

# Is research useful for the management of protected areas in central Africa?

Conservation Innovation Lab Meeting  
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with a special thank to:  
Samuel QUEVAUVILLERS  
Marie-Ange GOLARD



# My background

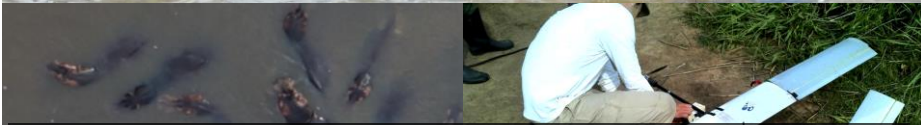
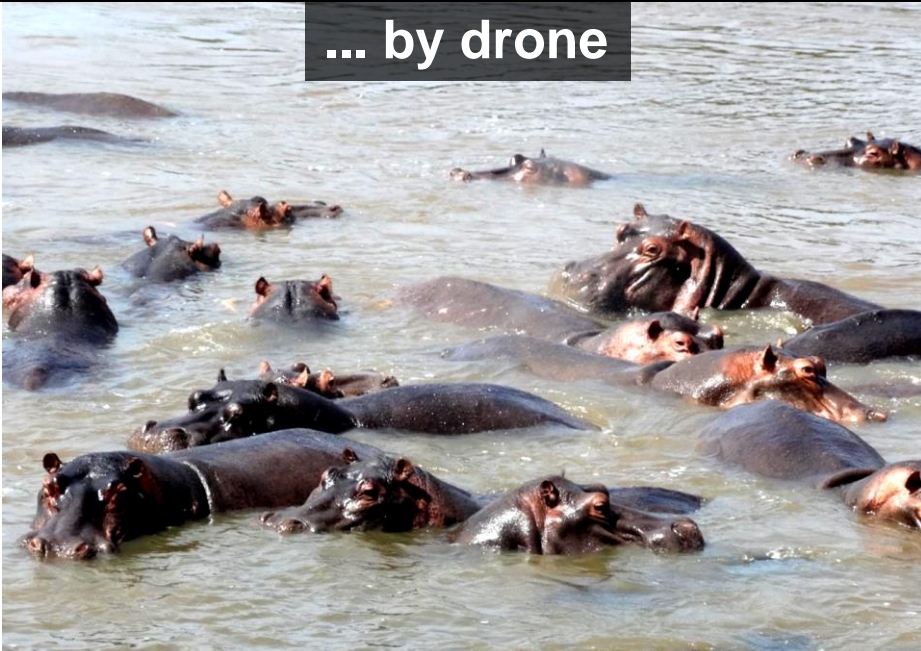
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Gembloux Agro-Bio Tech, University of Liège, Belgium



**Master (2015):** Bioengineering, Management of Forests and Natural Areas  
**PhD (2020):** Agronomic sciences and biological engineering

... by drone



Lhoest S. et al. (2015). How many Hippos (HOMHIP) : Algorithm for automatic counts of animals with infra-red thermal imagery from UAV. **ISPRS Archives**.

Linchant J. et al. (2015). WiMUAS: Developing a tool to review wildlife data from various UAS flight plans. **ISPRS Archives**.

Linchant J. et al. (2018). UAS imagery reveals new survey opportunities for counting hippos. **PLoS ONE**.

... with camera traps



Lhoest S. et al. (2020). Conservation value of tropical forests: Distance to human settlements matters more than management in Central Africa. **Biological Conservation**.

Fonteyn D. et al. (2020). Wildlife trail or systematic? Camera trap placement has little effect on estimates of mammal diversity in a tropical forest in Gabon. **Remote Sensing in Ecology and Conservation**.

Houngbégnon F.G.A. et al. (2020). Daily Activity Patterns and Co-Occurrence of Duikers Revealed by an Intensive Camera Trap Survey Across Central African Rainforests. **Animals**.

## Biodiversity



### Mammals

4 grids of 11 camera traps  
3 months/grid  
Species identification



### Dung beetles

72 baited pitfall traps  
48 hours/trap  
Species identification

## Ecosystem services

### Provisioning



Timber



Firewood



Meat



Fish



NTFP



Medicines

### Regulating



Water quality



Climate & air quality regulation



Soil quality

### Cultural



Heritage, rites & traditions



Education, science & tourism



Relaxation

Assessment with biophysical & social approaches

Supply

Use

## Forest stakeholders



Local populations  
Logging companies  
Ministry of Forestry and Wildlife  
Community forest entities  
NGOs and associative sector  
Universities and consultants

## Forest land allocations

A protected area (Dja Biosphere Reserve)

A FSC-certified logging concession (Pallisco company)

Three community forests (Medjoh, Avilso, Eschiambor)

Lhoest S. et al. (2019). Perceptions of ecosystem services provided by tropical forests to local populations in Cameroon. **Ecosystem Services.**

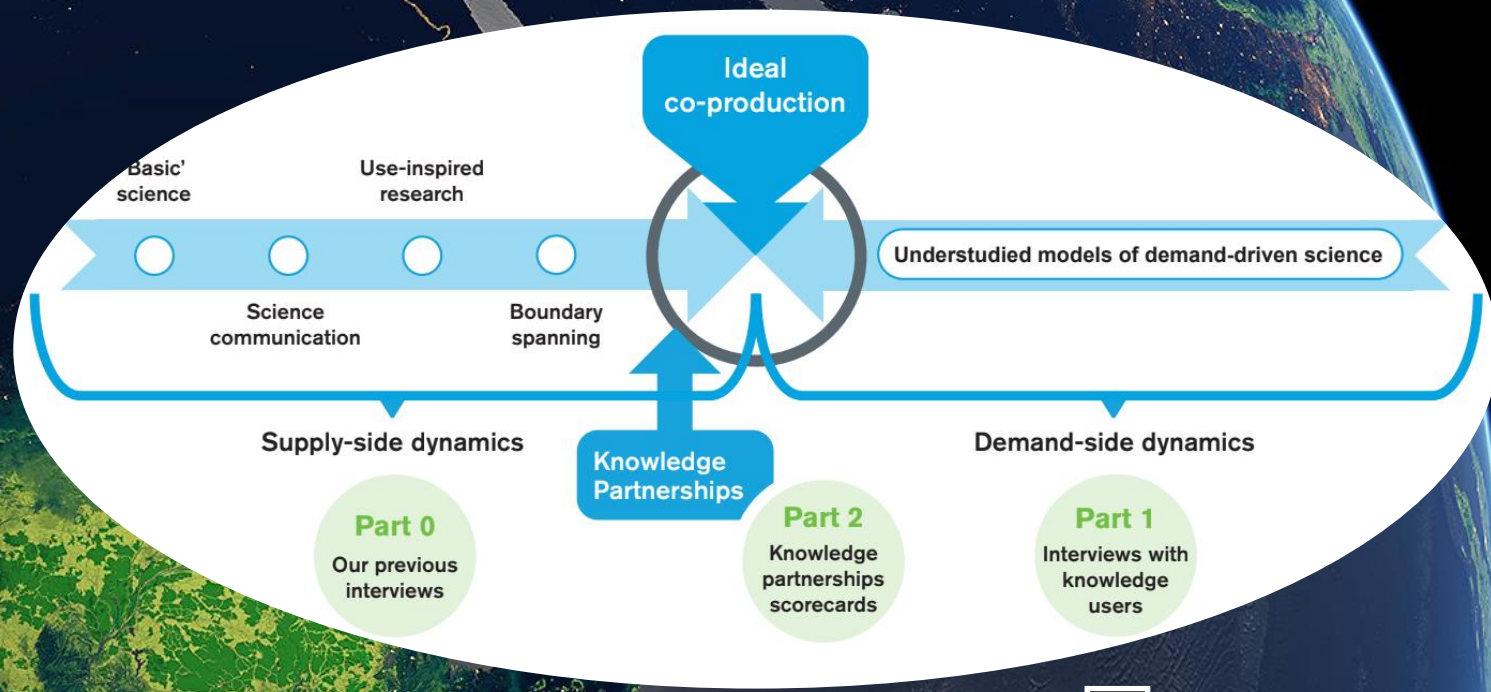
Lhoest S. et al. (2020). Use of forest ecosystem services by local populations in southeastern Cameroon. **Sustainability.**

