



# Supply, use and sustainability of ecosystem services in tropical forests: Insights from the Dja region in southeastern Cameroon

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Session B3: Ecosystem services from African tropical forests

**Ecosystem services for the future: Delivering value for Nature, Livelihoods and Economic Investment**

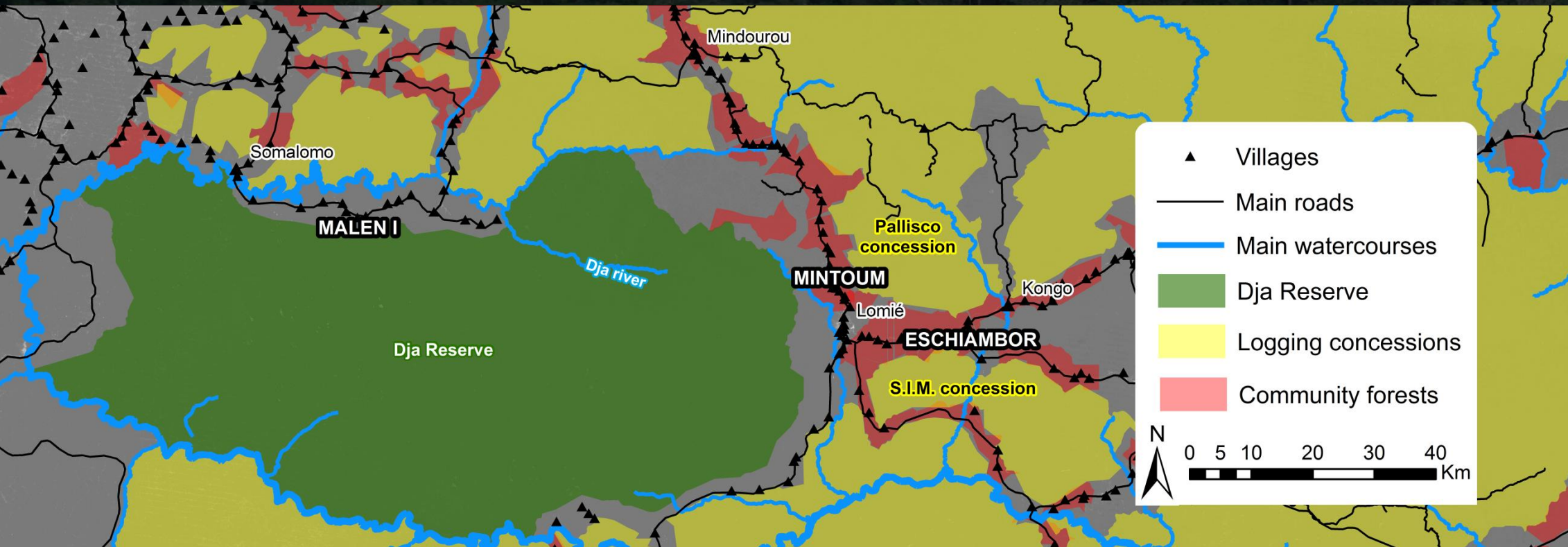


# Tropical forests in central Africa

**170 million hectares**



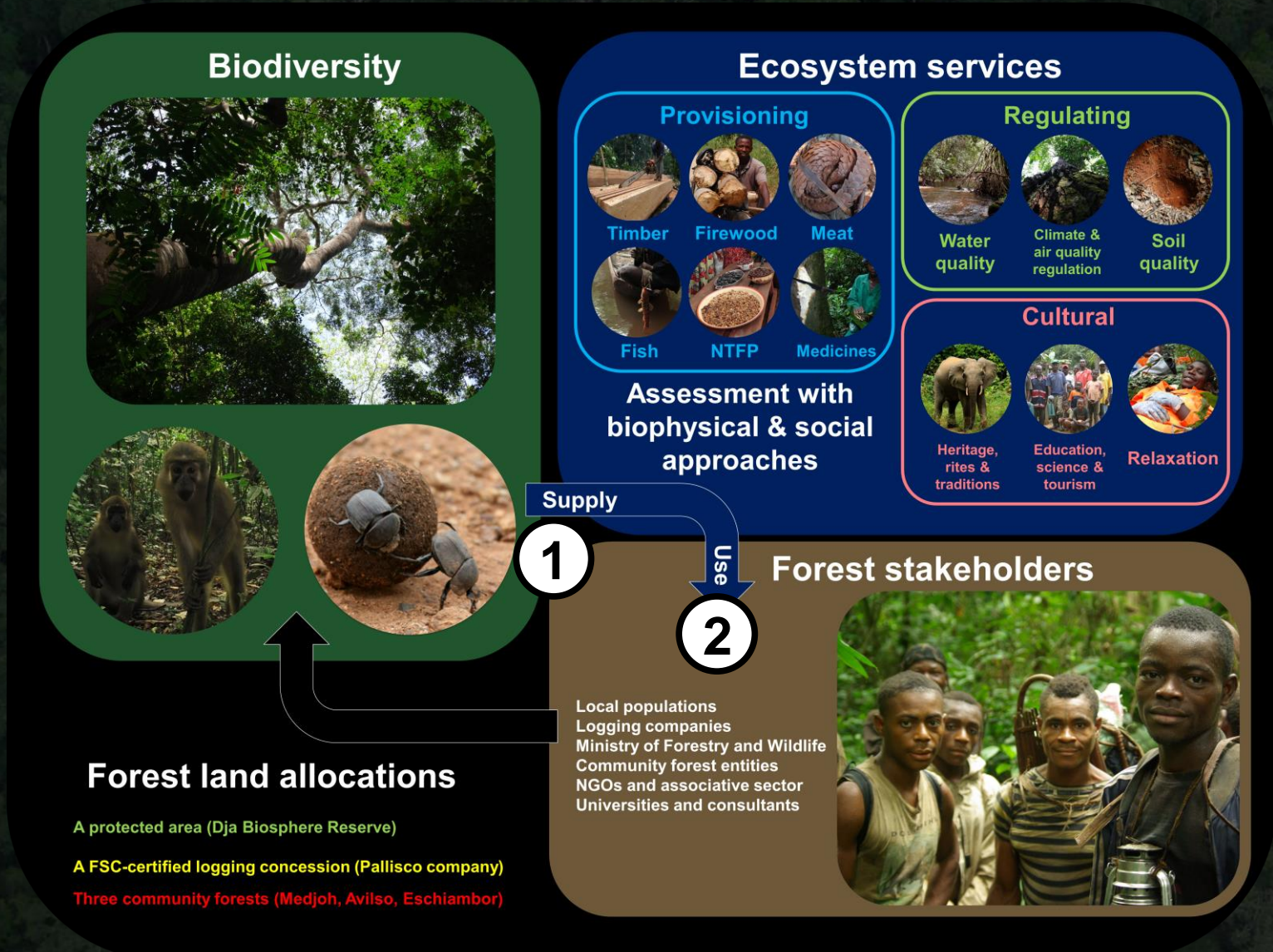
**Contribution to the livelihoods of >60 million people**



- Dense forests of the Guineo-Congolian Region
- Population density: 8 people/km<sup>2</sup>
- Local populations comprise 2 main ethnolinguistic groups: Ko'o Zime & Baka Pygmy
- Main activities: shifting agriculture, hunting, fishing, gathering, and artisanal logging

# Objective

## Assess the supply, use and sustainability of ecosystem services provided by tropical forests to local populations in southeastern Cameroon





# 1 Perceptions of ecosystem services supplied by tropical forests to local populations

Lhoest S., Dufrêne M., Vermeulen C., Oszwald J., Doucet J.-L. & Fayolle A. (2019). Perceptions of ecosystem services provided by tropical forests to local populations in Cameroon. *Ecosystem Services*, 38, 100956.



