16TH MEETING OF THE CONGO BASIN FOREST PARTNERSHIP'S PARTIES
KIGALI, RWANDA
21-26 NOVEMBER 2016

The value of Endangered species to local communities in the Tridom conservation landscape

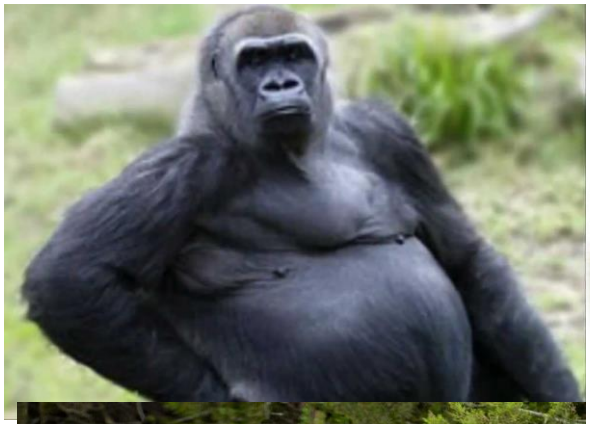
Jonas Ngouhouo Poufoun (INRA, LEF, CIFOR)
Jens Abildtrup (INRA, LEF), Denis Sonwa (CIFOR), Philippe Delacote (INRA, LEF, CEC)

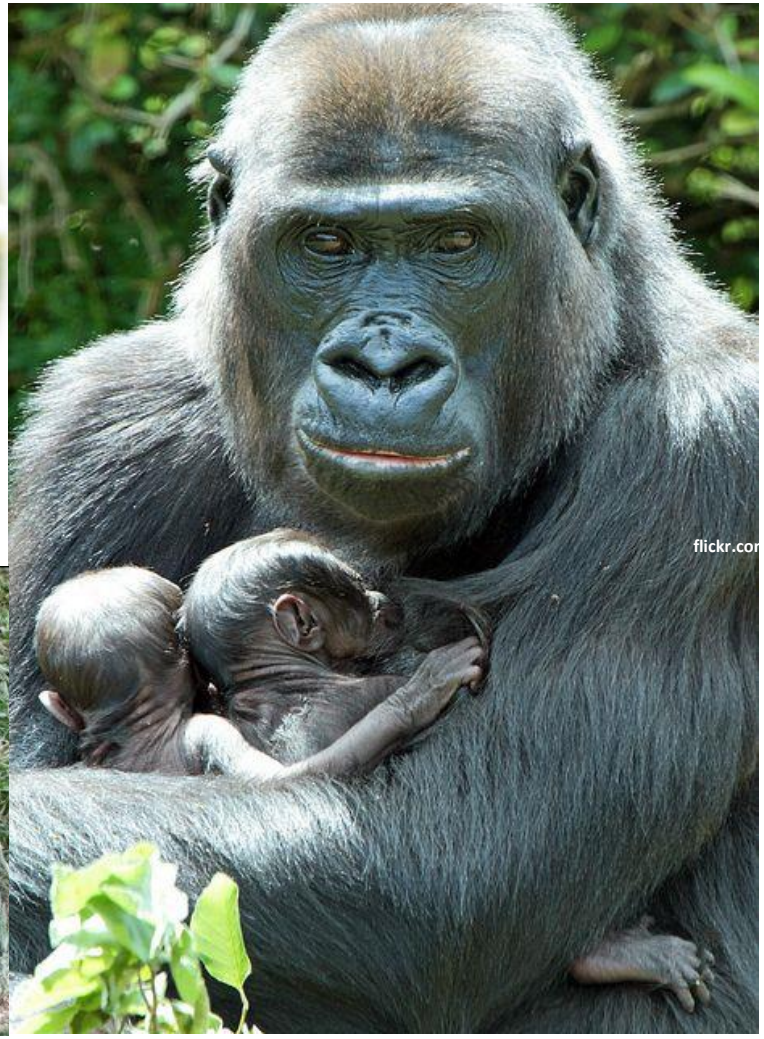
Laboratoire d' Economie Forestière
AgroParisTech
INRA SCIENCE & IMPACT
arbre
UNIVERSITÉ DE LORRAINE
CIFOR
Norad

OUTLINES

- Background and key issues
- Literature review
- Objective and hypothesis
- Methodology
- Results
- Policy implications

