Managing Social-Ecological Systems for People and Nature: Insights from the World Network of Biosphere Reserves

Ana Filipa Ferreira

Supervisors: Professor Rui Santos[1] and Professor Henrik von Wehrden[2]

1 - CENSE – Center for Environmental and Sustainability Research, NOVA College of Science and Technology, Caparica, Portugal

2 - Institute of Ecology, Faculty of Sustainability, Leuphana University Lüneburg, Lüneburg, Germany

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Section 1

Introduction

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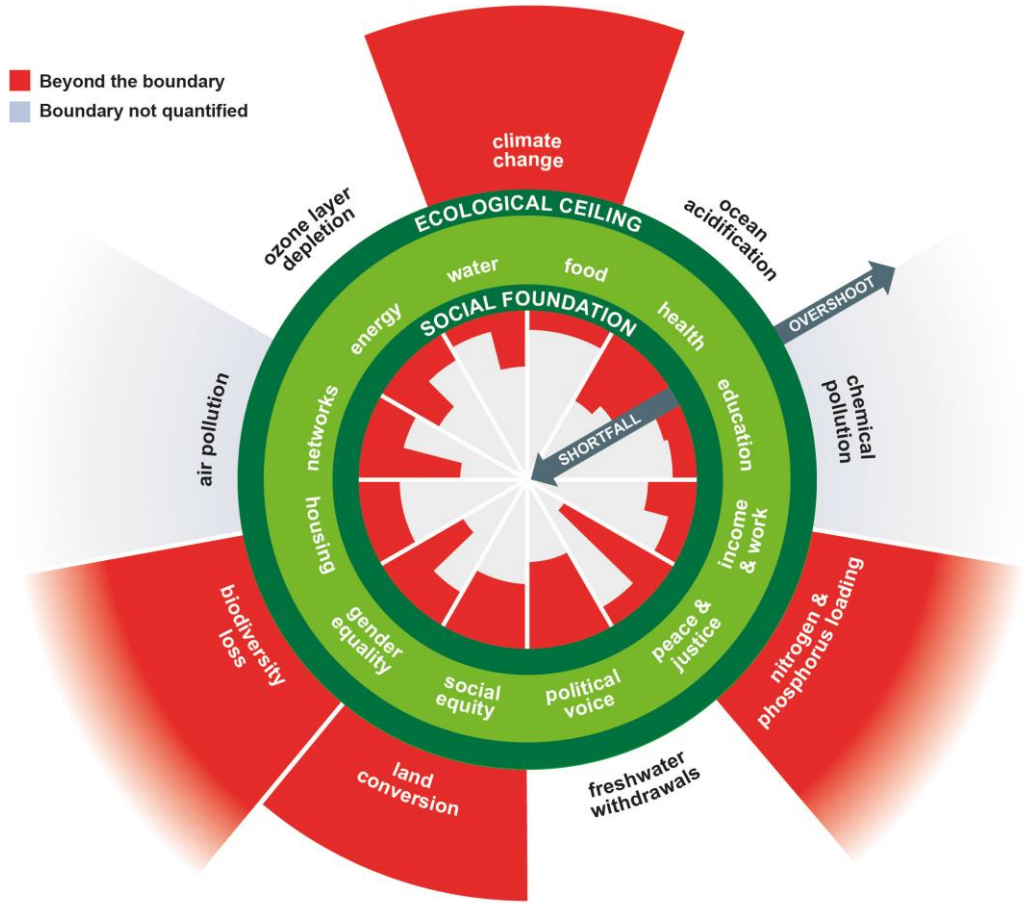
- Moreover, there are other urgent environmental and socio-economic problems;



Global performance in the ecological and social indicators of the *Doughnut* (Raworth, 2018)

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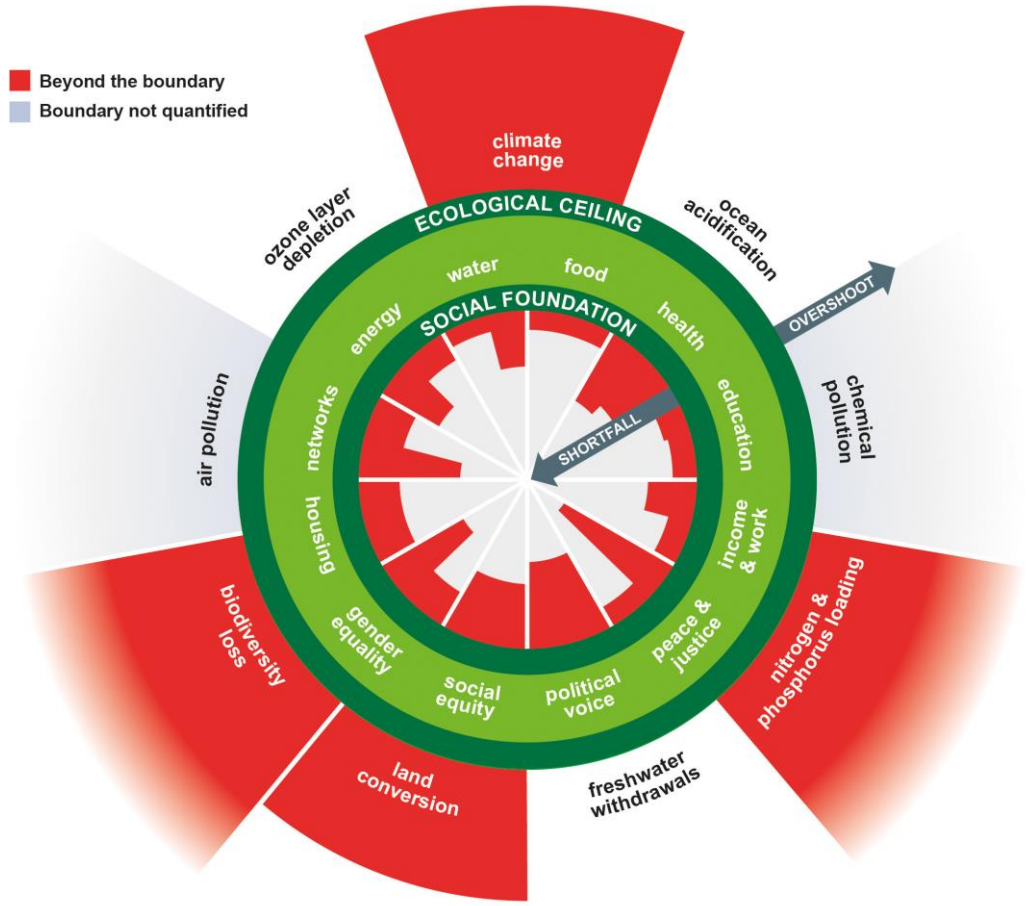
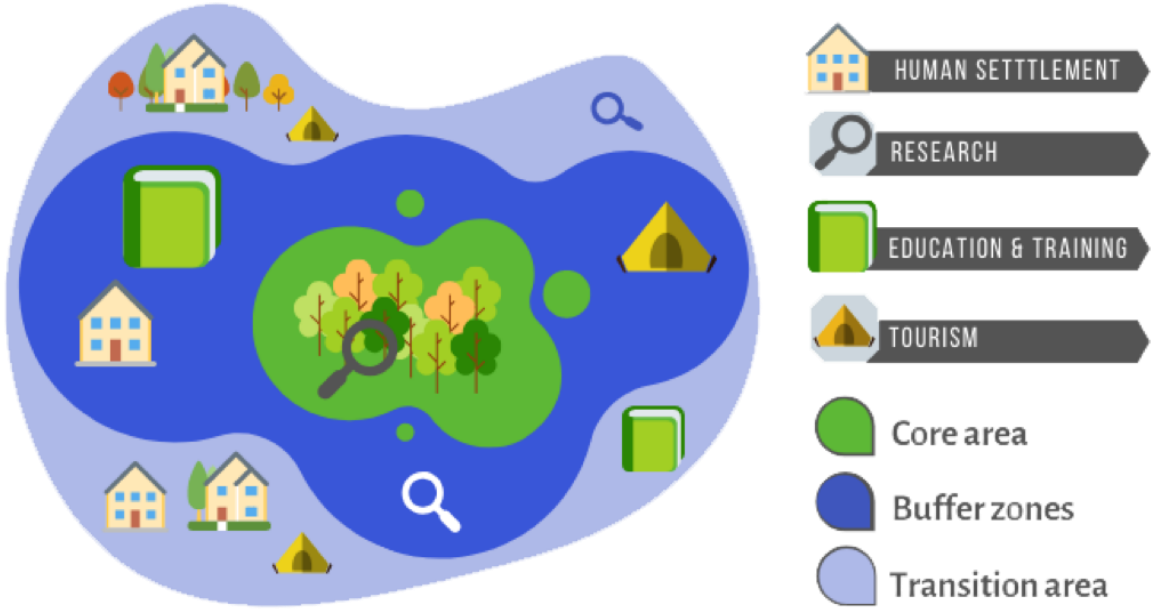
- Protected areas are the main global policy to halt biodiversity loss, but their having limited effectiveness they are frequently associated with negative social impacts;
- Moreover, there are other urgent environmental and socio-economic problems;
- **It is increasingly acknowledged that protected areas need to adopt more integrated strategies that are adequate to manage the complexity and interdependencies between social and ecological systems (SES).**



Global performance in the ecological and social indicators of the *Doughnut* (Raworth, 2018)

Biosphere reserves (BRs)

- Biosphere reserves are more integrated strategies because:
  - they have multiple social-ecological goals
  - zoning scheme embracing multifunctional landscapes
  - participatory management body
  - promote adaptive co-management, learning, experimentation



Zoning of biosphere reserves (UNESCO, 2019)

