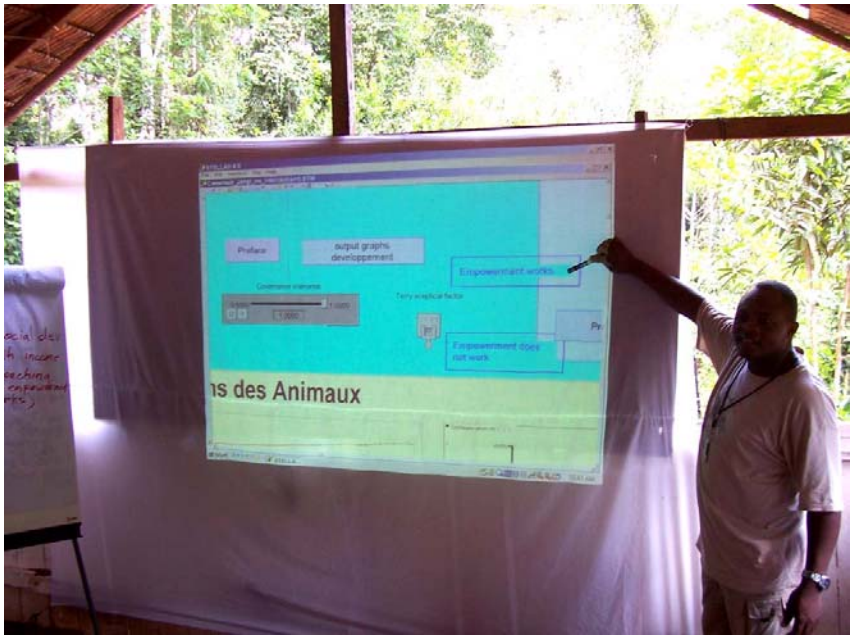
Landscape level evaluation and scenario building



Summary workshop Mambélé
(Lobéké National Park, SE Cameroon)

12-16 June 2006

Organized by WWF and CIFOR
(For further information contact M.Sandker@cgiar.org)

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Introduction

This workshop is a follow-up of previous workshops held in Kribi, Cameroon (2004) and Bayanga, CAR (2005) organized by WWF and CIFOR senior scientist (principally Jeff Sayer and Bruce Campbell). The previous workshops existed of exercises to create a landscape vision, like the discussion of changes in trends and tendencies in the past and the events or interventions that caused changes on the landscape level. During these workshops a tool has been introduced for the monitoring of changes in the landscape over the years, especially changes in development and conservation outcomes. The parameters of this 'tracking tool' are easily assessed and during the workshop a rapid assessment has been made. Another exercise was the creation of models of different aspects of the landscape using the modeling language STELLA with the experts working in the landscape (a model for the household income of a local ethnic group for example). After the Bayanga workshop, a landscape model has been created with the models of the landscape elements made by the participants and this model is used to create scenarios for the landscape to stimulate the thinking of how events will unfold over time, what the impact is of current management on the landscape and what strategy is most likely to have a positive impact on conservation and development outcomes in the future.

Information Box STELLA

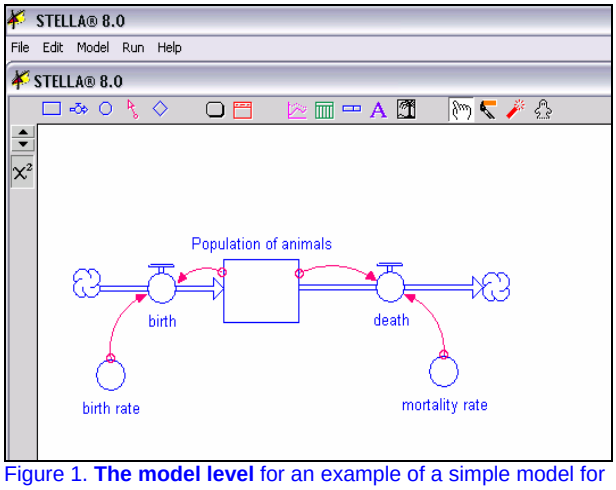


Figure 1. **The model level** for an example of a simple model for an animal population

Stella is a user-friendly modeling language. Due to the fact that it has multiple layers, it is easily used by non-experts who can remain in the visual layer or so-called "model level" as displayed in Figure 1, without being confronted with complicated mathematical equations (which are hidden in the equation level). The entire model can be built just in this model level without even the necessity of consulting the equation level. To build the model, one just drags in stocks (the square representing "population of animals" in the example in Figure 1), flows (the taps going in and out the stock, in this example animals being born and dying each year) and converters (the circles in this example representing birth and mortality rate). While doing so, STELLA automatically creates the mathematical equations in the equation level.