**Individual interviews  
with 225 forest stakeholders  
in 23 locations**

{ 75 respondents active/living in the protected area  
75  
75 } logging concession  
community forests

1 open-ended question

→ Perceptions of ES significance

16 directed questions

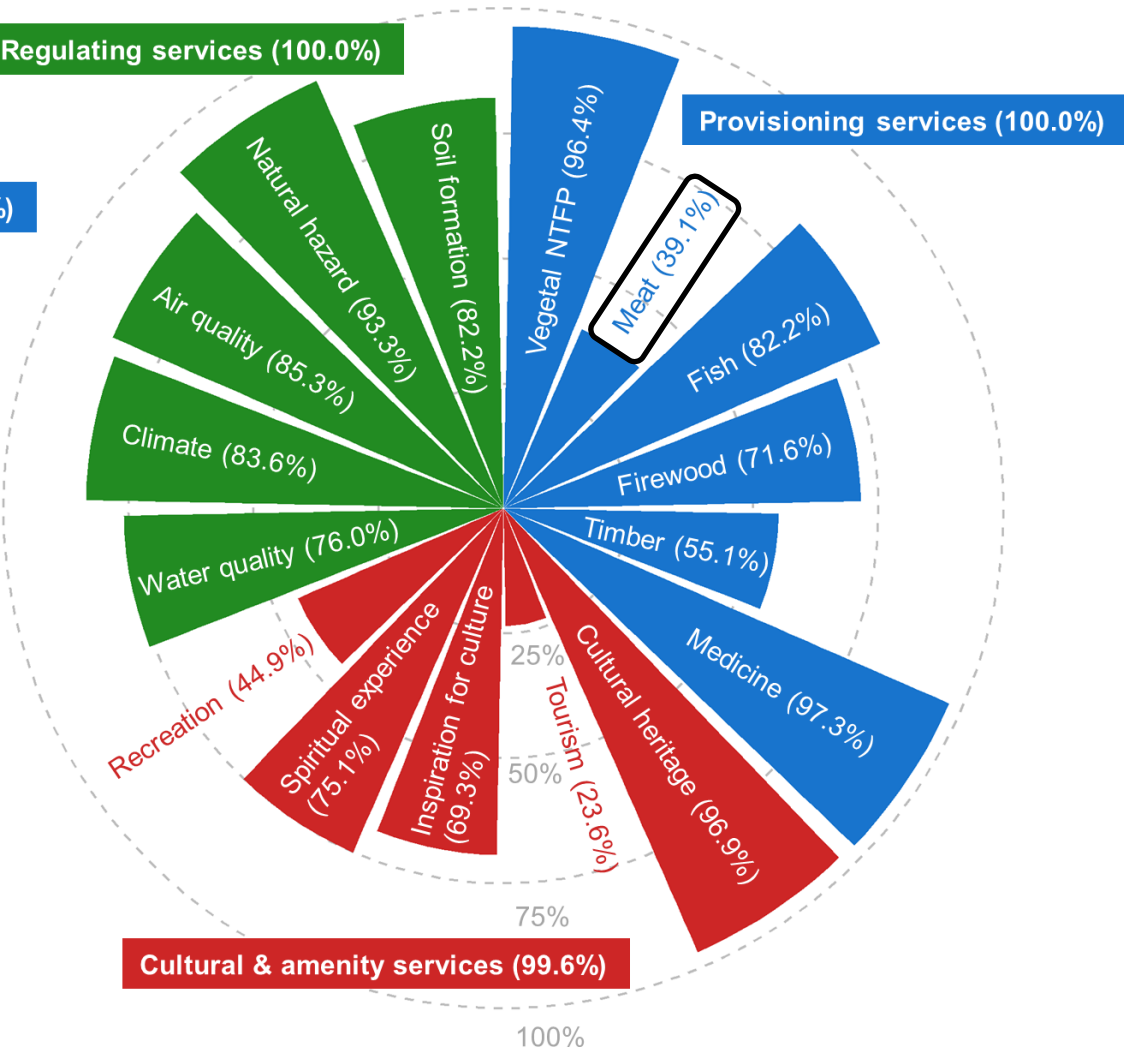
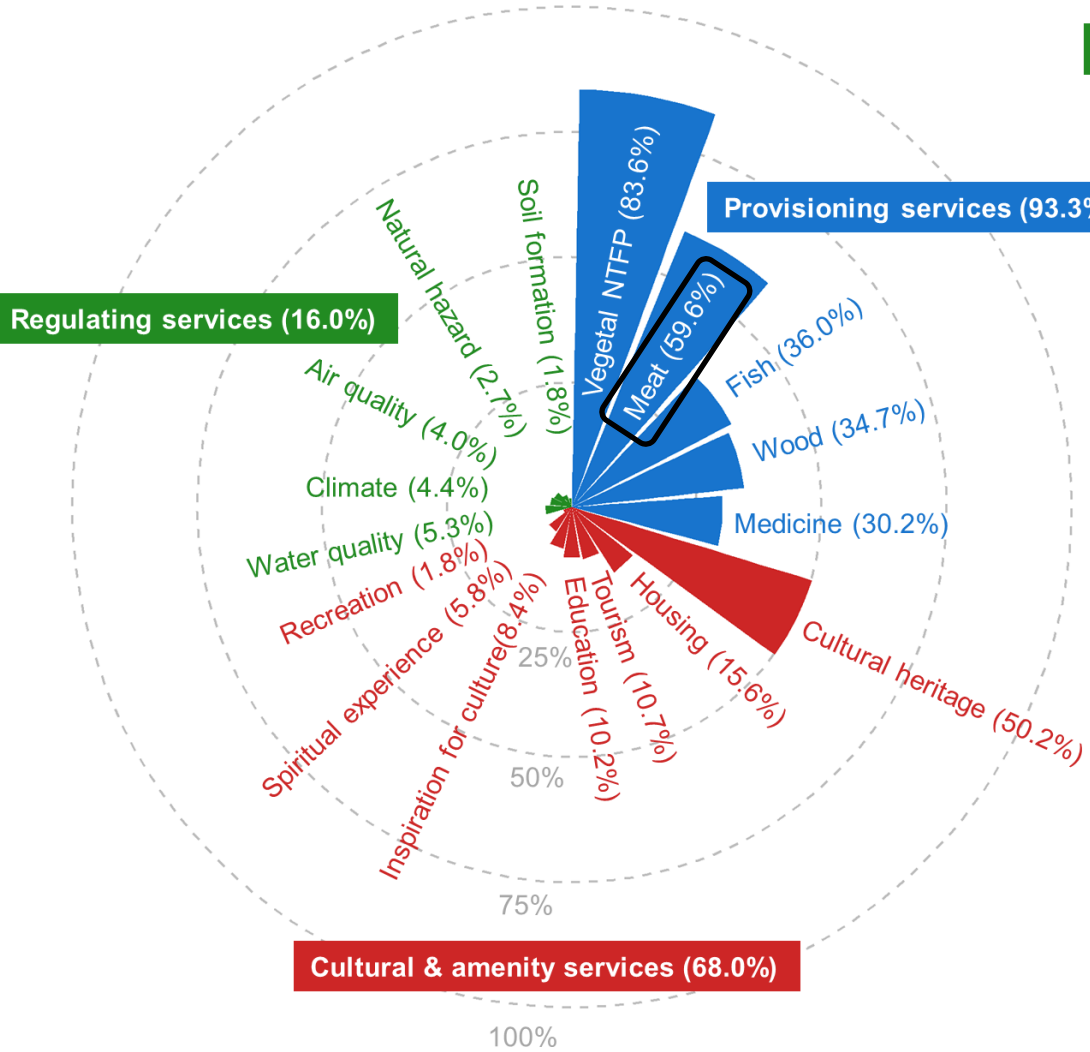
→ Perceptions of ES abundance



