



**CSR-EMP INTEGRATION
AND
VETIVER SYSTEM
in Mining Industry**
NATURE AT OUR SERVICE



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What do we do to the nature in mining for raw materials supply for the developmental needs?



Dump at Western part of OB-II Quarry



HUB

Quartzite

Ni-Limonite

OB-II Quarry



Local bench slope failure in OBX Quarry





Plantation successful. What about erosion?





Heaps of fines of iron ore end up in the river catchment. (Gua)



Drained Efforts!



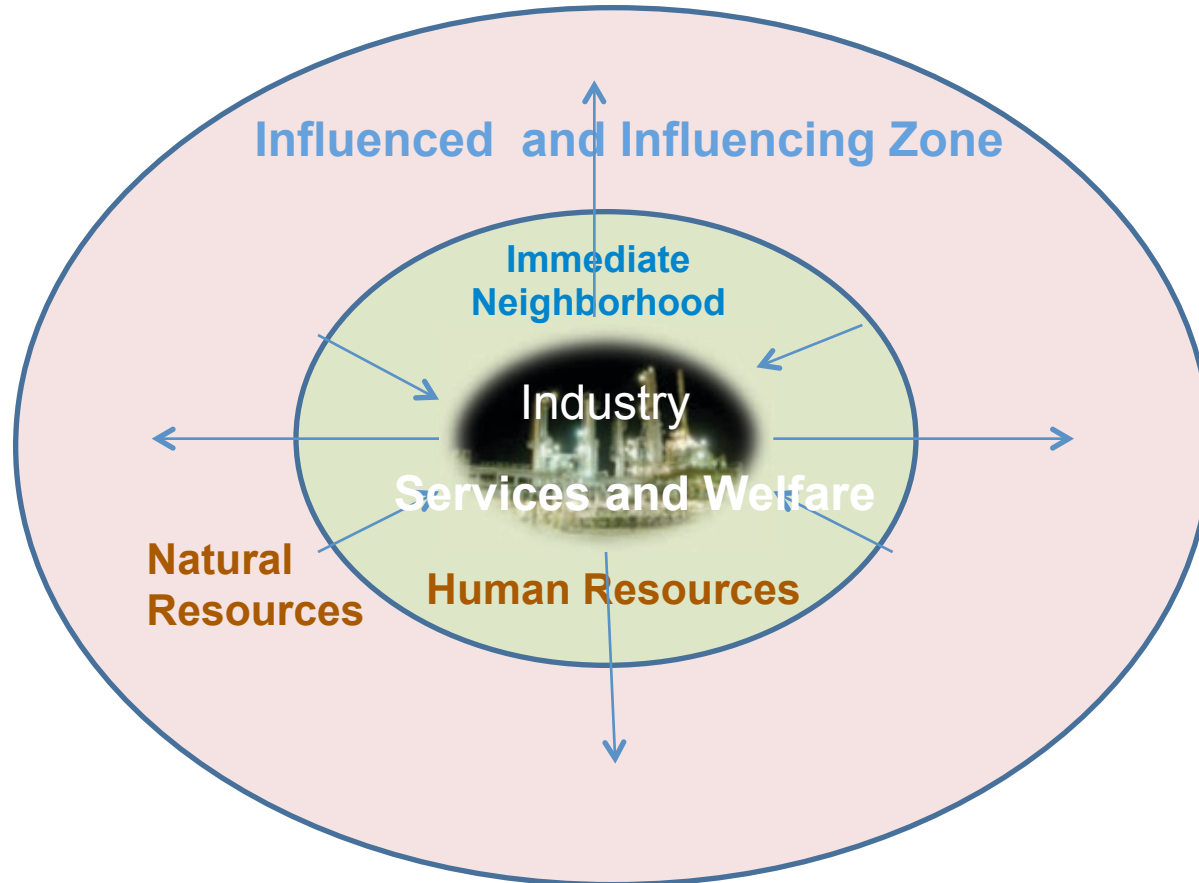


Rain and Spoil Dump leads to siltation on river



What is needed for CSR?

