



Observatory of the dynamics of interactions between societies and environment in the amazon

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FINAL REPORT

Longitudinal Study of Social Network Analysis of the ODYSSEA Project

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1. Context and Background of Final Report

This report presents the results of the Longitudinal Study of the Social Network Analysis (SNA) of the ODYSSEA Project, where we applied concepts and methods of social network analysis to deepen our knowledge of the dynamics of social relationships in the context of the project. In collaboration with researchers specialized in SNA, we mapped the collaborative relationships established between actors and partner institutions from 2016 to 2019. The report is divided into two sections. The first part briefly presents the characteristics of formal studies on SNA, aiming to define the concepts, vocabulary, and methods used in the second part of the report. The latter portion presents the study, objectives, methods, and the principal results and conclusions of our study.

2. Introduction to formal studies in Social Network Analysis

Social Network Analysis (SNA) is a research paradigm that seeks to understand social structures (Scott, 2000). It is a tool allowing for the study of relationships between individuals and groups in different social situations. Social Network Analysis includes distinct approaches to analyze the exchange of information, knowledge, and resources between social groups forming formal and informal networks (Mertens et al, 2005). The theoretical and methodological framework of SNA, as well as the various case studies that comprise this field, demonstrate that social structures can either facilitate or hinder specific outcomes, such as integration, cohesion, conflict or change. Social structures can also impact (negatively or positively) the processes that mediate these outcomes such as negotiation, bargaining, coercion, cooperation or coordination (Scott, 2000).

In this way, the study of social networks can be used to map actors' dynamics, to analyze information flows, to examine the position of each individual in the network related to rights and responsibilities and to decision making. It can also be used to analyze power distribution and the structures of interdependence and tensions within a given group (Marin & Wellman, 2009). To study the behavior and opinions of actors who depend on the structures within which they are inserted, individual characteristics and the set of relationships that people establish are also studied through their interactions with others. This type of analysis allows us to study the behavior and opinions of actors who depend on the structures within which they are inserted (Wasserman & Faust, 1994; Wellman, 1983).

Social networks can be defined as a set of social entities (individuals, organizations or institutions) that are connected to one another through one or various types of relationships (Borgatti & Foster,

2003). Social entities are frequently described as nodes, vertices, actors and agents and their relationships are cited as links, connections, linkages (bonds) and ties.

Social network studies include two types of data. Attribute data, defined at the level of the individual, include variables such as gender, age, education level and profession. Relational data, defined by pairs of individuals, include relationships such as collaboration, kinship, friendship, trust and power, among others.

Each type of relationship defines a distinct network, even if they are frequently empirically correlated (Wasserman & Faust, 1994). Formal SNA methods measure and represent micro, meso, and global structures of complex social systems (Borgatti & Halgin, 2011). In this first section we presented methods and concepts from SNA from the following references: Scott, 2000; Borgatti & Foster, 2003; Marin & Wellman, 2009; Borgatti & Halgin, 2011; Borgatti et al, 2013.

2.1. Types of Networks

Personal networks, egonetworks, are formed by a central actor called *ego* and the nodes that have direct relations with *ego*, termed *alters*. Egonetworks analyses also include the relationships that exist between *alters*. Studies on egonetworks can be based on information obtained from *egos* independent from each other, or alternatively a more complete network study can be done – from which personal networks for each ego can also be obtained (Borgatti & Foster, 2003). Complete networks refer to a macro-level of analysis where relational information is obtained for all actors. Analyses focus on understanding the structural patterns among the set of actors of an entire network.

2.2. Strategies for designing SNA studies

To develop a SNA study is it necessary to develop a few strategic elements:

i) Network Limits

Defining the limits of a scientific investigation is a central part of any research project. Within SNA, defining system frontiers is one of the greatest challenges. Defining the limits of a SNA study is a decision based in theoretical justifications regarding what is significant in the situation under investigation (Scott, 2000).

ii) Sample units and data collection methods

Sampling of social units can be defined on a micro or macro level and is closely linked to the definition of network limits.

iii) Content and relationship types

The content, or type of relationship, is defined by the scientific question the study seeks to answer. Friendships, collaboration, dialog and trust are some examples of “content” regarding social interactions. Ways of relating are associated to the intensity or strength of the relationship and the direction of the relationship (unidirectional, reciprocal or null). We call networks “multiplex” when more than one type of relationship is analyzed for the same set of actors, such as, for example, dialog and collaboration networks.

iv) Data analysis level

Network measures at the node level (micro level of analysis) include degree centrality, betweenness centrality, and closeness centrality, among others. Network measures used to characterize complete networks (macro level of analysis) include degree of network centralization, density, homophily, and center-periphery relation. Sub-groups form a “meso” level of analysis. Starting from a complete network, one can analyze the pattern of relationships between densely connected sub-groups or sub-groups with similar attributes.

3. Longitudinal SNA study of the ODYSSEA project

The ODYSSEA project sought to develop new and long-lasting collaborations between European and Brazilian institutions; it also aimed to reinforce already existing relationships in the context of Amazonian studies. For this reason, we proposed to map relationships between participants during two periods of the project: at the end of its first year in 2016 (and some answers sent during 2017); and at the end of 2018 (and some answers sent during 2019). It is important to note that results obtained at each time point are not simply a picture frozen in time; instead they represent a process of gradual construction and of the strengthening of relationships and alliances between people and their institutions.

In addition, the ties established between people may present different patterns when we analyze the moment that they enter into the network and their roles and strategic positions, which can determine the flow of information, collaborative activities, among other actions. The longitudinal character of the SNA study is directed to support short, medium, and long-term interventions – for example, to

develop strategies to strengthen collaborations between different disciplines, between countries, sectors or between work levels. It may also help disseminate information, promote innovation and amplify collaborative processes. In this way, it is important to discuss in more depth analyses at each mapping phase and show the results in an integrated way – to produce new information to better interpret the process of evolution and robustness of the ODYSSEA project.

4. Objectives of the SNA Study

The **main objective** of the longitudinal SNA study of the ODYSSEA project is to understand the evolution of the structural and functional properties of the collaboration network among project participants, aiming to strengthen the academic processes of research and action interventions in Amazon Region.

Specific objectives seek to:

1. Understand the structural and functional properties of the collaboration network among ODYSSEA project participants and its evolution over time;
2. Understand the role of the ODYSSEA project in fostering the collaboration network between academic disciplines, research projects, participant institutions, work sectors (academics, general public, civil society, etc.), and study regions;
3. Propose recommendations to strengthen relationships between actors and to promote collaborative activities, aiming to guide the academic, intervention and advocacy activities related to the ODYSSEA project and guarantee the sustainability of project results over time.

5. Methodology

The proposed methodology consists of a longitudinal study of the four years of the ODYSSEA project execution (2016-2019) and is based on two phases of data collection and analysis conducted during project annual events; data were also gathered through email correspondence.

- **PHASE 1: data collected from November of 2016 to May of 2017.**

Target audience: i. participants of the project launch, which occurred in April of 2016 in Pirenópolis/GO; ii. Participants of the first annual event, which took place in November of 2016 in Brasília/DF; iii. other project participants considered relevant by project coordinators (e.g. researchers that had realized secondments). Data on the collaborative relationships established

prior to the start of the project were also collected to define a baseline and understand the role of relations prior to the development of ODYSSEA activities.

- **PHASE 2: data collected from December 2018 to September 2019.**

Target audience: participants involved in the first data collection, in addition to new actors who were included in the project in 2017 through event participation, research activities, among other initiatives.

When possible, the study was conducted with all participants of each phase, aiming to analyze the evolution of collaboration network's structure in accordance with the advancement of ODYSSEA project activities. Figure 1 presents the timeline of SNA of the ODYSSEA project as well as the description of the study population from the two phases of data collection.

