sources


Local Village supplying Vetiver plants


Local Villagers queuing to sell their Vetiver planting material

Madagascar's
own
Vetiver
"Rastafarian"
carrying his crop
to the local
collection point.


Local Village supplying Vetiver plants


Collection point for Buying Vetiver plants from Local communities

Selected families from the Vetiver propagation community

- Andre & Auguste Mahalogny family from the Mangaiky Village.
- Antahova family from the Mangarivotra Village.
- Maria Agnes family from the Mandromdromotra Village.

HYDROMULCH Supplied every Farmer unit with:

- Potting bags
- Plant material
- Fertiliser
- Watering cans

PAYMENT in 3 phases – 1/3 after planting, 1/3 once established and balance on collection.

FARMERS IMPUT – to supply soil, labour and suitable growing area.

Mahalogny Family


Vetiver Nursery


Proceeds from Vetiver supply

Proceeds from Vetiver supply

Token of Appreciation by Vetiver Supplier/Farmer

Antahova Family


Vetiver Nursery-Covering every available space around dwelling


Vetiver propagation by all family members

An Ex-Ray of the broken arm of the Antahova mother showing her fractured arm. Hydromulch/Rio Tinto flew her to the capital, for medical attention.


Maria Agnes Family

Family Participation- Skills development

Proceeds from Vetiver supply

This community based "Vetiver propagation program" generated approximately (US $ 250,000.00) collectively to the respective communities within the construction period covering their labour & time related costs - All other costs (Vetiver slips/plant material, watering cans, potting bags, NPK fertiliser, transport etc) were paid for by Hydromulch.

It is most interesting to experience the positive outcome that has been generated by the community program where some farmers have benefited from the financial returns on their efforts and invested their returns in buildings and cattle.

Some families still to this day provide plant material to the mine.

Furthermore, the technology and community based participation concept expanded to the Ambatovy Nickel pipeline project as well as Yoann Coppin setting up a local company for training of communities in Vetiver propagation & poverty alleviation.

A Brief Review of the Rio Tinto/QMM Ilmenite Project Erosion Control & vegetation Establishment Process at Fort Dauphin, Madagascar

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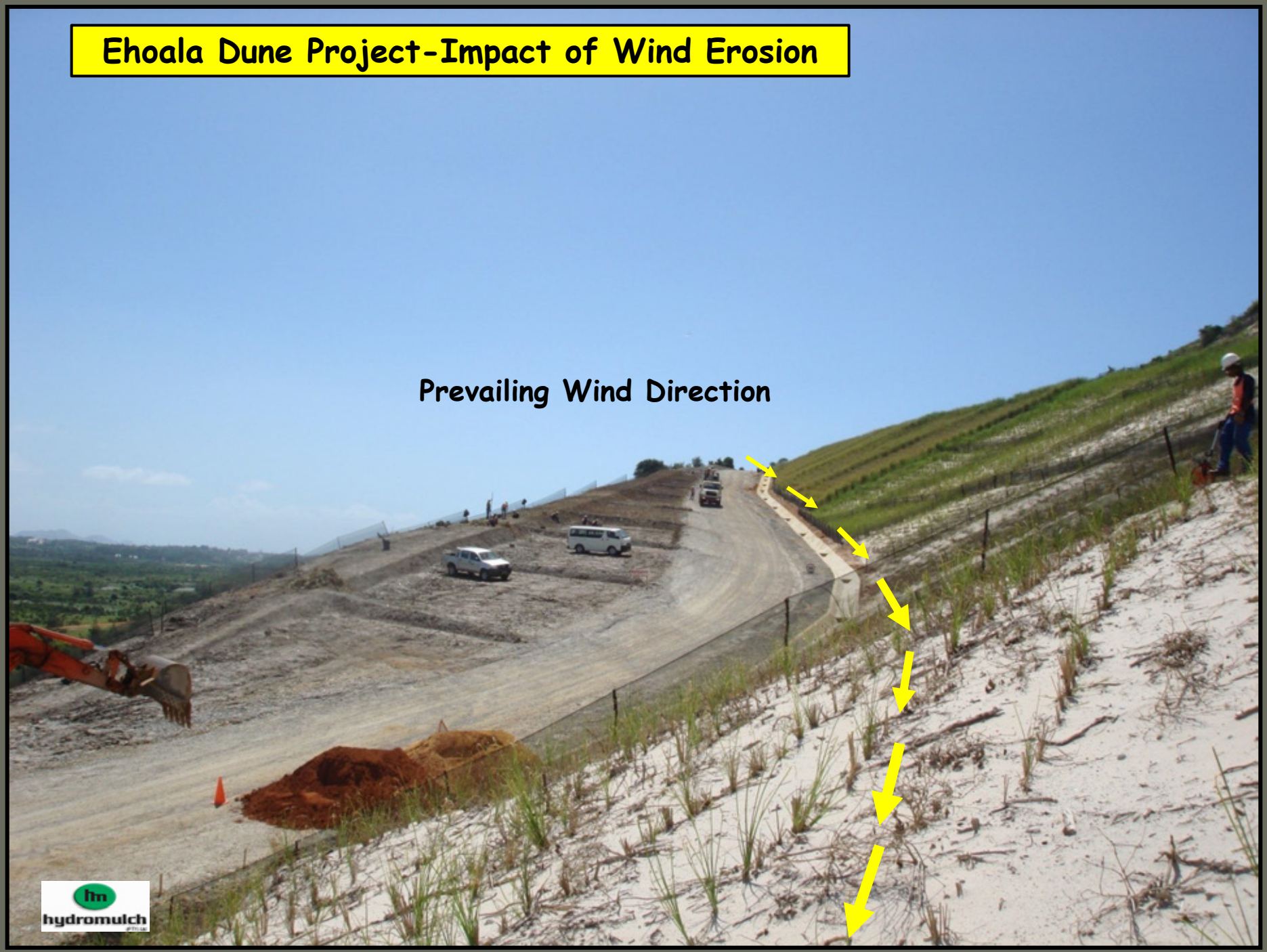
Ehoala Dune Project-Impact of Wind Erosion