**Objective of my PhD thesis:** Assessing the **conservation value** of tropical forests in southeastern Cameroon, as well as the **supply** of ecosystem services and **use** by local populations, in three contrasted forest land allocations



- Conservation biology
- Mammal biogeography
- Conservation perceptions
- Plant-animal interactions (seed dispersal, forest regeneration...)
- Mangrove restoration
- Hunting, poaching and illegal logging
- Protected area management plans
- Sustainable forest management across the tropics

# Is research useful for the management of protected areas in central Africa?



Focus on the demand-side dynamics of knowledge co-production

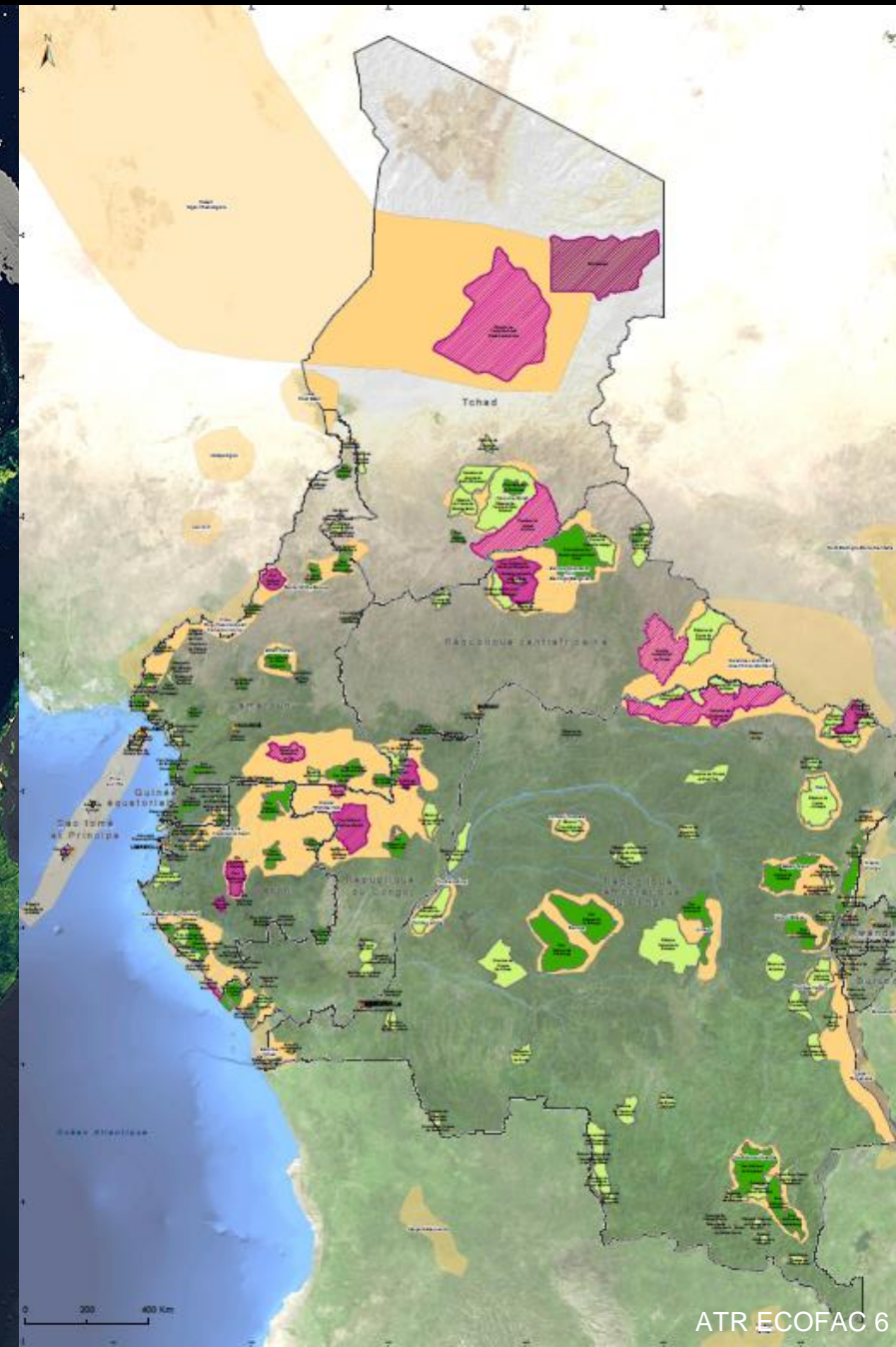


10 countries

Protected areas

~ 960 000 km<sup>2</sup>

~ 2 x  's protected areas



Research is supposed to help in decision-making (*'science-policy interface'*)