- Empowerment-oriented and strengths-based practices focusing on community participation in larger goals

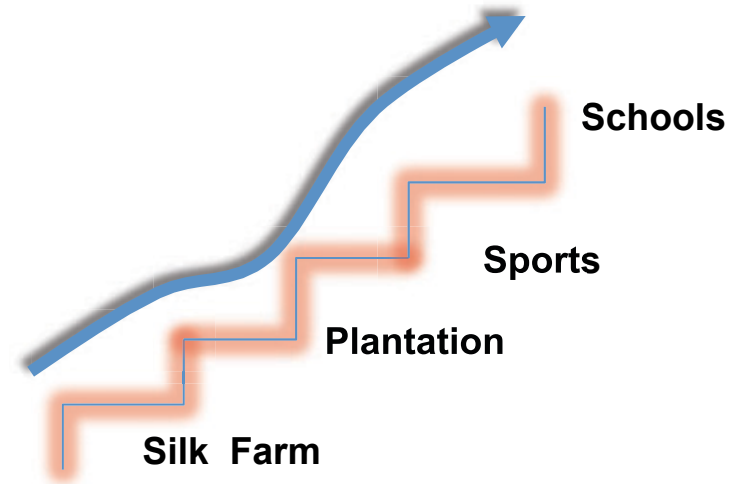


✓ Focus on

- ❖ community involvement
- ❖ strengths, self-direction, and empowerment of users.
- ❖ Stakeholder Integration and Stakeholder Engagement

Well Known for Its CSR, the corporates traditionally

- Supports education
- Supports NGOs
- Provides facilities
- Provides training
- Assists to earn



With Highly motivated and well executed EMP, companies

- win environmental awards
- demonstrate conservation and protection of environment
- aspires environmental harmony

....however, Challenges Grow Everyday.....

Mining company needs to ask themselves.....

- **Can we help the community to fix CO₂**
- **Can we provide the community renewable domestic fuel source?**
- **Can we provide the community sustainable economic activity?**
- **Can we help community to reduce carbon footprint?**

CAN THESE BE IN A NATURAL WAY?

What I learn from the Internet and going through Dr. Paul Troung's work is to say

YES !

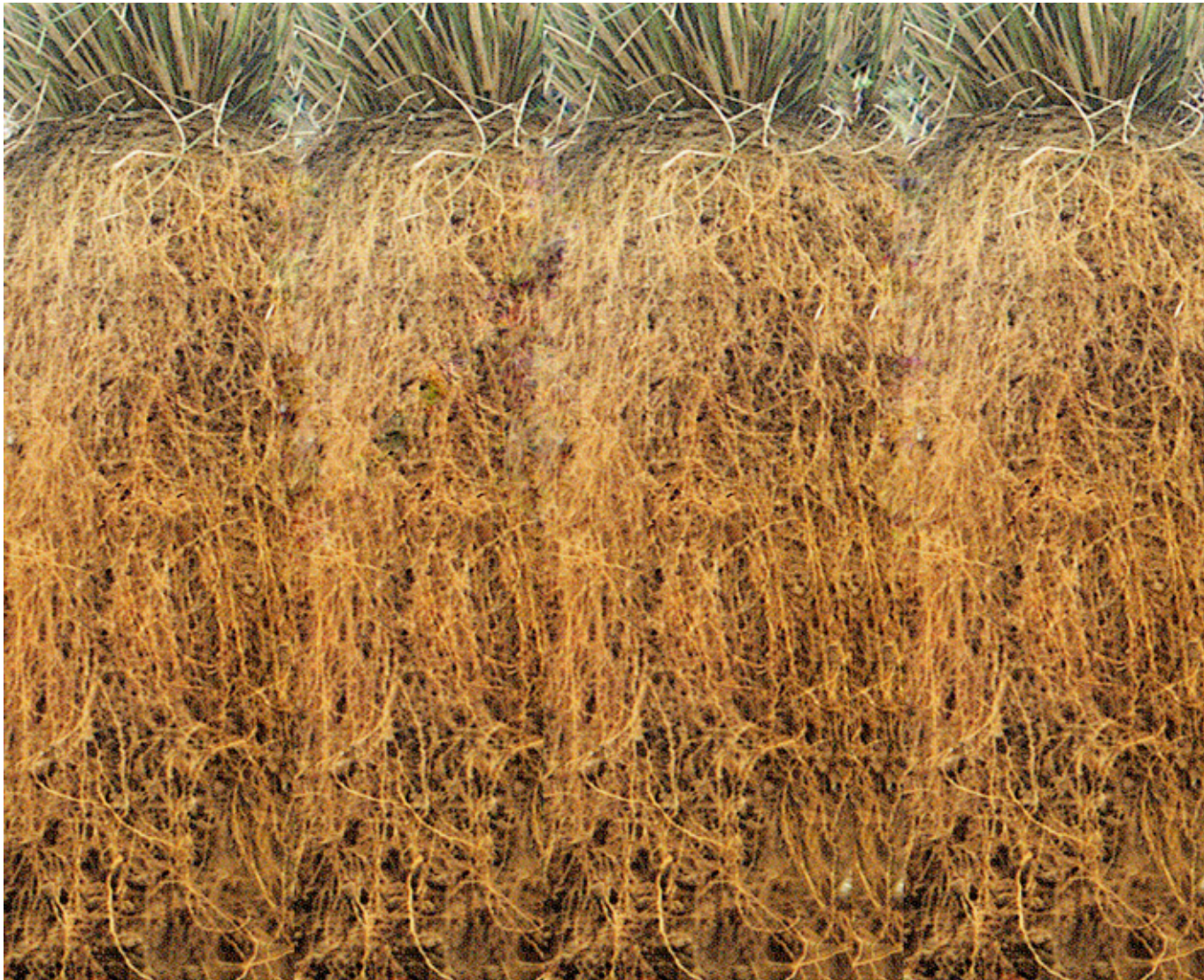
When Nature is at our Service.....