Planting design to divert "Surface Water Runoff back to concrete lined drain
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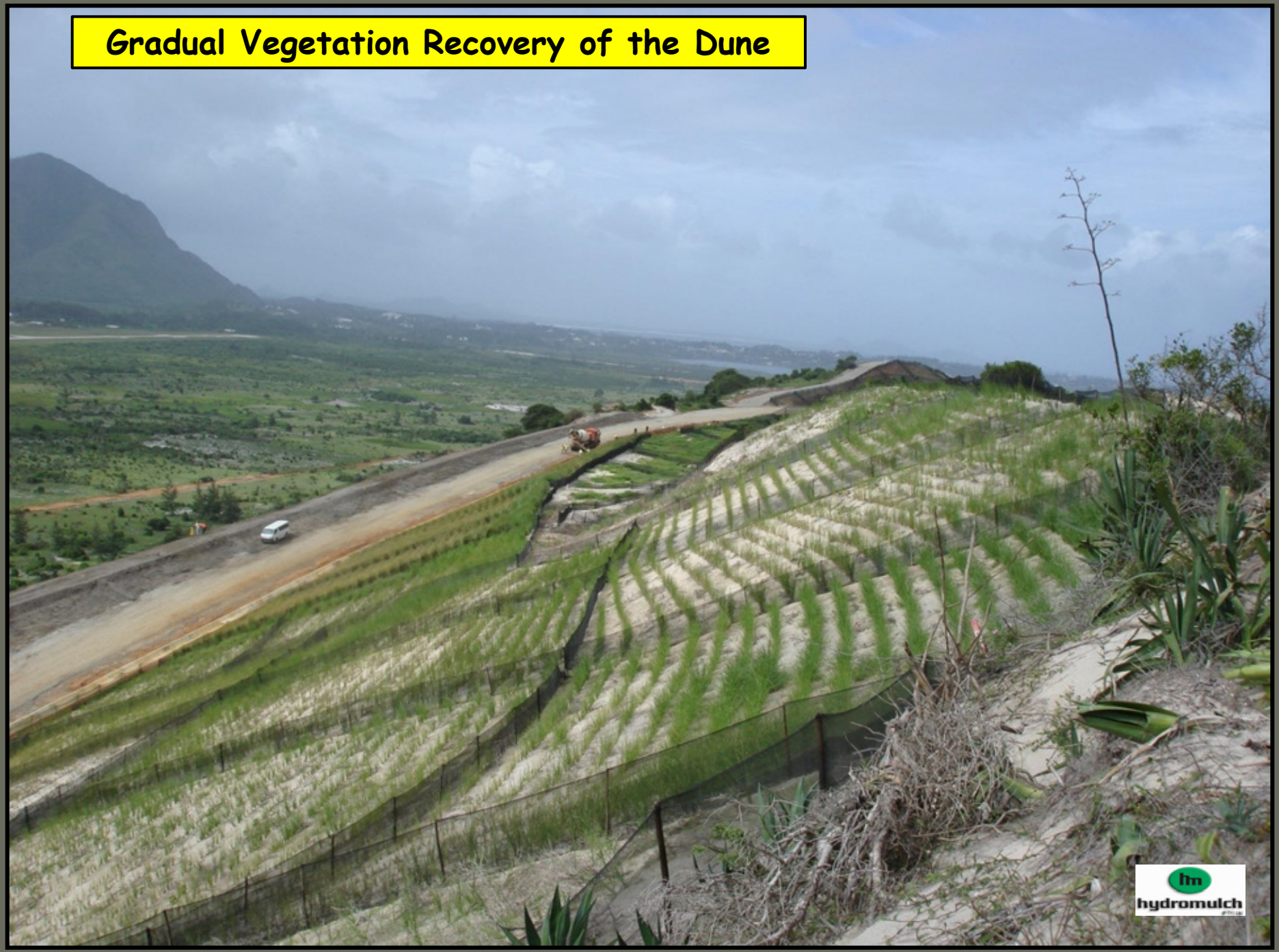
Stabilised coastal dune at Rio Tinto, Fort Dauphin, Madagascar