To connect the stocks flows and converters one simply pulls 'action connectors' (the red arrows in Figure 1) from one element to the other.

For example, the birth of animals per year is calculated by multiplying 'birth rate' by 'population of animals', therefore action connectors (red arrows) have to be drawn from the converter 'birth rate' to the flow 'birth' and from the stock 'population of animals' to the flow 'birth'. Now, to enter how we want the birth of animals per year to be calculated, we have to double-clicking on the flow 'birth' after which the window in Figure 2 is opened. Since we draw the action connectors, under required inputs we now see the 'population of animals' and 'birth rate' and thus we specify we want the flow 'birth' to be calculated by 'birth rate' * 'population of animals'. For the converter 'birth rate' and 'mortality rate' values have to be entered and for the stock 'animal population' and initial population size has to be entered. The values entered in our simple model are: birth rate= 0.6; initial population size=1000 and mortality rate= 0.5

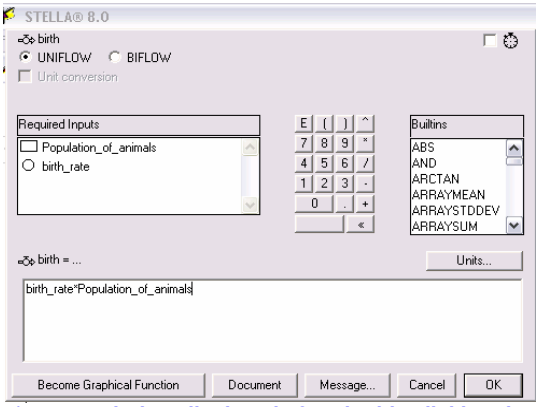


Figure 2. **Window displayed after double clicking the flow 'birth'** after connecting 'birth rate' and 'population of animals' with action connectors, they appear under 'required inputs'.

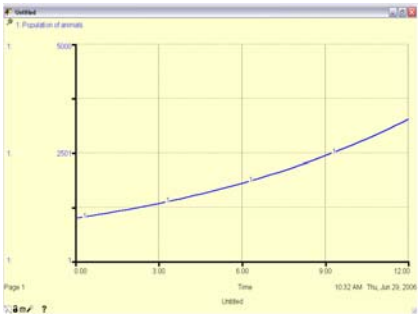


Figure 3. **The output graph for population of animals**

After building the model, from the menu bar one can drag in a so-called graph pad to the model level to see what happens with the features in our model over time. On the X-axis thus the years are displayed and on the Y-axis we can place the feature we are interested in, in our simple example we can display 'population of animals' on the Y-axis. After running the model STELLA gives us output graph as shown in Figure 3. The population of animals shows an exponential growth. By adding more features in the model (e.g. carrying capacity, hunting pressure on population of animals) we can now get closer to a more realistic scenario for the animal population.

Objectives of the workshop

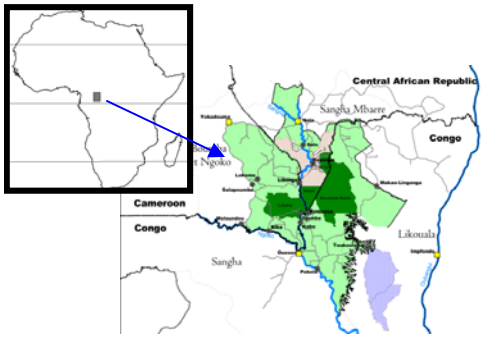
The first objective of the workshop was to (re-)formulate and test a landscape level tracking tool. This tool should enable to monitor changes in conservation and development outcomes of a landscape over the years, reveal trends and measure the impact of interventions on the landscape scale. Furthermore, the tracking tool should amend vertical communication (between technical "ground"-staff charged with the management of a landscape, donors and regional decision makers) and horizontal communication (the comparison of outcomes of different landscapes).