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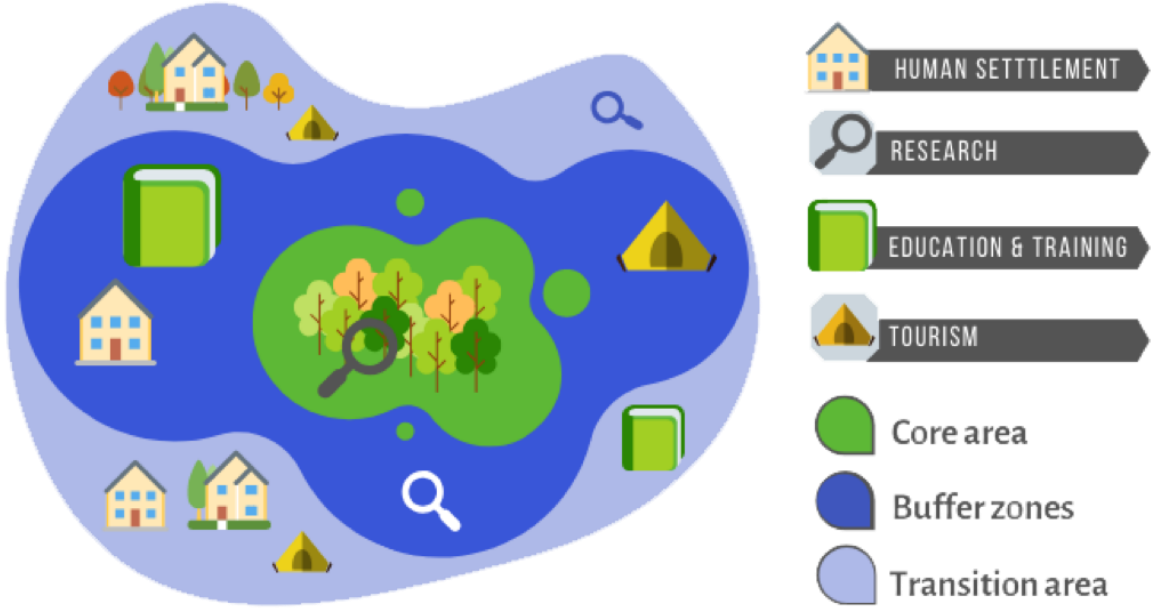

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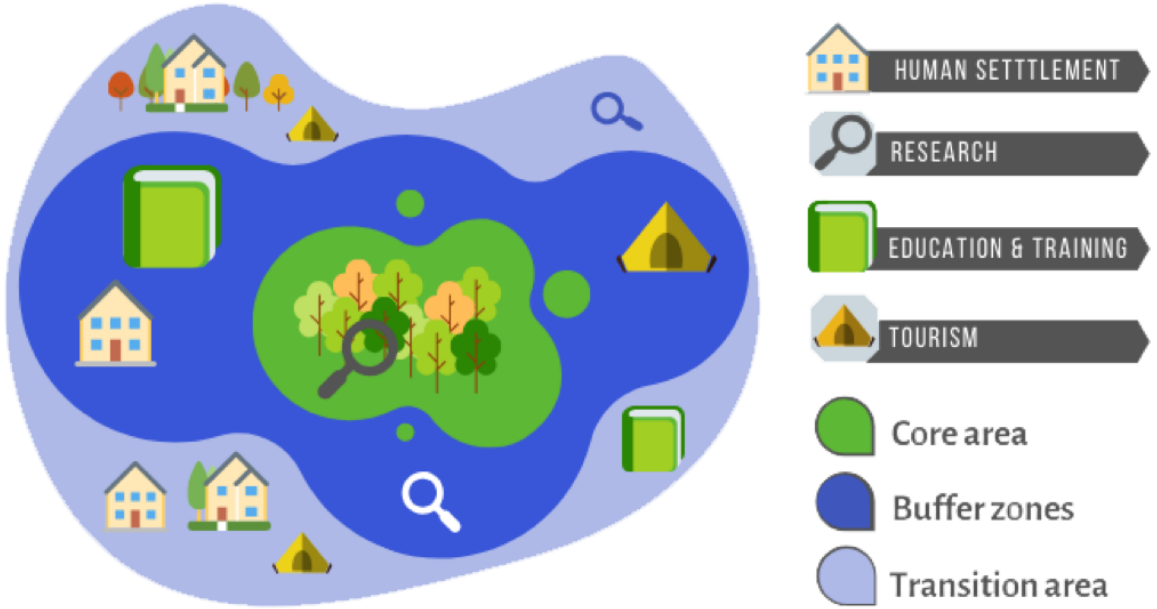

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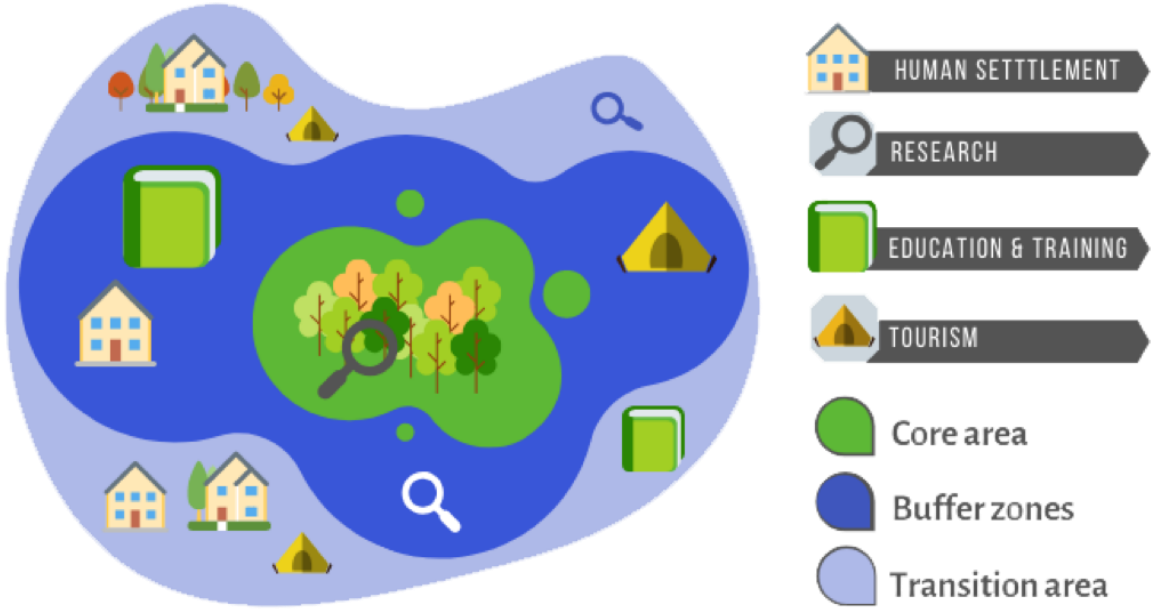
- However, it is widely acknowledged that there is a gap between the concept of BRs and its implementation;

- The current understanding about this gap is incomplete and biased to the opinions of experts or the analysis of a single process;

- **It is necessary a more holistic understanding of biosphere reserves' management effectiveness, that includes multiple processes and perspectives.**



Zoning of biosphere reserves (UNESCO, 2019)

Research questions

- **RQ #1** Which factors influence biosphere reserves' management effectiveness? → **Study 1**
- **RQ #2** How are factors of the context, inputs, processes and outcomes related, and which variables influence this relationship? → **Study 2**
- **RQ #3** What are the main differences in the management of biosphere reserves and grassroot approaches? → **Study 3**
- **RQ #4** How can experiences of grassroot approaches contribute to the success of biosphere reserves? → **Study 3**

Section 2

Studies developed

Study #1

A social-ecological systems framework as a tool for understanding the effectiveness of Biosphere Reserve management

Study #1 – A social-ecological systems framework

GOALS

- Develop a SES framework that considers the conservation of biodiversity and builds on empirical data;
- Identify which factors influence biosphere reserves' management effectiveness.

METHODS

- Systematic literature review (n=66);
- From the 2499 papers obtained only 66 concurred with the inclusion criteria;
- Inductive-deductive coding.

Review Step	Procedure	Results
1. Data gathering	Database search on Scopus using the defined search string.	Bibliographical information of 2499 potentially relevant papers
2. Data screening	Screening of the data to define the inclusion criteria. Papers published before 1996 were excluded.	Data set reduced to 2286 potentially relevant papers
3. Data cleaning	Screening the title, abstracts and keywords guided by the questions: (i) Is the study engaged with the biosphere reserve concept? (ii) Is the study about management or governance of biosphere reserves? Is the study useful to understand the factors influencing management and governance of biosphere reserves? (iii) Is it an empirical study? 10% of the papers were evaluated by two reviewers and the different decisions discussed.	Data set reduced to 186 potentially relevant papers
4. Data scoping	Download of the potentially relevant papers.	Download of 177 papers (9 papers with no full-text access)
5. Paper classification	Definition of the scale of analysis resulted in the exclusion of those studies with more than one case study. Further papers were excluded because they were not developed in UNESCO biosphere reserves or they didn't comply with the criteria defined in step 3.	66 case studies
6. Categorization	"Thought units" were selected as the units of coding. The category scheme was developed through a backward and forward inductive–deductive approach, based on preliminary and recursive coding.	Category scheme with 4 categories and 53 sub-categories