Gradual Vegetation Recovery of the Dune



The Hydroseeding Mixture

The Vetiver areas were hydroseeded with commercially available grass species:

***Eragrostis curvula* and *E. tef*, *Chloris gayana*, *Cynodon dactylon*, *Panicum maximum*, *Paspalum notatum* and an exotic clover for nitrogen fixing – *Trifolium subterranean (Clover)*.**

Locally native grass seeds collected by local communities included and were added to the mixture :

***Stenotaphrum dimidiatum* (Buffalo Turf Grass), *Dactyloctenium aegyptium* (Common Crowfoot), *Imperata cylindrica* and *Cynodon dactylon*.**

A soil binding agent, HydroPam, an Organic compost supplement, NPK fertiliser, Agricultural lime, Mulch was incorporated with the hydroseeding mixture.

FINN equipment coupled to a 4x4 truck was used for the hydroseeding application.

HydroSeeding the dune cut


Scaevola taccada, interplanting on the Ehoalo sand dunes.
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Maintenance of the dune cut


Bio-Diversity of Vegetated slope
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A Vetiver Plant
removed from
the Ehoala dune
8 months
after planting.

Interesting to note
the extent of the
root system that
grew on the infertile
sandy dune material

ANALYTICAL REPORT

SGS

SGS South Africa (Pty) Ltd.

Laboratory Services

Page 1

S A N A S

Method	Accr	Analysis	Units	1	2
SGS STP 022	SANAS	N	%	[illegible]	[illegible]
SGS STP 022	SANAS	P	%	[illegible]	[illegible]
ICP-OES		K	%	0.86	0.74
SGS STP 022	SANAS	Ca	%	[illegible]	[illegible]
ICP-OES		Mg	%	[illegible]	[illegible]
ICP-OES		Na	%	[illegible]	[illegible]
ICP-OES		S	%	[illegible]	[illegible]
SGS STP 002	SANAS	C	%	[illegible]	[illegible]
ICP-OES		Zn	mg/kg	[illegible]	[illegible]
ICP-OES		Cu	mg/kg	[illegible]	[illegible]
ICP-OES		Fe	mg/kg	[illegible]	[illegible]
ICP-OES		Mn	mg/kg	[illegible]	[illegible]
ICP-OES		B	mg/kg	[illegible]	[illegible]
ICP-OES		Mo	mg/kg	[illegible]	[illegible]

Notes:

Responsible Analyst

Lab Manager


Before
hydromulch

After

Rehabilitation of an Erosion Gully on the Project

- The erosion gully was repaired and stabilised using Vetiver hedge rows, wind barrier netting & Hydroseeding.
- Work started in 2007.
- By 2008 the gully was well established and the Vetiver grass hedge rows were healthy & strong.
- By 2010 the Vetiver had receded and disappeared. The native vegetation has now completely taken over.


2007
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2008
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2010
Native Grasses – Stenotaphrum spp.
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The expansion of the VS technology with community based participation concept extended to:

The Ambatovy Nickel pipeline project in the north east of Madagascar, under the supervision of

SNC Lavalin.