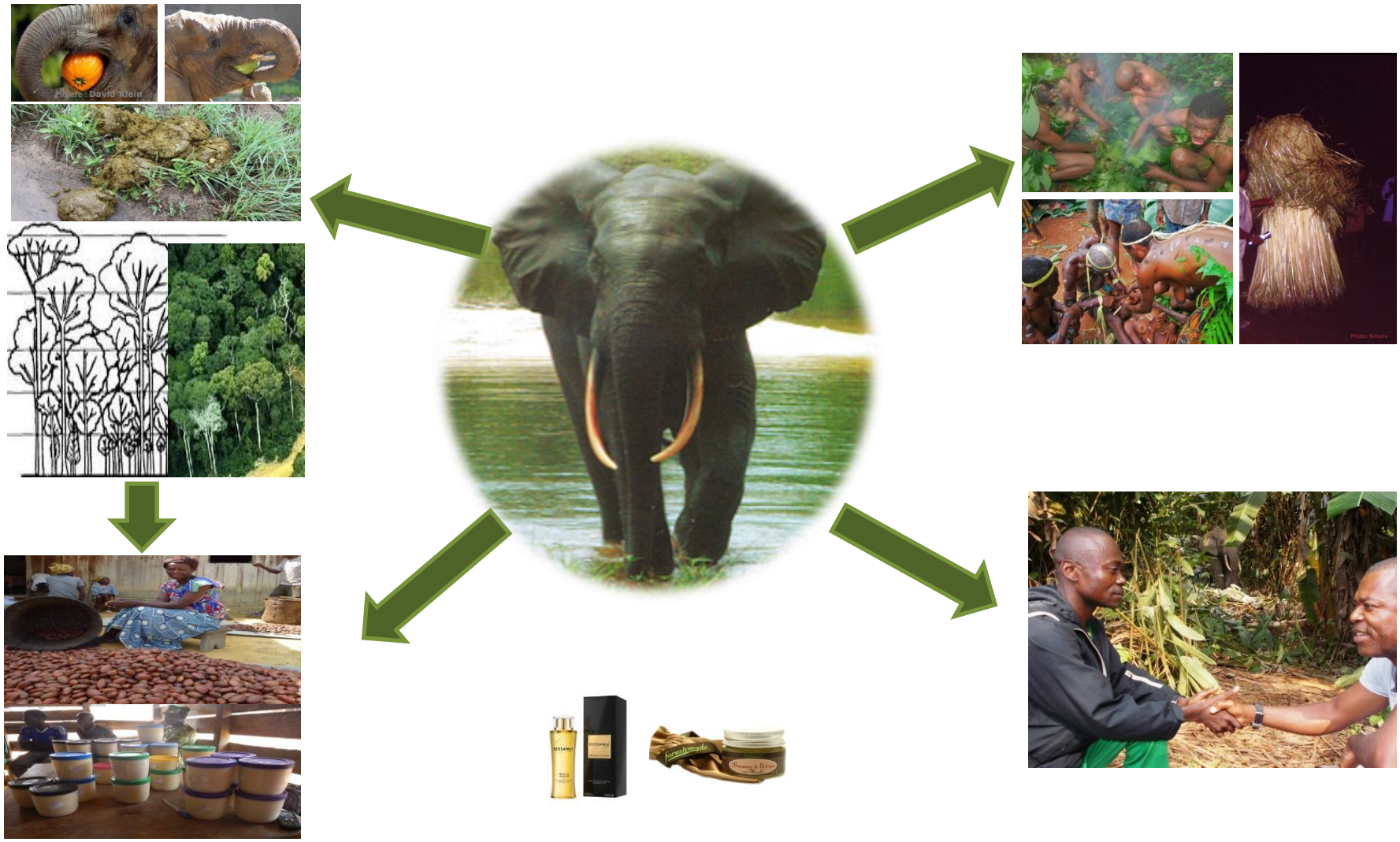
Awareness regarding the loss of biodiversity is not really new. However, there is **growing decline of flagship species** due to Wildlife trafficking and wildlife Crime that may cause **serious threat on human welfare**.