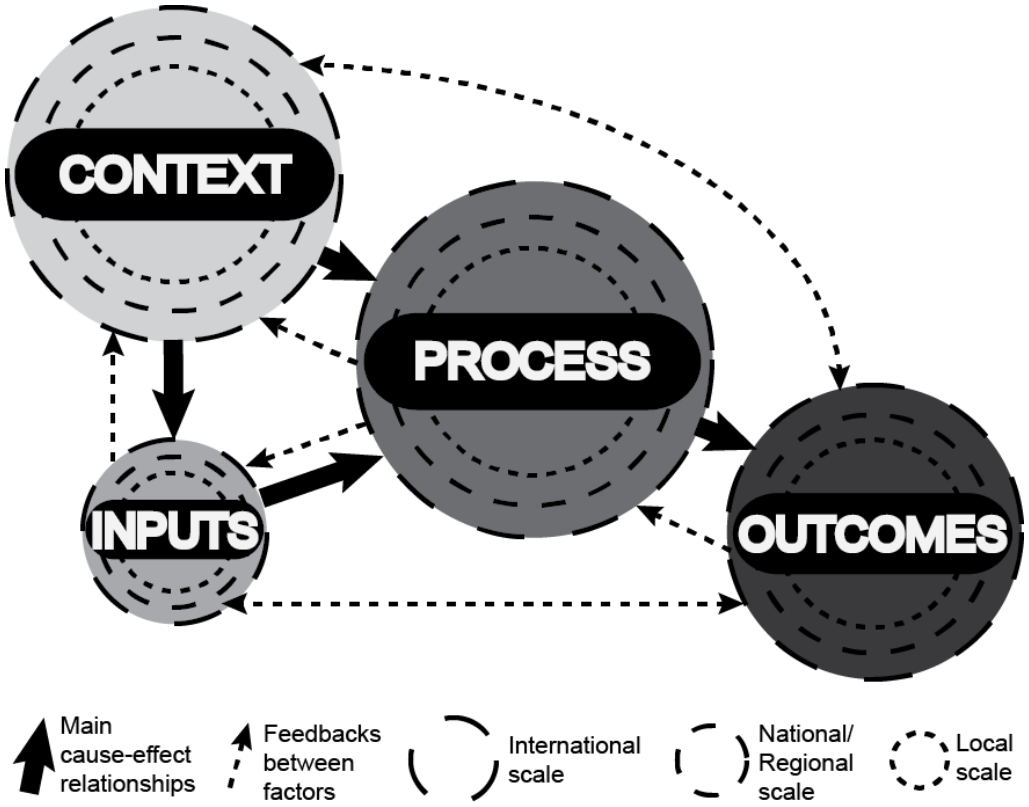
Main steps of the systematic literature review (Ferreira et al., 2018)

Study #1 – A social-ecological systems framework

RESULTS

- There were identified 53 subcategories of factors that influence biosphere reserves' management effectiveness, which are grouped in four main categories;

- Innovative elements of this framework:
  - The importance of the socio-ecological **context** - formal rules, purpose of use of natural resources, resource mobility;
  - **Power** issues – inequality, historical factors, politics;
  - **Relationships** between factors and **scale** dynamics.



A framework to understand biosphere reserve management effectiveness (Ferreira et al., 2018)

Study #2

Biosphere reserves management effectiveness – a systematic literature review and a research agenda

Study #2 – review of biosphere reserves' management effectiveness

GOALS

- Determine the relationship between subcategories of the context, inputs, processes and outcomes and which variables influence it.

METHODS

- Systematic literature review
- 147 subcategories*66 papers
- Deductive coding
- Multivariate statistics

Publication	Biosphere reserve scope, status and location	Research methods	Biosphere reserve' management effectiveness
Year of publication Journal subject area Affiliation of the author	BR name Transboundary BR? Withdrawn BR? Designation year Location	Methods - data collection Actors enrolled Methods - data analysis	Context Inputs Process Outcomes Scale*

Main categories used to review the publications; *International or national/regional relevance (Ferreira et al., 2020)

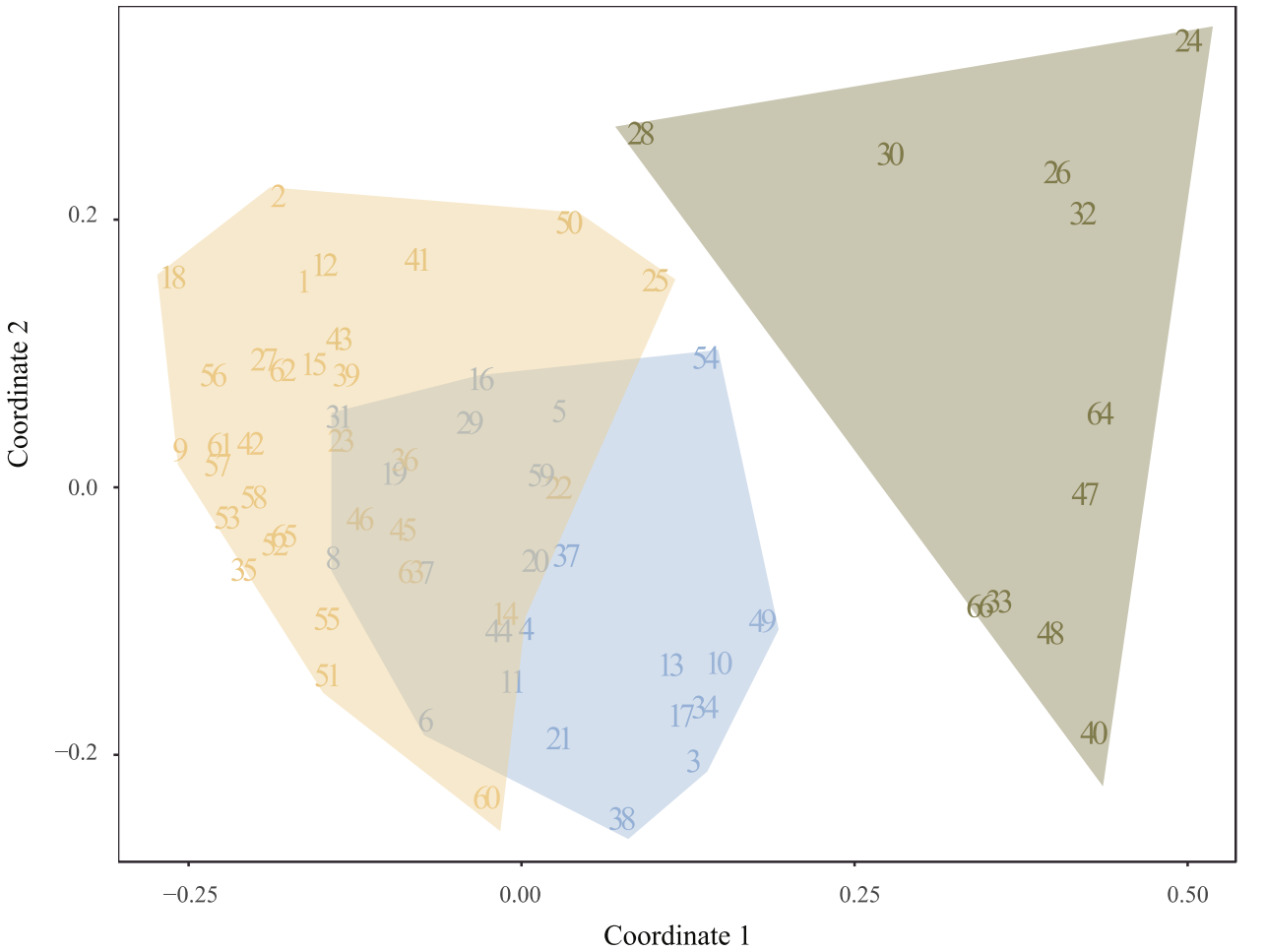
Study #2 – review of biosphere reserves' management effectiveness

RESULTS

- Existing research presents gaps and bias that prevent a more holistic understanding of biosphere reserves' management effectiveness;

- We propose a research agenda to contribute to a more holistic understanding of biosphere reserves' management effectiveness.

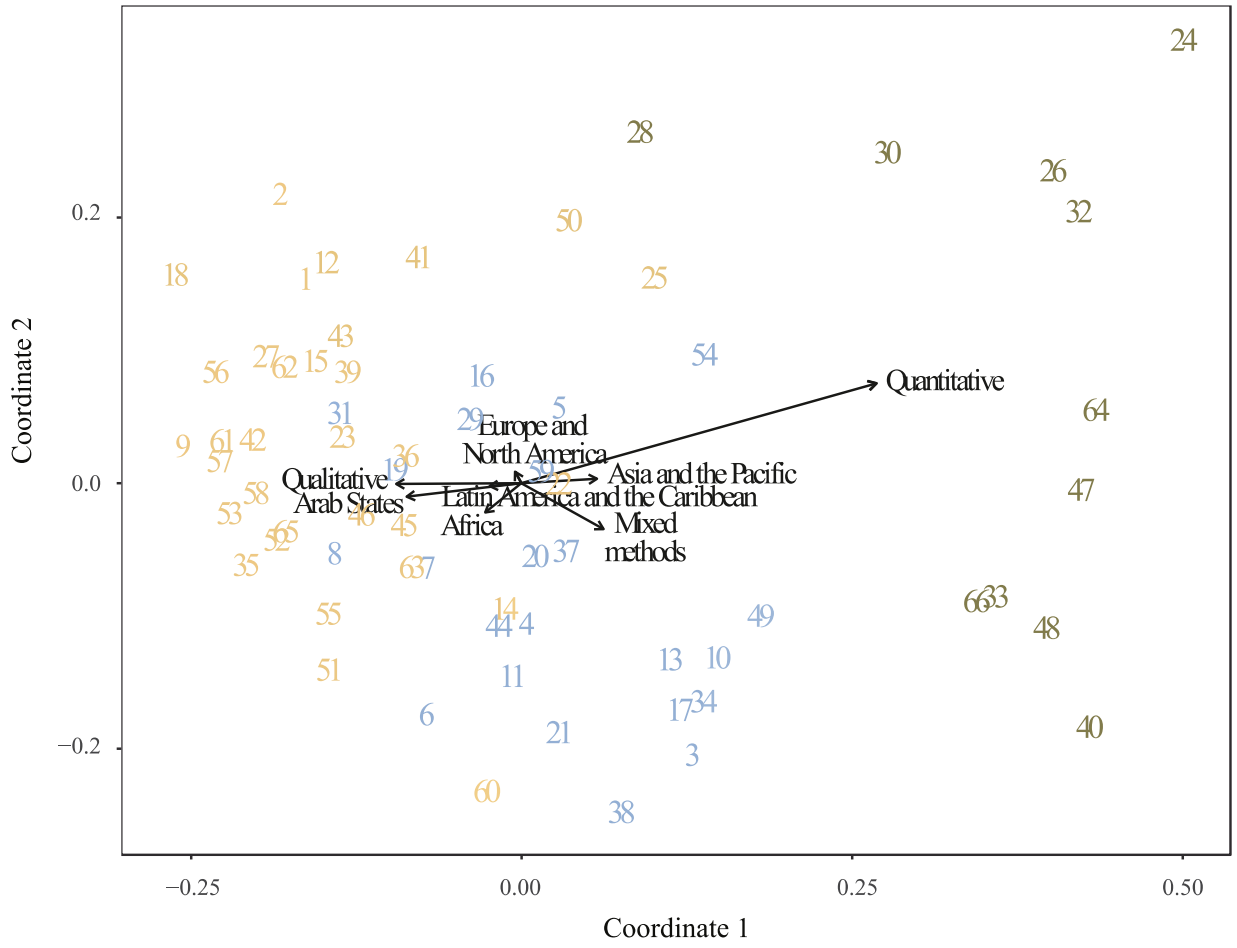
Study #2 – review of biosphere reserves' management effectiveness