# Perceptions of ecosystem services

Perceptions of ecosystem services significance  
(percentages of spontaneous mentions)

Perceptions of ecosystem services abundance  
(percentages of directed mentions)



The ES most frequently perceived as important are provisioning and cultural services. Bushmeat is the only ES perceived more often as important than abundant.

Most frequently reported ES among local stakeholders:

**Provisioning** > **Cultural** > **Regulating**

Deep disconnection between perceptions of the importance of **regulating services** of local stakeholders and international priorities (REDD+, PES, ...)

→ Need to integrate local actors in policy decisions for legitimacy

The most variable ES perceptions should be assessed with complementary methods:

**Bushmeat, firewood, timber, cultural services**

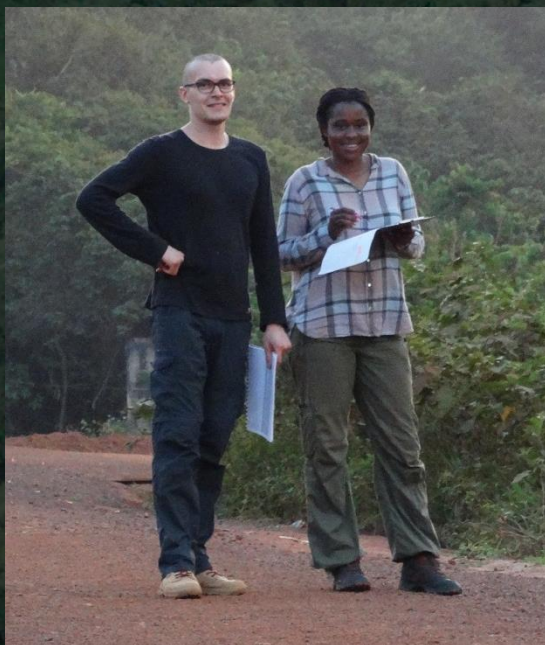




## ② Use of forest ecosystem services by local populations

Lhoest S., Vermeulen C., Fayolle A., Jamar P., Hette S., Nkodo A., Dufrêne M. & Meyfroidt P. (2020). Use of forest ecosystem services by local populations in southeastern Cameroon. *Sustainability*, 12(6), 2505.

- Exhaustive household census (structured interviews, n = 133)
- Sampling of 55 volunteer households stratified by: main source of income & ethnic group



Participatory  
mapping



Data collection in 3 villages:  
Field surveys (biophysical approaches) and interviews (social approaches)

**3 provisioning services:**  
Bushmeat, firewood, timber

**5 cultural services:**  
Cultural heritage, inspiration, spiritual experience, recreation, education

# Bushmeat use

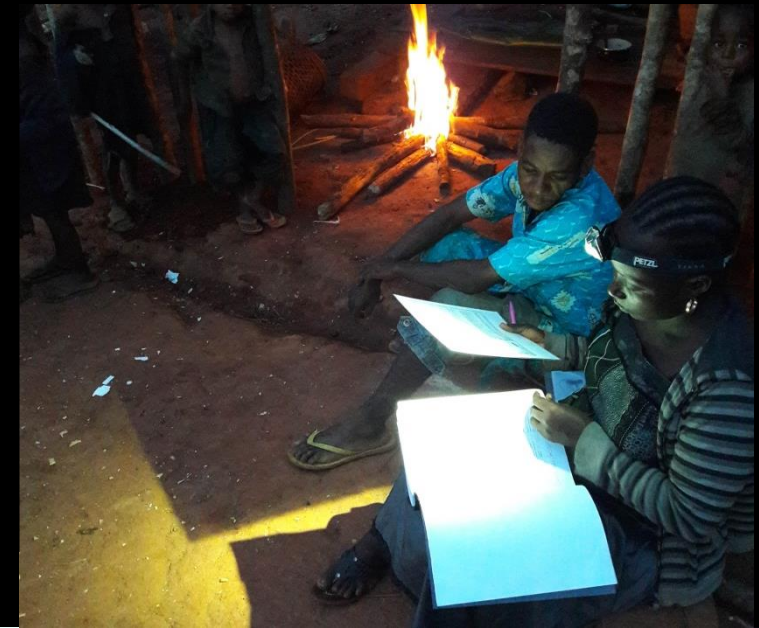


- GPS tracking of volunteer hunters  
(n = 651 km)
- Daily survey of dietary intake: Structured interviews + Weighing  
(n = 3291 meals)