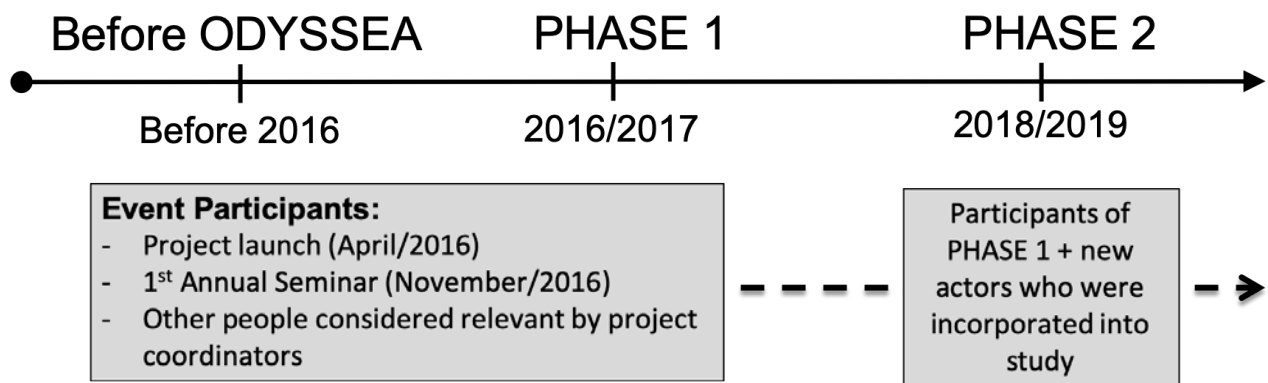


Figure 1. Timeline and population involved in the Longitudinal Study of the Social Network Analysis of the ODYSSEA Project

5.1. Data collection instruments

Data were collected using questionnaires with questions about participants' personal characteristics (attribute data) and the relationships established between them (relational data). In the second phase of the project, the questionnaires were adapted according to changes that reflect the involvement of actors over time.

The questionnaire was organized in two parts:

Part I. Identification of attribute variables, which can be of three different types:

- In reference to the personal information of interviewed actors (age, gender, academic training, profession, etc.);

- In reference to actors' organizations, institutions and projects (sector, level and prioritized themes, etc.);
- In reference to their opinions and expectations (personal or institutional) about the contributions that the ODYSSEA project promoted in their study areas, regions, etc. For example:
 - Participants were invited to indicate activities, events, exchanges, internships, that the project had supported to strengthen their personal or professional capacities.

Part II. Identification of relational variables, i.e, the set of relationships between study participants. During the two phases of data collection, each individual received a complete list of the names of ODYSSEA project participants to facilitate the identification of relationships with each person. Relationships were identified and mapped for the two phases and named "Collaboration", within the ODYSSEA project. We identified who the person collaborated with in joint activities through ODYSSEA. Some examples of collaboration were presented to the participants: joint efforts to elaborate and organize research projects, courses, events, student co-advising or directing, research groups (laboratories), co-authoring scientific papers, books, among others.

During Phase 1 of data collection (2016-2017) we asked participants to identify from the list of names provided on the questionnaire, which individuals they already collaborated before the beginning of the project, and with whom they started collaborating because of their involvement in the activities of the ODYSSEA project. In this way, during the first phase, we mapped two types of collaboration networks: one before and one during the first year of the ODYSSEA project.

During Phase 2 of data collection (2018-2019), we asked participants to select only the people with whom they maintain active collaborations within the ODYSSEA project.

5.2. Data integration and analysis

The two parts of the questionnaire, the attribute and relational data, were analyzed in an integrated using the following software programs: UCINET (Borgatti *et al*, 2002) and Netdraw (Borgatti, 2002).

Data analyses were similar for Phase 1 and Phase 2 and the following measures were calculated:

- **Density of network relationships** – Ratio between the total number of connections established between actors and the total number of possible relationships between them.
- **Diversity of actors in the network** – Number of actor groups that share a certain attribute, such as sector, discipline, or professional area.

- **Average distance between nodes** – average distance between all the pairs of nodes in the network.
- **Size of the groups** - Calculation of the number of nodes in subsets defined by a shared attribute as a percentage of the total number of nodes in the network (Aboelela et al., 2007).
- **Connectivity and fragmentation** – Number and size of the different components present in the network. One component is a subset of the nodes that are directly connected or connected through other nodes (Wassermann & Faust, 1994). The network is fragmented if it is composed of various distinct components, without connections between themselves.
- **Distribution of degree centrality** – the degree centrality of a node is the number of connections that it has in the network. The distribution of degree centrality is the number of nodes that have “N” connections divided by the total number of nodes in the network.
- **Network Reciprocity Index** – Degree of reciprocal and non-reciprocal relationships existing within the network.
- **Average number of bonding ties per individual in a given group** – Bonding ties are the connections between individuals of the same social group. These ties are usually associated with trust and reciprocity, favoring the establishment of shared norms, which increase group consensus and conflict resolution processes (Bodin & Crona, 2009; Bebbington & Perreault 1999; Woolcock & Narayan 2000; Mertens et al., 2011).
- **Degree Centrality** –The number of connections that each node has within the network.

6. Results

Results are organized in four parts to describe the genesis, evolution, and the present and future of the ODYSSEA project. Results compare two data collection phases and seek to respond to some of the project objectives, as well as the aims of this study.

6.1. The genesis of the ODYSSEA network

The ODYSSEA project, carried out from 2016 to 2019, gathered together an interdisciplinary and intersectoral team with long-term experience in environmental and social research in Amazon Region. The project sought to produce knowledge and fundamental tools to evaluate the dynamic interactions between Amazonian societies and their environments. Most of the institutions involved in the project already had ongoing cooperative relationships and were partially connected to one another through international research networks, although each with their own specialties.

In this way, Phase 1 of the study sought to deepen our understanding of the existence of relationships prior to the project, as well as the emergence of new relationships established through the ODYSSEA project. In the following section we present the results obtained during the first phase of data collection.

Figure 2 presents two collaboration networks, one prior to the ODYSSEA project (2a) and another that represents the relationships active during Phase 1 of the project (2b).

In Figure 2a (prior), of the 78 study participants, 76 were connected in a main component and two were isolated, in other words, these are individuals who did not maintain prior collaborations with any of the network participants. In Figure 2b (Phase 1), of the 78 study participants, 75 are connected in a main component and three are isolated.

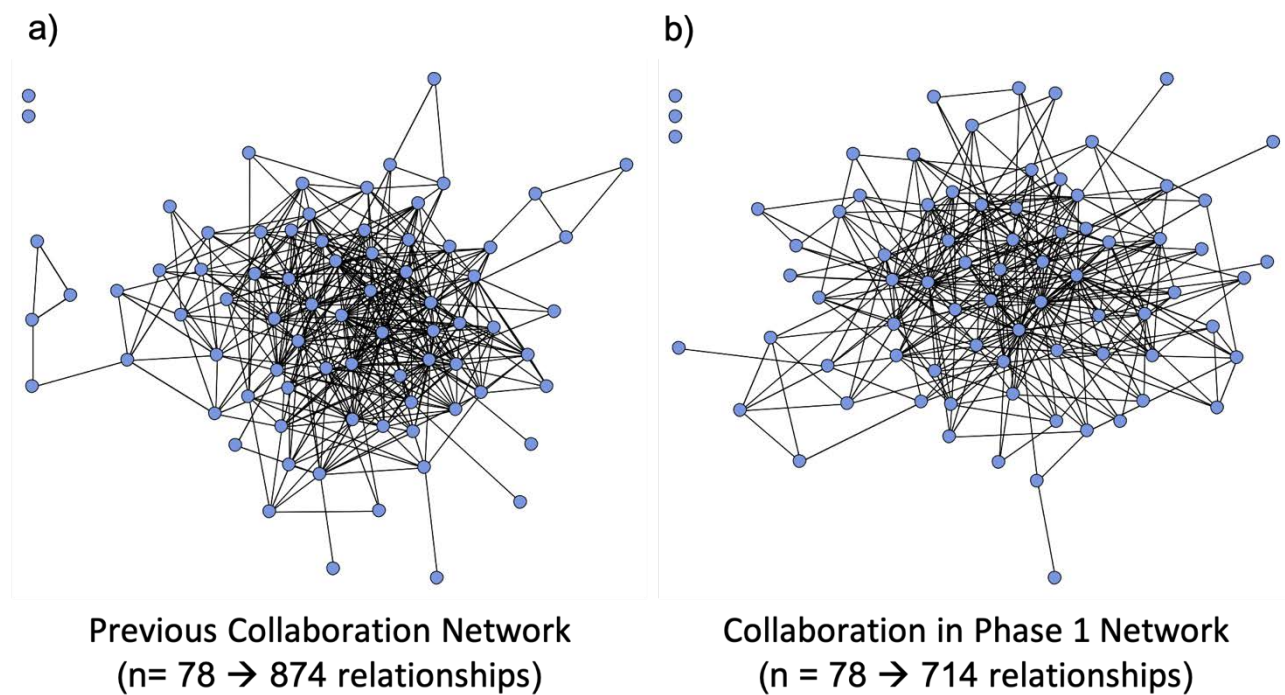


Figure 2. Previous Collaboration Network (a) and Collaboration in Phase 1 (b) of the ODYSSEA Project

New questions were constructed with the goal of understanding how collaborative relationships prior to the ODYSSEA project contributed to form a network of active collaborations occurring since the beginning of the project:

- What was the pre-ODYSSEA collaboration space, which can be considered a collaborative foundation upon which the project could potentially capitalize?
- Which previous relationships are active within ODYSSEA?
- What new relationships have emerged from the project between its members?