## However:

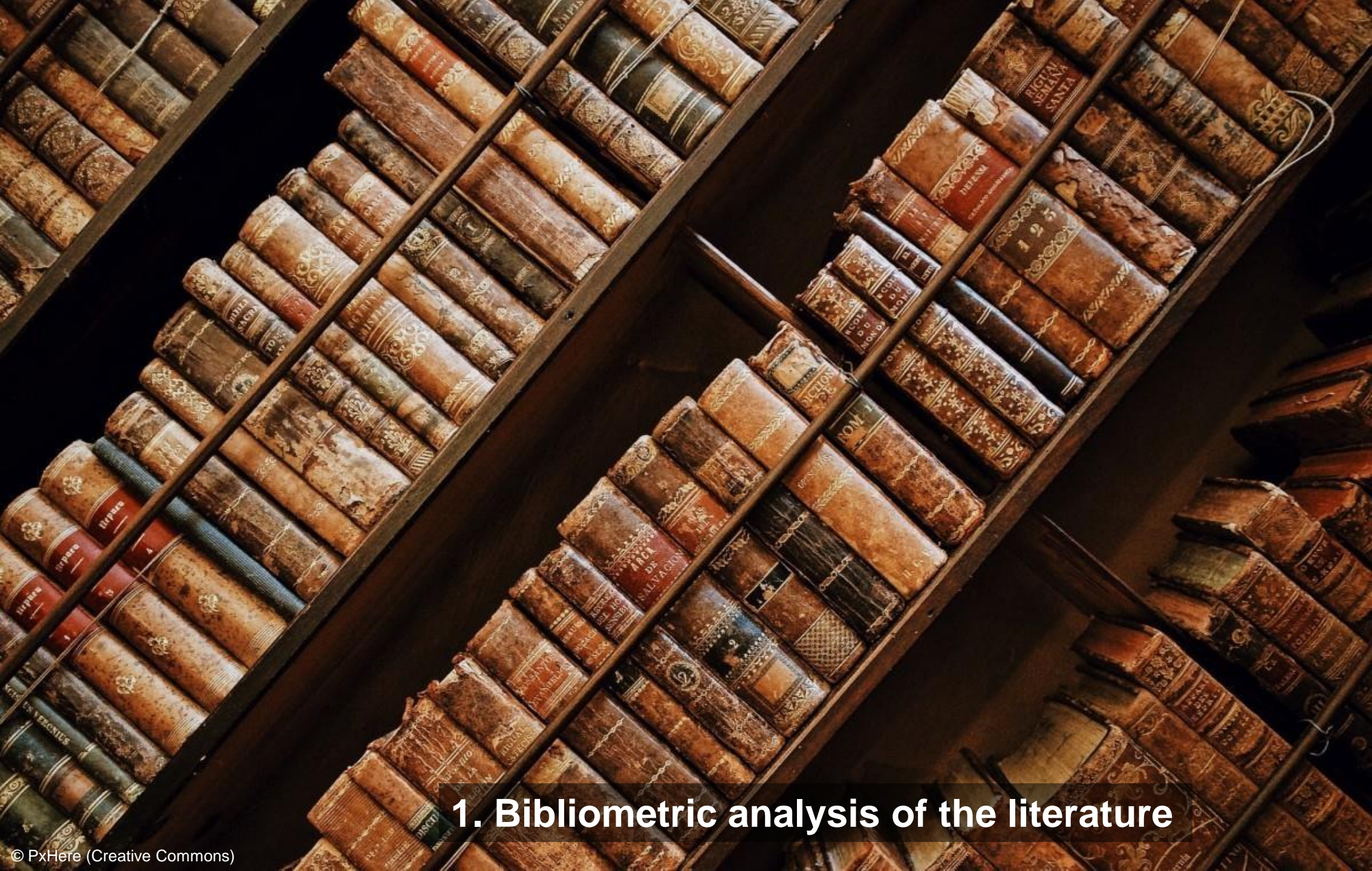
- The sharing of results is insufficient, as well as the dialogue among scientists, field managers and policy makers
- Research in protected areas is rarely connected with the priorities of managers



1. Characterize the research effort in the protected areas of the 10 central African countries  
→ **Bibliometric analysis of the literature** (1<sup>st</sup> planned paper)
2. Capitalize on managers' experiences with their practical use of research  
→ **Interviews** (2<sup>nd</sup> planned paper)



3. Make **recommendations** that aim to:
    - i. Define priority research topics for protected areas
    - ii. Improve the conditions for funding, producing and disseminating research to enable its efficient use
- **'Finalized research'**: meeting an initial management objective, within a timeframe compatible with decision-making

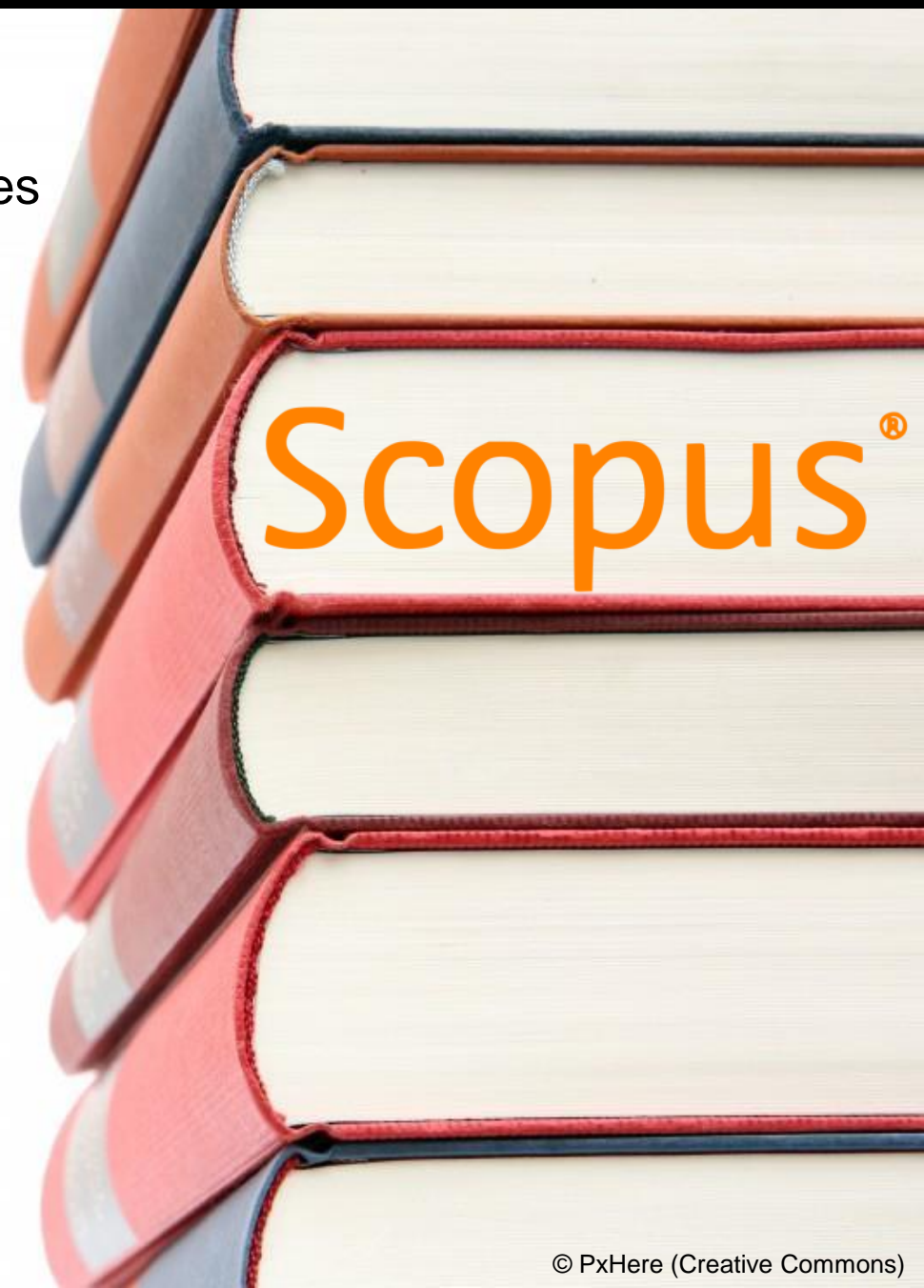


# 1. Bibliometric analysis of the literature

- Inventory of scientific articles published in international journals (Scopus)
- All protected areas of the 10 central African countries
- Period 2011-2020 (Aichi Targets)

For each publication, identification of:

- **Country(ies) studied**
- **Protected area(s) studied**
- **Research subject(s)**
- **Metadata:**
  - Authors
  - Title
  - Year of publication
  - Journal
  - Download link
  - Author affiliations
  - Abstract
  - Keywords
  - Funding sources
  - Language of the document
  - Type of article
  - Accessibility (open access or not)

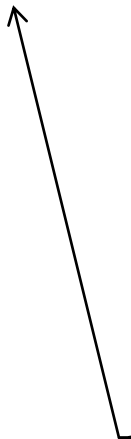


# Online database

- Access link to the database: [Tinyurl.com/protectedareascentralafrica](https://tinyurl.com/protectedareascentralafrica)
- 1140 scientific articles analyzed → List of 779 relevant articles selected

## Sub-selections by:

- Authors
- Countries
- Protected areas
- Topics



A database produced by Gembloux Agro-Bio Tech (University of Liège), under the supervision of the Regional Technical Assistance ECOFAC 6



[Click here to read more information about this tool...](#)



Search by...