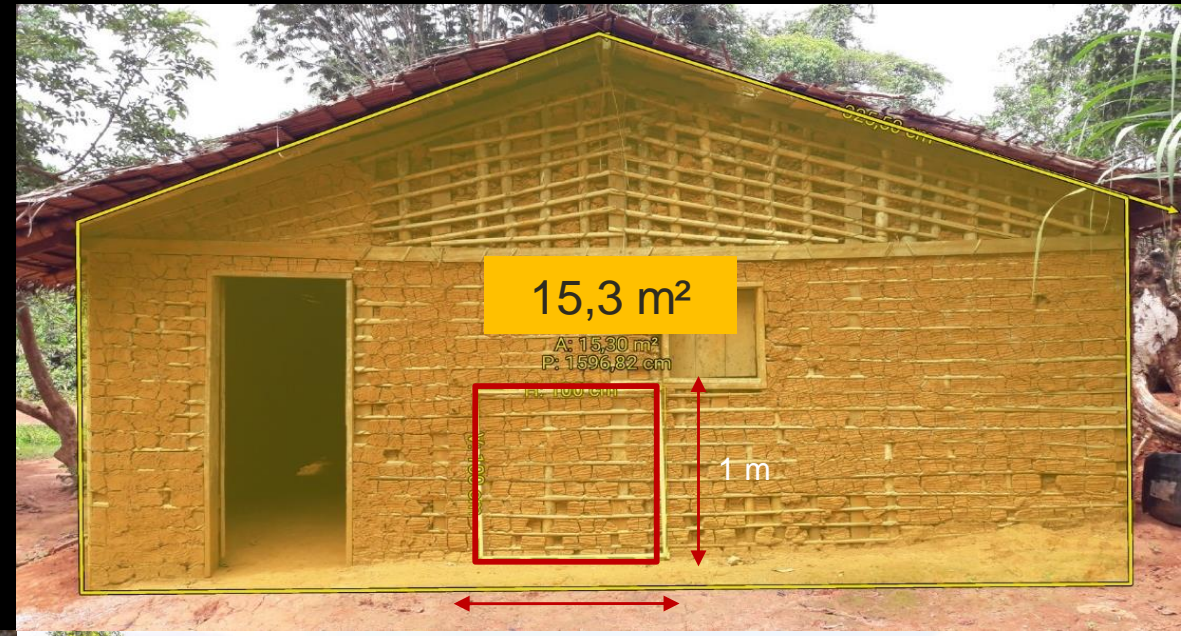




- GPS tracking of volunteer villagers  
(n = 50 km)
- Daily survey of firewood use:  
Structured interviews +  
Weighing  
(n = 3367 days)



## Quantification with structured interviews + Measurements (n = 69 households)





- Participatory mapping + Georeferencing  
(n = 26 sites)
- Evaluation of the use of cultural services:  
Structured interviews  
(n = 145 respondents)



**56** kg / person / year

**57** % is purchased

(n = 3291 meals)





**1.17** m<sup>3</sup> / person / year

**1** % is purchased

(n = 3367 days)



# Timber



**0.03** m<sup>3</sup> / person / year

**21** % is purchased

(n = 69 households)



**73%** of positive mentions

(n = 145 respondents)



# 25% of positive mentions

(n = 145 respondents)

Photo: S. Hette



**56%** of positive mentions

(n = 145 respondents)

