

# Pragmatic approaches to tackling the problems of obsolete pesticides in the context of the African stockpile programme

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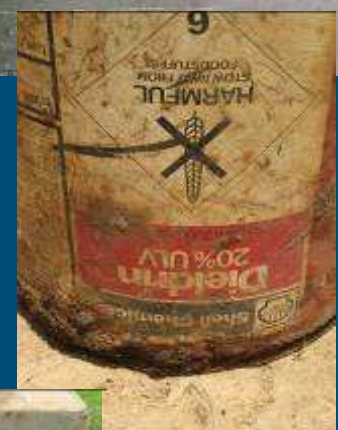


# Problem 1: Locust



Photos FAO

# Problem 2: Obsolete pesticides



# Risks



# Problem

- Application of pesticides for locust control has lead to soil pollution,
- Polluted soils are a risk for men and environment,
- A sustainable solution is needed.

# Traditional approach

## ■ Suspected site (Problem)

- Sampling and analysis

• Logistic problems

• Sampling

• Analysis

## ■ Assessment

- Compare with target values
- Human and ecological risks

• Insufficient data

• Logistic problems

## ■ Solution

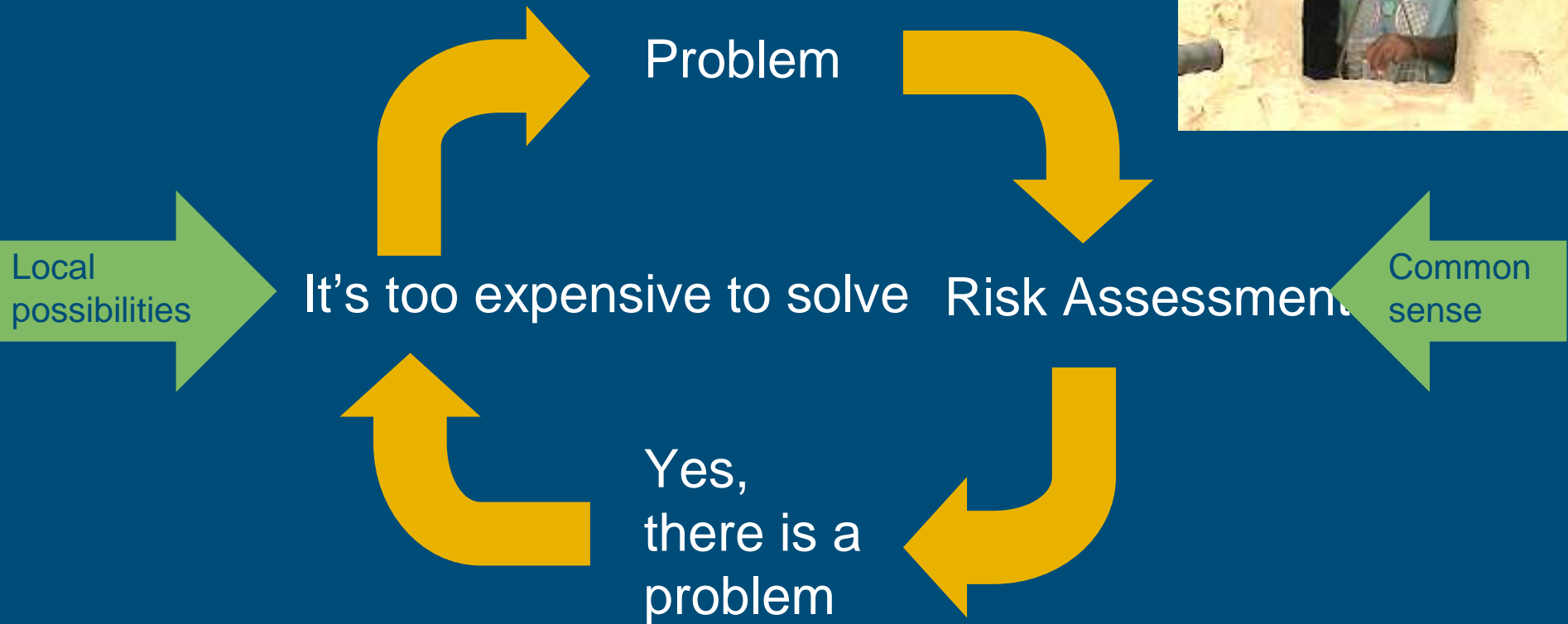
- Remediation (removal of soil)
- Treatment on special sites (thermal treatment)