Vetiver Grass can contribute to a solution!



I saw pictures: difficult to believe
Longitudinal section of a vetiver hedge





**China - excavated root.
Average tensile root
strength 75 MPa**



We noted.....

Deep, extensive and penetrating root system

- **Although classified as a grass, for land stabilization purposes, Vetiver plants behave more like fast growing trees or shrubs. Per unit area Vetiver roots are stronger than tree roots.**
- **Extremely deep and massive finely structured root system, capable of reaching down to 2 to 3m in the first year. Many experiments show Vetiver grass can reach 3.6m in the first 12 months on fill slope**
- **This extensive and thick root system binds the soil and at the same time makes it very difficult to be dislodged and extremely tolerant to drought.**
- **Vetiver roots can penetrate compacted soil profile such as hardpan and blocky clay pan common in tropical soils, providing a good anchor for fill and topsoil.**

Requirement for plants for use in phytoremediation

(Phytoremediation is a technology, based on application of plants as solar driven and living technology **for improving environmental sanitation and conservation** problems)

1. **The plant must have high threshold limit against toxicity.**
2. **Fast growing**
3. **Extensive root system**
4. **Ability to grow in adverse agricultural conditions**
5. **Long living, perennial.**
6. **Ability to extract toxic materials from soil/water**

Vetiver has all the above quality

A LOW-COST TECHNOLOGY FOR:

- ❑ Soil and water conservation (on-farm and off-farm)**
- ❑ The stabilization of soil related infrastructure, and the containment of sediment from such structures**
- ❑ Rehabilitation of wasted and ecologically damaged sites and the containment of such sites against future disasters**
- ❑ Water-pollution and waste management**

With co-lateral benefits :

- ✓ As a source of feed for livestock and wild life**
- ✓ For pest control (intercropping, bio-pesticide)**
- ✓ For handicraft (baskets, hats)**
- ✓ In building construction (bricks, roofing)**
- ✓ For water purification and medicinal purposes**
- ✓ Vetiver grass, leaves and roots as ingredient for cosmetics**

Work in Guwahati



Slope before plantation



plantation of vetiver

..... and after 3 months



HOW VETIVER WILL HELP THE COMMUNITY?

- Assist in raising cattle with supply of fodders
- Provide substitute of fuel wood with dung cakes with vetiver shoots
- Thatching and wall materials
- Handicrafts and artifacts material and alternative earning
- Compost materials from green mass
- Increased productivity of corms
- Enhanced Horticulture
- Water body cleaning

Community Quality of Life and Poverty Reduction:

Dried grass can be ground and compacted into briquettes

This method is done close to vetiver source easier to transport and resell can be stored through rainy season with little expense but more labor than bundles.



A science and technology Project in technical schools for innovative design of appropriate oven



Picture spoke to us.....