Multidimensional scaling showing the dissimilarities among three groups of papers (Ferreira et al., 2020).

- 3 groups of papers address different subcategories of management effectiveness;
- These subcategories are related with different goals of biosphere reserves;
- Goals of biosphere reserves as more effective leverage points for success.

Study #2 – review of biosphere reserves' management effectiveness

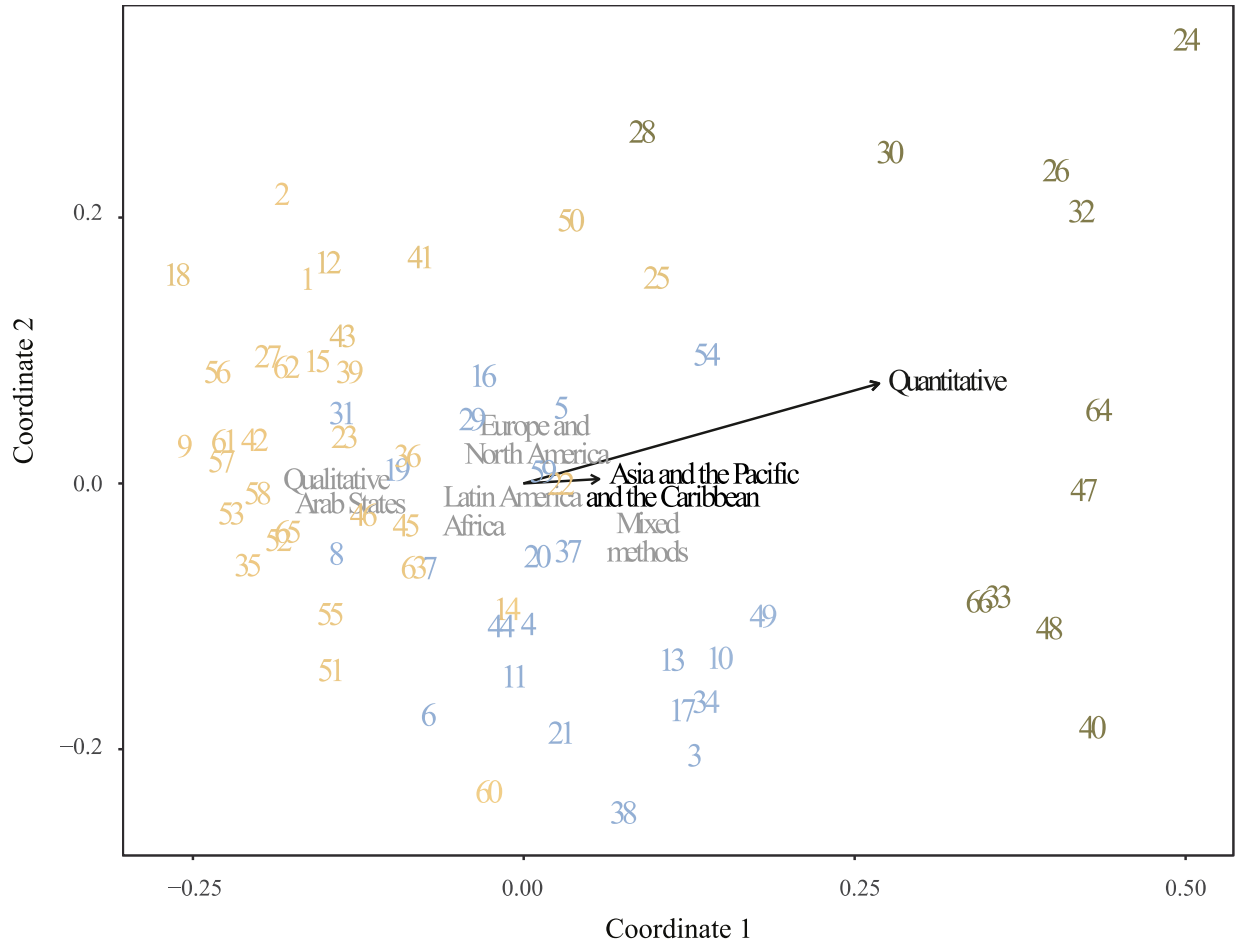


Capacity building | Biodiversity conservation | Sustainable Development

Multidimensional scaling showing the dissimilarities among three groups of papers and the significantly correlated variables (Ferreira et al., 2020).

- Different groups are associated with different methods for data analysis and different regions of the world;

Study #2 – review of biosphere reserves' management effectiveness



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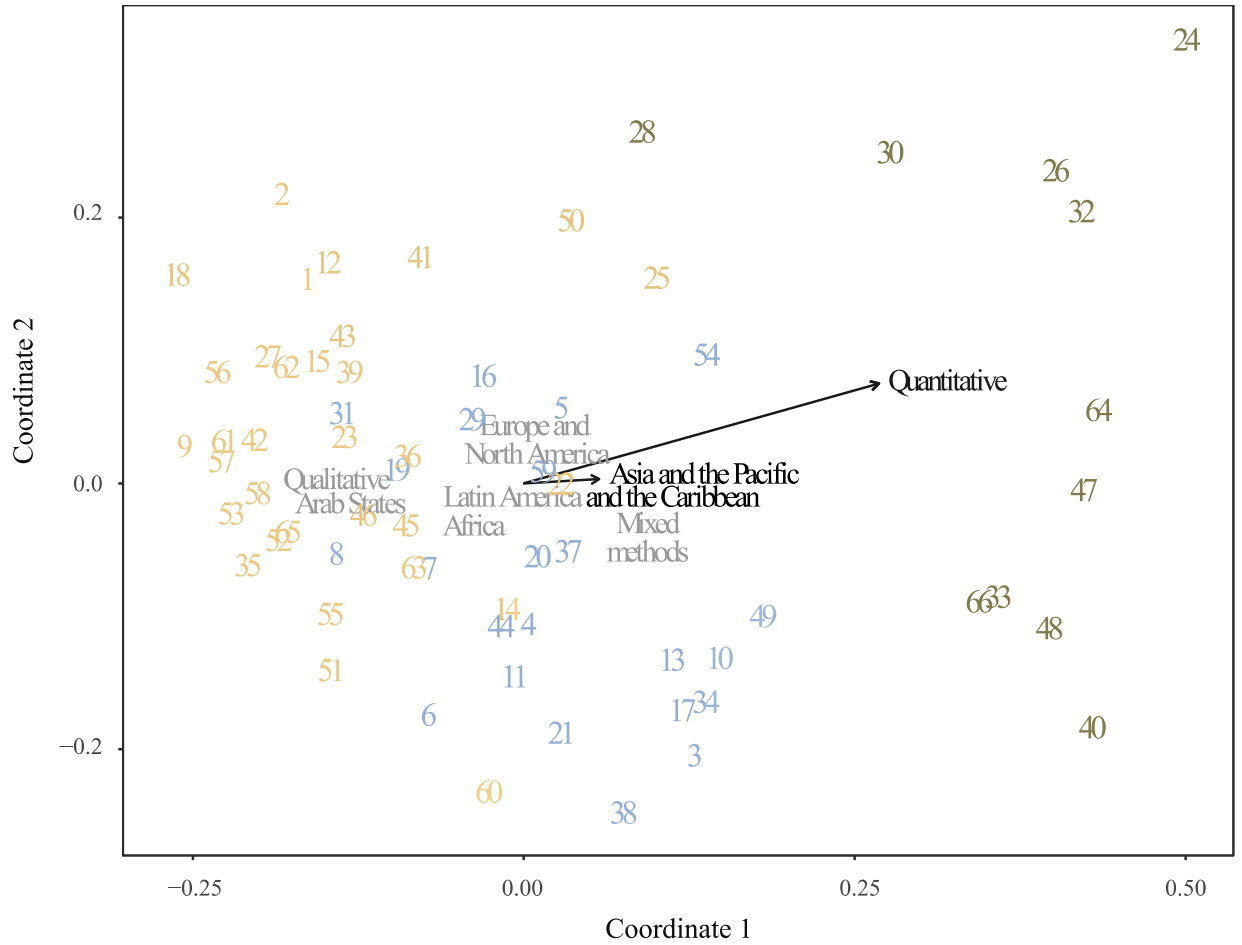