The second objective of the workshop was the building of a range of different scenarios for the Tri National de la Sangha landscape using the modeling language STELLA, an easy accessible language for non-experts. Modeling is used as a visioning tool to support strategy building: The different scenarios constructed explore the potential impact of certain interventions to try and achieve greater synergy between conservation and development outcomes for the landscape. Furthermore, in common with the tracking tool, scenario building stimulates communication between the actors within the landscape and national and international decision makers.

The third objective of the workshop was the better understanding of the problematic and the preferred scenarios of a specific indigenous group in the region (namely the Baka or so-called *'pygmies'*).

Location of the workshop

The workshop took place at Mambélé village, where the WWF headquarters for Lobéké National Park is located. This National Park forms part of the Tri National de la Sangha, which extends across the boarders of Cameroon, Central African Republic and Republic of Congo (Congo-Brazzaville). Each of the three countries of the TNS was represented at the workshop.



Tri National de la Sangha landscape (image WWF CAR)

What is a landscape?

During the workshop, the following definition of a landscape is used:

A landscape is a geographical construct that includes not only biophysical features of an area but also its social, political institutional and aesthetic attributes. (Sayer, pers. com. 2006)

What is a tracking tool?

A tracking tool is an instrument used to evaluate a landscape in a relatively simple way giving a clear result. If this assessment is repeated each year it can monitor changes in conservation and development outcomes over the years. In that way, the tool enables

projects working on a landscape to reveal trends and measure the impact of interventions at the landscape scale.

Landscape evaluation using a tracking tool

During the workshop in Bayanga, held in 2005 a tracking tool for the evaluation of the main assets of the landscape was presented with the aim to track changes and measure the impact of landscape scale intervention. In Bayanga these assets were defined as the natural, financial, human, physical and social assets but according to Jeff Sayer, the financial assets can be divided over the other assets. However, for the purposes of this workshop, the assets of the landscape which were evaluated by the tracking tool were revised and consisted of: local natural, global natural, social, human and physical assets. For each of these assets a set of 5 relevant indicators are chosen by experts working in the landscape and at the regional level, and their score is given a number between 0 and 5: 0 represents the worst case scenario and 5 is the ideal situation. For the scores of the 5 indicators per asset a mean score is calculated and for its presentation this score is placed on an axis. For the display of the total landscape in a way that allows to see instantly and in one diagram the weak and strong points of the landscape, the 5 capital assets of the landscape are represented by 5 axes in a pentagram and their mean scores of the indicators are placed on the location of the axis (see for example Figure 4).

It is interesting to note that the tracking tool has been elaborated and tested. Dominique Endamana –from the WWF Benoué Savannah project in the North of Cameroon- has applied the tracking tool to evaluate the savannah landscape and presented the results (Figure 4) after participating in the Bayanga workshop.

