Integration of Vetiver System within Conventional Erosion Control Technologies in Brazzaville, Republic of the Congo

By

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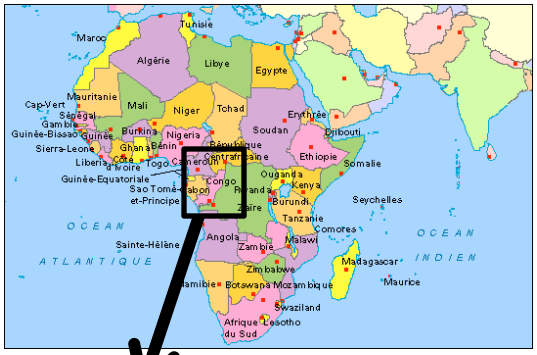
Brazzaville location

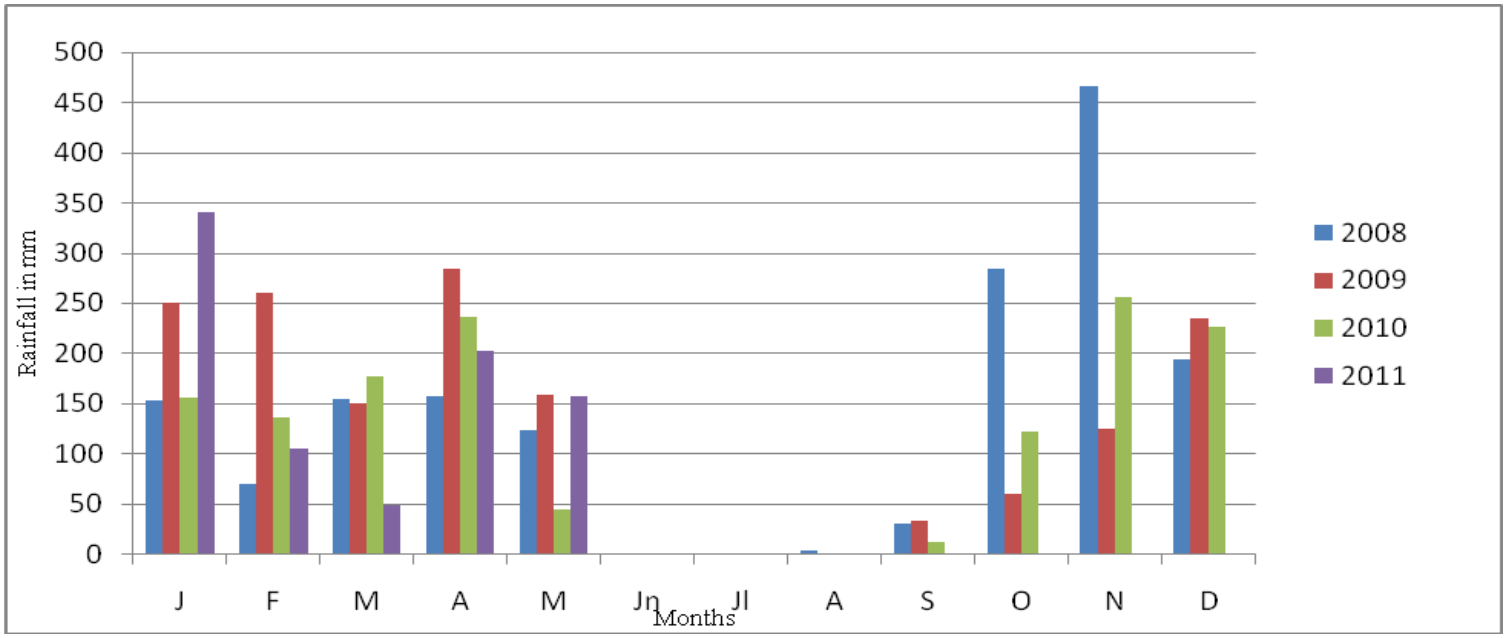


Brazzaville is the capital of Republic of Congo, one of African the countries located in central Africa.

Most of its population is urban (62.2%) and is concentrated in two major cities, Brazzaville and Pointe-Noire.

Brazzaville in particular, with its increasing population, new housing estates are not only out of control in hilly areas, but also are done without regard to urban standards: **<u>This is one of the causes of erosion</u>**.

Brazzaville monthly rainfall, 2008 through May 2011



Regarding precipitation, there are 3-months of dry season and a 9-month rainy season, as shown in this graph. High intensity rains are creating significant erosion in hilly and non urbanized areas. The average monthly rainfall amounts as shown in the above graph do not give any indication of the rainfall intensity within each rainfall event capable of creating erosive damage. For this reason, the following table shows for each year, the number of rain events with the corresponding quantity of rainfall per event .

Number of rainfall events per year sorted by the amount of rainfall per event

Quantity of rain per rainfall event in mm			
	< 30	30-50	>50
2009	94	12	7
2010	71	9	8
2011, (though May)	33	8	3
TOTAL	198	29	18

According to our observations, rainfall events of less than 30 mm have low erosive capability if they are spread throughout the day. However, it is also noted that while being considered less erosive in nature individually, the succession of rainfall events of less than 30 mm in two or three consecutive days, or if you get 15-30 mm rainfall in two or three hours, It will cause significant damage in some places because of the high soil moisture saturation level, thus increasing the amount of runoff and the intensity of the erosive forces of those events.

Consequently:

On these hilly and non urbanised areas, the rainfall causes severe erosion.

Unfortunately, conventional engineering efforts to halt erosion progress have remained ineffective as the following pictures show.