Authors:

Country:

- Burundi
- Cameroon
- Central African Republic
- Chad
- Democratic Republic of Congo
- Equatorial Guinea
- Gabon
- Republic of Congo
- Rwanda
- São Tomé and Príncipe
- Central Africa

Protected area:

Main Topic:

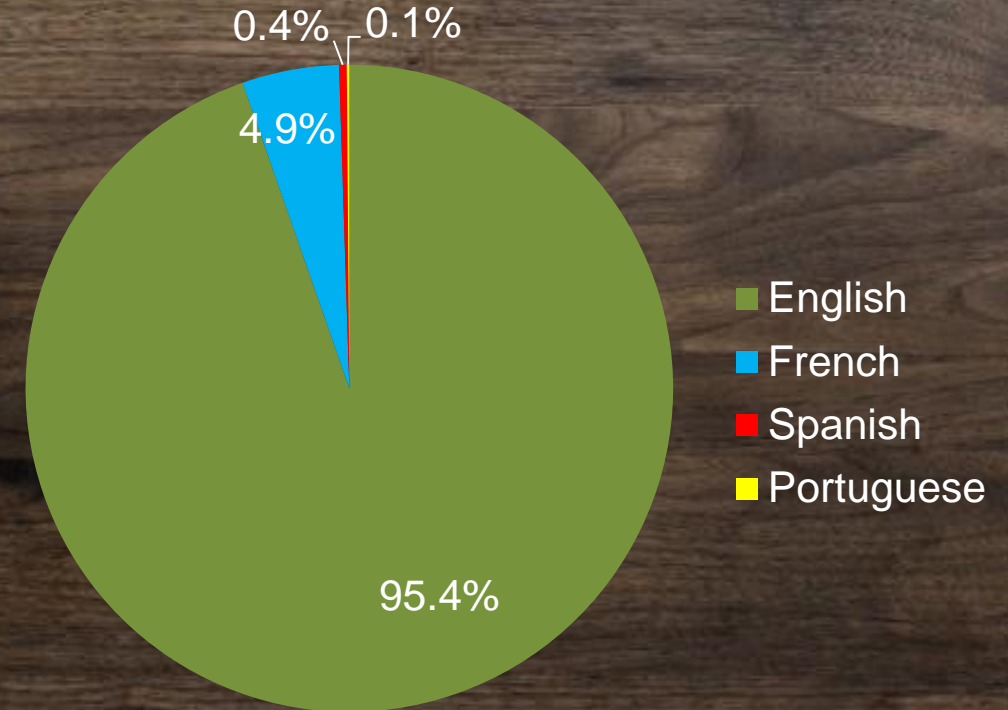
- Biodiversity
- Environment
- Humans
- Health

Sub Topic:

List of 779 scientific articles available

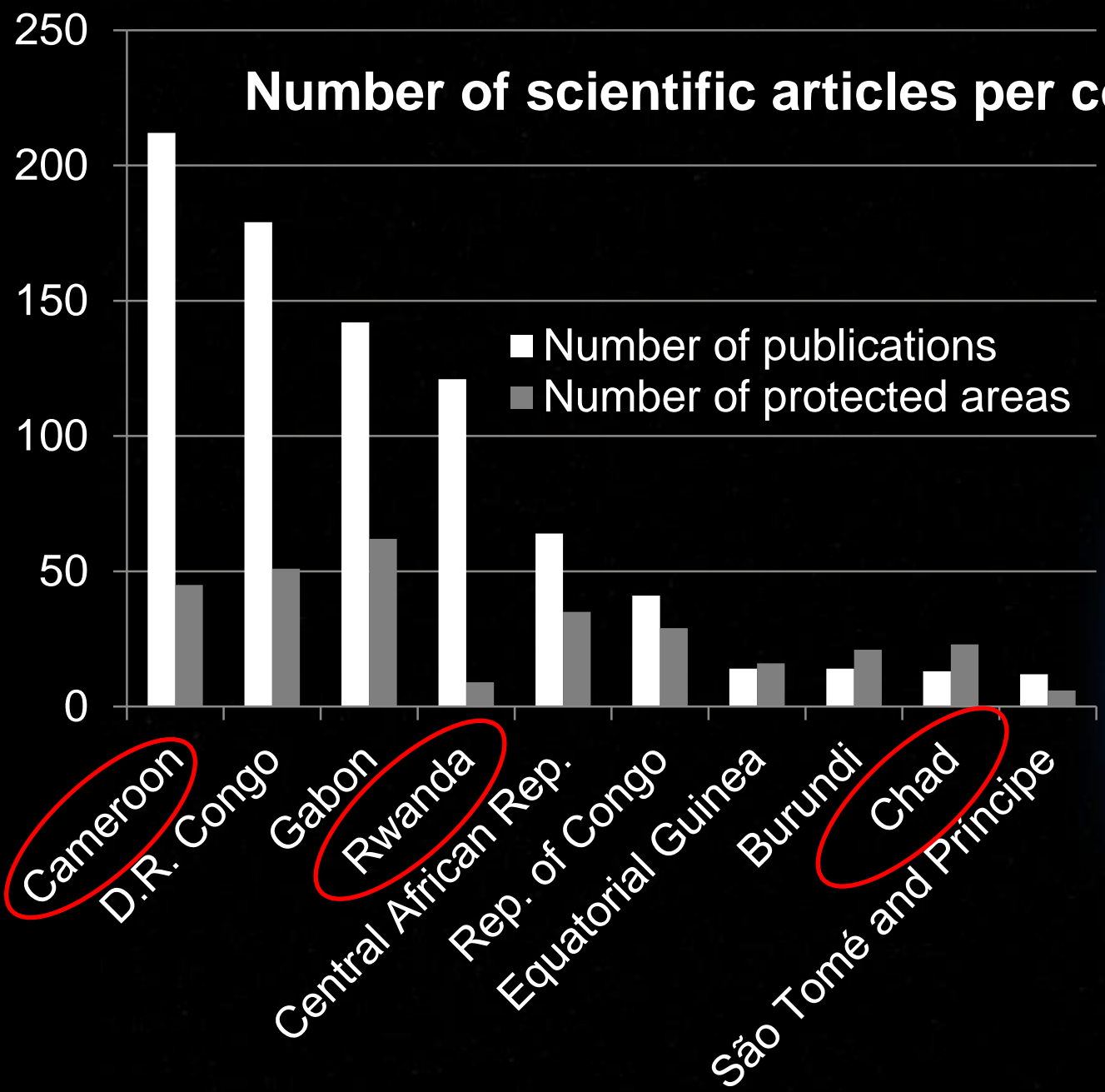
|   | Year |
|---|------|
| <b>A case study of improved cook stoves in primate conservation from Democratic Republic of Congo</b><br>Kahlenberg S.M., Bettinger T., Masumbuko H.K., Basyanirya G.K., Guy S.M., Katsongo J.K., Kocanjner N., Warfield L., Mbeke J.K.   | 2020 |
| <b>A cryptic new species of Chlidoonoptera karsch, 1892 from the south west protected zone of the Central African Republic (Insecta, mantodea, hymenopodidae)</b><br>Moulin N.  | 2020 |
| <b>A microdynamics approach to geographies of violence: Mapping the kill chain in militarized conservation areas</b><br>Verweijen J.  | 2020 |
| <b>A partnership to build scientific capacity of Rwanda's future conservationists: The Memoirs Program</b><br>Eckardt W., Tuyisingize D., van der Hoek Y., Tolbert S., Stoinski T.S., Ndagijimana F., Kaplin B.A., Mudakikwa A., Lukas K.   | 2020 |
| <b>A survey of snakes in the patte d'oe forest reserve (Brazzaville, republic of congo): An urban snake community in central africa</b><br>Zassi-Boulou A.G., Tchimbakala J.G., Mavoungou L.B., Jackson K.  | 2020 |
| <b>Abundance, density, and social structure of African forest elephants (Loxodonta cyclotis) in a human-modified landscape in southwestern Gabon</b><br>Brand C.M., Johnson M.B., Parker L.D., Maldonado J.E., Korte L., Vanthomme H., Alonso A., Ruiz-Lopez M.J., Wells C.P., Ting N.  | 2020 |
| <b>An annotated checklist of the fish fauna of the river systems draining the Kahuzi-Biega National Park (Upper Congo: Eastern DR Congo)</b><br>Kisekelwa T., Snoeks J., Vreven E.  | 2020 |
| <b>Anthropogenic modification of forests means only 40% of remaining forests have high ecosystem integrity</b><br>Grantham H.S., Duncan A., Evans T.D., Jones K.R., Beyer H.L., Schuster R., Walston J., Ray J.C., Robinson J.G., Callow M., Clements T., Costa H.M., DeGemmis A., Elsen P.R., Ervin J., Franco P., Goldman E., Goetz S., Hansen A., Hofsvang E., Jantz P., Jupiter S., Kang A., Langhammer P., Laurance W.F., Lieberman S., Linkie M., Malhi Y., Maxwell S., Mendez M., Mittermeier R., Murray N.J., Possingham H., Radachowsky J., Saatchi S., Samper C., Silverman J., Shapiro A., Strassburg B., Stevens T., Stokes E., Taylor R., Tear T., Tizard R., Venter O., Visconti P., Wang S., Watson J.E.M. | 2020 |
| <b>Apex predators decline after an influx of pastoralists in former Central African Republic hunting zones</b><br>Aebischer T., Ibrahim T., Hickisch R., Furrer R.D., Leuenberger C., Wegmann D.  | 2020 |
| <b>Assessing attitudes towards gorilla conservation via employee interviews</b><br>Robbins M.M.   | 2020 |
| <b>Assessment of in situ nest decay rate for chimpanzees (Pan troglodytes ellioti Matschie, 1914) in Mbam-Djerem National Park, Cameroon: implications for long-term monitoring</b><br>Kamgang S.A., Carme T.C., Bobo K.S., Abwe E.E., Gonder M.K., Sinsin B.   | 2020 |
| <b>Behavioural diversity of bonobo prey preference as a potential cultural trait</b><br>Samuni L., Wegdell F., Surbeck M.   | 2020 |
| <b>Birds of Burhinyi mountain forest, North of Itombwe Nature Reserve, Democratic Republic of Congo</b><br>Murhabale B.C., Bwanamudogo I., Magadju A., Tolbert S., Bapeamoni F., Kahindo C., Marks B.D., Agenong'a U.   | 2020 |
| <b>Boots on the ground: The role of passive acoustic monitoring in evaluating anti-poaching patrols</b><br>Astaras C., Linder J.M., Wrege P., Orume R., Johnson P.J., MacDonald D.W.  | 2020 |
| <b>Bringing the tracker-guards back in: Arms-carrying markets and quests for status in conservation at war</b><br>Lombard L., Tubiana J.  | 2020 |
| <b>Bushmeat hunting around Lomami National Park, Democratic Republic of the Congo</b><br>Batumike R., Imani G., Urom C., Cuni-Sanchez A.  | 2020 |
| <b>Chimpanzee ranging responses to fruit availability in a high-elevation environment</b><br>Green S.J., Boruff B.J., Niyigaba P., Ndikubwimana I., Grueter C.C.  | 2020 |
| <b>Climatic and Resource Determinants of Forest Elephant Movements</b><br>Beirne C., Meier A.C., Brumagin G., Jasperse-Sjolander L., Lewis M., Masseloux J., Myers K., Fay M., Okouyi J., White L.J.T., Poulsen J.R.  | 2020 |

## Document languages



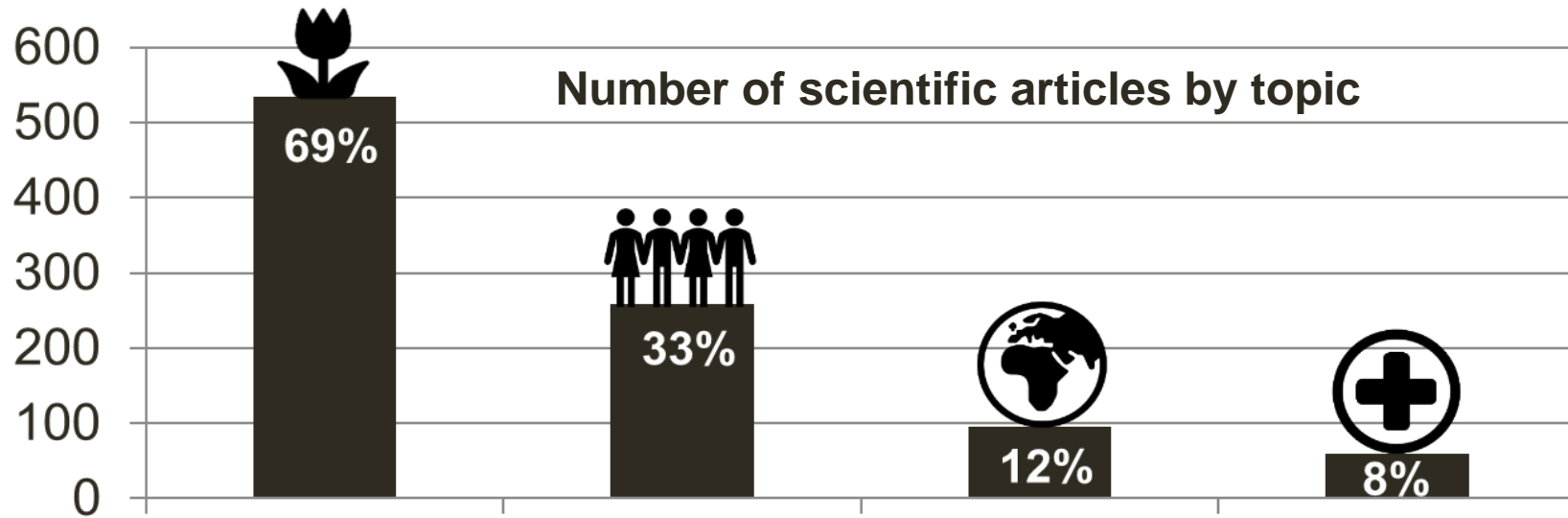
Only **37%** of articles are published in open access

For only **29%** of the publications, the first author has an affiliation in central Africa



- ### Most studied protected areas:
1. Volcanoes NP (Rwanda)
  2. Korup NP (Cameroon)
  3. Virunga NP (DRC)
  4. Dzanga-Sangha (CAR)
  5. Dja Faunal Reserve (Cameroon)
  6. Lopé NP (Gabon)
  7. ...