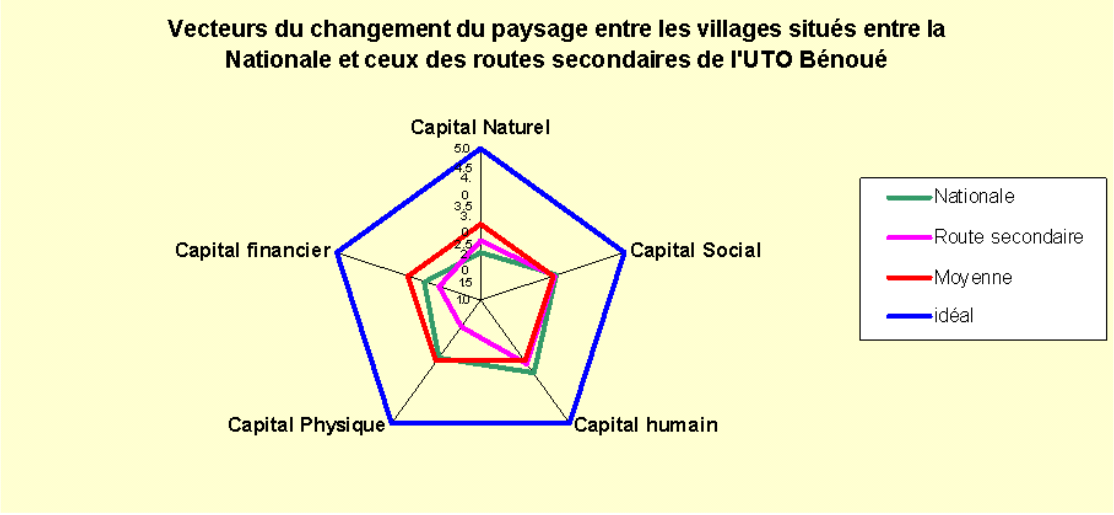


Figure 4. **The evaluation of villages bordering a national road and a secondary road in the North of Cameroon** conducted by Dominique Endamana (WWF) as a follow up after his participation to the workshop in Bayanga, 2005. The evaluation shows that the national road has above all a big impact on the physical capital asset of the villages (meaning on the village infrastructures).

During the workshop the tracking tool was applied to evaluate the Cameroonian and Central African Republic components of the TNS landscape (see the indicators for the

capital assets in table 1). An example of how the values per indicator are distributed in table 2 and the result of the tracking tool in the evaluation diagrams in Figure 5.

Table 1. **The indicators for 5 capital assets of the landscape** (in general 5 indicators are selected for each capital asset)

VECTEURS DE CHANGEMENT DU PAYSAGE TNS CAMEROUN				
Acquis naturels locaux	**Acquis naturel global**	**Aquis sociaux**	**Acquis humains**	**Acquis phisiques, construits**
Disponibilité au PFNL	Taux de deforestation	Fonctionnement des COVAREF	Accès aux soins de santé	Moulins à manioc
Disponibilité des ressources fauniques	Population éléphants	Initiatives communautaires CBNRM	Qualité scolarité (taux d'alphabétisation)	Qualité d'habitation
Incidence feux	Populations grands primates (Gorilles)	Gouvernance étatique (présence des institutions etatiques et leur efficacité)	Nombre de personnes avec qualification technique ou professionnel	Nombre de point d'eau potable
Processus de certification	Population Bongo	Gouvernance traditionelle (litiges, participation de toutes les composantes sociales a la gestion des affaire de la communaute, efficacite du chef...)	Taux de mortalité infantile	Accessibilité
Pollution/dechet liquide	Condition d'autres éléments de la biodiversité	Perception de la corruption (fonction publique et secteur privé)	Connaissances rite, cérémonies, traditionelles	Infrastructures touristime national
Condition des cours d'eau		Niveau d'activité associative	Usage de la pharmacopéé traditionnelle	Permis de chasse sportive
		progrès dans l'attribution des FC Baka		Usine de transformation du bois
		Participation des baka pour la résolution des litiges dans la cour du chefs		Evolution des prix des 3 produits de premières nécessité
		Emploi de la redevance forestière		

Table 2. **The value assessment of the indicators for the local natural assets of the landscape** (the yellow scores are for the Cameroonian part of the TNS landscape)

Acquis naturels locaux	5	4	3	2	1
Disponibilité au PFNL	Totalement disponible	Assez disponible	Disponible	Assez limité	Très limité
Disponibilité des ressources fauniques	Très abondant	Assez disponible	Disponible	Assez limité	très rare
Incidence feux	Zéro	Quelques - isolées	Plusieures	Incendies importantes	Grandes incendies
Processus de certification	Plus de 70% de la superficie des concessions sont certifiées	50-70% de la superficie des concessions sont certifiés	Premières concessions certifiées	Initiation du processus	Zéro progrès
Pollution/dechet liquide	Zero	Pollution mineure et localisée	pollution moyenne	Pollution généralisée	Pollution majeure
Condition des cours d'eau	aucun problème	ensablement des grands cours d'eau	Perturbation localisée des cours d'eau	Perturbation des cours d'eau secondaires	Perturbation généralisée