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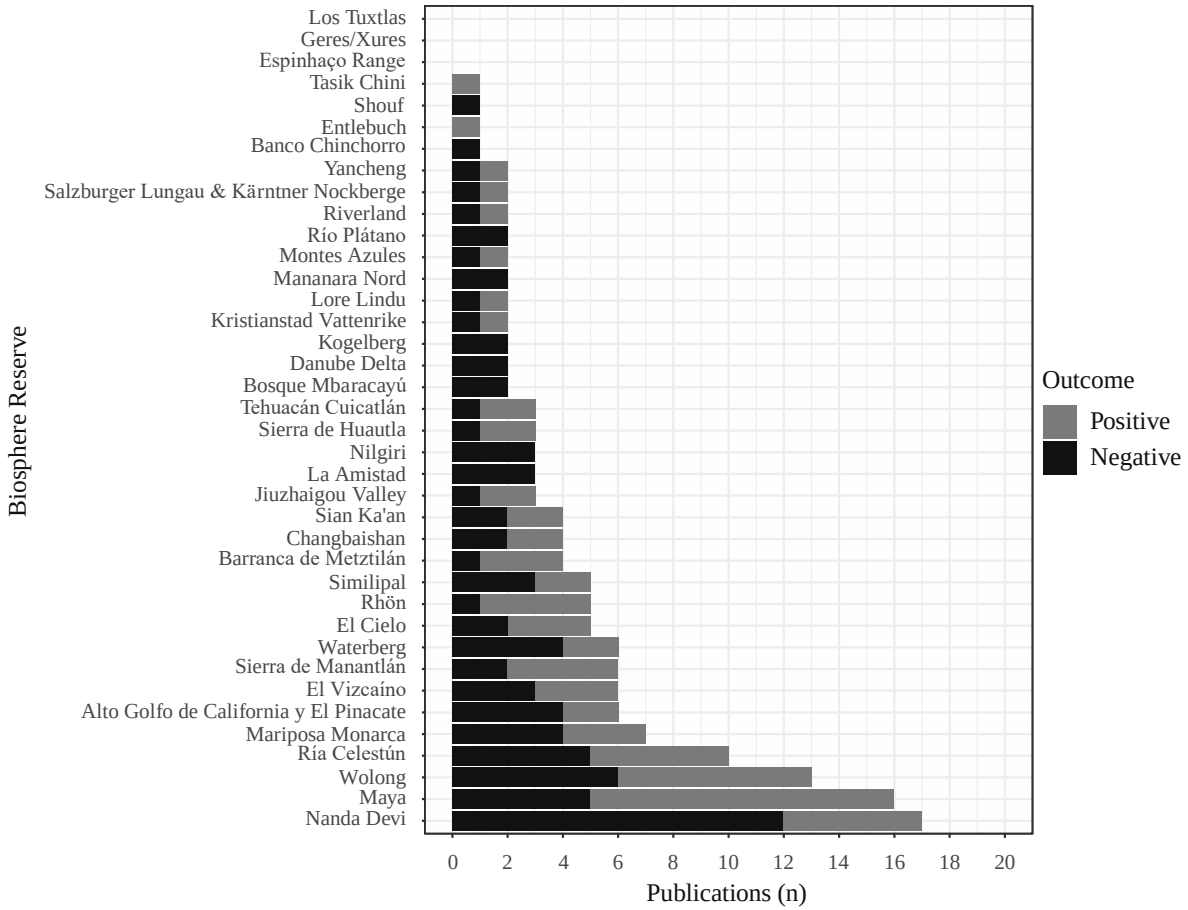
Multidimensional scaling showing the dissimilarities among three groups of papers and the significantly correlated variables (Ferreira et al., 2020).

- Different groups are associated with different methods for data analysis and different regions of the world;

There is a need to investigate:

- Mechanisms for holistic research (e.g. using a diversity of methods and perspectives);
- Transformations for social-ecological fit (e.g. what processes are needed to ensure that the management and goals of biosphere reserves fit their social-ecological context).

Study #2 – review of biosphere reserves' management effectiveness



Sum of the number of publications that report positive and negative outcomes of biosphere reserves' management (Ferreira et al., 2020)

- Positive and negative outcomes were identified in most of the biosphere reserves studied;

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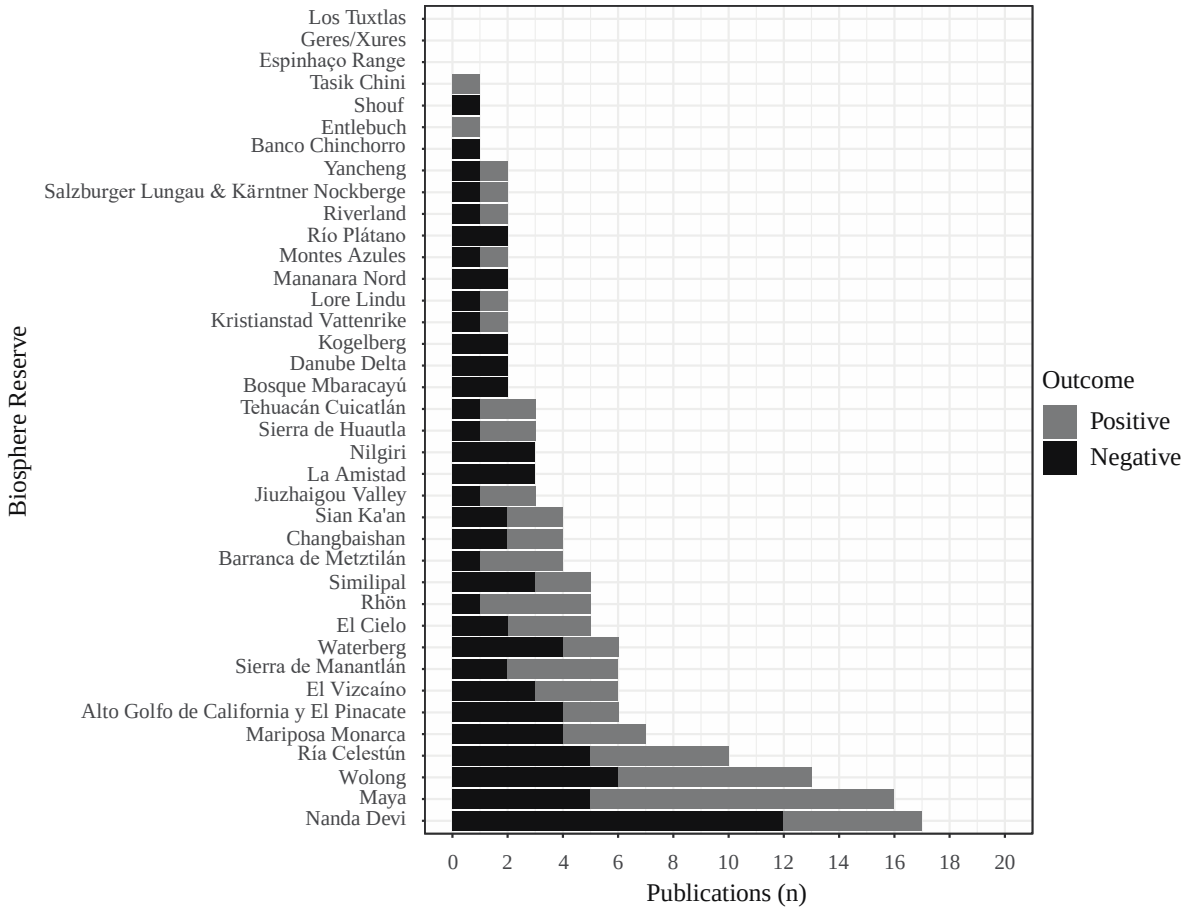

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- Positive and negative outcomes were identified in most of the biosphere reserves studied;

There is a need to investigate:

- Outcomes and trade-offs (e.g. what are the causes of trade-offs in biosphere reserves and how to overcome them).

Study #2 – review of biosphere reserves' management effectiveness

Category	Subcategory	% of papers
Inputs	Funding and material support/ opposition	81.1
Context	Organizations	65.9
Context	Economy and politics	65
Context	Conservationist value	53.8
Outcomes	Cultural benefits	50
Context	Historical factors	45.5
Context	Power issues	44.4
Context	Socio-economic attributes	44.1
Context	Formal rules	44
Inputs	Non-material support/opposition	42.6

Most frequent subcategories referred at non-local scales (international and national/regional) (Ferreira et al., 2020)

- There are many subcategories which control lies outside of the biosphere reserves;

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There is a need to investigate:

- Institutions for integrated management across scales (e.g. how to promote multi-scale cooperation).

Study #3

Management of social-ecological systems in the Portuguese Mediterranean Biome – what can biosphere reserves learn from grassroots approaches?

Study#3 - Biosphere Reserves and Grassroots Approaches

GOALS:

- Identify the main differences in the management of a biosphere reserve and two grassroot approaches;
- Identify opportunities to increase the success of a biosphere reserve, building on the experiences of grassroot approaches.