Construction Materials



**Thatching material
in Africa and Asia**



Courtesy: Eastern Vetiver Network

Environmental Protection

Australia - water purification



Stagnant pond heavily infested with bluegreen algae



Clear water



Three months after planting

Erosion control - Problem crop -Cassava

The Problem



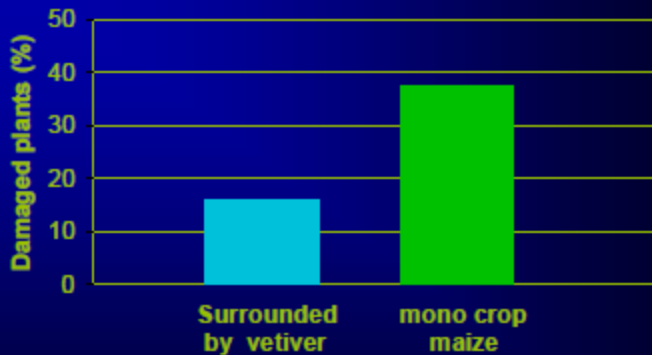
Thailand



The Solution

Increase in Crop Production

Field experiment (20 x 20 m blocks of maize)



Damaged maize plants (%) in a block of maize surrounded by vetiver under field conditions





**BRAZZAVILLE
CONGO**
West Africa
Ravine rehabilitation



Sand Bags
Bags can be filled with sand, soil and fertilizer or a mixture of sand and soil where local soil is poor or rocky.

**BRAZZAVILLE
CONGO**

Vetiver is planted into the bags with soil and fertilizers



COLOMBIA



Vetiver planted following application of Eco Mortar



OTHER USES OF VETIVER

Medicinal Uses

Traditional Medicines:

Dissolve gallstones; *reduce* fever; *heal* stomach discomfort; *relief* rheumatism, lumbago, headache, sprain, prostate cancer, diabetes; *improve* skin conditions.

Aromatherapy

- ☺ *balance the activity of sebaceous oil gland*
- ☺ *normalize oily skin and clear acne*
- ☺ *prevent stretch marks of pregnant women*
- ☺ *strengthen central nervous system*
- ☺ *overcome depression, insomnia, anxiety, stress, tension and nervousness, etc.*

SO WHAT VETIVER WILL DO?.....

- Reduce soil loss by more than 90%.
- Reduce rainfall run-off by up to 70%.
- Increase crop yield by as much as 40%.
- Improve tree seedling growth (15%) and survival rate (95%).
- Stabilise engineering structures, and reduce point source erosion from highway and building sites at reduced costs, often less than 90% of the cost of the "hard" solution.
- Improve polluted sites (landfill stabilisation, removal of excess nutrients, herbicides and pesticides from farmland).
- Improve ground water recharge.
- Rehabilitate wasted land (gullies, mining, extreme degraded lands).
- Prevent or reduce natural disasters caused by hurricanes, land slides and flooding.
- Vetiver grass was also demonstrated as an excellent material for thatch, building materials, handicrafts, natural pesticides, and aromatic oils.

For successful application of vetiver a **full understanding of the chemical properties of the materials** requiring rehabilitation is needed for best results. Only getting the sapling and planting with some manure is **NOT** vetiver Technology!

PLAN AND PLANT FOR RESULTS TARGETTED!

And already people are practicing
marvel....