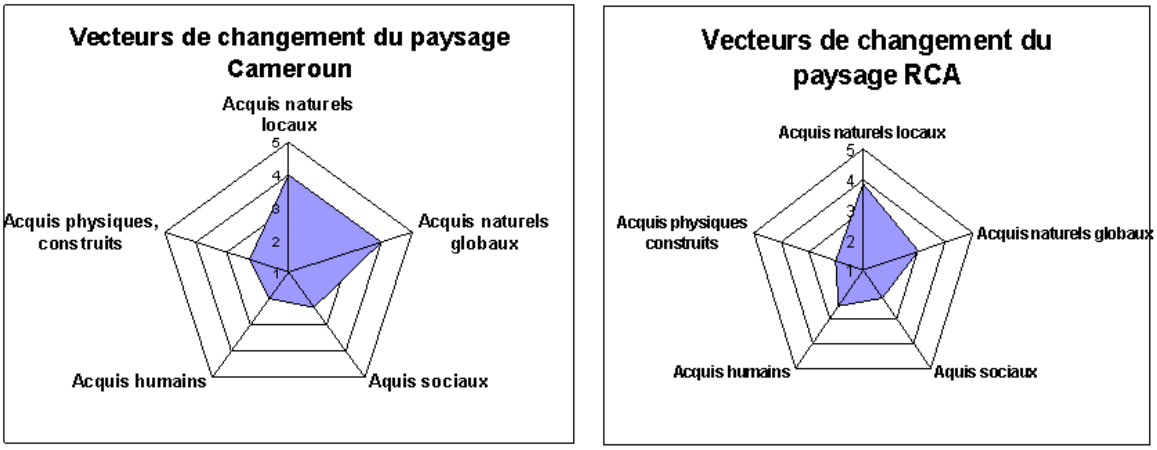


Figure 5. **Landscape evaluation diagrams** resulting from the application of the tracking tool for the Cameroonian and Central African Republic landscapes in the TNS

The landscape evaluation diagrams for TNS Cameroon and CAR show that the landscape performances are quite similar only that the Cameroonian landscape has a higher mean score for the natural global asset, while the CAR landscape scores slightly better on the human asset. Landscape interventions now face the challenge to raise the score, particularly of the human, physical and social assets, while not comprising local and global natural assets.

What is a scenario?

During the workshop, the following definition of a scenario is used:

A scenario is a story that offers an internally consistent and plausible explanation of how events unfold over time (Gallopin et al 1997; Raskin et al 2002)

Modeling exercise for scenario building

The scenario building exercise is meant to stimulate the thinking of how events are expected to unfold over time and what the possible impacts of interventions are. The modeling language STELLA is relatively simple, easily used by non-experts, and the aim of the modeling exercise is not to predict the future, rather the scenario building stimulates discussion surrounding landscape level developments and interventions, and contributes to the formulation of a management strategy for the landscape with optimal outcomes for both conservation and development.

In Bayanga a start was made with the building of scenarios of the different aspects of the landscape using the modeling language STELLA. With the WWF and GTZ experts working in the TNS, models have been built for the different elements of the landscape: populations of elephant, gorilla and duiker (*Cephalophus sp* of which 6 different species are found in the landscape, all put together in the model), agriculture, Baka or BaAka, Bantou and Immigrant households and for forest concessions. Folowwing the Bayanga workshop, modelers from CIFOR have connected the models for the elements of the landscape creating one model for the entire TNS landscape. However, since the issues surrounding conservation and development in each of the 3 countries within the TNS landscape differ significantly, it was decided to create different models for the different countries and run different scenarios for the countries according to their likeliness. In Figure 6, an element of this landscape model is displayed, namely the population of migrants in the region and the dynamics of migration into and outside the landscape. Figure 7 shows the models interface which gives an overview of the elements in the landscape model (the model displayed in Figure 6 is found in the sub-model 'human population'). The arrows between the sub-models show that the elements in the model are connected and influence each other.

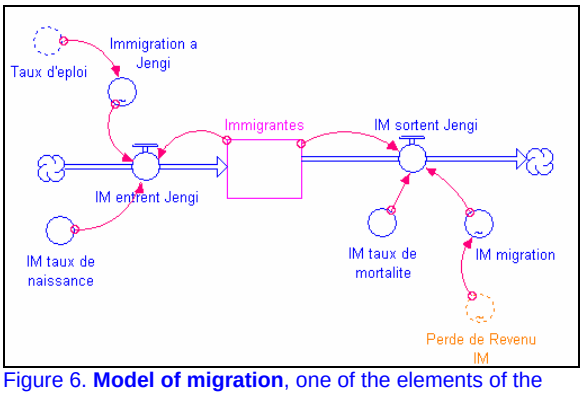


Figure 6. **Model of migration**, one of the elements of the landscape model built for the TNS landscape in the modeling language STELLA