&

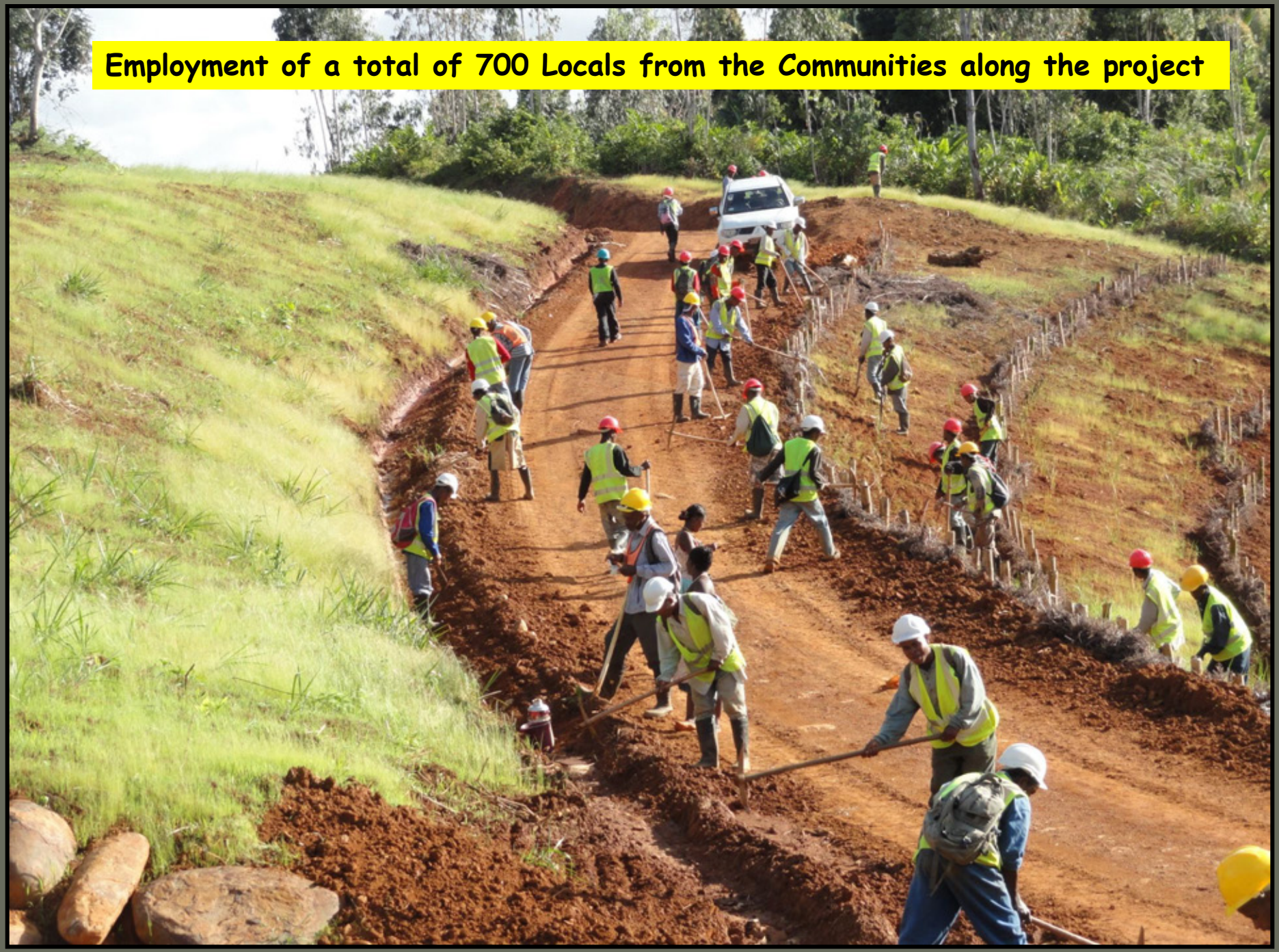
The setting up a local company for training of communities in Vetiver propagation by Yoann Coppin (La Plantation Bemasoandro).

HYDROMULCH had in addition to its community participation, employed 52 people from the local community who have, over the past 36 months been working on the project and have been trained in various skills ranging from seed collection, planting techniques for Vetiver on contours, maintenance of vegetation, placing barrier netting, soil preparation and hydroseeding.

Many of the old HYDROMULCH staff have joined the QMM environmental team and are continuing with the experiences learned over the construction period.