# Distribution of publications by topics



Biodiversity

Humans

Environment

Health

- Animals
- Plants
- Inventories
- Biology / Ecology
- Genetics
- Taxonomy
- ...

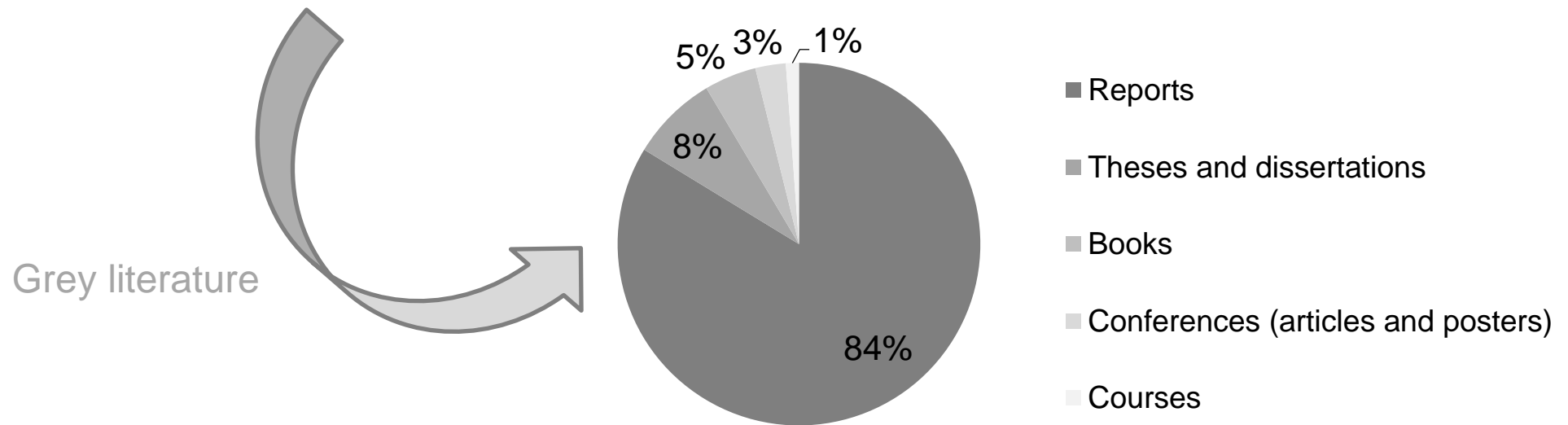
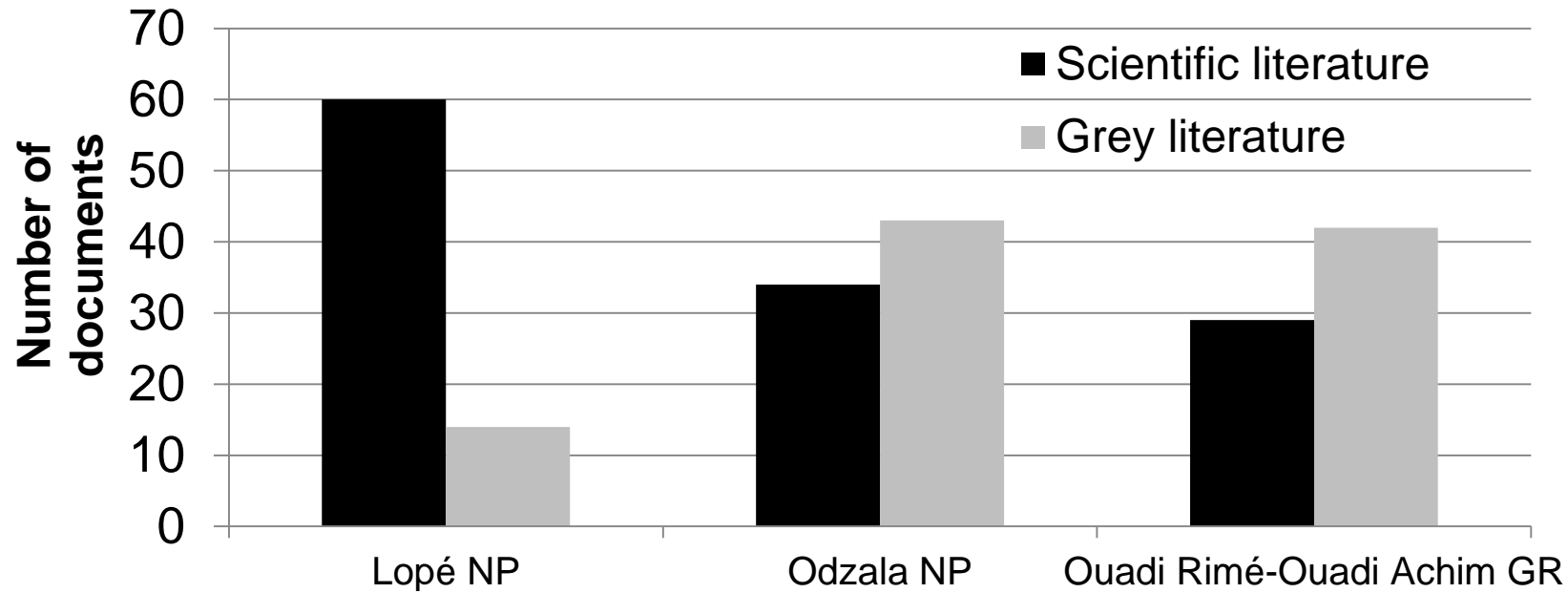
- Periphery management
- Perceptions / Behaviors
- Conservation activities
- Income-generating activities
- Governance / Policy
- Hunting / Poaching
- Anthropology
- Agriculture
- NTFPs
- Conflicts
- ...

- Land use / Land cover
- Geology / Pedology
- Climate
- Carbon
- ...

- Animal health
- Human health

→ Research topics VS priority management challenges?  
 → Fundamental VS applied / 'finalized' research?