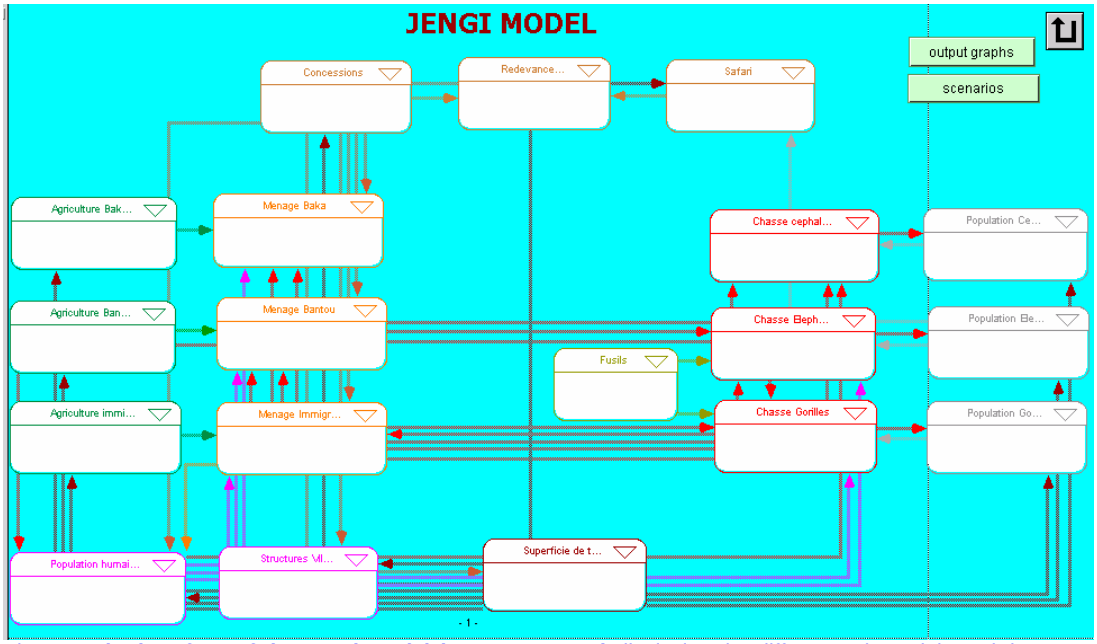


Figure 7 **The interface of the Jengi model (TNS Cameroon)** displaying the different sub-models and the connections between the sub-models. Under each sub-model we find models such as the one displayed in Figure 6. The sub-models are: Baka, bantou and migrant agriculture, Baka, bantou and migrant households, human population, village structures, land surfaces, forest concessions, safari hunting, tax flows from forest concessions and safari hunting, rifles, hunting of duiker, elephant and gorilla, and populations of duiker, elephant and gorilla.

For the creation of the model of the TNS landscape, data from known studies are entered (e.g. ecological surveys of animal populations give estimations of the population size of animals in the national park, census reports give human population size and migration dynamics and socio-economic surveys give the average income per activity per household in the region). In the situation where little or no data was available from studies, local experts provided estimates which were entered in the model. In the interface of the model (as shown in Figure 7) the left side corresponds with development (village structures, households) and the right side with conservation (large mammal populations). Likewise, the outcome of the model displays how the current trends in conservation and development might proceed in the future.

For example, as indication for the landscape outcome for conservation, population sizes of elephant, gorilla and duiker are displayed (deforestation rates are low and fire incidences rare in the region and the focal point for conservation organizations are the large mammal populations). Conversely, as indication for the landscape outcome for local development are displayed: the incomes of the 3 ethnic groups (baka, local bantous and immigrants) and the funds available for village projects. In the building of the model, the experts of WWF, GTZ and WCS are consulted as to what their vision is regarding the future of the region. In that way the plausibility of the output of the model (the scenario) is continuously discussed, trends are reviewed and the model continuously altered.