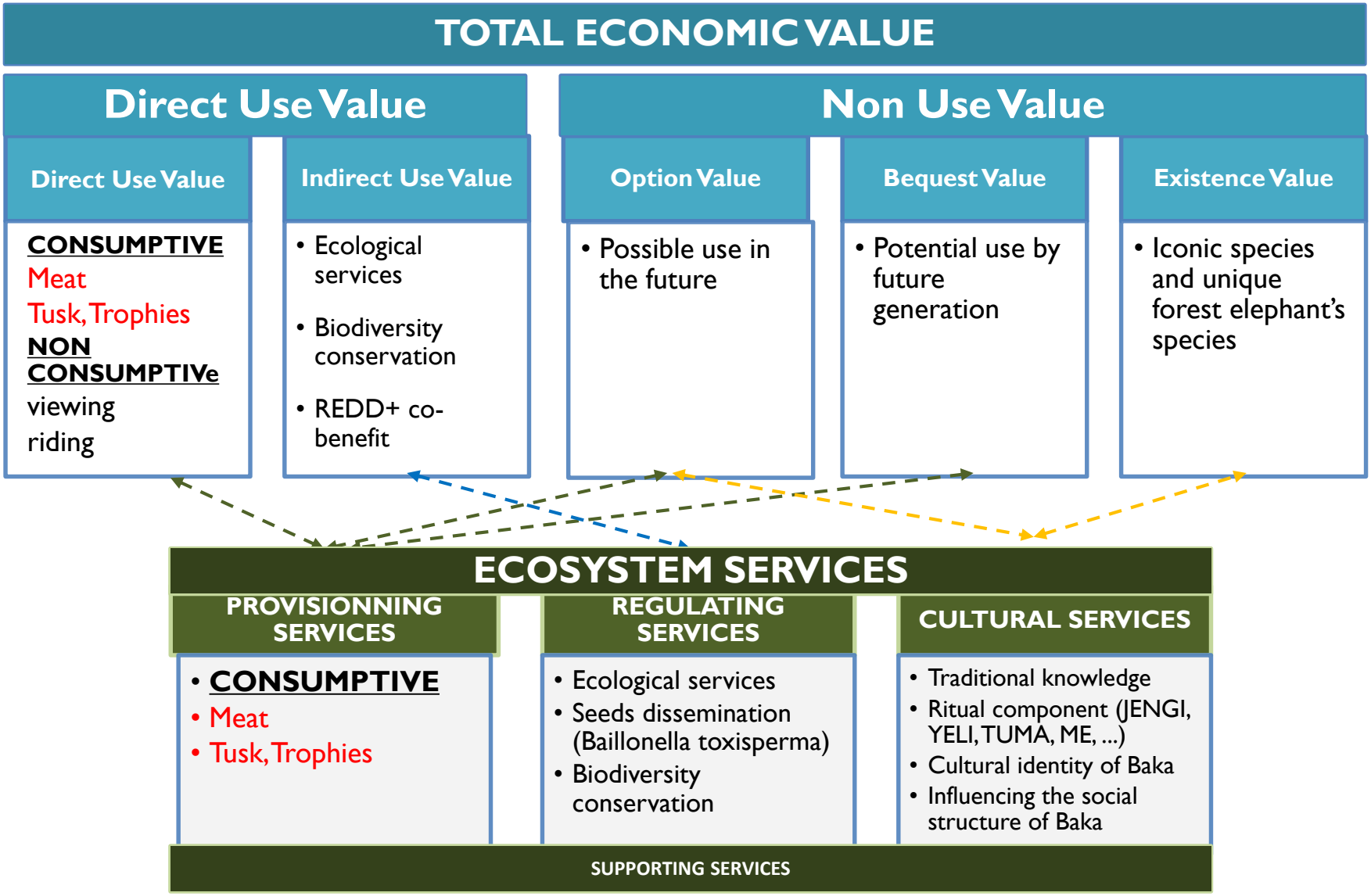
BACKGROUND AND KEY ISSUES

Importance of Endangered Forest Elephants (EFE)