To respond to these questions, relationships were re-organized in three distinct groups – following the participants’ answers recorded on the questionnaire, according to the legend below:

- **Previous collaborations NOT active within ODYSSEA (1.0)** – when participants declared that they had previous collaborative relationships pre-dating the ODYSSEA project (1) – although not activated within the ODYSSEA project;
- **Previous collaborations active within ODYSSEA (1.1)** – when participants responded that they had prior relationships (1) that are active within ODYSSEA (1);
- **New collaborations active within ODYSSEA (0.1)** – when participants responded that they had established new relationships through the ODYSSEA Project (1), which were previously non-existent.

Figure 3 (a, b & c) displays the three groups of relationships extracted from two original networks (Figure 2a and b):

- Figure 3a, with 306 prior relationships, not active in the ODYSSEA project;
- Figure 3b, with 568 relationships that already existed and are being employed in the ODYSSEA project;
- Figure 3c, with 146 new relationships that did not exist beforehand and were born within the realm of the ODYSSEA project.

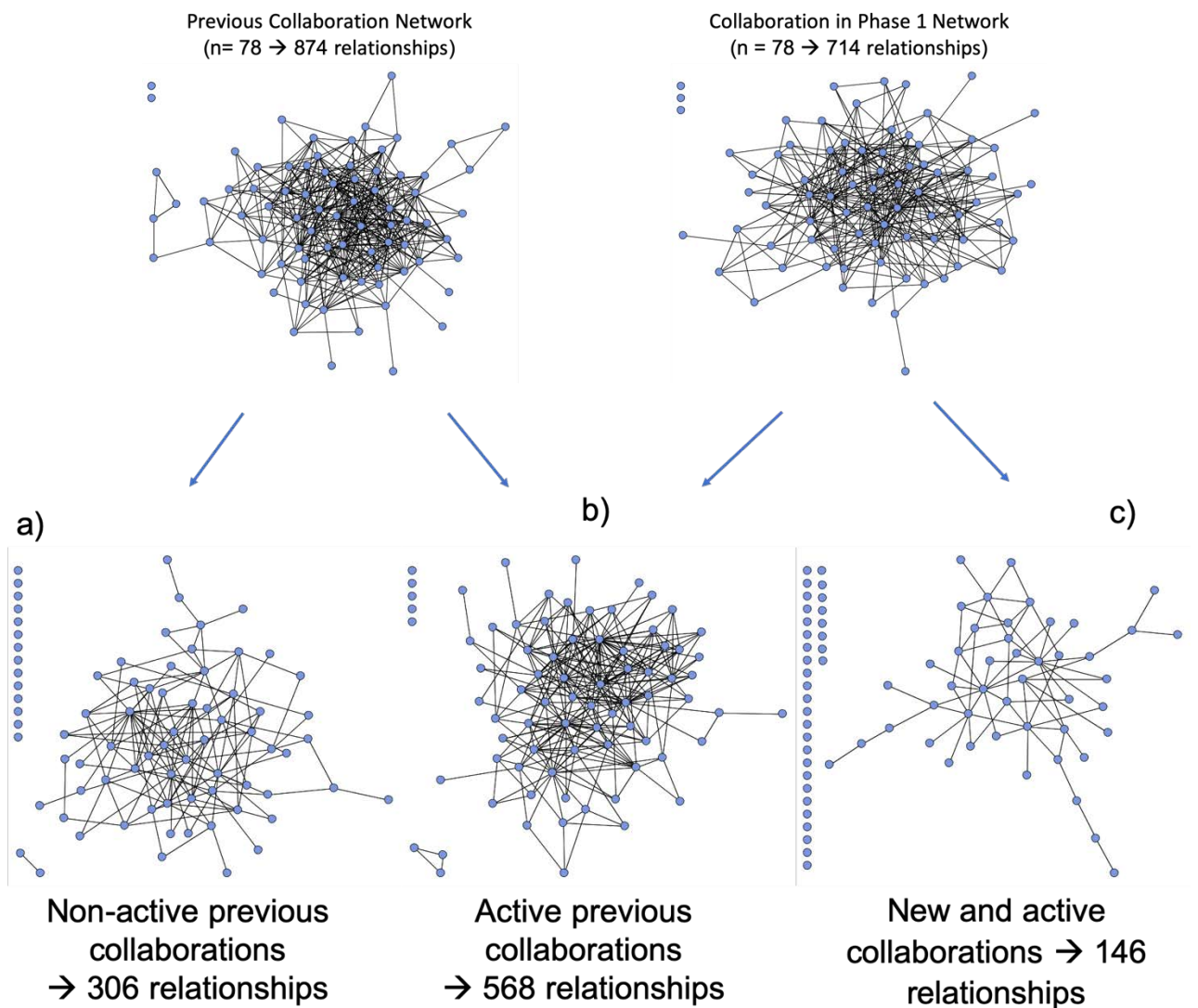


Figure 3. Three networks extracted from the two original networks (previous collaboration and Phase 1)

The sum of the number of relationships in each smaller network corresponds to the total value of relationships of the original networks. Between the active relationships in Phase 1 of the ODYSSEA project, almost 80% already existed before the beginning of the project. Thus, we can infer that the project was supported by a solid base of previous collaborations. This was one of the originalities found in the study, the project offered an opportunity for previous research and intervention activities to be united – by strengthening pre-existing connections – and by sparking new collaborations between researchers and their partner institutions. This result stands in contrast to network analyses conducted for other international research projects. Frequently at the beginning of a project, a collaborative network is quite hierarchized, with a few individuals standing out for having many connections, while the majority have just a few connections. The Ecohealth International Forum (COPEH-LAC) community of practice constitutes a clear example of a project that

was not established from a network of previous collaborations. (Figure 4).

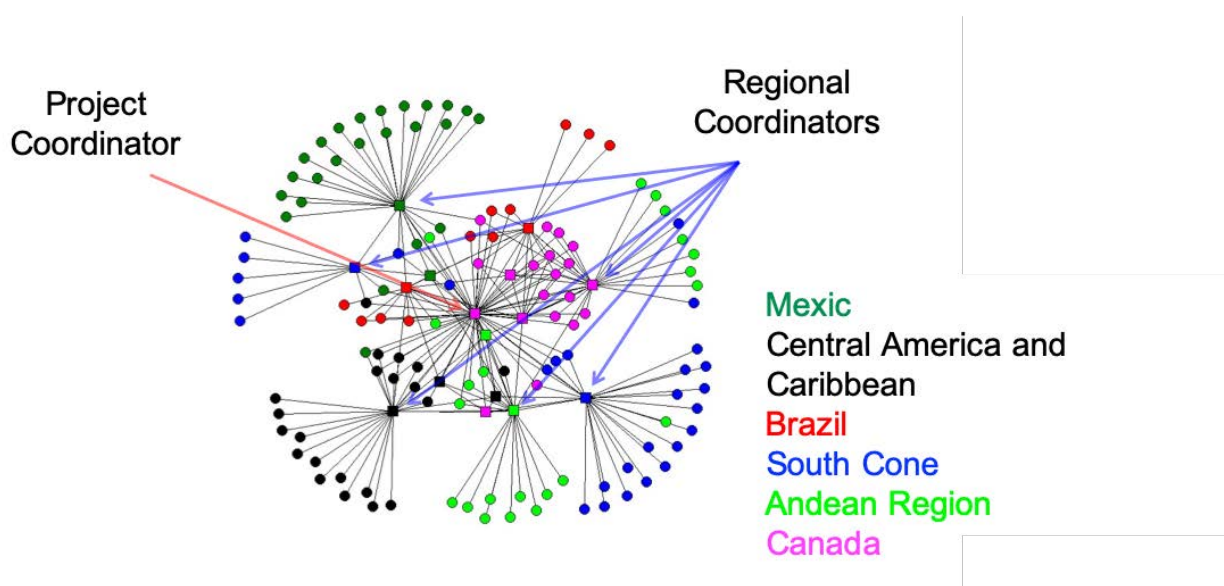


Figure 4. Collaboration network among participants of the Ecohealth International Forum of Latin America and the Caribbean in the first year of the Project¹.