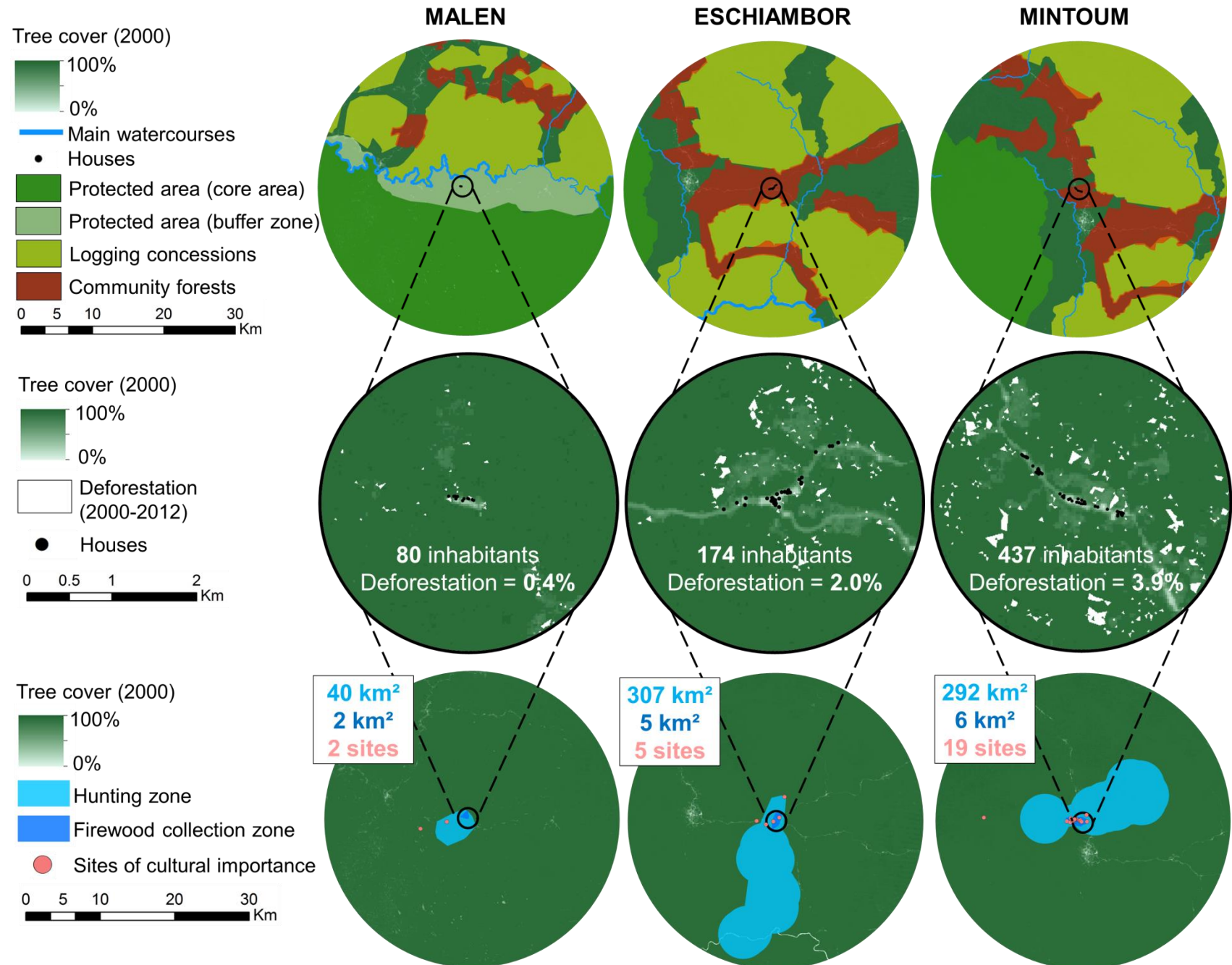


**55%** of positive  
**mentions**  
(n = 145 respondents)



**86%** of  
**positive mentions**  
(n = 145 respondents)

# Mapping of ES use at the village scale



## This study (2018)

4.7 km<sup>2</sup>/household

32 kg/km<sup>2</sup>/year

## Delvingt et al. (2001)

2.0 km<sup>2</sup>/household

93 to 173 kg/km<sup>2</sup>/year

→ Extension of hunting areas

→ Decrease of hunting catch

Decrease of animal populations since decades  
(according to 100% of 24 interviewed hunters)