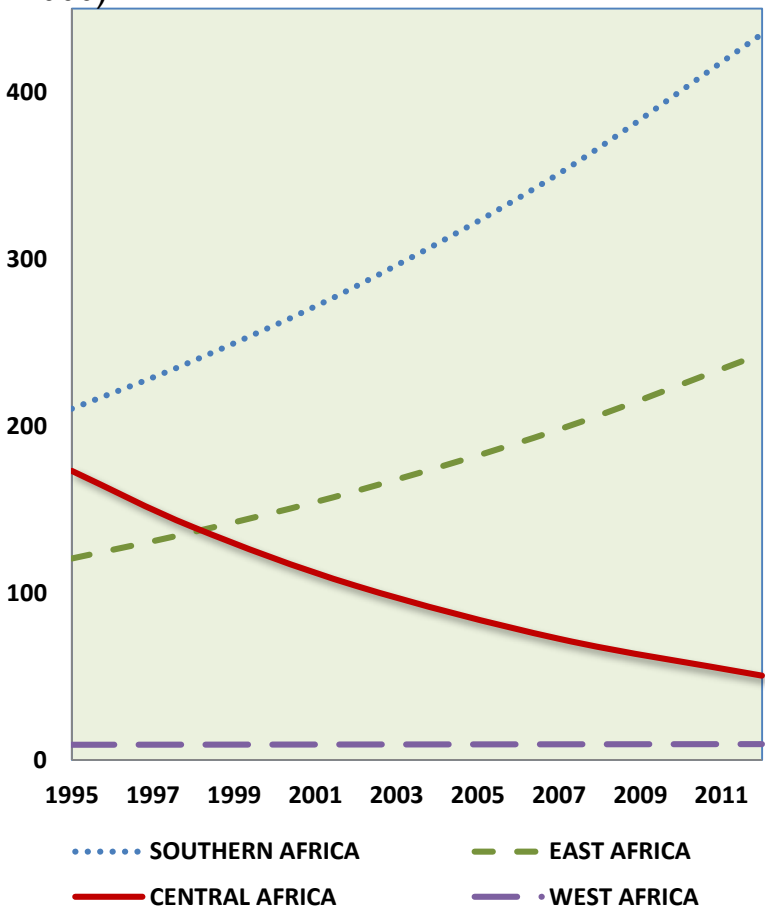
BACKGROUND AND KEY ISSUES

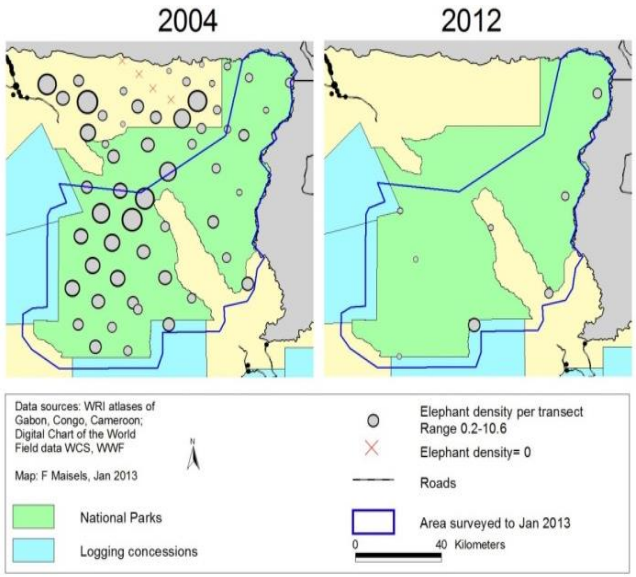
Importance of Forest Elephants (EFE)



BACKGROUND AND KEY ISSUES

Fig. 1 : Devastating Decline (CITES, 2012, Maisels and Al, 2013; Blake et al., 2007; Martin and Stiles, 2000)





- < 10% size; < 25% range
- Large scale land grabbing
- Poaching; Related illegal Ivory trade, meat
- **Threshold effect, Inbreeding mattings**

BACKGROUND AND KEY ISSUES

Importance of EFE

BACKGROUND AND KEY ISSUES

Research question

Thus, incentives for Forest Elephants' Conservation should go **beyond utilitarian criterion** and integrate **a wider set of value including social, cultural and intrinsic values.**

- ***What are local communities willing to pay (WTP) to prevent the elephant extinction?***

LITERATURE REVIEW

Economics of endangered species conservation (Bishop, 1978; Tisdell, 2002; Bulte and Kooten, 2002; Barbier et al, 2013).

Few research on local people's valuation of the indirect-use and non-use values of savannah (including asian) elephants (Vredin, 1997; Bandara and Tisdell, 2003, 2004; Muchapondwa et al, 2009; Smith and Sullivan, 2014),

Bandara and Tisdell (2001, 2003, 2005)

- 300 residents in Colombo /Sri Lanka
- Kaldor–Hicks hypothetical compensation

No research has addressed this issue in the Congo Basin. While this iconic species plays important roles in socio-cultural and ecological integrity (Lewis, 2002; Blake et al., 2009).

- Among first peer review academic paper **on households preferences** for endangered species conservation in the Congo Basin.
- Landscape factors (distance, the elephants' density and land holding).