The general project coordinator supported by regional coordinators acted as an “articulator” of the collaboration network. In this way, at the beginning of COPEH-LAC, the network was critically dependent on a small group of people who had elaborated the project and controlled its financial resources. Not being based on previous collaborations, the COPEH-LAC collaboration network took a significant amount of time to reach the horizontal collaborative structure needed for its members to have autonomy in relation to project coordinators. During the first year of the project, a necessary effort was made, using a large part of project funds, to connect diverse project members who did not know one another. These efforts were not required in the case of the ODYSSEA project, which capitalized on a broad base of previous collaborations between actors, not only from the academic sector, but also for the public sector and from civil society.

Relationship strength also constituted another relevant factor that can explain why we observe an intense collaborative process at the beginning of the ODYSSEA project. Bond strength between two individuals can be defined as a combination of time, emotional intensity, and intimacy associated to the relationship (Granovetter, 1973). Reciprocity is a frequently used indicator to measure relationship strength (Mertens et al, 2015). According to Friedkin (1980), reciprocal ties can indicate

¹ Source: Saint-Charles J, Rioux-Pelletier ME, Mertens F, Mergler D (2008) Evaluation of a community of practice. Ecohealth International Forum, December 1-5, Mérida, Mexico.

that a relationship is stronger and reveal a more stable social network structure. Reciprocal relationships between pairs of individuals are those recognized by both members of the dyad, when individual A recommends individual B and individual B recommends individual A. In the first phase of the longitudinal study, we calculated the reciprocity percentages for collaboration relationships in the three networks presented in Figure 3. This allowed us to compare the relationship strength established between members of the previous collaboration network and in Phase 1 of the project.

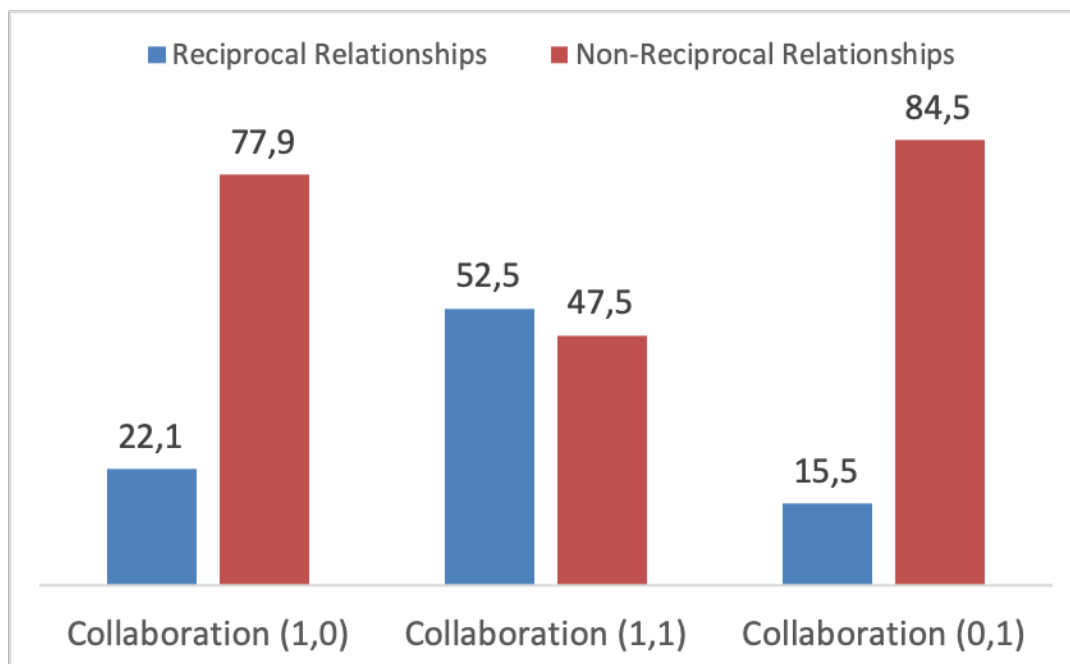


Figure 5. Percent (%) of reciprocal relationships of previous and active collaborative relationships within the ODYSSEA project

We observe that previous collaborations not activated during Phase 1 of the project (1.0) displayed low reciprocity levels, or rather, these are not relationships mutually recognized by both network pairs. Collaborations in Phase 1 (0.1) have low reciprocity, only 15%. These can be considered weaker relationships still undergoing consolidation. Yet, relationships that previously existed and remained active during Phase 1 of the project presented a reciprocity of 52.5%, demonstrating that the consolidation of the ODYSSEA collaboration network mainly from previous relationships allowed for the construction of a network of strong relationships. These strong relationships have the potential to bring benefits to the project because they are usually associated with trust, durability, and resilience.

6.2. The evolution of the ODYSSEA network

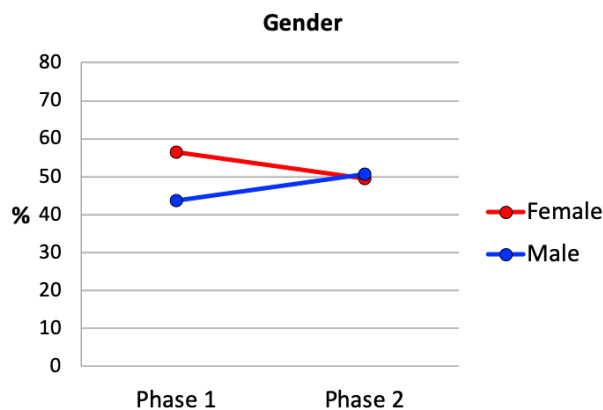
The second set of results is divided into two parts that present the evolution of the participation of ODYSSEA project members during the two phases of the study (Phase 1 and Phase 2). It also shows the evolution of collaborative relations from the beginning of the project, from Phase 1 to Phase 2, and the distribution of ODYSSEA members across countries.

6.2.1. Evolution of member participation

To characterize the evolution of member participation within the ODYSSEA project, we analyzed actor categories to eventually identify which categories stand-out in the network, which are maintained, and which emerged and disappear over time. To do so, we show the distribution of actors according to diverse attributes, for example, gender, institution country, major study areas, sectors, education level, among others. Results are presented on Table 1 (a-s) and display the percentage of actors per category during the two study phases.

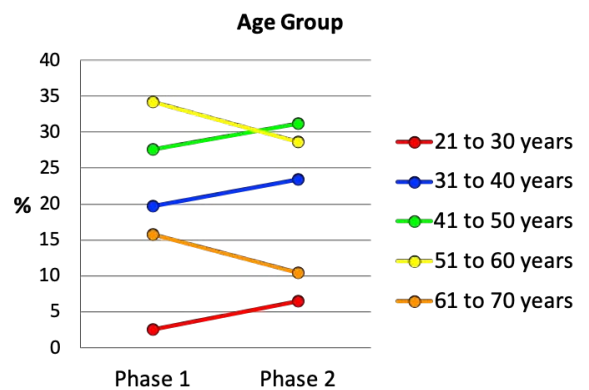
Table 1. Participant distribution in the longitudinal study per attribute categories.

a. Distribution of study participants according to gender (male/female).



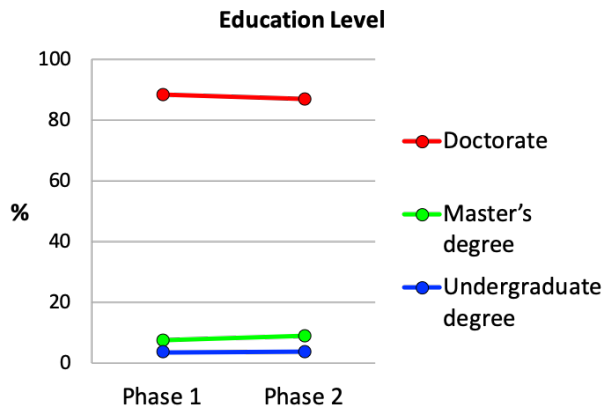
With respect to the category “Gender”, we observe a small inversion of the percentage of males (M) and female (F), since Phase 1, (M=44%, F=51%) up to Phase 2 (M=51%, F=49%). However, the values are all near 50% such that the project guaranteed gender balance.

b. Distribution of study participants according to Age Group.