• Distance

• Not available

• costs

# The assessment circle



# From problem to solution, breaking the circle

- Do not repeat previous assessments. Sites are polluted
- Complete clean-up of soil is difficult
  - Northern technology is not locally available
  - Northern technology is expensive
  - Logistics are a problem (transfer of equipment or transfer of large amounts of polluted soil)
- Risk reduction?
- Is there a local African way to solve the problem?

# Step-wise approach

- Step 1 Preliminary investigation, followed by intense investigation of the site (e.g. historical use, hydrology, climate, transport).
- Step 2 Defining of the site specific risks.
- Step 3 Gathering of missing information, including sampling strategy.
- Step 4 Proposal for site specific and sustainable remediation by risk reduction.
- Step 5 Technical and economic feasibility of proposals on risk reduction measures and planning.
- Step 6 Implementation of the risk reduction measures.

# Objectives of the project

- **Step 1-3.** Investigate the possibilities to reduce the risks of the contaminated sites using (July, 2007):
  - Biodegradation of pesticides
  - Local possibilities for stimulation of biodegradation
  - Local possibilities for isolation of pollution
  
- **Step 4 and 5.** Make a plan for sustainable management of the sites (Discussed May, 2008)
  
- **Step 6.** Start implementation in Mali (July, 2008)
  - Several applications in Mali and Mauretania (2008-2010)
  - Follow-up in Botswana (2010)