# Scientific literature VS Grey literature



➔ More applied topics (human, environment, ...) in the grey literature





- Important differences among the 10 countries and among protected areas
- Only 1/3 of publications are accessible to managers
  - ➔ Ensuring open access + appropriate format of research recommendations
- Only 1/3 of authors are based in central Africa & few publications per protected area, per country and per year
  - ➔ Give priority to the financing of national theses, with North-South collaborations
- Large majority of publications in English, but managers largely French-speaking
  - ➔ For each scientific publication, associate an abstract in French

## 2. Managers' experiences with the operation and use of research



## 3 interview types with protected area managers:

1. Online questionnaire
2. Focus group
3. Individual interviews

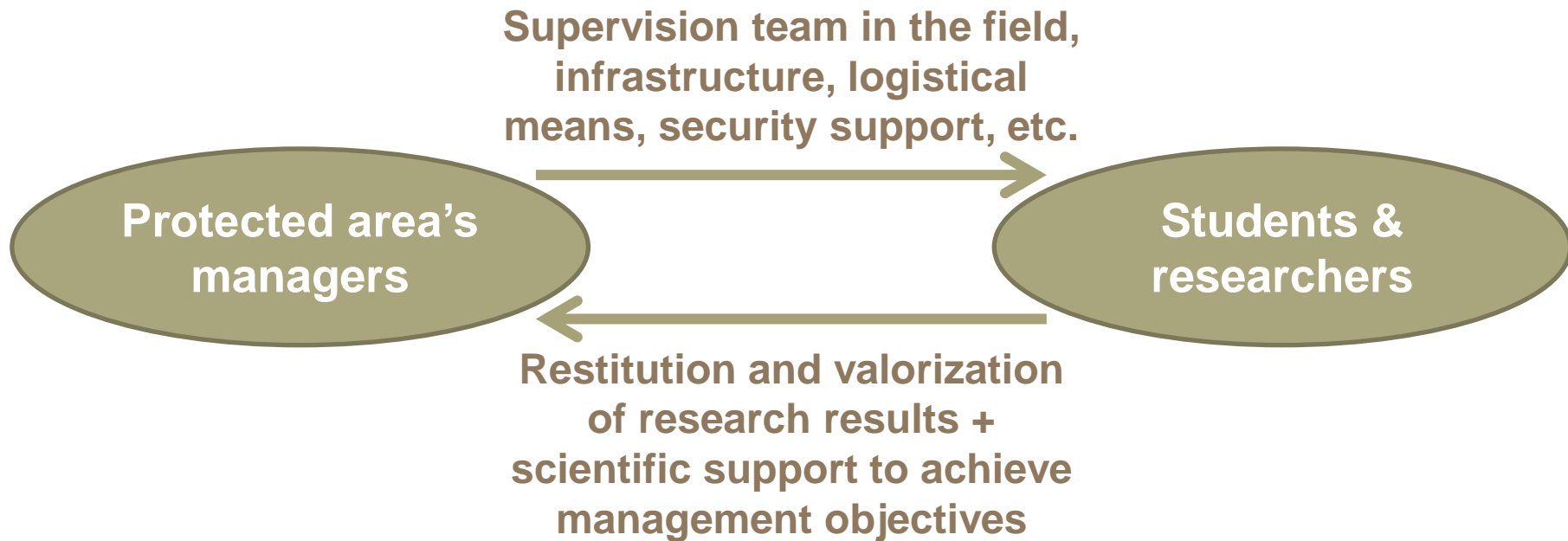
## Questions related to:

1. Research actors
2. Research questions
3. Use of research results in management
4. Access to research

**→ 73 respondents, representing 42 protected areas**

**More than 70%** of protected areas:

- Welcome (inter)national students and researchers
- Have signed formal collaboration agreements with privileged partners for research



**Only 20%** of protected areas have defined their priority research questions

Highest priority research questions are related to:

1. **Animal biodiversity**
2. **Human aspects**
3. **Fight against illegal activities**
4. **Vegetal biodiversity**



**61%** report that there are "dormant data" that are not used by anyone

**70%** are involved in the design of research protocols and  
**49%** in writing scientific publications...

**BUT 82%** would like to be better involved  
in the design of research protocols and scientific publications

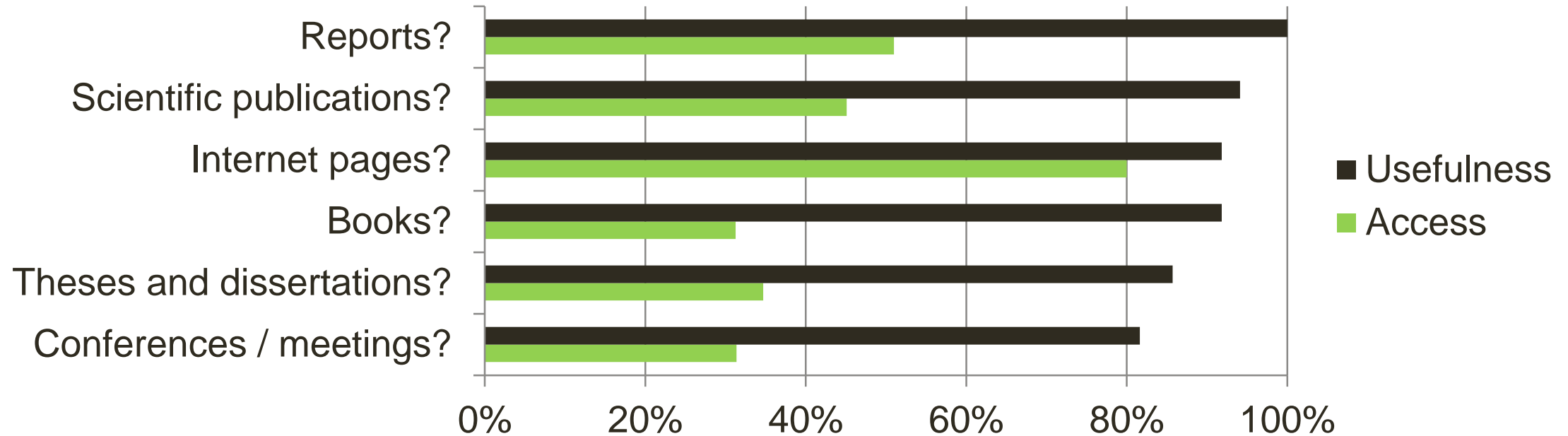
**Biomonitoring** results are directly used by **90%** of protected area managers...

... while **only 45%** consider that **scientific research is produced quickly enough** to respond to management issues.

The main use of scientific research by managers consists in using tools developed by researchers, such as applications, GIS, databases...