Study#3 - Biosphere Reserves and Grassroots Approaches

GOALS:

- Identify the main differences in the management of a biosphere reserve and two grassroot approaches;
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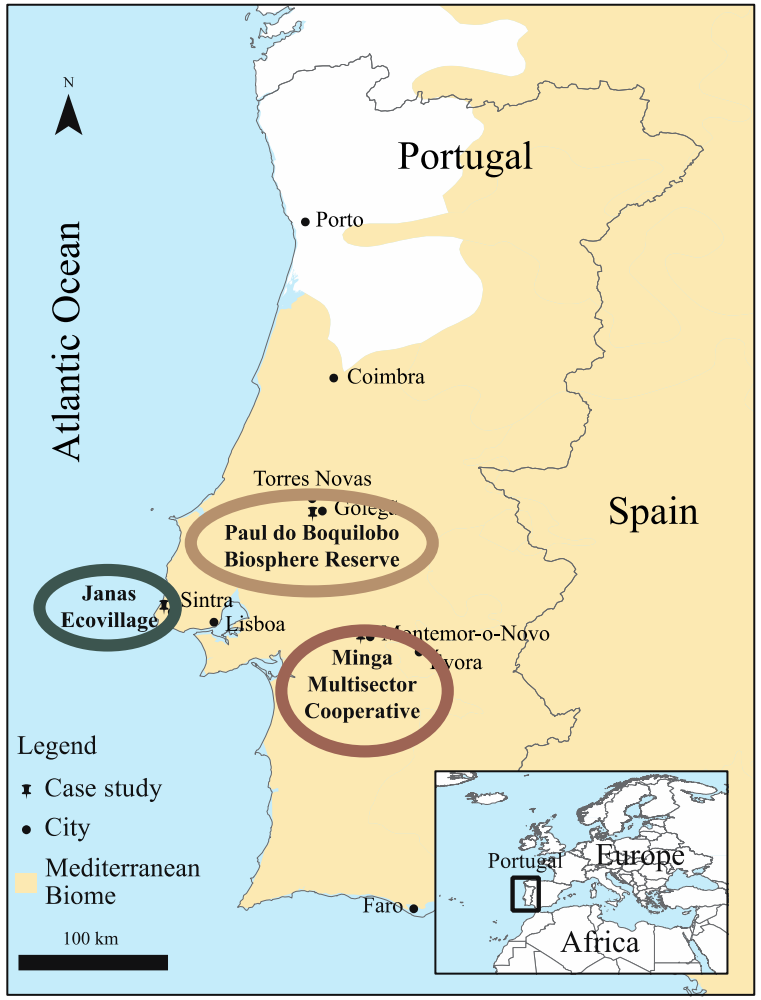
METHODS:

- Multiple case-study analysis
- Semi-structured interviews with a diversity of actors (n=35)
- Deductive & inductive coding
- Triangulation with data from observation and secondary sources
- Qualitative analysis, geographic information systems and descriptive statistics.



Location of the case studies. Mediterranean Biome according to Olson & Dinerstein (2002)

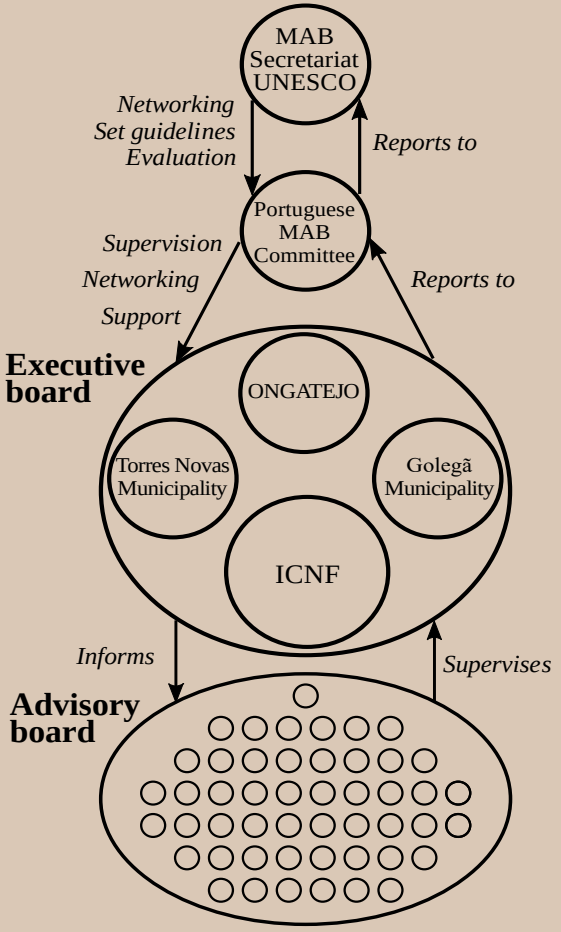
Study#3 - Biosphere Reserves and Grassroots Approaches

RESULTS:

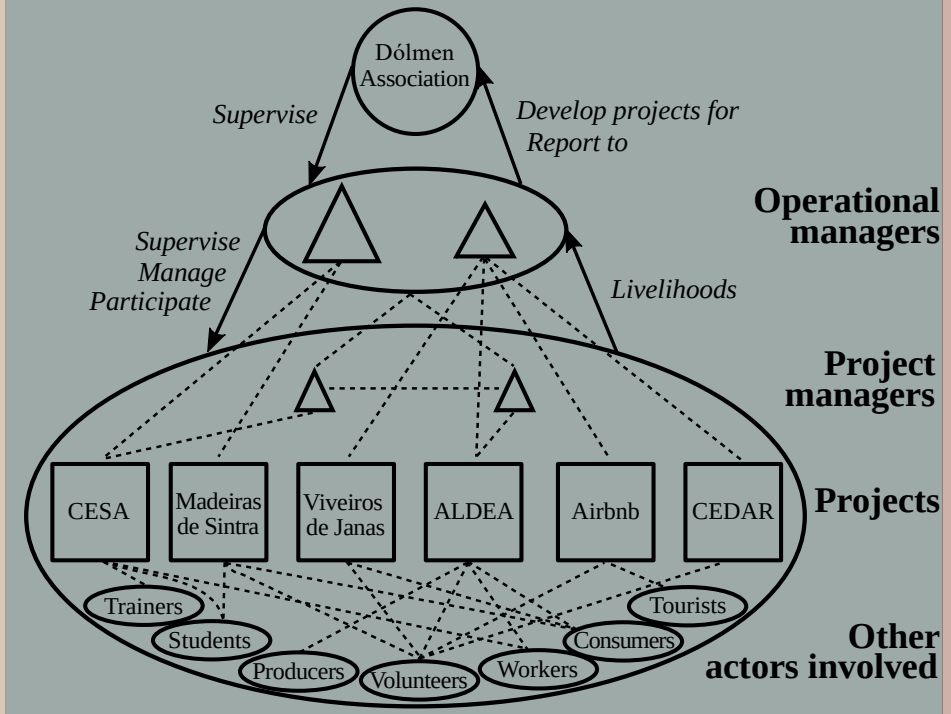
- The initiatives are very distinct regarding how they started, goals, management, governance and outcomes.

E.g. **governance:**

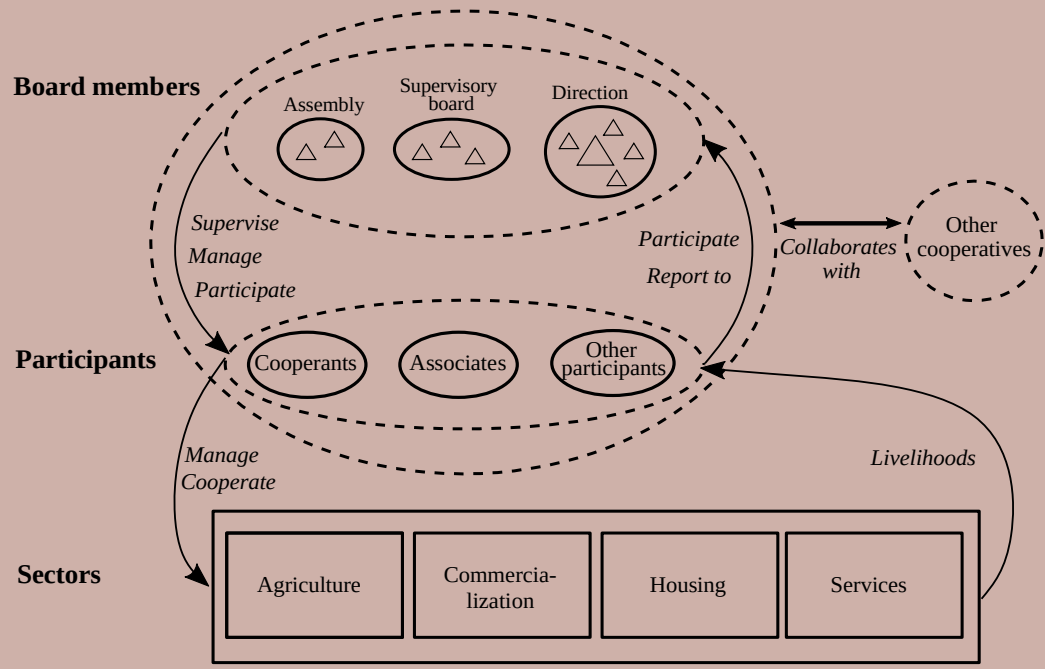
Paul do Boquilobo BR



Janas Ecovillage



Minga Multisector Cooperative



Different sustainability pathways (Luederitz et al., 2017)

Paul do Boquilobo Biosphere Reserve

Green Economy

Janas Ecovillage

Ecotopian solutions

Minga Multisector Cooperative

Transition movements

Study#3 - Biosphere Reserves and Grassroot Approaches

Practices from the grassroots that provide learning opportunities to the Paul do Boquilobo

Bios

Study#3 - Biosphere Reserves and Grassroot Approaches

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Financial sustainability

Definition of formal institutions

Study#3 - Biosphere Reserves and Grassroot Approaches

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Sociocratic governance

Study#3 - Biosphere Reserves and Grassroot Approaches

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Financial sustainability

Definition of formal institutions

Sociocratic governance

Recreation of an integrated and shared vision

Section 3

Concluding remarks

Contributions

- This work provides contributions for a better understanding about how to manage social-ecological systems to achieve multiple social and ecological goals, including biodiversity conservation:

- **Conceptual** contributions
  - A holistic framework to analyse the management of social-ecological systems along with biodiversity conservation that allows to understand the relationships and see the conflicts and synergies among different dimensions and scales.