# Pilots

## ■ Mali

- Molodo
- Sévaré
- Niogoméra

## ■ Mauretania

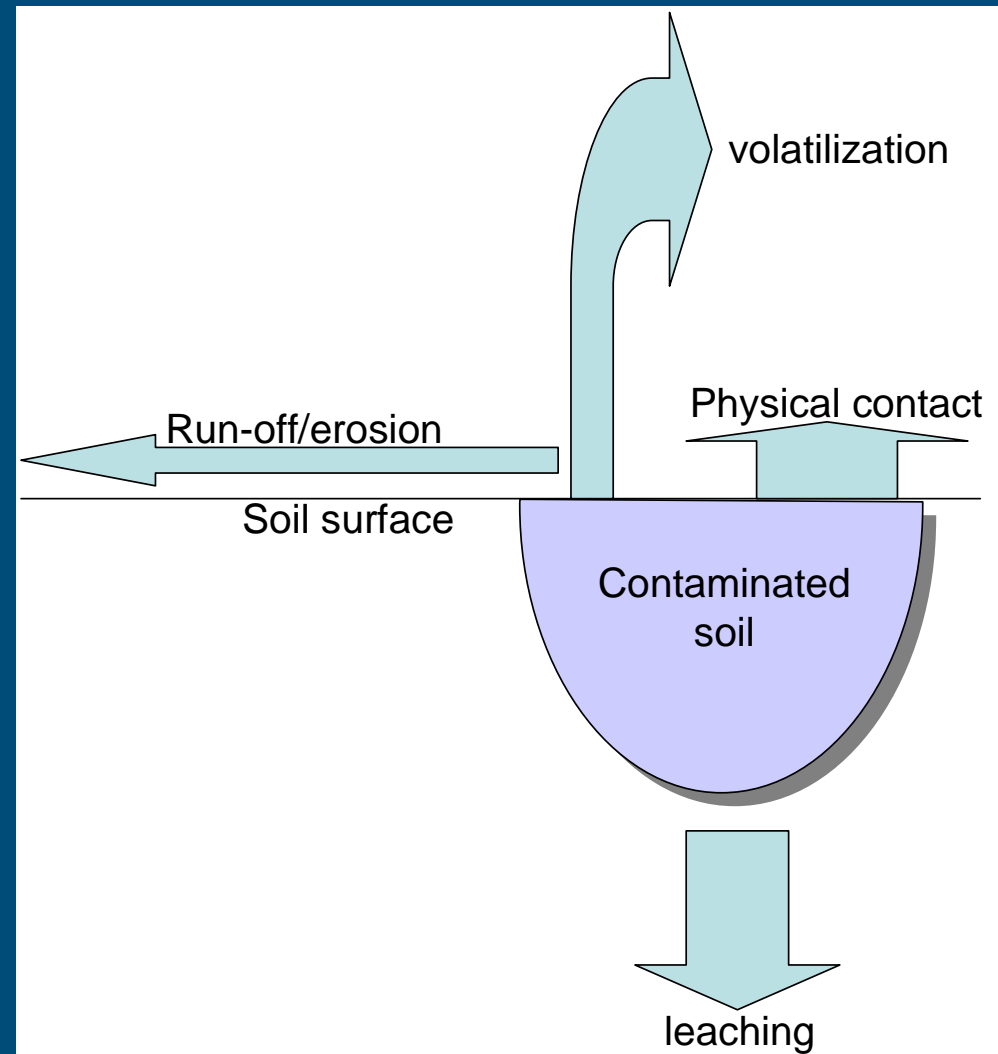
- Nouakchott
- Letfetar
- Kiffa



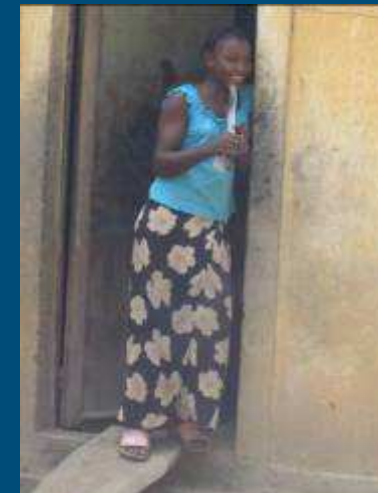
# Risks of pesticides in soil

Risks are:

- Site specific
- Monitoring necessary



# Risks - Molodo



Irrigation area, high ground water table

Rainfall 250-600 mm/year

# Identified risks

- Direct contact
- Run-off
- Leaching



Hot spot



Bore holes

- Different distances
- Depth 3 meter



# Identified risks

- Direct contact +
- Run-off +/-
- Leaching -

- High pollution 0-3 m
  - Dieldrin
  - Parathion ethyl
- Isolating clay layer



- No run-off of parathion
- Biodegradation

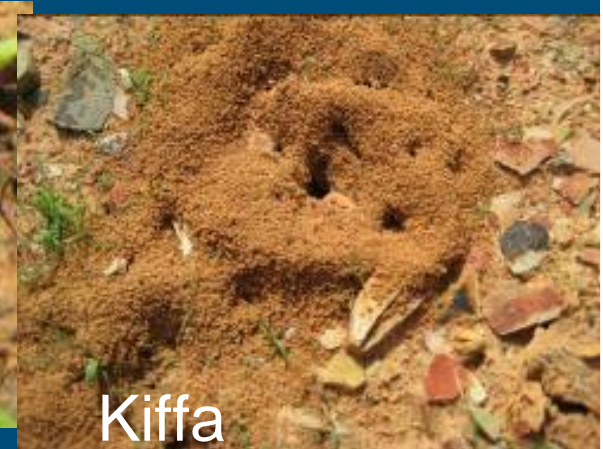
# Direction of solutions

- Biodegradation

- Soils are active



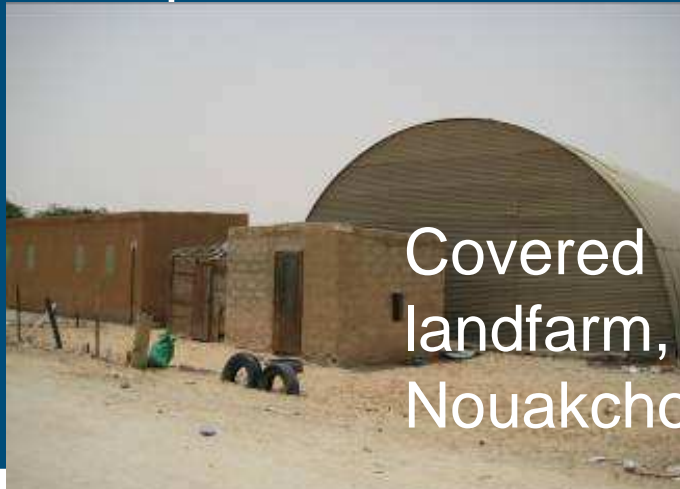
Niogémer



Kiffa

- Isolation

- Evaporation of rain water using vegetatio



Covered  
landfarm,  
Nouakchott



Natural  
sand  
dunes,  
Ledfatar

# Biodegradation



<i>Pesticide</i>	<i>DT 50 Soil (d)</i>	<i>Pesticide</i>	<i>DT 50 Soil (d)</i>
<b>Degradable</b>		Methamidophos	rapidly
Aldrin	20-100	Monocrotophos	17-96
Captafol	3-55	Paraquat	8-12
Carbaryl	7-28	Parathion ethyl	rapidly
Chlordimeform		Parathion methyl	rapidly
Chlorpyrifos ethyl	10-120	Pentachlorophenol	rapidly
Chlorvinfos	10-45	Phenthoate	rapidly
Chlorbenzilate	10-35	Phosalone	1-4
Cyanophos		Phosphamidon	21-32
Cyhalothrin	28-84	Propoxur	44-59
Deltamethrin	21-25	Pyridaphenthion	11-24
Diazinon	9-35	2,4,5,T	14-300
Dimethoate	4-122	Tetrachlorvinphos	2
Dinoseb	5-31		
Endosulfan (alpha)	60	<b>NOT or difficult degradable</b>	
Fenitrothion	12-28	Chlordan	>1500
Fenthion	34	DDT	>1500
Fenvalerate	75-80	Dieldrin	> 2500
Fluoracetamide	50	Endosulfan (beta)	>800
$\alpha$ -HCH	140	Endrin	>1500
Heptachlor	250	$\beta$ -HCH	>500
Lamdacyclohalothine	6-40	Hexachlorobenzene	>1500
Malathion	4-6	$\gamma$ -HCH (Lindane)	>500
<b>Mancozeb</b>	1-7	Toxaphene	>2500

# Biodegradation using landfarming

- Biological active soil
- Stimulation of biological activity (compost, manure, water)
- Use proper season
- Addition of contaminated soil (1<sup>ste</sup> charge)
- Addition of following charges