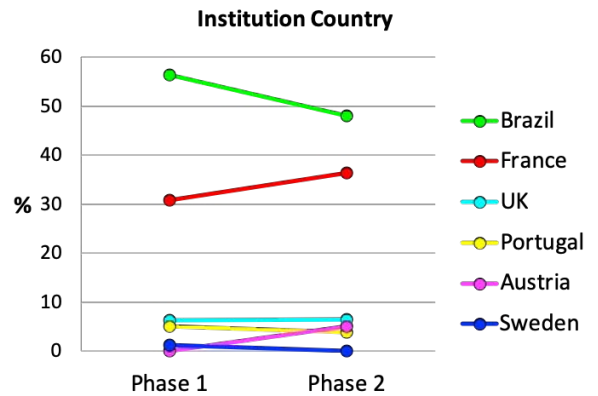
The proportion of participants in the oldest age groups (older than 51 years) fell between Phase 1 and Phase 2. We observe the opposite with the youngest age group (21 to 30 years). The collaboration network appears to have recruited more young participants along the course of the project (master, doctorate and post-doc fellows).

c. Distribution of study participants according to education level.



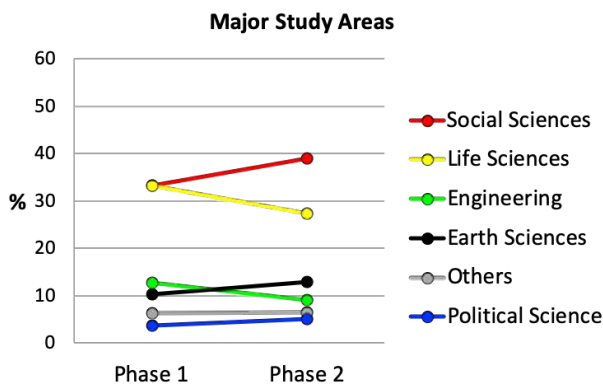
In both phases of the study most participants had doctorate degrees, being 89% in Phase 1 and 87% in Phase 2.

d. Distribution of study participants according to the country of their work institution.



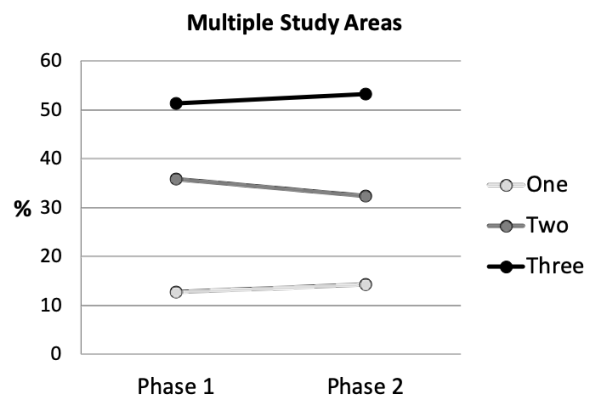
Most individuals work for Brazilian institutions during both study phases, followed by individuals who work for French institutions.

e. Distribution of study participants according to Major Study Areas.



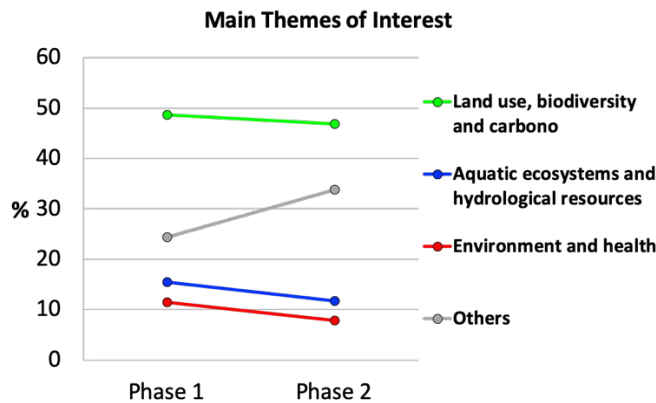
In Phase 1, individuals working in the Social Sciences - including disciplines like Anthropology, Sociology, Economy, Human Geography, as well as those in the Life Sciences – including, Ecology, Botany, Agronomy represented 33.3%. In Phase 2, 39% were from Social Sciences while 27.3% were from Life Sciences. Some people reported to work in other areas, such as Environmental Sciences, Landscape Geography, Fisheries, Health and Environment and Law.

f. Distribution of study participants according to Multiple Study Areas.



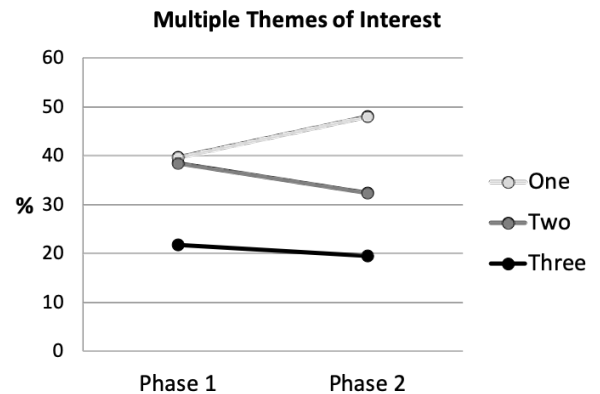
Many participants work across multiple study areas; this proved an interesting result represented in the descriptive statistics and the network analyses. In this graph, we observe that during both study phases, more than 50% of all actors stated that they worked simultaneously in three distinct areas, which shows the interdisciplinary nature of ODYSSEA project members.

g. Distribution of study participants according to Main Themes of Interest (based on initial themes of the ODYSSEA project)



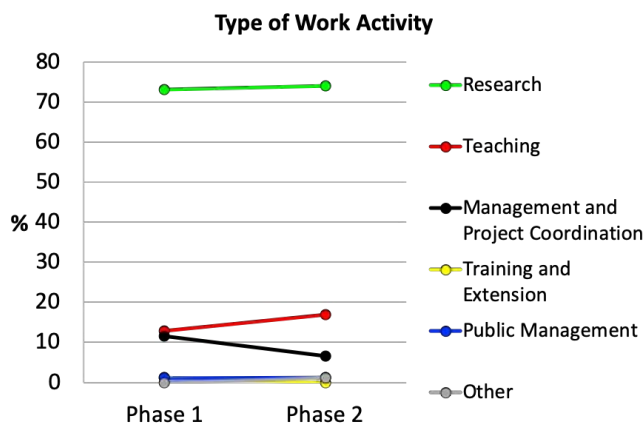
The theme “Land use, biodiversity and carbon” was the most common, followed by “Others”, which included in Phase 1, regional development, modeling and scenarios, environmental governance, social participation, environmental policy, resilience and adaptation to climate change. In Phase 2, the “Others” included: social learning, territorial development, food security, social conflicts, vulnerability and adaption to climate change. Data demonstrate the diversity of interests of ODYSSEA participants.

h. Distribution of study participants according to Multiple Themes of Interest



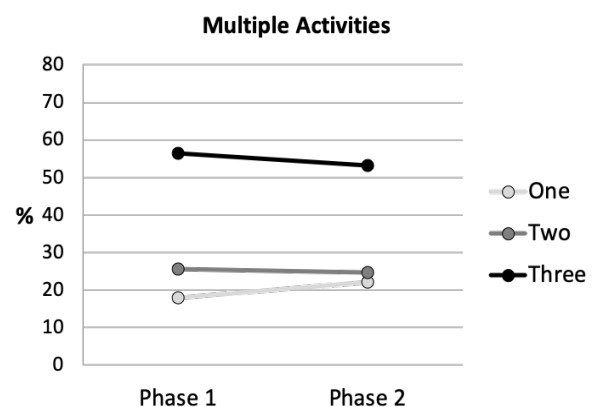
With respect to multiplicity of interests, most participants stated that they worked on just one specific theme, both in Phase 1 (40%), and in Phase 2 (48%). This shows that, even though themes vary between participants, individuals’ engagement is more specific.

i. Distribution of study participants according to type of Work Activity.