For the CAR TNS landscape a scenario has been developed demonstrating the possible impact of certification of the concession located in the bufferzone around the national park and the possible impact of the development of ecotourism (5 times as it is now in a period of 30 years). For the Cameroon TNS landscape a scenario has been developed,

run and discussed on the possible impact of WWF increasing investment in 'better governance'.

The Better Governance scenario

In the TNS landscape, a huge amount of money is coming from forest concessions and safari hunting taxes. By law, a percentage of this tax money is destined for the development of the villages in the area where the forest concessions and safari hunting companies are operating. For example, from the surface rental taxes of the concession forest and government managed hunting zones (called ZIC), 40% is destined for the commune and 10% to the community while from the community managed hunting zones (called ZIGCG) even 100% of the taxes are destined to the community. However, many villages do not have a well organized social structure to receive these funds and both mismanagement and outright corruption means that money intended for local development is not available, especially money for the forest concession taxes. Since recently, the tax money from the safari hunting is managed by such a structure of villagers put in place by WWF, GTZ and the government which resulted in a better spending of the money and the realization of some small projects. However, the lump sum of the money is still (mis-)managed by the commune.

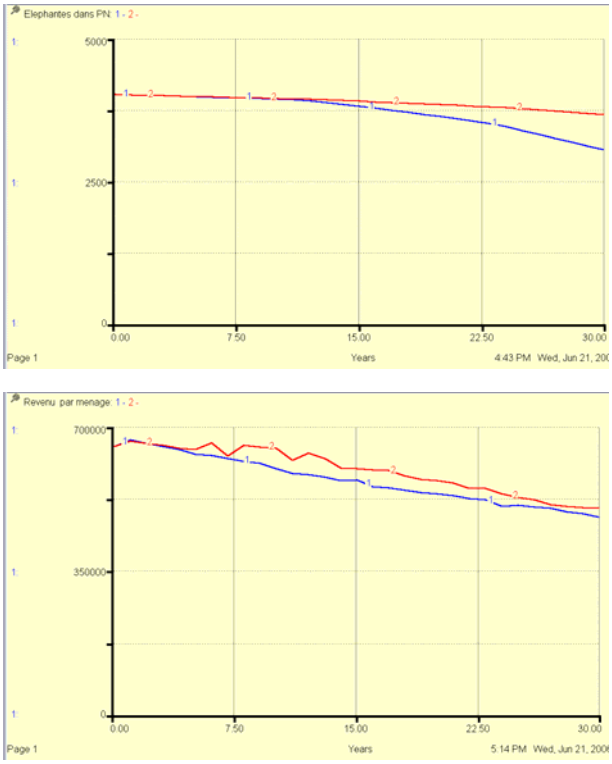


Figure 8. **Scenario outcomes for the population of elephants (above) and income per household (below)** for the next 30 years. The blue line shows the population of elephants and the income per household under the no intervention scenario and the red line under the better governance scenario

A WWF intervention could amend a village organization for receiving this money and once such a structure is put in place there would be no reason anymore for leading it through the commune. In the 'better governance' scenario, this specific WWF intervention is modeled and its impact on poaching (animal populations) and local development is simulated for the next 30 years.

For the plausible simulation of the impact of intervention, amongst experts the possible impact is discussed based on their experience, on the current impact of interventions, its impact in other regions and / or lessons learned from known trends and tendencies in the past. For example, a tendency seen in the past is a rise in poaching after a sudden loss of income (namely in Cameroon the sudden drop in cocoa prices in the 1990's was followed by a sudden rise in poaching as was the sudden closure of the saw mill of the logging concession and subsequent loss of wage-based employment for many residents in CAR in 2004).

The Cameroon ‘better governance’ scenario showed that there is a plausible long term positive impact for the population of big mammals (see Figure 8) and the incomes of the local people from the WWF intervention amending village organization for better managing forest concession and safari hunting tax money. The scenario also revealed that this effect remains stable even when the WWF budget might be halved in the future and that the effect of short term interventions, like anti-poaching, diminishes with a diminishing budget. Not only does this scenario support the decision making process, it is also a means of communicating the vision for the region to donors and regional or international decision makers.

What is important in the landscape for the Baka?