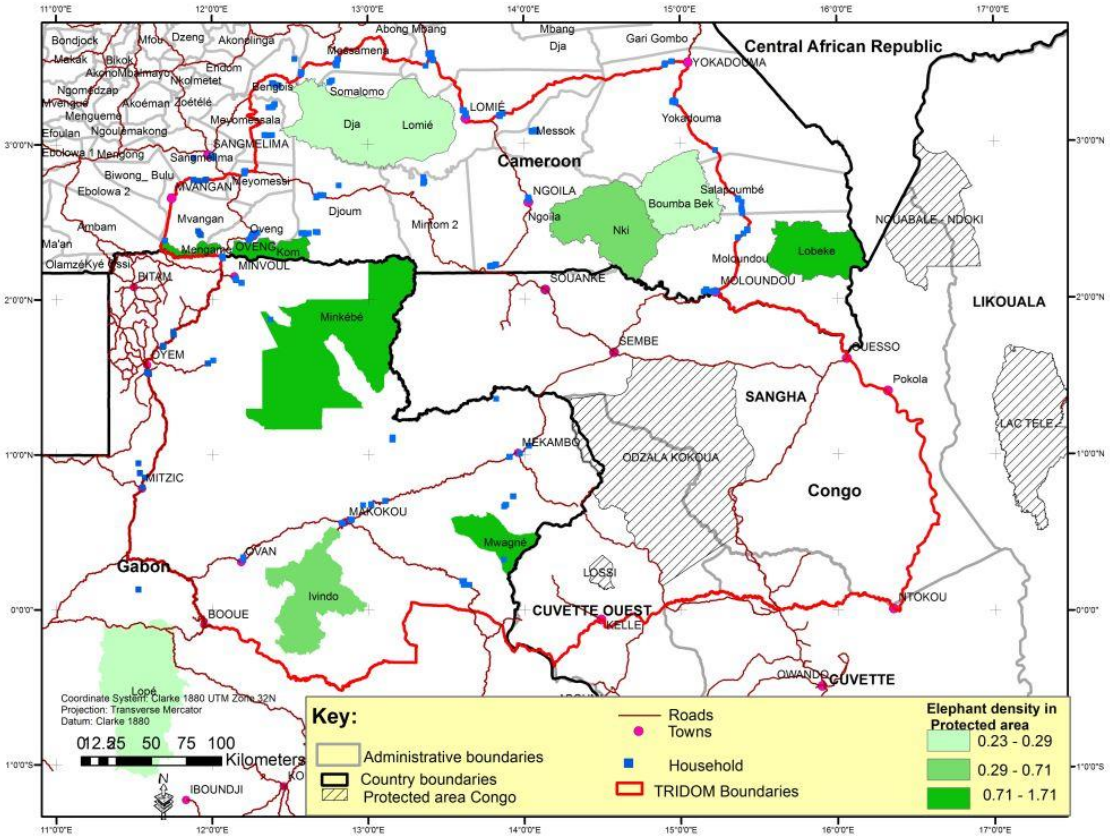
OBJECTIVE AND HYPOTHESIS

- **Threefold purposes**
  - determine the social and cultural preferences for EFE conservation.
  - analyses the factors that influence its value
  - determine the impact of an incremental change of the drivers on the WTP

It tests the following hypothesis.

- *The extinction EFE (-) welfare (**WTP>0** indirect utility theory).*
- *Distance to PA (+/-)*
- *Human-Elephant Conflicts (-)*
- *Indigenousness (+)*

METHODOLOGY: Sampling and Study Area



- **Survey**
  - Sample (1035/ 65140)
  - 26 administrative units
  - 108 village
  - 8 months field work
  - 8 GPS

METHODOLOGY : Valuation Technique - Implementation

- **MEA, economic valuation and decision making**
- No market of elephants, Stated Preferences – Contingent Valuation Questions
- Attributes **Description** of EFE
- Hypothetical scenario(non-market good without implicit market)

  "Considering the trend towards the extinction of forest elephants, if action is not taken quickly, this multi-use, iconic species will disappear in the next few years. To stop this tendency towards extinction and make the species more abundant, the Tridom Regional Project Management Unit would develop ***a 10-years elephant conservation program*** *that aims to* ***seize weapons*** *currently used by poachers and to effectively fight cross-border poaching by (1)* ***creating joint checkpoints*** *on the landscape scale and (2) recruiting more young people from villages and involving them in* ***a communication network to improve*** *anti-poaching control strategies and prevent human-elephant conflicts"*
- Question : ***are you willing to contribute to the program by paying some monthly amount if finance support is demanded from all the inhabitants of the village?***

METHODOLOGY : Survey Design

- **Combining Open-ended** (OE) and **Closed-Ended elicitation formats** (Cameron & James, 1987; Hanemann, 1985 ; Carson, 1985 ; Hanemann & Kanninen, 1998)
- CE, considered as a learning design that encourage individual to reveal their real preferences when answering to the OE questions.
- 4 econometric models to evaluate the possible lost in welfare and derive the drivers of decision to parcition to such a program
  - Intervall regression models,
  - Corner solution models (Heteroscedastik Cragg's Double Hurdel model, Hekman, tobit)

VARIABLES AND DESCRIPTIVE STATISTIQUES

Variable	No Protest (n=936)	Protest bidders (n=99)	Comparison test Chi 2 (1) <3,84 [t-test (5%, 1033)] <1,96
	Mean (Std. Dev.)	Mean (Std. Dev.)	
Gender	0,76 (0,42)	0,77 (0,42)	0.007
Age	48,29 (14,68)	50,79 (13,52)	[-14,07]
Hsize	6,43 (4,05)	7,02 (3,90)	[-0,0194]
Education level	0,55 (0,50)	0,68 (0,47)	6.21
Monthly exp.	46604 (59463)	59792 (68242)	[-2,40E+19]
Indigenousness	0,05 (0,22)	0,03 (0,17)	0.77
Small farmer	0,41 (0,49)	0,42 (0,50)	0.09
Trad gold miner	0,03 (0,16)	0,00 (0,00)	2.82
Hunther gatherer	0,15 (0,36)	0,09 (0,29)	2.81
Fmu or forest ad	0,03 (0,18)	0,02 (0,14)	0.48
Other admin	0,09 (0,28)	0,10 (0,30)	0.16
Hum/eleph conflict	0,28 (0,45)	0,23 (0,42)	0.88
Land tenure	4,32 (5,32)	5,36 (4,32)	[-0,09,73]
Dist_narea	28,98 (22,26)	27,60 (22,14)	[40,17]
Elephantdensity	0,94 (0,84)	0,83 (0,72)	[0,01,51]

MAJOR OUTCOMES AND POLICY ISSUES

OUTCOME I

The **extinction** of *Loxodonta cyclotis* ➔**net loss of welfare**.

