Characterizing the human-nature relationship and its changes using Material and Energy Flow Analysis:

The social metabolism of the Cauololo village, Angola

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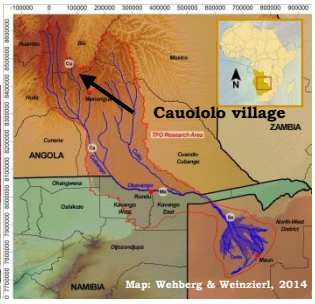


The Cubango-Okavango River Basin (CORB) is undergoing rapid socio-economic changes due to its recent connexion to the world economy. These are causing a land-use intensification.

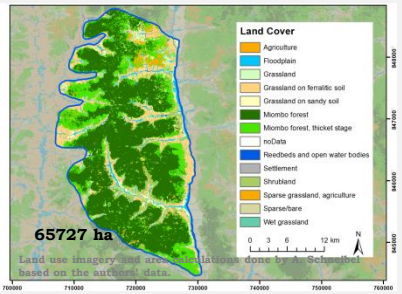
What exactly the current land and resources use is in rural areas of the CORB and towards which state they will transition is unclear.

The transition and intensification paths taken by the CORB communities, who live from subsistence agriculture, gathering, hunting and fishing, is crucial in terms of development, resource use and sustainability.

Our case study gives a close-up analysis of the Cauololo society, southern Angola, with the objective of assessing its socio-metabolic regime and to qualify its possible transition paths.

Mixed methods approach

1. **Social Metabolism using Material and Energy Flows Accounting (MEFA),** based on household and individual surveys, observation, own measurements, diaries, focus groups.
2. **Identification of transition pathways using SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis**, based on 11 interview transcripts on perception of local stakeholders of the land-use system.



Case study: The Cauololo socio-ecological system

- Mid-road between Cuito and Menongue cities.
- Road constructed in 2010.
- In 2013: 253 people
- Staples: corn and cassava
- Occasional small stock
- Shifting cultivation system
- 50% intact Miombo forest
- 0,15% fields in use in 2013

- Agrarian socio-metabolic regime with significant role of hunter-gatherer practices.

- Low but essential and growing connexions to outside market , especially food.
- Village subsistence largely consisting of own ecosystem resources.
- Low burden on the village resources and ecosystem.
- Exported products are related to the highest material (mainly biomass) extraction.
- Imported productsare less nutritious and less bio-degradable than the exported products.

Social metabolism of the Cauololo society: quantitative indicators of village-environment interactions

Material Imports	Imported material kg/pers/year	**568 kg** (Gasoline, Food and Alcohol make 85%)
	Share of total used material	**10,1%**
Material Exports	Exported material (/pers/year)	**159 kg** (Crops and honey make 74% and charcoal 14%)
	Share of total material extracted and directly used	**8%**
Share of calorie intake	Imported foods	27%
	Cultivated foods	**42%**
	Foods from the wild	**29%**
Overall provision of material	Share of material used from the own ecol. system	**89,9%**
Material efficiency of production	$\frac{Kg\ material\ extracted}{Kg\ product}$	**9 (exported products)**
		3 (overall production)
Human colonization	HANPP (Human Appropriation of Net Primary Production) (%)	**0,34**
Pollution	Share of imports made out of utensils, sanitary products and gazoline	**43%**

SWOT scenarios: transition paths in the resource use system of Cauololo

GIVING IN TO THREATS
Vicious cycle of impoverish-ment driven by the fast amplification of cash-generation oriented commercialisation of collected and agricultural subsistence products**.**

MISSING OPPORTUNITIES
Slow drift towards ecological and economic impoverishment related to unsuccessful transition towards sustainable intensification and marginalisation from developing tourism activities.

BUFFERING FOR THREATS
Damages related to continued natural resrouce extraction are limited thanks to resource abundance and the introduction of some organic practices. Local economic exchanges (markets) are fostered.

SEIZING OPPORTUNITIES
Successfull intensification of agriculture (agro-ecological and agro-industrial), thanks to targeted knoweldge production, providing for subsistence, while tourism triggers small satellite businesses.

How to foster a sustainable socio-metabolic transition in Cauololo?

The limits of commercialisation
Increase in commericalisation of agricultural products is the aim of policies and farmers. However, the growing exchanges with outside market may well exacerbate degradaton risks and fail to improve nutrition.

⇒ **Need to highlight the role of agriculture and hunter-gathering practices for subsistence** and pursue this aim in parallel with the support of agricultural markets, preferably on the local scale to avoid drainage.

⇒ **Invest in non-agricultural activities for cash generation (tourism)**

Pristine ecosystem, knowledge and empowerment

⇒ The resource abundance and pristineness of the Cauololo environment is an asset that should be combined with the craving of land users for new knowledge on sustainable agricultural practices to quickly enable farmers to take their own future in their hands and enable them to at least co-exist with larger scale industrial agricultural systems without being marginalised.

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