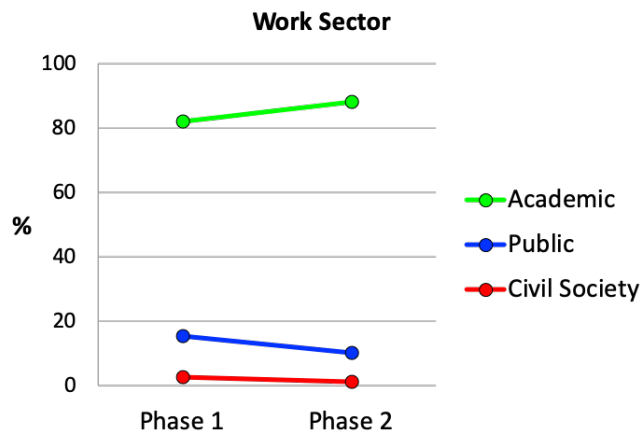
In both phases of the project, most individuals work within research, followed by teaching.

j. Distribution of study participants according to Multiple Activities.



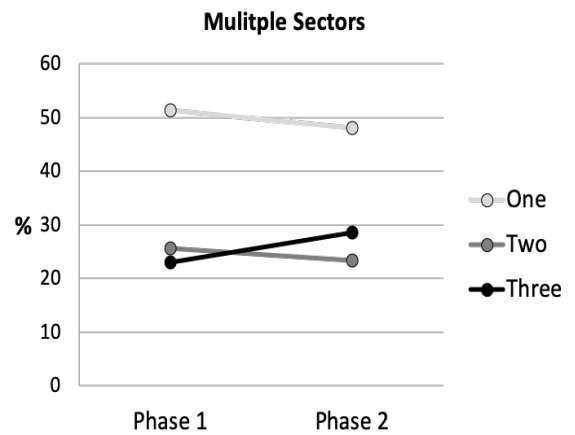
However, frequently project participants state that they worked in more than one type of activity, both in Phase 1 and Phase 2.

l. Distribution of study participants according to type of Work Sector.



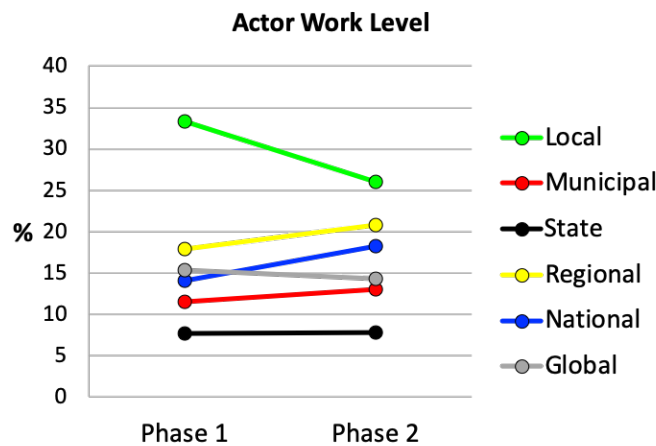
Most participants belong to the academic sector.

m. Distribution of study participants according to Multiple Sectors.



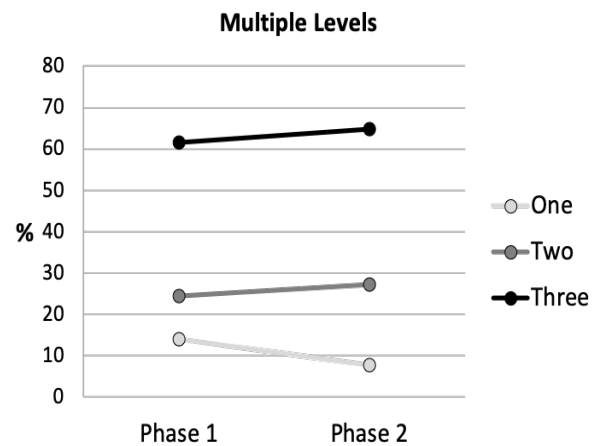
Half of all participants report to work in more than one work sector.

n. Distribution of study participants according to actor Work Level.



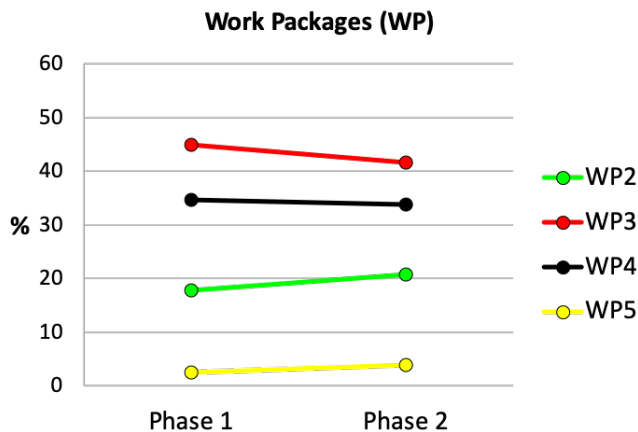
Many participants work at the local or national/regional/global levels. Fewer work at intermediate levels, municipal and state.

o. Distribution of study participants according to Multiple Levels.



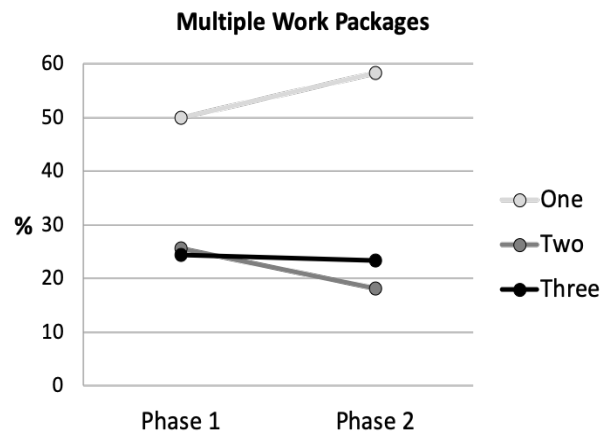
A majority of participants (more than 90% in phase 2) work on more than one level.

p. Distribution of study participants according to Work Packages (WP).



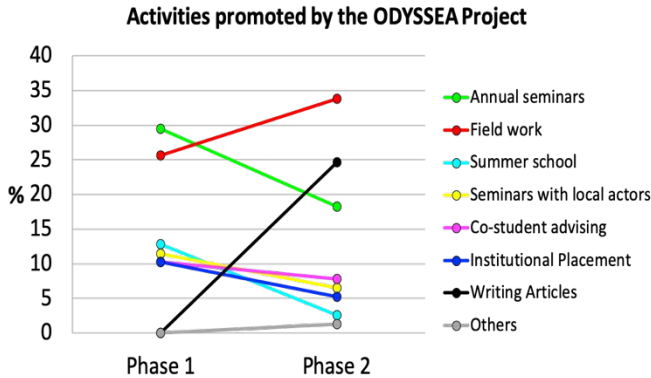
Participants are more numerous in WP3 (environmental dynamics), followed by WP4 (social vulnerability and governance) and WP2 (co-construction between society-science). Fewer people work on WP 5 (digital platform).

q. Distribution of study participants according to multiple WP.



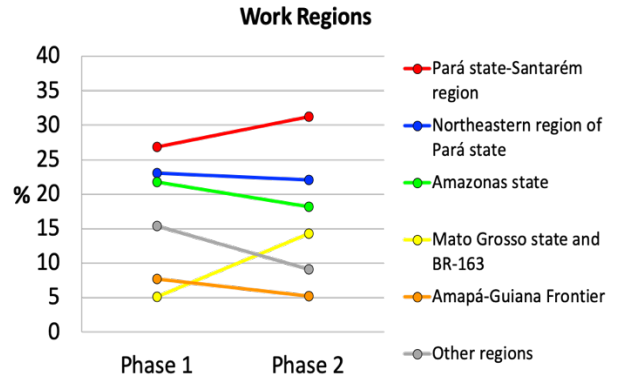
Half of all participants work on a single WP; the other half on two or three WPs at the same time.

r. Distribution of study participants according to the activities they considered most important to reinforce connections.