PTISR-01

PTISQ-01

PDLA-01

PDTB-01



PL6B-03



PLF-01

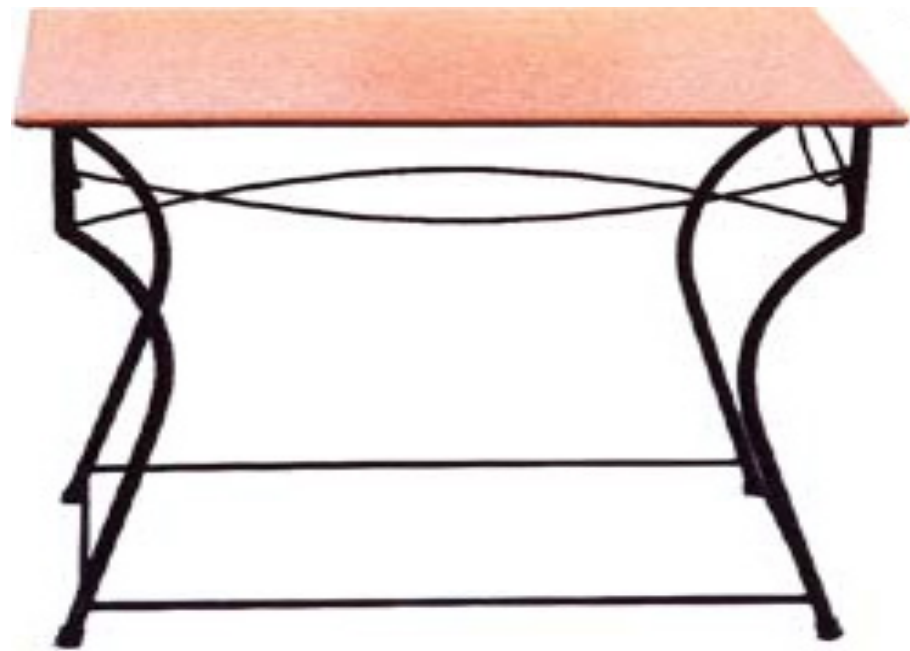


PL4-01



PL6A-01

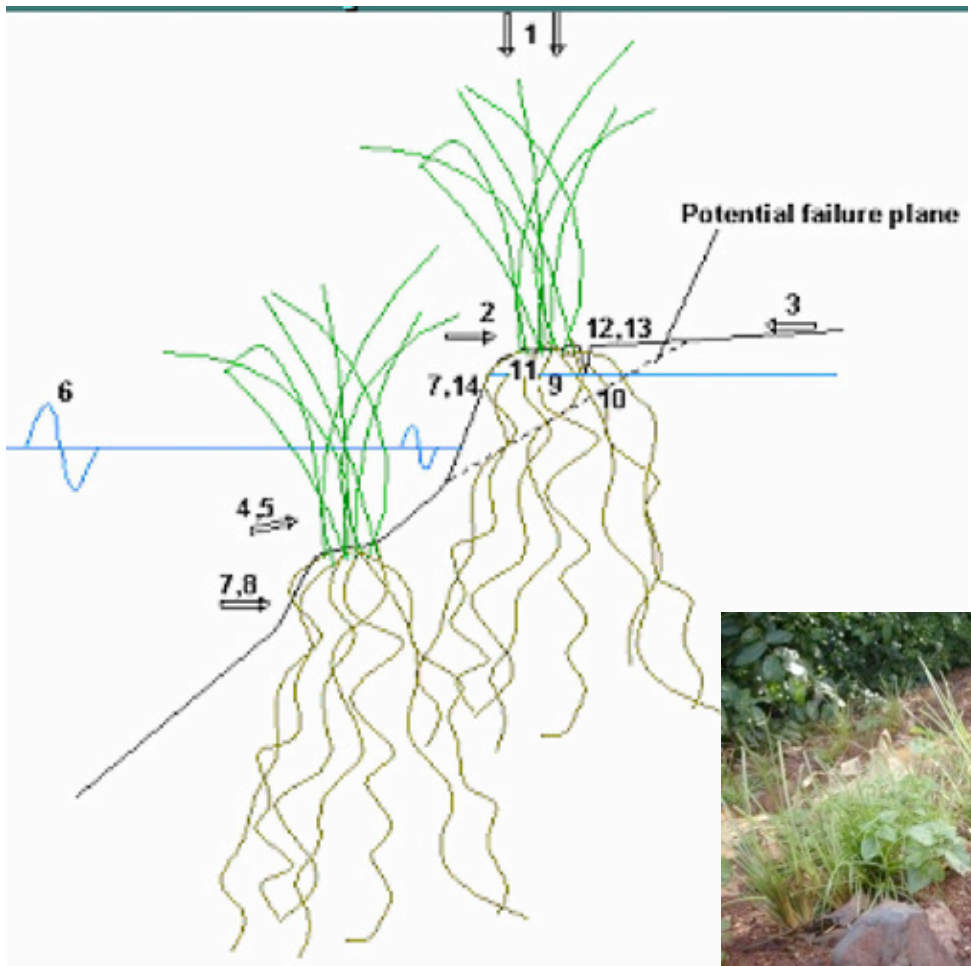




Perhaps now we can boldly answer the question?

CAN VETIVER BE A MEANS OF CSR-EMP INTEGRATION?

Vetiver Controls Slope Failure and Erosion



Growing other plants!

To be concluded

Thanks