## Are these types of documents useful and accessible for your work:



**73%** of managers generally have access to the **results** of research conducted in their PA  
**61%** **raw data**

## **Odzala-Kokoua National Park (Congo) :**

Sampling of urine, faeces, carcasses, parasites to monitor infections and inter-species transmissions (great apes and bats)



## **Lopé National Park (Gabon) :**

Census of zoonotic diseases at the country level, serological samples to list the bacteria and viruses that the consumption of bushmeat can potentially transmit to humans



## Scimitar-horned oryx in the Ouadi Rimé-Ouadi Achim Game Reserve (Chad) :

- Species classified as "extinct in the wild" since 2000 by the IUCN
  - Reintroduction of 144 animals in 2016 → today 382 individuals
- 
- Logistics, breeding, monitoring and scientific research (progress assessment, threat detection and management information)
  - Monitoring: demography (population size, survival, reproductive success), space and habitat use
  - Responses to threats: epidemics, bush fires, poaching
  - Adaptation of release protocols and veterinary prophylaxis



Little used in Central Africa, but can finance conservation + socio-economic benefits with income-generating activities for local communities + development of basic / applied research projects

## Lopé National Park (Gabon) :

Vision tourism for emblematic species, thanks to the GPS tracking of animals

- Mandrill excursion: 250€
- Pangolin excursion: 280€

## Obô Natural Parks (São Tomé and Príncipe) and other countries (South Africa, Kenya, Uganda, Namibia):

EARTHWATCH model of science tourism

→ Amateur "research tourists" pay thousands of dollars to participate in scientific field studies without having to manage the paperwork



WILDLIFE & ECOSYSTEMS

Moderate

Conserving Endangered Rhinos in South Africa

Rhino populations are in crisis due to the high value of rhino horn combined with widespread poaching.

**Africa :** Northwest Province, South Africa, Africa

**Lead Scientist:** [Dawn Scott, Ph.D.](#)

**Duration:** 12 days (avg. \$300 a day)

Starting at **\$3,595**

[Expedition Details](#)

[View Dates & Join](#)



WILDLIFE & ECOSYSTEMS

Easy

Elephants and Sustainable Agriculture in Kenya

Help local farmers to conserve elephants and their habitat in southeast Kenya by implementing sustainable agriculture practices

**Africa :** Kasigau Corridor, Kenya (between Tsavo East and West National Parks), Kenya, Africa

**Lead Scientist:** [Bruce A. Schulte, Ph.D.](#)

**Duration:** 12+ days (avg. \$250 a day)

Starting at **\$2,995**

[Expedition Details](#)

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WILDLIFE & ECOSYSTEMS

Very Active

Investigating Threats to Chimps in Uganda

Explore interactions between people and chimpanzees and other primates in the rainforest of Uganda to improve human-primate rel

**Africa :** Budongo Forest Reserve, Uganda

**Lead Scientist:** [Fred Babweteera, Ph.D.](#)

**Duration:** 12 days (avg. \$254 a day)

Starting at **\$3,050**

[Expedition Details](#)

[View Dates & Join](#)

- $\frac{3}{4}$  of managers have privileged research partners: the restitution of results is essential
- The concrete use of research results by protected area managers is not optimal

- 
- A black and white photograph of a person wearing a hat, a backpack, and outdoor clothing, walking up a dark, rocky hillside. The person is in the center of the frame, facing away from the camera. The background shows a cloudy sky and some sparse trees on the left side of the hill.
- Only 1/5th of managers have defined their priority research questions, and there are frequently dormant data that nobody uses
  - Support for researchers is substantial, but the results of scientific research are generally not produced quickly enough for management purposes

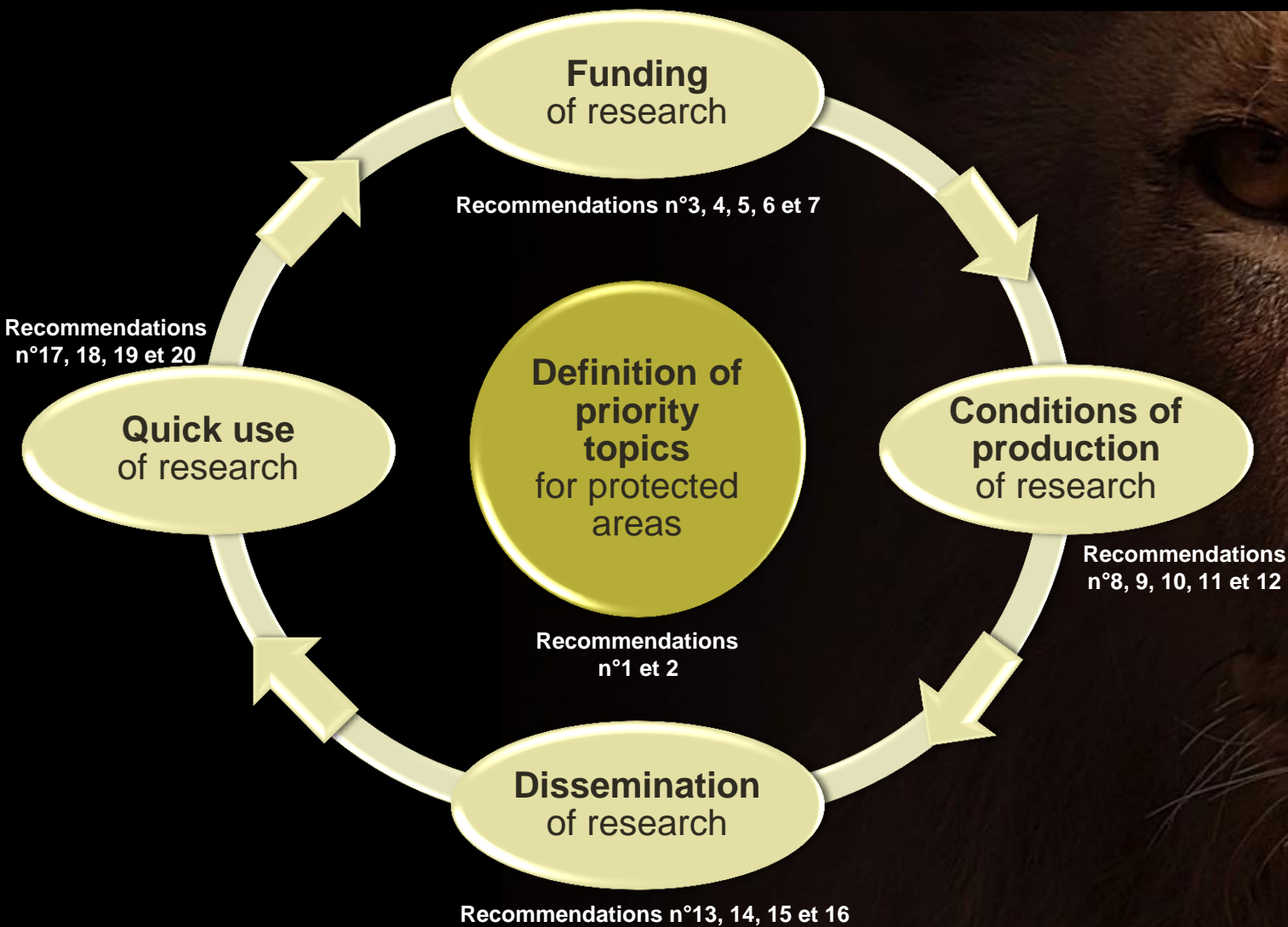
How to translate research results into operational recommendations?

How can managers and researchers be better mobilized to focus research efforts on priority management issues?

How to reconcile the different time frames between scientists and managers?

# 20 recommendations...

... to protected area managers, central African States, research and training institutions, donors, and civil society



➔ See our complete report: <https://orbi.uliege.be/handle/2268/261099>

Research is directly useful for conservation,  
but only when it is strategically aligned with protected area management issues.

Thank you for your attention!

[simlho@hotmail.com](mailto:simlho@hotmail.com) / [slhoest@asu.edu](mailto:slhoest@asu.edu)