The activities that participants consider important to create connections evolve significantly between Phases 1 and 2. Participation in seminars, relevant in the initial project phase to construct work plans was identified as the most important activity in Phase 1. In Phase 2, participants considered field work and writing articles to be most important, in accordance with the maturation process of the project.

s. Distribution of study participants according to project Work Regions.



Participants are distributed among the diverse work regions of the ODYSSEA project – with a dominance of activities is Pará state – particularly in the Santarém region, which is the pilot site of the observatory. The proportion of participants involved in activities in Mato Grosso (BR 163) tripled between the two phases.

6.2.2. Evolution of the collaboration network

Figure 6 displays the average number of relationships between project participants over the years, showing all existing relationships (in red) and only reciprocal relationships (in blue). We observe that the average number of collaborations between participants was already high before the project began. In Phase 1, this average number fell since ODYSSEA activities were just beginning. The average number of collaborations per participant increased again in Phase 2, suggesting that new relationships were established, this time specifically related to project activities.

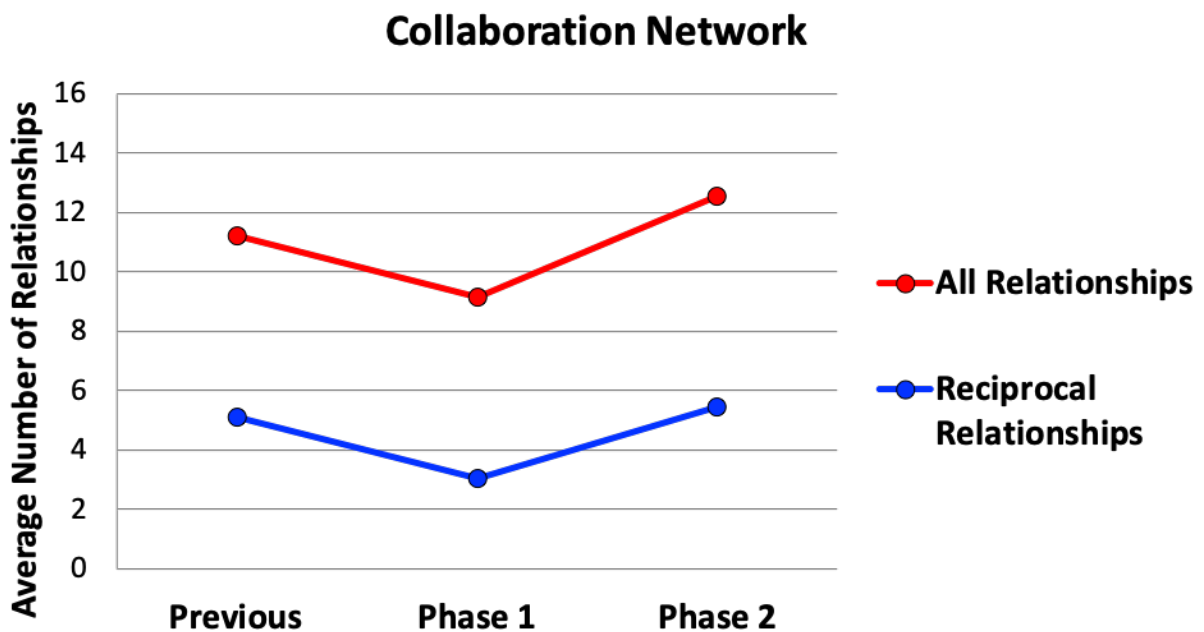


Figure 6. Average number of collaborative relationships prior to the Project, in Phase 1 and in Phase 2.

Table 2 displays some averages and properties of the three collaboration networks (prior to the project, Phase 1 and Phase 2). We observe some differences between the three networks related to the time it took for collaboration relationships to become established. For example, the collaboration network in Phase 2 of the study has a greater number of relationships as compared to the two other networks (968 relationships). Additionally, the average number of relationships of this network is also greater than the other two. This network is the only one in which all actors are connected in the principal component.

Table 2. Comparison of the three collaboration networks of the ODYSSEA network

	Network Measures and Properties	Previous	Phase 1	Phase 2
1	Number of network actors (n)	78	78	77
2	Total number of relationships	874	714	968
3	Number actors in the Principal Component (n)	76	75	77
4	Smaller Components (n)	0	0	0
5	Isolated (n)	2	3	0
6	Average Number of Relationships	11.205	9.154	12.571
7	Average Distance	2.8	2.6	2.1
8	Average Density	0.146	0.119	0.165
9	Actors who entered in Phase 2	-	-	27
10	Actors who left in Phase 2	-	-	28

The average distance, which is measured as the distance between all node pairs in the network, is relatively short for all three groups, which allows information to circulate more easily between members of all groups. The average distance is shorter in the Phase 2 network. The relationship density of the network (which is the ratio between the total number of connections established between actors and the total number of possible relationships between them) is also greater in the Phase 2 collaboration network. In this way, the diverse indicators converge to show that the collaboration network quickly established itself in Phase 1 from the pre-existing relationships and became consolidated in Phase 2, with a greater number of collaborations, a greater density, and closer proximity between its participants.

In Figure 7, we present the three collaboration networks of the ODYSSEA Project over the years from the phase prior to project (7a), onto to Phase 1 (7b) until Phase 2 (7c). Individuals are represented by different colored circles, defined by the Work Institution Country, meaning the countries of the institutions where participants work (for example, a Brazilian working for a UK institution will be counted in UK; a person working for a French institution and based in Brazil counts as French). The country colors are detailed in the legend to the right of the figure, which also indicates the total number of individuals (n) for each group. The figure next to each network describes the average number of collaboration relationships, pertaining to members of each group. Significances between the differences between the average number of collaborations per group were analyzed using the ANOVA test and are presented in the text.