In order to facilitate the discussion with local people about what they see as important elements of the landscape a map can be drawn of their village or landscape. During the Mambele workshop, anthropologist Intu Boedhihartono went into baka settlements and let them draw a map of their village Yenga (shown in Figure 9). This participatory mapping process reveals that the road around which the village is located (seen running left tot right in the center of the map) plays a central role in their lives: the houses are all drawn in a position towards the road, and the Baka indicated it is important for them since it allows them to sell their products alongside the road. The drawing also reveals that important resources for them are forest products (including hunting and fishing), cocoa and agriculture and that there is some conflict between conservation and development because of large mammals damaging crop fields (in the top of the map a gorilla is eating the harvest).

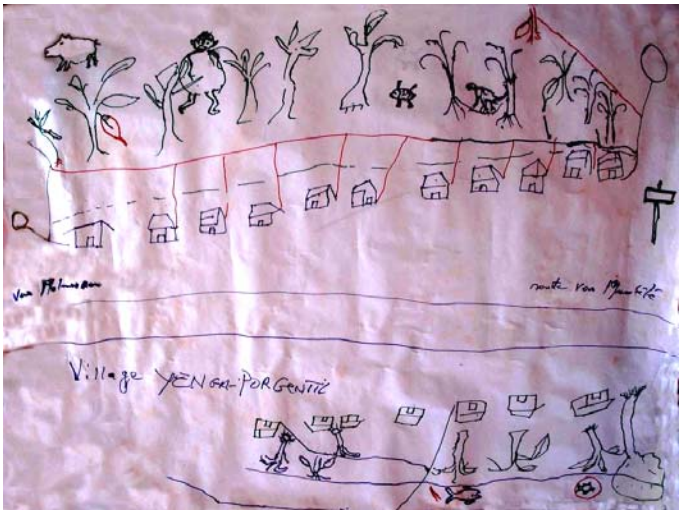


Figure 9. **Map drawn by the Baka pygmies** of their village in South-East Cameroon

Conclusion and follow-up

The participants expressed to have found the exercise especially useful for communicating their landscape strategies with donors and partners working on different levels. The outcome graphs of the scenarios give a visually very clear impression of the potential impact of a certain intervention and it shows that their vision is based on a thorough exploration of different potential impacts.

The organization of the workshop wants to make this workshop a yearly event amongst experts working on the landscape level and decision makers on the regional and international level. These sessions hold the potential of putting forth some tools applicable for different landscapes to assess changes, to bring in the picture what drives

changes and to focus on interventions that can realize optimal outcomes for conservation and development of the landscape.

List of participants

Name	Organisation	Email
Nzooh Dongmo, Zacharie	WWF-Jengi	ZNzooh@wwfcarpo.org
Fouda, Expedit	WWF-Jengi	exfouda@yahoo.fr
Ontcha Mpele, Thierry	Conservateur PN Lobéké	ontchampele@yahoo.fr
Terry Sunderland	CIFOR-Indonesia	t.sunderland@cgiar.org
Bruce Campbell	CIFOR-Indonesia	b.campbell@cgiar.org
Endamana, Dominique	WWF-Projet Savanes	dendamana@wwfcarpo.org
Bassama, Charles	WWF-Jengi	basscharles@wwfcarpo.org
Marieke Sandker	WWF-Central Africa, Yaoundé	M.Sandker@cgiar.org
Jeff Sayer	WWF International, Gland, Switzerland	JSayer@wwfint.org
Intu Boedhihartono	UNEP Geneva & Université Paris 7	klintuni@hotmail.com
Louis Defo	WWF-Jengi	ldefo@wwfcarpo.org
Omoze, Ferdinand	Projet Dzanga-Sangha GTZ	Fermoz2@yahoo.fr
Bokoto de Semboli, Bruno	Projet Dzanga-Sangha WWF	bbokoto@hotmail.com
Germain Mavah	WCS-PROGEPP Kabo	mavahgermain@yahoo.fr
Erica Cochrane	Projet Dzanga-Sangha WWF	ecochrane@wwfcarpo.org
Philipp Roth	Projet Dzanga-Sangha GTZ	yedaki76@web.de
Eyebe, Antoine Justin	CARPE	aeyebe@wwfcarpo.org
Ndikumagenge, Cleto	UICN / IUCN	Cleto.ndikumagenge@iucn.org

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