- **Predicted monthly WTP** by household head : CFA **1138.17 (€1.74)**
- Closed to **Bandara and Tisdel** (2005) : **Rs. 110.17 (€1.65)**
- Annual social value : CFA 889.7 million (€1.36 million)
- **NPV over 10 years : CFA 8.67billion (€13.2 million)**.

POLICY ISSUES I

- Expected annual budget of € 1,5 million for the Tridom conservation
- Completed annual budget : € 0,9 million on average between 2007 – 2011 (9000 species)

As a matter of comparison,

- The social value of EFE only =150% of the total conservation cost.
- **The program is under-funded compared to the social benefits brought about by biodiversity conservation.**

RESULTS

Drivers of participation and intensity's decisions

- **Indigenousness** (+)
- **Human-Elephant Conflict** Neutral
- **Distance**: Local communities prefer elephant but far from their crops
- Distance as an indicator of scarcity holds compare to the distance decay assumption

Predictors	Tobit model	Heteroscedastic Double Hurdle ML Estimates		
		First Hurdle	Second Hurdle	Het
	Estimates (Std Dv)	Estimates - α (Std Dv)	Estimates - γ (Std Dv)	sigma (Std Dv)
AGE	-22,153*** (7,482)	-0,008** (0,003)	16,136 (15,671)	-20,297** (8,669)
EDUCATION LEVEL	639,181*** (197,365)	0,296*** (0,092)	2204,333*** (643,792)	-678,365*** (247,065)
MONTHLY EXP.	0,00784*** (0,002)	6E-07 (8E-07)	-0,005** (0,011)	0,022*** (0,005)
INDIGENOUSNESS	881,164** (347,409)	0,417** (0,210)	2802,750*** (666,533)	-1002,568*** (283,159)
SMALL FARMER	181,726 (218,536)	0,126 (0,103)	-	-
TRAD GOLD MINER	1776,781** (686,945)	0,660** (0,305)	-	-
HUNTHER GATHERER	406,523 (280,632)	0,195 (0,141)	-	-
FMU OR FOREST AD	1408,703*** (456,845)	0,962*** (0,304)	-	-
OTHER ADMIN	868,687** (355,409)	0,418** (0,177)	-	-
LAND TENURE	589,087*** (211,915)	0,177* (0,096)	-8663,312 (7696,3)	2960,953* (1642,55)
HUM/ELEPH CONFLICT	48,305 (202,818)	-0,013 (0,098)	-1394,463 (1231,3)	905,122** (452,839)
DISTANCE*DENSITY	-0,763 (1,911)	0,001 (0,001)	7,398** (2,890)	0,315 (2,409)
INTERCEPT	336,557 (393,581)	0,298 (0,196)	-1956,741 (1203,5)	2553,671*** (582,020)
/lnsigma	-	-	-	-
SIGMA _CONS	2582,161 (314,105)	-	-	-

RESULTS

Impact of change in dependant variables (Partial Effects)

Predictors	Partial Effect on the probability of participation to elephants' conservation	APE of on the Conditional expected WTP for Elephants' Conservation	APE on the unconditional expected WTPfor Elephants' Conservation
	$\frac{\partial P(y_i > 0/x_i)}{\partial x_j}$	$\frac{\partial E(y_i/y_i > 0, z_i)}{\partial x_j}$	$\frac{\partial E(y_i/x_i, z_i)}{\partial x_j}$
Age	**-0,003**	4,648	-3,036
Education level	**0,107**	**635,031**	**615,652**
Monthly exp.	2,29E-07	**-0,001**	0,0004
Indigenousness	**0,151**	**807,42**	813,368
Trad gold miner	**0,239**		-260,821
Fmu or forest ad	**0,348**		93,277
Other admin	**0,152**		487,291
Land tenure	0,064	-2495,752	143,959
Hum/eleph conflict	-0,005	-401,721	709,561
Distance*density	-4,14E-04	**2,131**	308,764
Unconditional wtp ($E(y_i\|x_i, z_i)$)		1326,873	
Conditional wtp ($E(y_i\|y_i > 0, z_i)$)		2081,839	
inverse mills ratio ($\lambda\left[\phi\left(\frac{z_i\beta}{\sigma_i}\right)/\Phi\left(\frac{z_i\beta}{\sigma_i}\right)\right]$)		1,344296	