- **Empirical** contributions
  - Provision of recommendations to the management of the MAB Programme, the Paul do Boquilobo Biosphere Reserve, but also to the Janas Ecovillage and the Minga Multisector Cooperative (in the general discussion).

- Contributions for the **research**
  - A research agenda for biosphere reserves' management effectiveness.

Future research

Future research is necessary, in special regarding the third study, e.g.:

- **Collect complementary information about the initiatives –** inclusion of more actors and practices besides perceptions (e.g. inequality);

- **Follow-up study –** develop and implement in a collaborative way priority actions.

Outputs

- **Peer-reviewed publications**

1. Ferreira, A.F., Zimmermann, H., Santos, R. & von Wehrden, H. 2018. A social-ecological systems framework as a tool for understanding the effectiveness of Biosphere Reserve management. ***Sustainability***, **10: 3608.**

2. Ferreira, A.F., Zimmermann, H., Santos, R. & von Wehrden, H. 2020. Biosphere reserves management effectiveness – a systematic literature review and a research agenda. ***Sustainability,*** **12(14): 5497.**

3. Ferreira, A.F. Cosme, I., von Wehrden, H. & Santos, R. n.d. Management of social-ecological systems in the Portuguese Mediterranean Biome – what can biosphere reserves learn from grassroot approaches? ***In preparation***

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Review

A Social–Ecological Systems Framework as a Tool for Understanding the Effectiveness of Biosphere Reserve Management

Ana F. Ferreira [1,2,*], Heike Zimmermann [3], Rui Santos [1] and Henrik von Wehrden [2]

[1] Center for Environmental and Sustainability Research (CENSE), NOVA School of Science and Technology, NOVA University Lisbon, Campus de Caparica, 2829-516 Caparica, Portugal; rfs@fct.unl.pt
[2] Institute of Ecology, Faculty of Sustainability and Center for Methods, Leuphana University, Universitätsallee 1, 21335 Lüneburg, Germany; henrik.von_wehrden@leuphana.de
[3] Institute for Ethics and Transdisciplinary Sustainability Research, Faculty of Sustainability, Leuphana University, Universitätsallee 1, 21335 Lüneburg, Germany; heike.zimmermann@leuphana.de
* Correspondence: afdinisferreira@gmail.com; Tel.: +351-21-294-8397

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Review

Biosphere Reserves' Management Effectiveness—A Systematic Literature Review and a Research Agenda

Ana Filipa Ferreira [1,2,*], Heike Zimmermann [3], Rui Santos [1] and Henrik von Wehrden [2]

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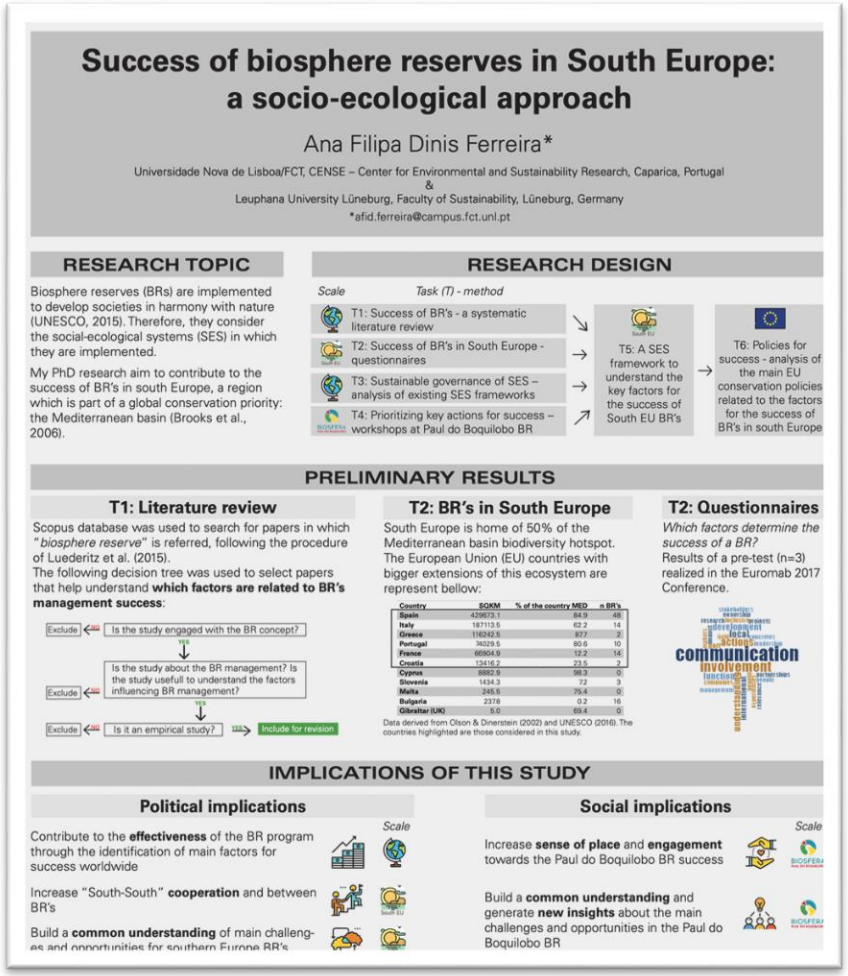
[3] Institute for Ethics and Transdisciplinary Sustainability Research, Faculty of Sustainability, Leuphana University, 21335 Lüneburg, Germany; heike.zimmermann@leuphana.de
* Correspondence: afdinisferreira@gmail.com; Tel.: +351-21-294-8397

Outputs of the thesis: publications in scientific journals

Outputs

- 3 presentations in **scientific conferences**
  - 2nd Biennial Conference of the Political Ecology Network (2018, Oslo);
  - 12th Conference of the European Society for Ecological Economics (2017, Budapest).



Success of biosphere reserves in South Europe: a socio-ecological approach

Ana Filipa Dinis Ferreira*
Universidade Nova de Lisboa/FCT, CENSE – Center for Environmental and Sustainability Research, Caparica, Portugal
&
Leuphana University Lüneburg, Faculty of Sustainability, Lüneburg, Germany
*afid.ferreira@campus.fct.unl.pt

RESEARCH TOPIC

Biosphere reserves (BRs) are implemented to develop societies in harmony with nature (UNESCO, 2015). Therefore, they consider the social-ecological systems (SES) in which they are implemented.

My PhD research aim to contribute to the success of BR's in south Europe, a region which is part of a global conservation priority: the Mediterranean basin (Brooks et al., 2006).

RESEARCH DESIGN

Scale *Task (T) - method*

- T1: Success of BR's - a systematic literature review
- T2: Success of BR's in South Europe - questionnaires
- T3: Sustainable governance of SES – analysis of existing SES frameworks
- T4: Prioritizing key actions for success – workshops at Paul do Boquilobo BR

→ T5: A SES framework to understand the key factors for the success of South EU BR's → T6: Policies for success - analysis of the main EU conservation policies related to the factors for the success of BR's in south Europe

PRELIMINARY RESULTS

T1: Literature review

Scopus database was used to search for papers in which "*biosphere reserve*" is referred, following the procedure of Luederitz et al. (2015).
The following decision tree was used to select papers that help understand **which factors are related to BR's management success**:

Is the study engaged with the BR concept? (Exclude)
↓ Yes
Is the study about the BR management? Is the study usefull to understand the factors influencing BR management? (Exclude)
↓ Yes
Is it an empirical study? (Exclude) Yes → Include for revision

T2: BR's in South Europe

South Europe is home of 50% of the Mediterranean basin biodiversity hotspot. The European Union (EU) countries with bigger extensions of this ecosystem are represent bellow:

Country	SQKM	% of the country MED	n BR's
Spain	429673.1	84.9	48
Italy	187113.5	62.2	14
Greece	116242.5	87.7	2
Portugal	74029.5	80.6	10
France	66904.9	12.2	14
Croatia	13416.2	23.5	2
Cyprus	8892.9	96.3	0
Slovenia	1434.3	72	3
Malta	246.5	75.4	0
Bulgaria	2378	0.2	16
Gibraltar (UK)	5.0	69.4	0

Data derived from Olson & Dinerstein (2002) and UNESCO (2016). The countries highlighted are those considered in this study.

T2: Questionnaires

Which factors determine the success of a BR?
Results of a pre-test (n=3) realized in the Euromab 2017 Conference.

IMPLICATIONS OF THIS STUDY

Political implications

Scale

- Contribute to the **effectiveness** of the BR program through the identification of main factors for success worldwide
- Increase "South-South" **cooperation** and between BR's
- Build a **common understanding** of main challenges and opportunities for southern Europe BR's

Social implications

Scale

- Increase **sense of place** and **engagement** towards the Paul do Boquilobo BR success
- Build a **common understanding** and generate **new insights** about the main challenges and opportunities in the Paul do Boquilobo BR

Outputs of the thesis: a poster presentation

Outputs

- 3 presentations in **scientific conferences**
  - 2nd Biennial Conference of the Political Ecology Network (2018, Oslo);
  - 12th Conference of the European Society for Ecological Economics (2017, Budapest).

- **Visiting researcher** in the Faculty of Sustainability of the University of Leuphana between February 2017 to April 2019

Outputs of the thesis: visiting researcher in the HvW lab

Outputs

- 3 presentations in **scientific conferences**
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- **Visiting researcher** in the Faculty of Sustainability of the University of Leuphana between February 2017 to April 2019;

- Participation in 3 **meetings with practitioners**
  - European Meeting of the Man and Biosphere Programme (EuroMAB) (2017, Bassin de la Dordogne Biosphere Reserve);
  - UNESCO MAB Youth Forum (2017, Po Delta Biosphere Reserve);
  - 2nd Meeting of the Portuguese MAB Committee (2016, Paul do Boquilobo Biosphere Reserve).