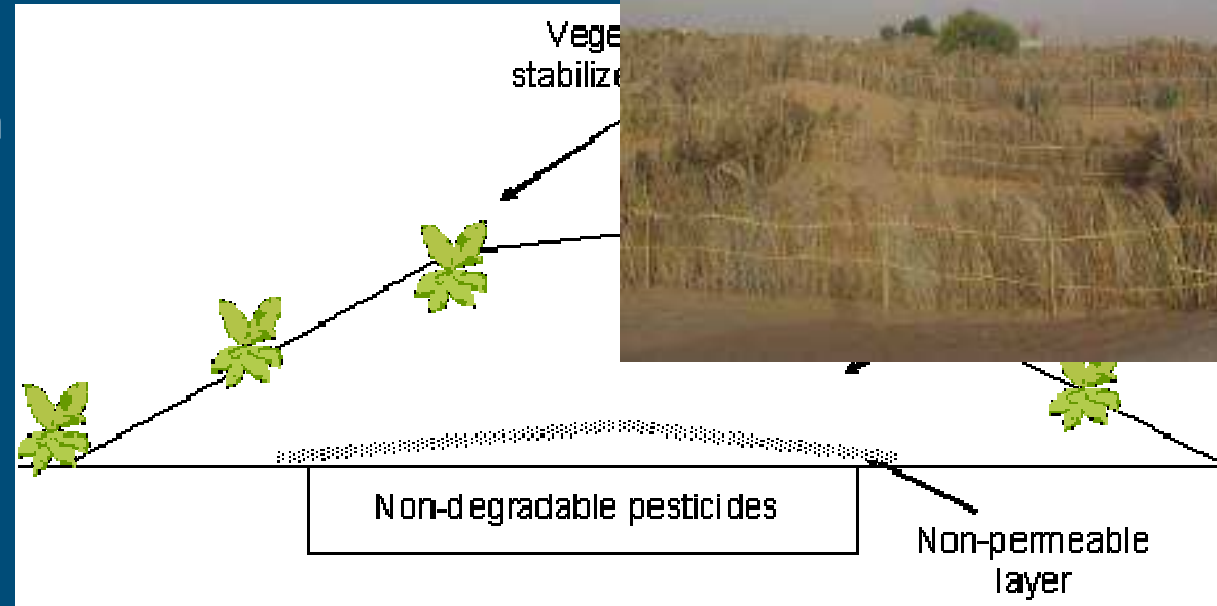


# Isolation

- Prevent contact
- Prevent leaching by rain
- Increase adsorption

# Isolation, prevent contact

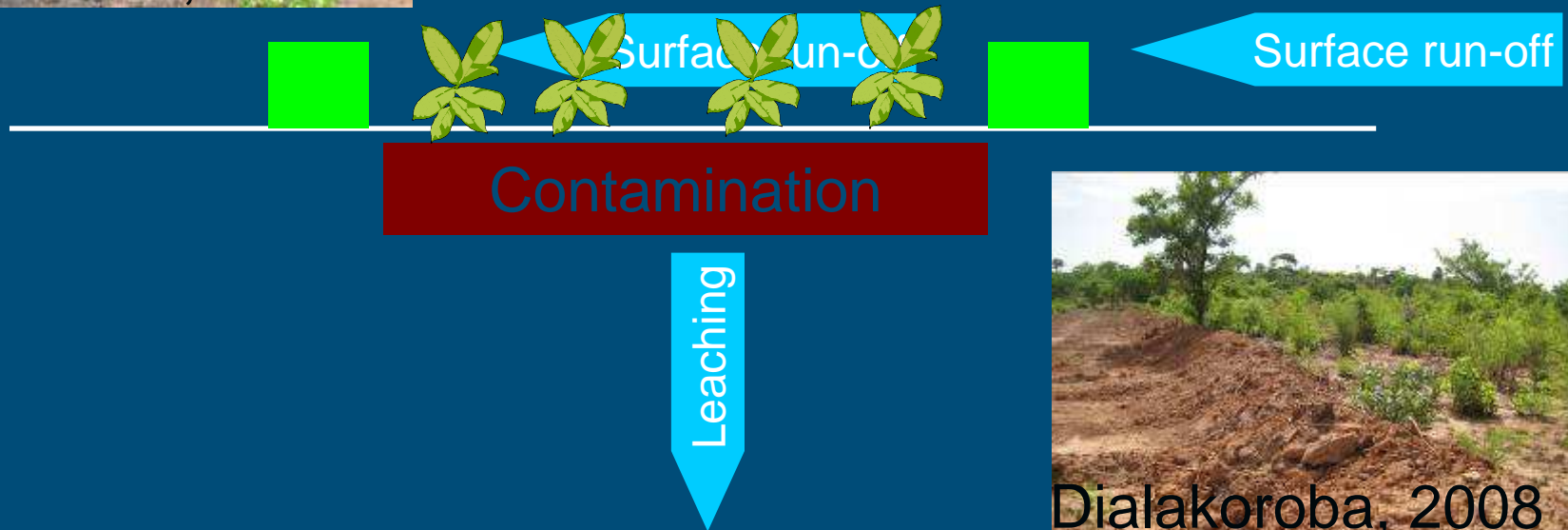
- Cover
  - Stabilization



- Prevent entrance
  - Fence vegetation, non consumable, *Vetiver, Jatropha*
- Define use
  - meteo station



# Isolation, prevent run-off and leaching by rain



# Isolation, increase adsorption

- Black carbon (soot, activated carbon....) increases adsorption
- Char coal is locally available
- Use for isolation in depot



# Isolation of not excavated soil

Deep rooting vegetation  
(*Vetiver*, *Jatropha*) to  
activate biodegradation and  
stimulate evaporation