MAJOR OUTCOMES AND POLICY ISSUES

OUTCOME 2 and 3

- **Distance:** Local communities prefer elephant but far from their crops
- Distance as an indicator of scarcity and security

- **Human-Elephant Conflict Neutral;** tolerance (Belief)
- (annual damage cost : €43 faced by 27,7% households,)
- Conditional to the Hypothetical Scenario, EFE conservation is socially beneficial,

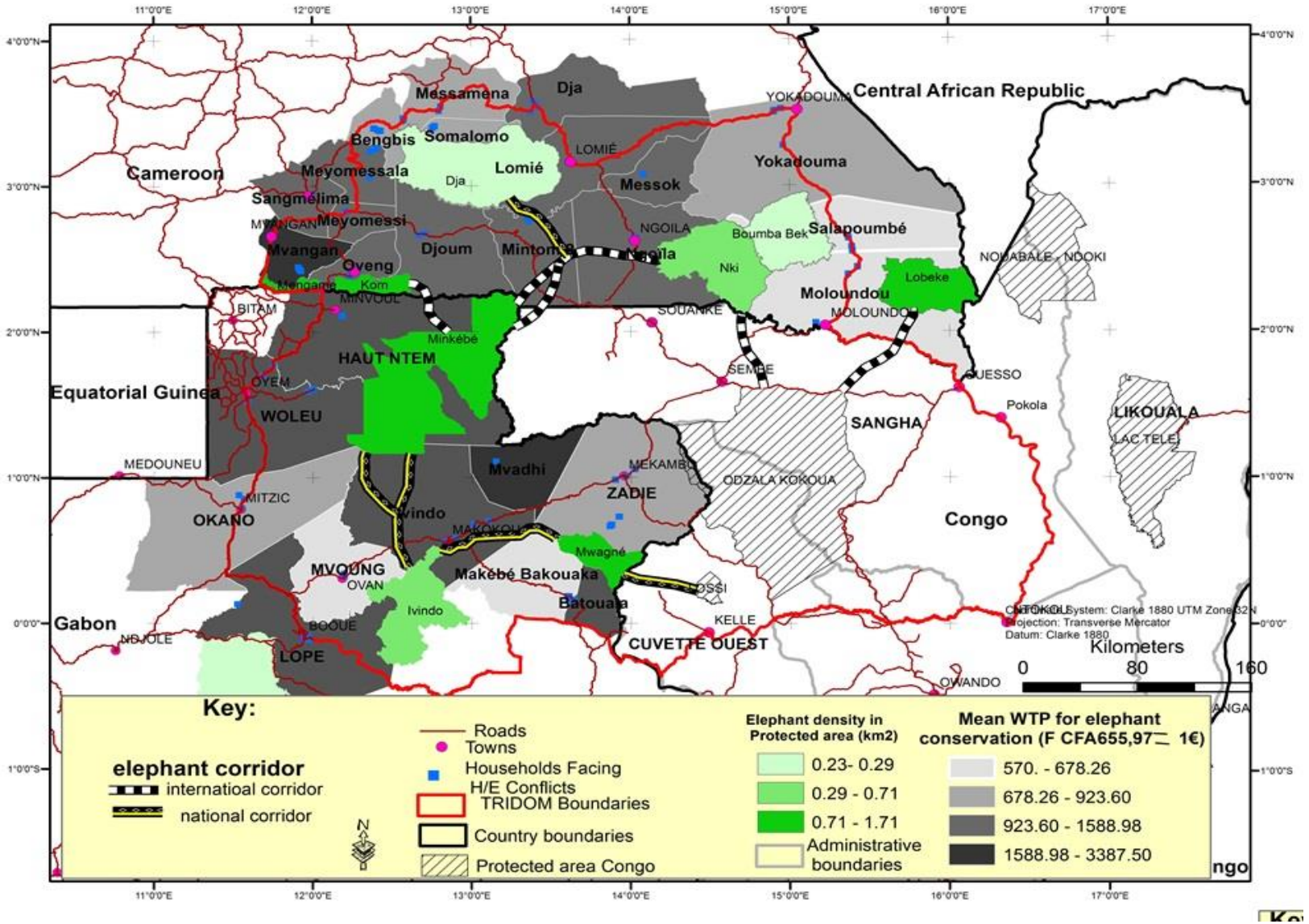
POLICY ISSUES 2

➔ Optimizing trade-off (LUC VS Natural Habitat). **WTP for EFE conservation ? Or for avoiding HEC? A crictical issue remain (ability to cope with public benefit of conservation and private benefits of reducing HEC).**