→ Defaunation & **unsustainable hunting practices**



# Sustainability of firewood and timber use

Mean use of firewood: 1.8 kg/person/day

Mean use of timber: 3.75 m<sup>3</sup>/household

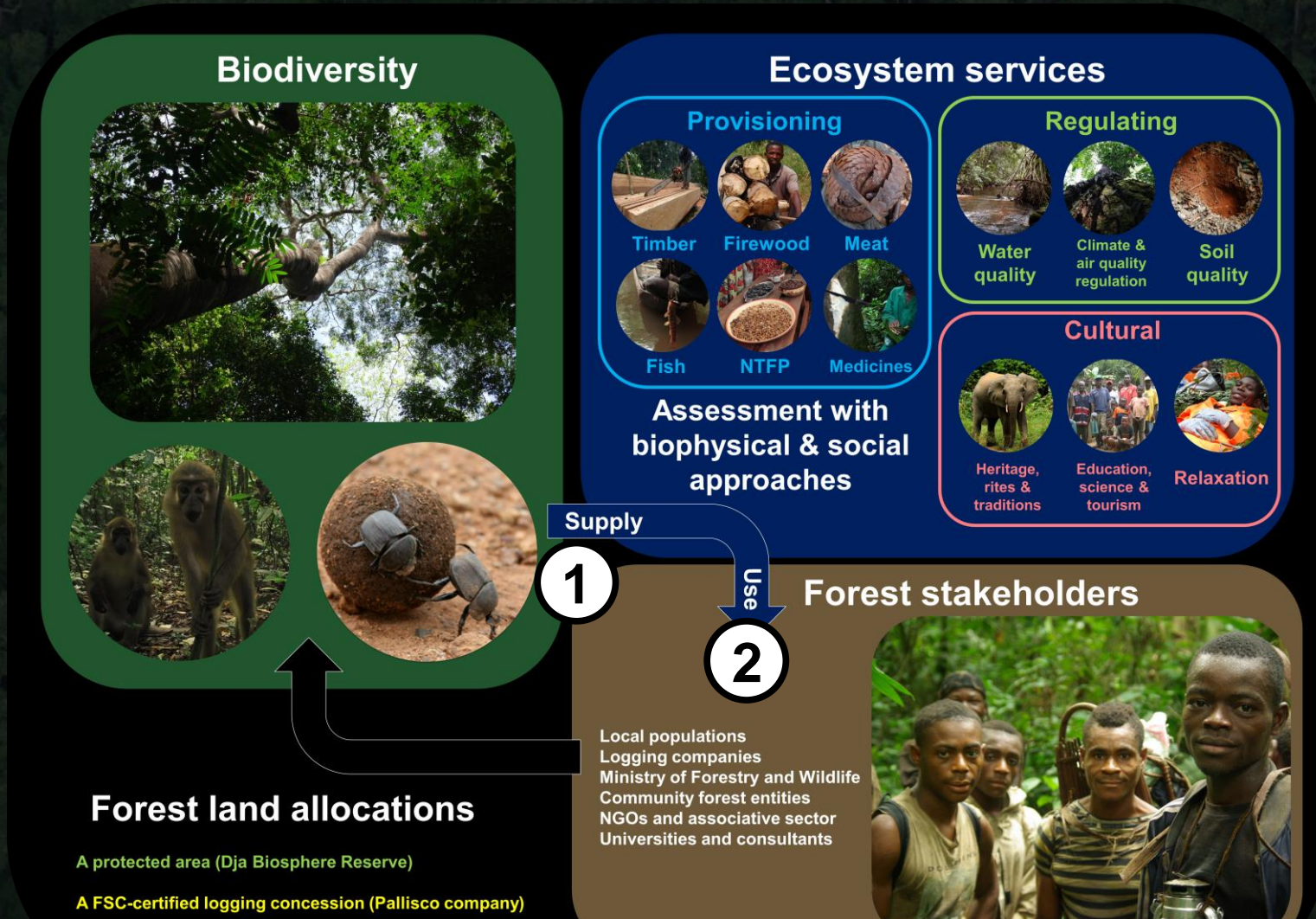
Firewood use = 39 x timber use

Total firewood mass used annually in each village = 0.20 to 0.69 Mg/ha/year  
= 4 to 13% of the natural growth of the wood resource\*

**Sustainable use of wood by rural populations, minor impact on forest ecosystems**

\*based on a biomass increment of 5.46 Mg/ha/year estimated in Cameroon agro-forest areas (Djomo *et al.*, 2011)

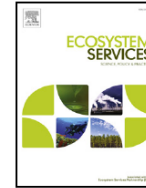
# Take-home message



**Any policy and management decisions regarding the use of ecosystem services should be based on such assessment of the sustainability of use, and the match of human needs with the natural supply.**



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## Perceptions of ecosystem services provided by tropical forests to local populations in Cameroon

Simon Lhoest<sup>a,\*</sup>, Marc Dufrêne<sup>a</sup>, Cédric Vermeulen<sup>a</sup>, Johan Oszwald<sup>b</sup>, Jean-Louis Doucet<sup>a</sup>, Adeline Fayolle<sup>a</sup>







*sustainability*



Article

## Quantifying the Use of Forest Ecosystem Services by Local Populations in Southeastern Cameroon

Simon Lhoest<sup>1,\*</sup>, Cédric Vermeulen<sup>1</sup>, Adeline Fayolle<sup>1</sup>, Pierre Jamar<sup>1</sup>, Samuel Hette<sup>1</sup>, Arielle Nkodo<sup>1</sup>, Kevin Maréchal<sup>1</sup>, Marc Dufrêne<sup>1</sup> and Patrick Meyfroidt<sup>2,3</sup>

# Thank you for your attention!

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