Some rainfall damages in Brazzaville : Boukeni Gully

Some rainfall damages in Brazzaville: Casis Gully

Some rainfall damages in Brazzaville : Mimi Gully

Some rainfall damages in Brazzaville : Pylone Gully

Integration of Bio-engineering and Conventional Technologies

The integration of bio-engineering technology, including the Vetiver System into the conventional technology has been a very effective new approach:

- **not only to halt the progression of erosion,**
- **but also to ensure the protection and sustainability of conventional structures built.**

I. Boukeni site, February 2009

Initial status at the Boukeni ravine, before placing sandbags containing soil and planting vetiver

Placing bags containing topsoil and vetiver planting on the Boukeni site

Boukeni site, 2 months after planting vetiver directly into the bags of topsoil (April 2009)

Boukeni site, status of the vetiver cover 10 months after planting (November 2009)

II. Casis site: Initial status, failure of certain conventional engineering techniques

Palplanche or sheet piling wall

Unprotected outlet

Gabion wall

Failure of certain conventional engineering techniques:

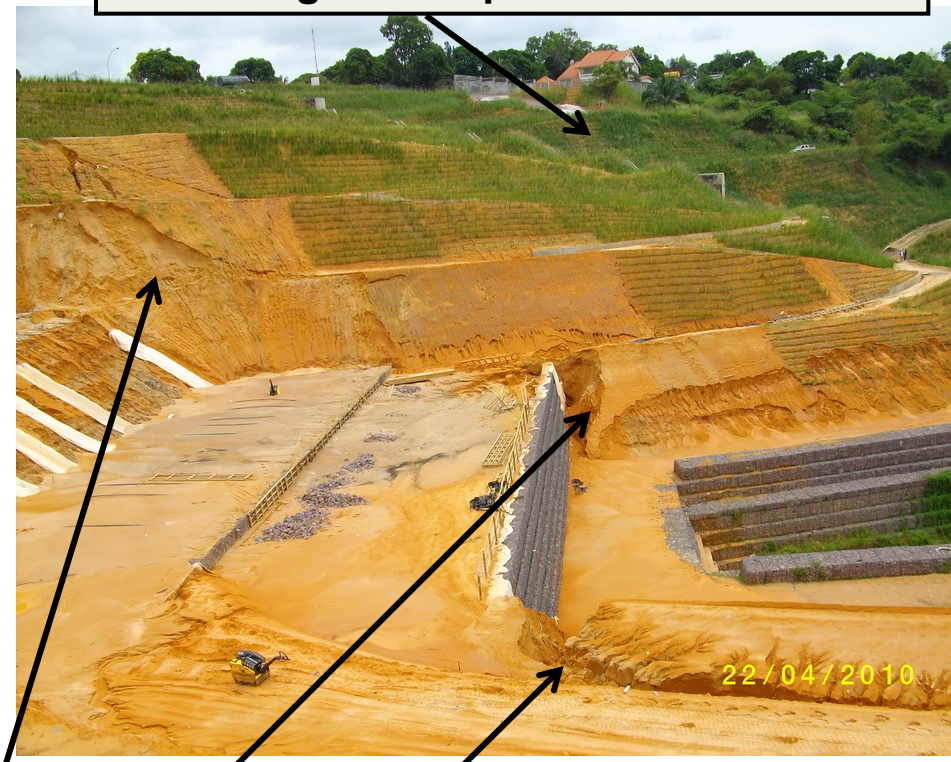
Palplanches, rocky protection, soil bags, etc… were not efficient to halt erosion progress

The integration of the Vetiver System:

Gully slope reshaping and vetiver planting at the Casis site November, 2009

Casis site, five months after planting vetiver on part of the site (April 2010)

After rainfall events, the site has been damaged on several unprotected slopes and on slopes recently planted with vetiver, but no damage was seen on slopes protected with old vetiver.



Several instances of damage on unprotected slopes and on slopes recently planted with vetiver

Therefore, close to the main drain, visible damage has been recorded on the unprotected slopes and embankments adjacent to the Casis main drain

Casis site 17 months after planting vetiver:

Completely stabilized and no damage has been recorded despite of record rainfall exceeding 70 mm per rain event

Comparison status

Damage was recorded during rainfall events, before vetiver was growing on the slope

The same place one year later, well established vetiver grass and no damage was seen, despite of record rainfall exceeding 70 mm per rain event

Comparison status

Damage was recorded during rainfall events, before vetiver was well established on part of the slopes

The same place one year later, well established vetiver grass and no damage was seen, despite of record rainfall exceeding 70 mm per rain event

Comparison status

Before planting vetiver grass: damages was recorded during rainfall events

One year later: No damage in the same place

Comparison status as seen from afar

May, 2011

April, 2010

Global view of stabilized site

November, 2009

May, 2011: 17 months later

CONCLUSION

The integration of this vetiver-based bio-engineering technology involved the planting of vetiver hedgerows along land contours to protect embankments, slopes and man-made conventional anti-erosion structures (drains, gabions, and Terramesh retaining walls) at the erosion sites in the northern part of Brazzaville, specifically on the sites at Casis, Boukeni and Pylône.

Observations made during three years (2009, 2010 and 2011) showed that the development of vetiver hedges has been producing dense vegetative cover and has been effective in preventing erosion damage on these sites. The vetiver vegetative cover and the deep penetration of the dense root system into the soil has contributed greatly to effective erosion protection of man-made structures, as well as protecting the slopes and embankments on these sites.

THANK YOU !