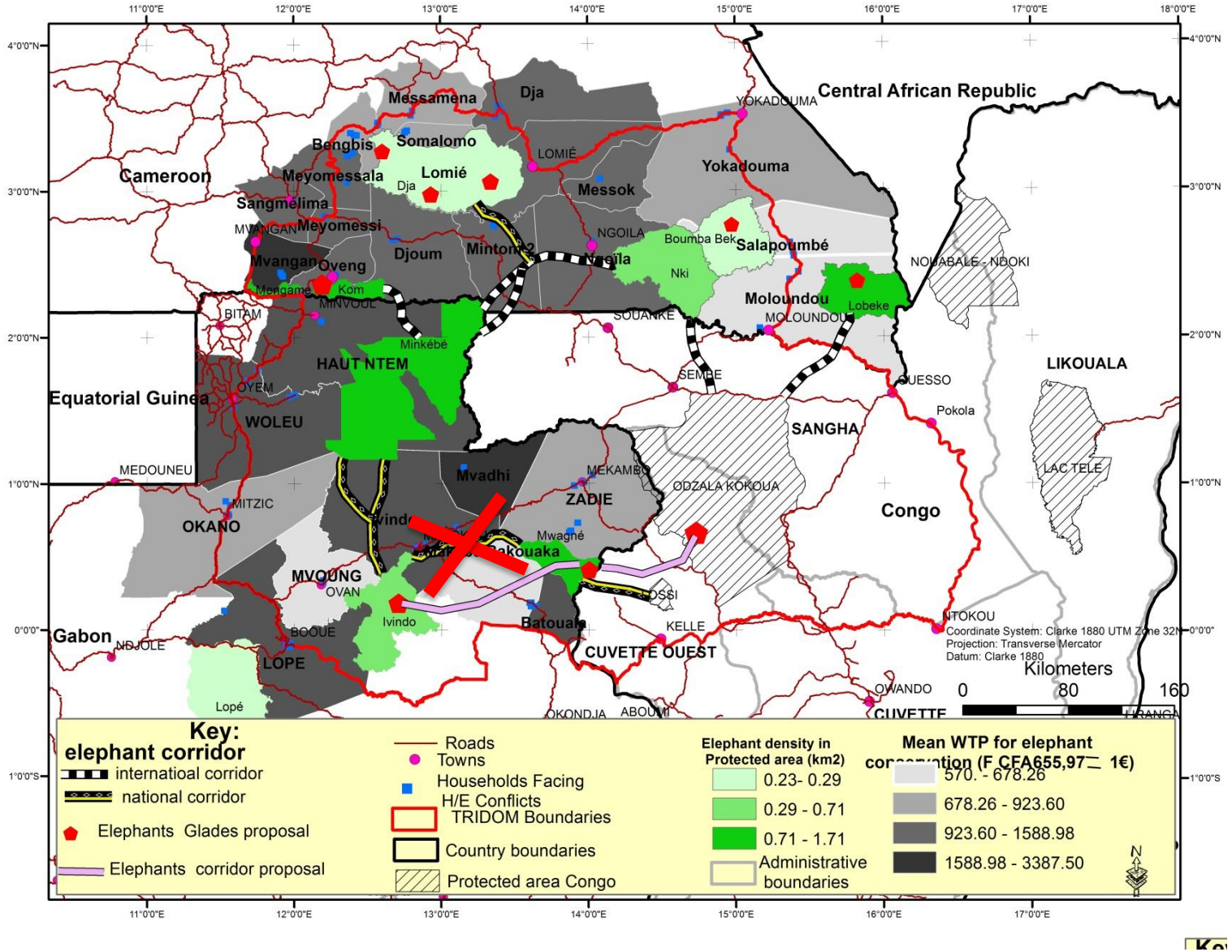
The issue of where the habitat is needed and how it should be managed are the core of the problem.

Overlaping maps of social value, HEC and elephants density to optimizing trade-off between Land use activities and fauna natural habitat.

H-E conflicts, Corridors, WTP



H-E conflicts, Corridors, WTP



POLICY ISSUES 3

- The international standard for management of protected areas : 1 guard for 5000 ha“. In the Tridom, it is 1 guard for 6000 ha to 9000 ha
- Recruiting and training additional **18 guards** on average per protected area for a total of **160 guards** (**12,4% of the social value**), employed to (1) create additional checkpoint in **intensive poaching areas, such as Bengbis, Somalomo, Mouloundou, Ngoyla Mintom, Ouésso and Ntam-Carrefour,** and to (2) create vehicle and foot transboundary patrols to **strengthen cross-border** cooperation for anti-poaching surveillance.
- Recruiting young people from the villages and involving (4% of the social value).

THANK YOU

"THE TRAVEL GRANT TO THE 16TH CBFP MOP WAS PROVIDED BY THE ARCUS FOUNDATION"

Laboratoire d' Economie Forestière

INRA SCIENCE & IMPACT

CIFOR

Norad