Outputs of the thesis: participation in the MAB Youth Forum

Outputs

- 3 presentations in **scientific conferences**
  - 2nd Biennial Conference of the Political Ecology Network (2018, Oslo);
  - 12th Conference of the European Society for Ecological Economics (2017, Budapest).

- **Visiting researcher** in the Faculty of Sustainability of the University of Leuphana between February 2017 to April 2019;

- Participation in 3 **meetings with practitioners**
  - European Meeting of the Man and Biosphere Programme (EuroMAB) (2017, Bassin de la Dordogne Biosphere Reserve);
  - UNESCO MAB Youth Forum (2017, Po Delta Biosphere Reserve);
  - 2nd Meeting of the Portuguese MAB Committee (2016, Paul do Boquilobo Biosphere Reserve).

- Opinion paper in the Revista Agrotejo União Agrícola do Norte do Vale do Tejo (2018)
  - *Gestão de Reservas da Biosfera – Que fatores influenciam o*

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OPINIÃO ANA FILIPA FERREIRA ESTUDANTE NA FACULDADE DE CIÊNCIAS E TECNOLOGIA DA UNIVERSIDADE NOVA DE LISBOA

GESTÃO DE RESERVAS DA BIOSFERA – QUE FATORES INFLUENCIAM O SEU SUCESSO?

52

Quais os fatores mais importantes para a gestão de sucesso das reservas da biosfera? Vários estudos têm procurado responder a esta questão. De entre os fatores mais frequentemente identificados, destacam-se o financiamento e a participação das comunidades na tomada de decisão. As reservas da biosfera procuram conciliar a conservação da natureza com o desenvolvimento económico, no entanto entre os objetivos do programa da UNESCO Homem e Biosfera (Man and Biosphere) e a prática nas reservas, ainda persiste um longo caminho.
De acordo com um recente artigo publicado na revista *Sustainability*[1], 53 diferentes grupos de fatores influenciam a gestão das reservas da biosfera. Os autores agruparam estes fatores

O FINANCIAMENTO E A PARTICIPAÇÃO DAS COMUNIDADES NA TOMADA DE DECISÃO É UM DOS FATORES MAIS IMPORTANTES PARA A GESTÃO DE SUCESSO DAS RESERVAS DA BIOSFERA

vez, a gestão das reservas produz benefícios e impactos económicos, sociais e culturais. Além disso, podem fortalecer a autonomia de indivíduos e/ou comunidades (ou outros grupos sociais) na gestão dos seus próprios recursos ou, por outro lado, causar desigualdades, quando os benefícios e custos da gestão da reserva não são distribuídos igualmente. Além destas relações diretas, *feedbacks* entre os vários fatores foram identificados. Por exemplo, a exclusão de determinados grupos sociais da gestão da reserva pode potenciar as relações de poder existentes – *feedback* positivo. Por outro lado, ações de conservação, como a reflorestação, podem contribuir para a diminuição de problemas ambientais existentes, como a erosão dos solos

Outputs of the thesis: an opinion paper in the journal *Agrotejo*

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Paul do Boquilobo Nature Reserve. Photo: AFFerreira

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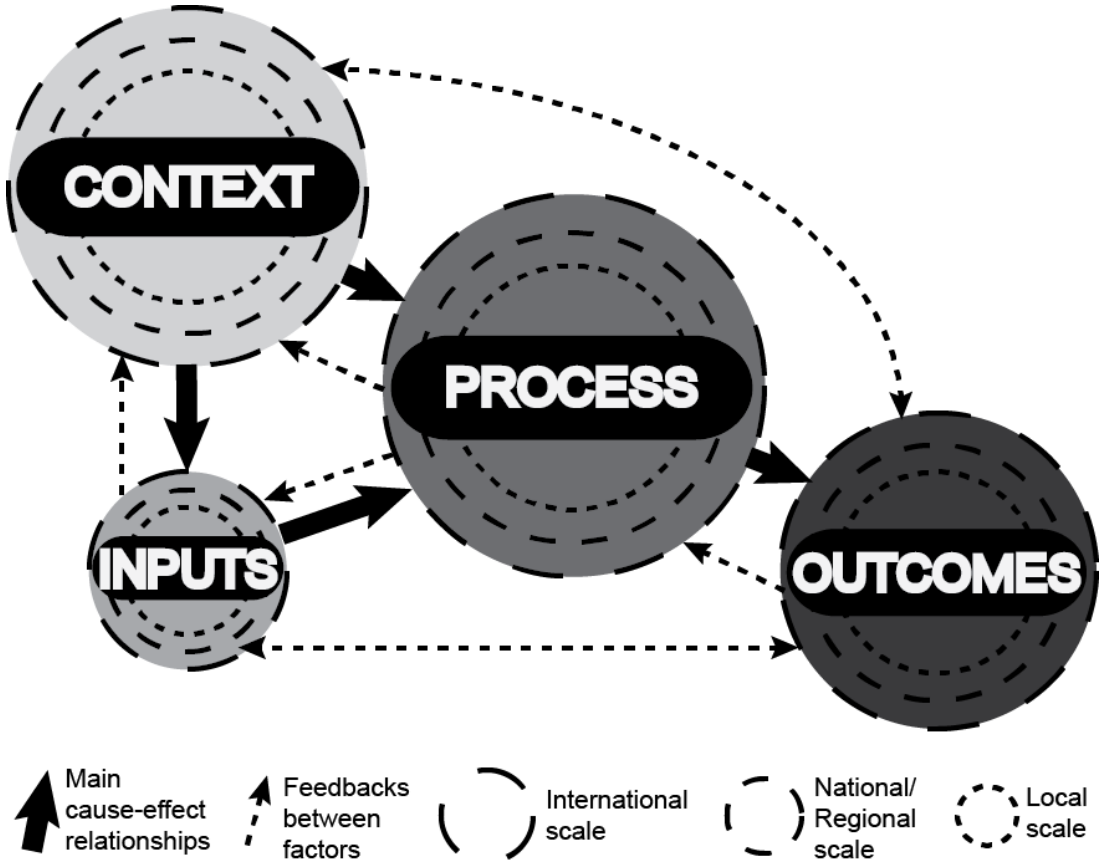
- Funding from *Fundação para a Ciência e Tecnologia*

Identify interactions among factors

- Main relationships
- Feedbacks, causal relationships
- Scales (local, national, international)

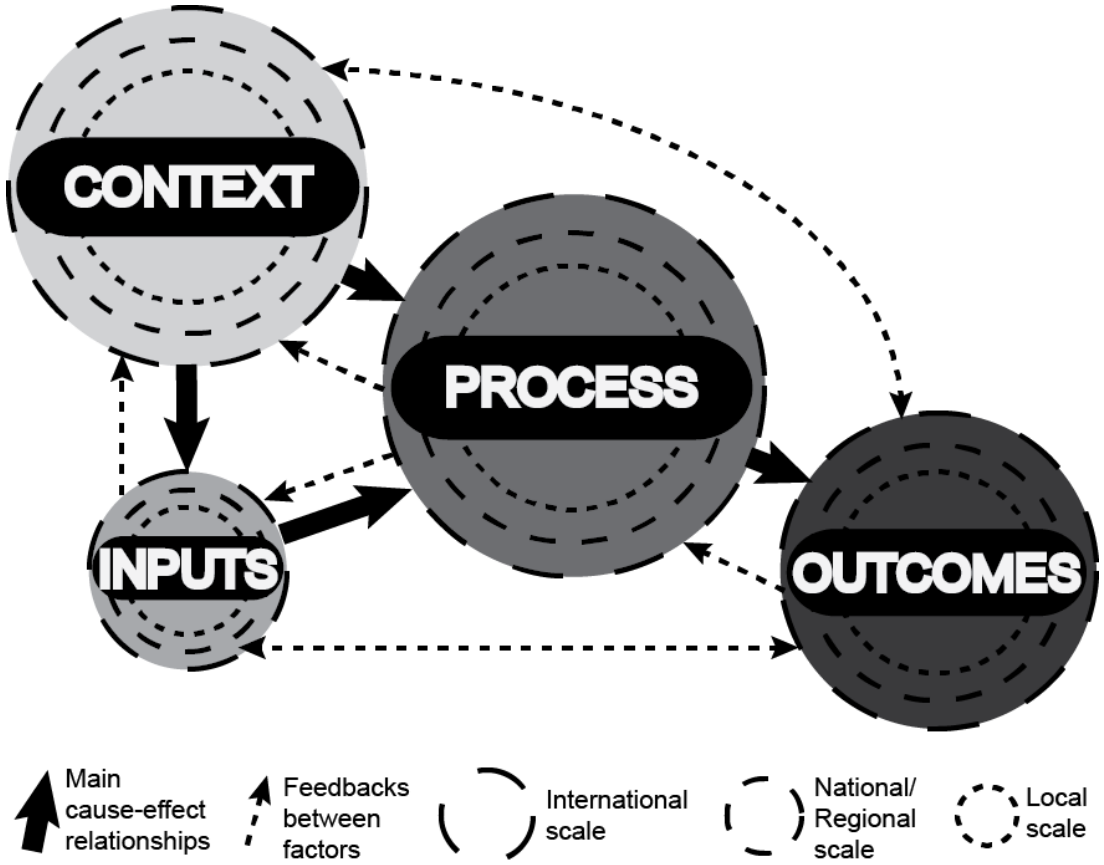


Retrieved from: Ferreira et al., 2018. A Social–Ecological Systems Framework as a Tool for Understanding the Effectiveness of Biosphere Reserve Management. Sustainability 10, 3608.

Identify interactions among factors

- Analysis of the paper of Lyon et al. 2017. *Are we any closer to sustainable development? Listening to active stakeholder discourses of tourism development in the Waterberg Biosphere Reserve, South Africa*. Tourism Management 61, 234-247.

- Draw a scheme identifying some factors in the system influencing biosphere reserves management' effectiveness. Think about relationships, feedbacks and scales.



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