New Mine Site

Ambatovy Nickel Slurry pipeline project-2 year Project


Employment of a total of 700 Locals from the Communities along the project

Community Vetiver Training Class by Yoann Coppin


Vetiver Nursey
09/04/2010
La Plantation
Bemasoandro


Pre-Grown Vetiver Strip by Yoann Coppin
10/04/2010
La Plantation
Bemasoandro


Community Vetiver Training Class by Yoann Coppin
La Plantation
Bemasoandro

Logistic of moving Vetiver Strips across River


Preparation of Canal Embankment
La Plantation
Bemasoandro

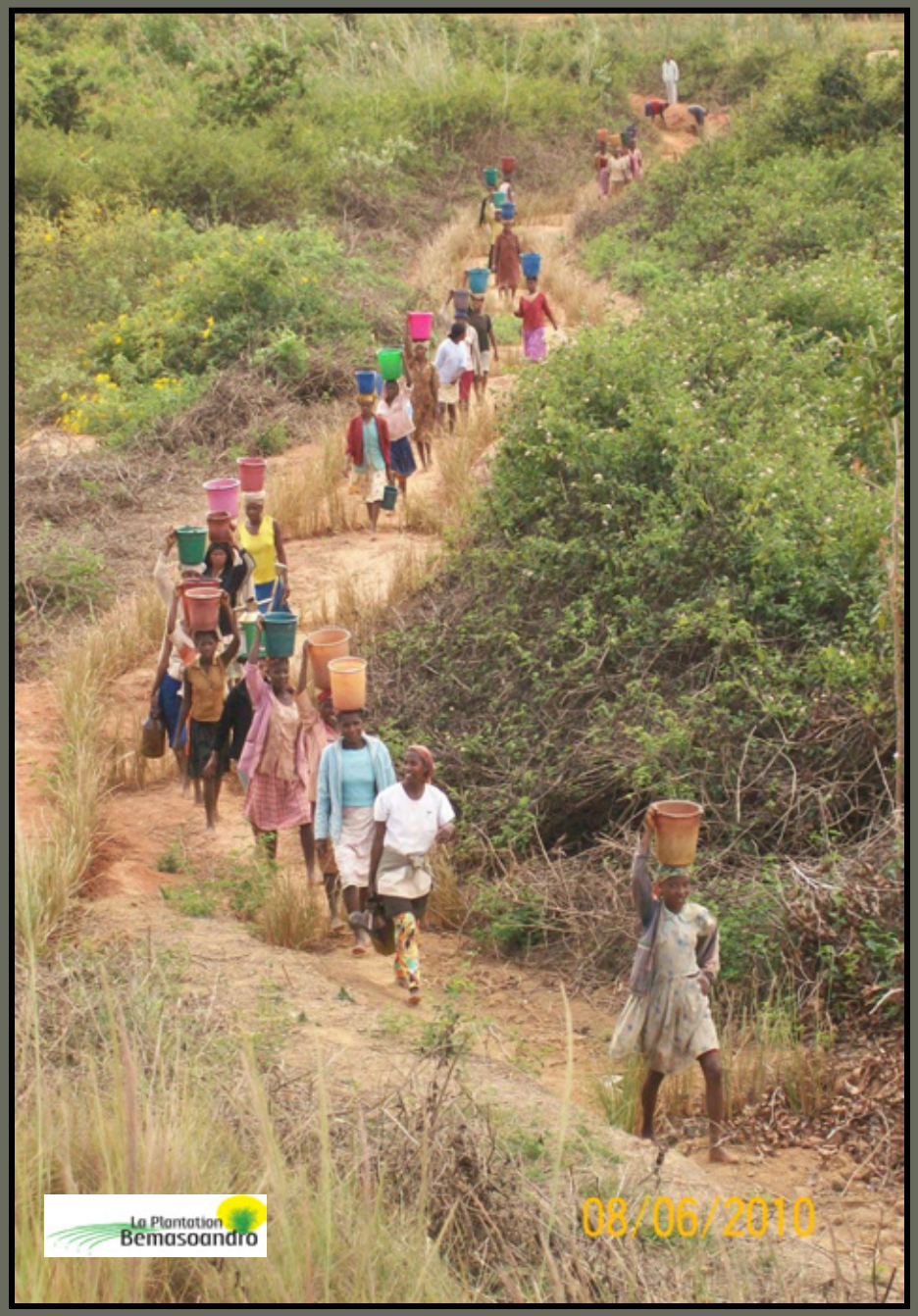

In field Vetiver training Class by Yoann Coppin
La Plantation
Bemasoandro

Vetiver hedge rows planted along the embankment of the canal.

Note

The community participation
And
Protection of the shoulder break point


Canal embankment with established Vetiver grass
27/08/2010
La Plantation
Bemasoandro



Local community members
carrying out
watering of the planted
Vetiver hedge rows
as apart of the
maintenance requirements

Also Note how the Ravine
has been planted
with
Vetiver Hedge Rows


Thank you
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