

# THE CONFERENCE ON COMPLEX SYSTEMS, 2018

THESSALONIKI, GREECE – SEPTEMBER 23/28

---

## ABSTRACT FOR A REGULAR TALK

### **Landscape as a complex system to study interactions between human beings and environment: coupling local knowledge and remote sensing to highlight landscape structure and dynamics.**

By Christophe Demichelis: Ph.d Student in geography/ethnology

University of Rennes 2, UMR CNRS 6590 ESO Rennes

**Key words:** landscape, socio-ecological system, human beings-environment interactions, local knowledge, remote sensing

---

Firstly, this paper focuses on the conceptual framework developed in my doctoral research in geography, which puts the landscape as the result of interactions between humans and their environment. Then the presentation will show the first results of the study resulting from a crossing between local knowledge and remote sensing in order to characterize the structure of the landscape. This doctoral research is part of the SHAPES project initiated by the Pasteur Institute of Paris. This project focuses on the evolution of humans and non-human primates contacts, at the prism of emerging diseases in equatorial Africa<sup>1</sup>. This multidisciplinary project brings together researchers from both social sciences and natural sciences (anthropology, geography, history, ecology, microbiology).

Holding a master's degree in tropical ecology, but defending a PhD in geography/ethnology, I developed a transdisciplinary approach mobilizing the concepts and analysis methods of both social sciences and natural sciences. This choice is part of the *OneHealth* and *EcoHealth* movements<sup>2</sup>, bringing together the different actors of health and the environment. The aim is to develop a global and preventive approach for the protection of human health, animal health and ecosystems. In this context, the landscape, which is a concept resulting from the collaboration between naturalistic geographers and ecologists, is the central object of my research. Indeed, landscape studies can shed light on health-related processes, and particularly on the emergence of diseases linked to specific environments and / or species, especially when zoonoses are concerned<sup>3</sup>.

Even if old demons are sometimes hard to dislodge, the rift between natural and social sciences is no longer necessary. On a planet entirely influenced by human action, it seems obvious to break this artificial and arbitrary delimitation between social and ecological systems. In this sense, a landscape approach based on a complex system was developed. Thus, I deconstructed the concept of socio-ecological system<sup>4</sup> and incorporated the concept of socio-spatial formation<sup>5</sup> in the model. This

---

<sup>1</sup> Victor NARAT, Lys ALCAYNA-STEVENS, Stephanie RUPP et Tamara GILES-VERNICK, « Rethinking human-nonhuman primate contact and pathogenic disease spillover », *EcoHealth*, 2017, 14(4), p 840-850.

<sup>2</sup> Didier VIOLLE & Jean LESNE, « One Health, EcoHealth », *Environnement, Risques & Santé*, 2014, 13.(3), p. 256-259.

<sup>3</sup> Patrick GIRAUDOUX & Francis RAOUL, « Ecologie du paysage et santé », *Ecologie 2010*, Montpellier, sep 2010.

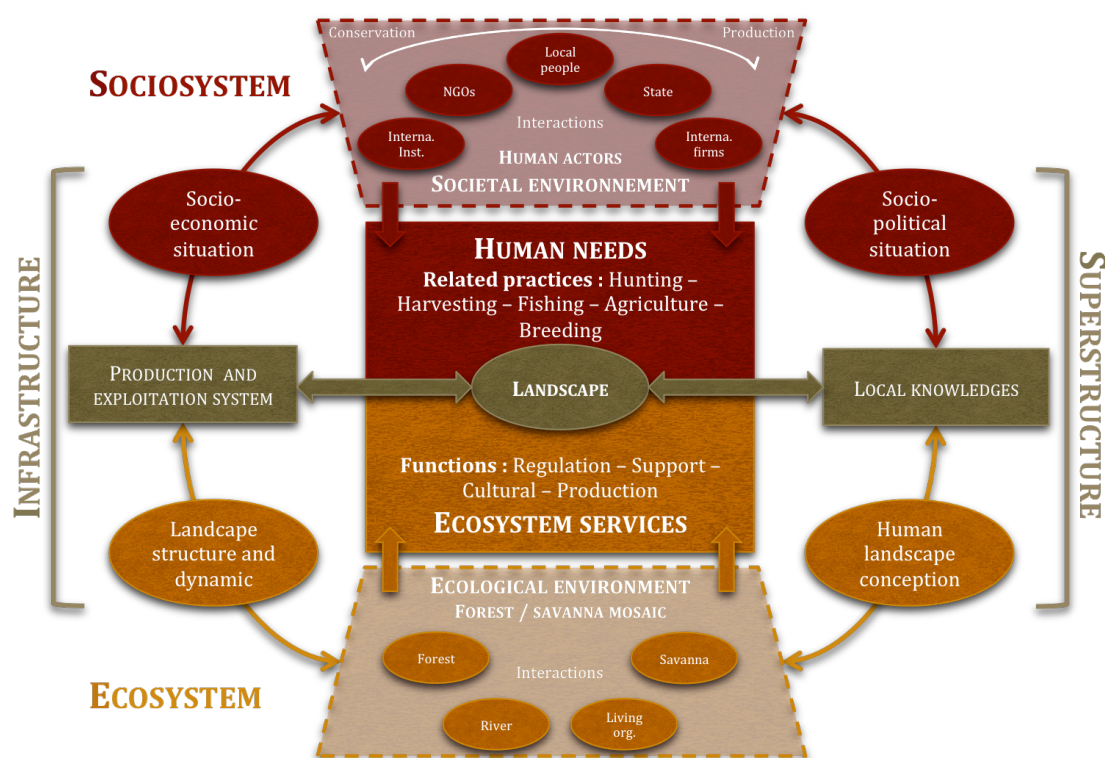
<sup>4</sup> Charles REDMAN, Morgan GROVE & Lauren KUBY, « Integrating social science into the long-term ecological research (LTER) network: social dimensions of ecological change and ecological dimensions of social change », *Ecosystems*, 2004, 7(2), p. 161-171.

system is composed by ecological and social characteristics in interaction; the landscape, at the centre of this system, is both the cause and the result of these interactions. The presentation of this conceptual and complex system will be the first topic of the presentation (Figure 1).

This communication will be divided into three parts. First and foremost, I will briefly present the scientific and institutional context of this research, before presenting the unique ecological and social characteristics of the field study. In fact, the Northern Batéké Chiefdom's landscape in the Democratic Republic of Congo is structured around a forest – savannah mosaic housing an irregularly distributed bonobos population. In addition, two communities of this population contracted an epidemic episode caused by a human respiratory virus in 2014 and 2015. This highlighted the crossing of the species barrier by a pathogen even though there is a local food taboo about this great ape.

I will then present the conceptual framework of this study with a reflexive approach that led to the development of a complex analytical system. The main goal of this conceptual approach is to understand how humans are involved in the dynamic and the structuration of the landscape through their interactions with the environment.

Last but not least, I will present the first results of the study resulting from a crossing between local knowledge and remote sensing in order to characterize the structure and the dynamics of the landscape. Indeed, I have tried during this research to produce a landscape map based on local landscape conceptions. The typology of the landscape classes determined according to local knowledge was then confronted with an analysis by remote sensing in order to produce this map.



**Figure 1:** Complex system developed from the concepts of *socio-ecological system* and *socio-spatial formation* placing the landscape at the centre of human-environment interactions, adapted to the social and ecological characteristics of the studied area (realization Christophe Demichelis).

<sup>5</sup> Guy DI MEO & Pascal BULEON, *L'espace social. Lecture géographique des sociétés*, Paris, Armand Colin, Collection U, 2005.