Elavation to  
prevent run-off

Molodo, 2010



Refill with biological active soil

Biodegradable pesticides

Excavated area

# Molodo, measures

- Removal of old vesse
- Excavating the hot spot
- Using the depots
- Biodegradation of parathion on a landfar
- Isolation of dieldrin in depots
  - prevent leaching
  - Use of charcoal for immobilization



# Results landfarm

	<i>July 16, 2008</i>			<b>November 11, 2008</b>		
	Parathion-ethyl g/kg d.m.	Dieldrin g/kg d.m.	Ratio	Parathion-ethyl g/kg d.m.	Dieldrin g/kg d.m.	Ratio
1	0.53	0.79	0.67	0.0095	0.44	0.021
2	1.50	0.52	2.89	0.021	0.75	0.028
3	1.62	0.87	1.86	0.011	2.78	0.004
4	3.09	1.08	2.85	0.01	0.78	0.013
5	0.87	0.46	1.89	< 0.003	0.12	<0.025
<b>Average</b>	<b>1.52</b>	<b>0.74</b>	<b>2.03</b>	<b>0.011</b>	<b>0.97</b>	<b>0.018</b>



# Publicity and exchange of knowledge



Television,  
radio, authorities



Regional workshop on risk reduction of  
pesticide-contaminated soils

21-24 February, 2010, Bamako, Mali

# Implementation



The Mali-team



Landfarm Sévaré



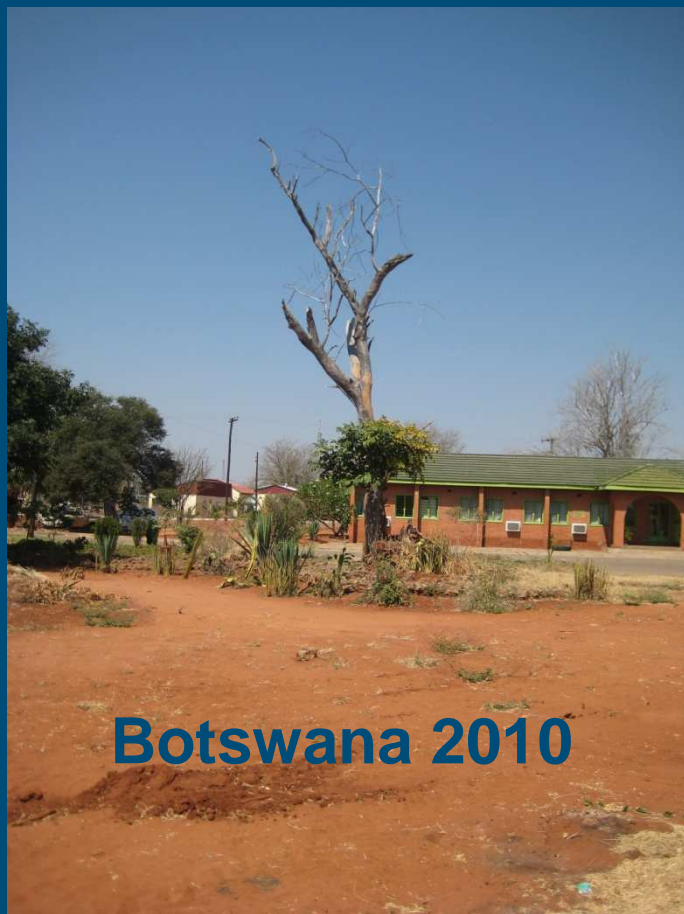
Landfarm  
Dialakoroba

# Implementation

Niogoméra:  
Removal of 1917  
vessels, landfarm  
and prevention run-  
off



# Implementation



**Botswana 2010**



**Paraguay 2011**

# Conclusions

- It is possible to reduce the risks on the investigated sites
- Bioremediation can be used to remove the pollutants, Natural bioremediation already occurs
- Isolation can be used to prevent leaching, direct contact, run-off and wind erosion
  - Existing clay layers
  - Natural dunes
  - Non consumptive vegetation to evaporate rainfall
  - Char coal
- Define final and sustainable use of the sites
- From monitoring to first implementation 1-2 years

Volgermee  
r > 20

# Thanks for your attention



People



Knowledge transfer



Publicity



Food and drinks



1000 star Hotel