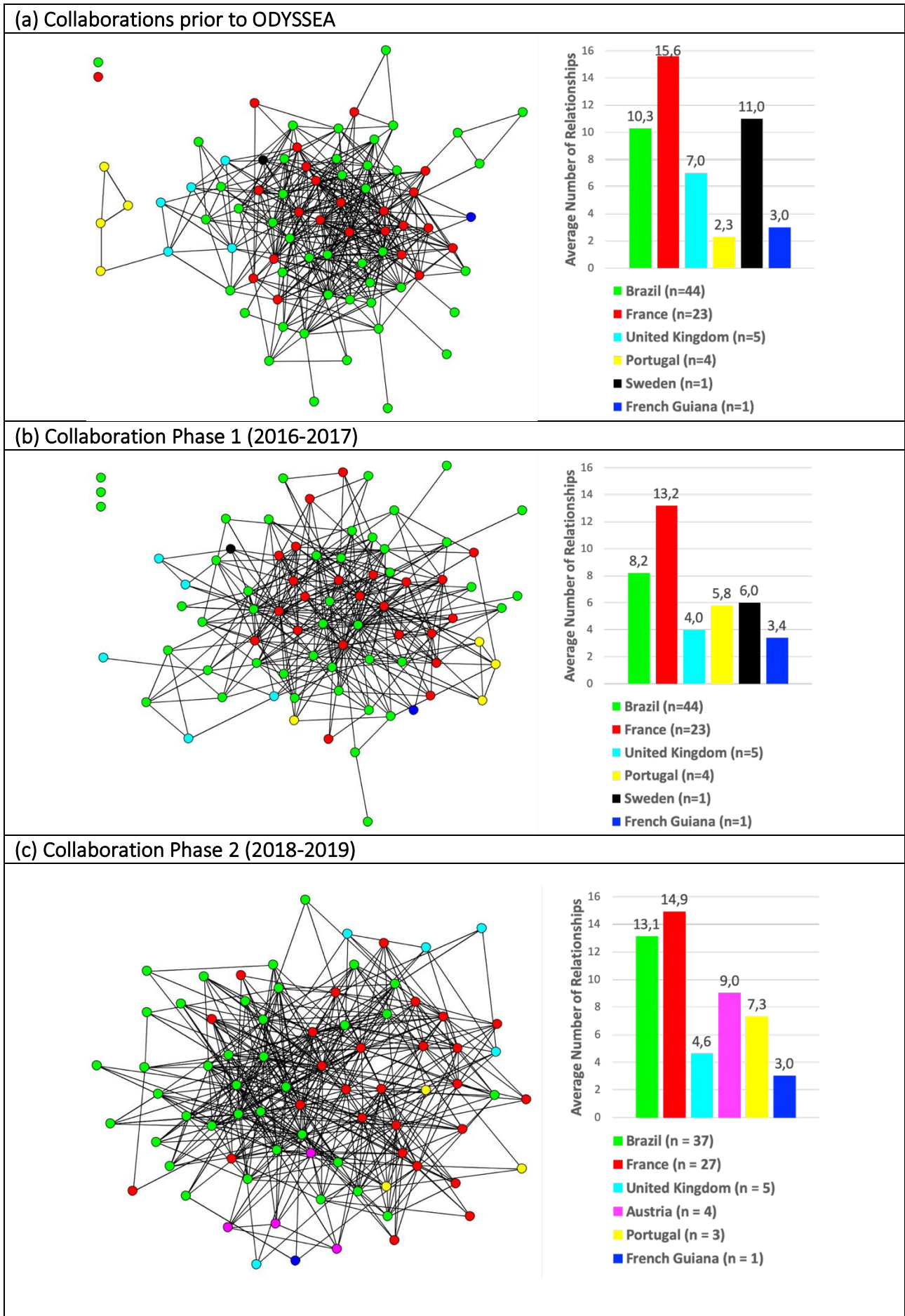


Figure 7. Collaboration Networks (a) previous, (b) in Phase 1 and (c) Phase 2 of the ODYSSEA project

Prior to the project and in Phase 1, French participants had 50% more collaborations than Brazilian participants. In Phase 2, the average number of collaborations was equal across both groups. Between Phase 1 and Phase 2, a participant from a Swedish institution left the project; meanwhile in the last year of the study, four individuals from Austria entered as project participants. There is not a significant difference between average number of collaborations between groups.

In the next section, we analyze how relationships are distributed between countries using the Collapse function of the UCINET program. This procedure allows us to group together actors who share the same characteristic or attribute and aggregate the relationships between them. In this way, Collapse sums existing relationships, making it possible to identify the distribution of shared relationships within groups (e.g. *bonding ties*) and also between groups (*bridging ties*).

The next sequence of Figures (8a, b e c) presents the distribution of collaboration relationships between project member countries during the three different project moments (previous phase, Phase 1 and Phase 2). The colors are the same used for the previous networks (Figures 7a, b, c). The value inside the circles designates the number of people within each category; circle size is also proportional to the number of people in each category. The arrows represent the relationships that establish themselves – both between members of the same country and between those of different countries. The width of the arrows represents the average number of existing relationships. The average number of collaborations (values) are indicated in some of the arrows of the figures.

We observe that the project was supported by strong previous collaborations among French and Brazilian participants, both between members of the same country and between different countries. Numerous collaborations between members of French institutions exist during all three moments of the study. In the case of Brazil, collaborations increase significantly between Phases 1 and 2 of the project. This suggest that participating in the project made possible new collaboration relationships between Brazilian members. People from the French institutions extend more relationships to Brazilian members than the other way around.

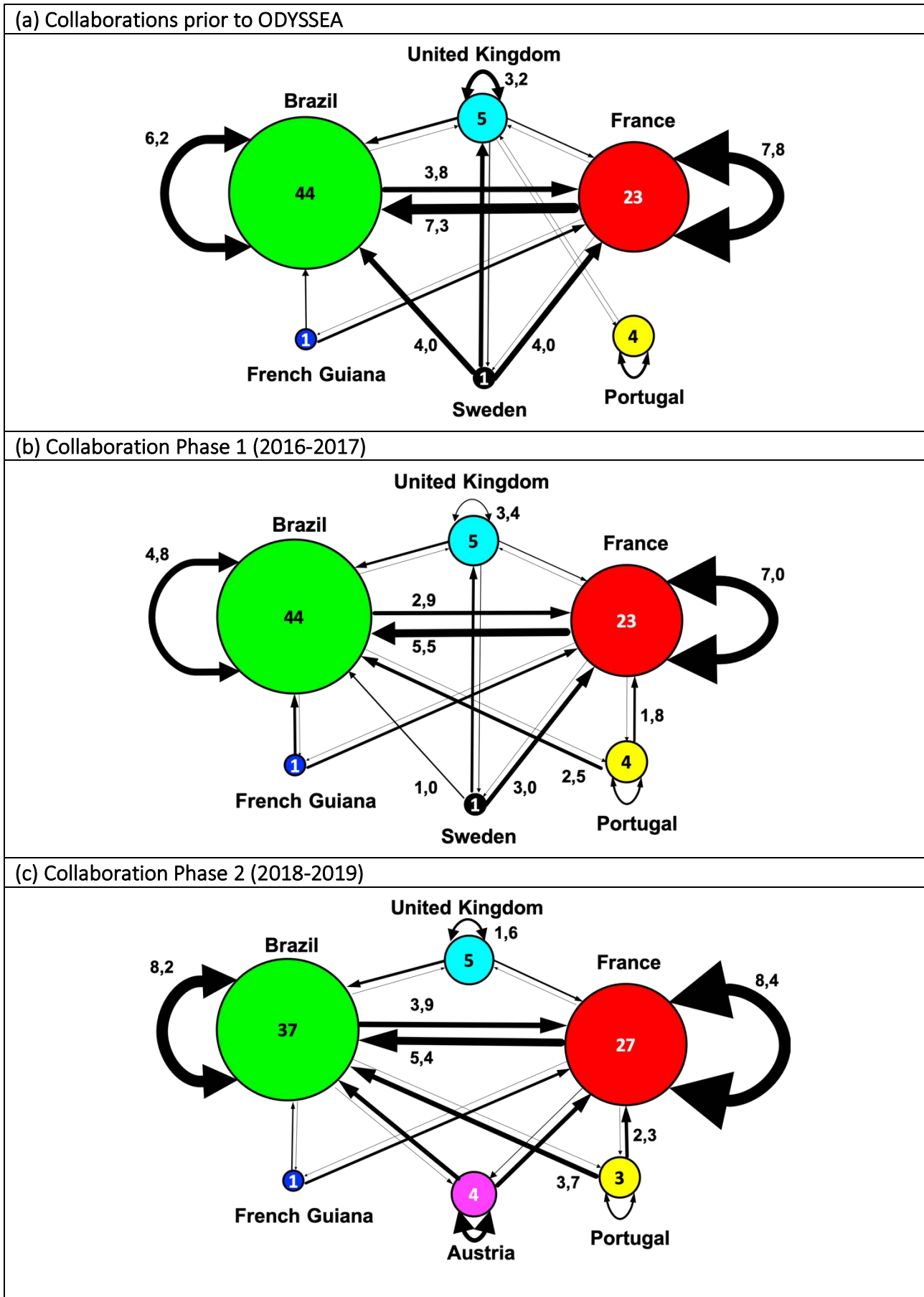


Figure 8. Collaboration network (a) previous, (b) in Phase 1 and (c) in Phase 2, with relationships and actors grouped by Work Institution Country

6.3. The ODYSSEA network today

Next, we present the results of the collaboration network obtained in Phase 2 of the project. These analyses are based on project participants' multiple affiliations. One aspect that is often overlooked when discussing the diversity of actors who participate in strategic alliances is that a particular agent may characterize him or herself according to various criteria, such as, professional discipline, sector, level and geographic region, or even with the type of project that they work with. The ODYSSEA project sought to understand the complex interactions in socio-ecological systems and share generated knowledge with diverse actors in society. Therefore, it is important to analyze the ODYSSEA project as a system of *multistakeholder* governance that links research with action/interventions and political impact through a framework for collaboration and knowledge generation. In this context, we considered mapping the collaboration relationships between disciplines, sectors, work levels, and methodological components pertinent to our study. We analyzed the following types of collaborations:

- Interdisciplinary: between different fields of study, disciplines and themes;
- Intersectoral: between participants of different professional sectors (academic, public, private, civil society, etc.);
- Multi-level: between participants of different levels and spheres of participation and intervention – from the local to the global level;
- Technical: between participants involved in different methodological components of the ODYSSEA project, as well as in different networks and projects associated with ODYSSEA and who work in different regions within the project.

6.3.1. Interdisciplinary Collaborations

Figure 9 presents the Collaboration Network during Phase 2 of the Study characterized by the “Major Study Areas” attribute. Groups of actors from diverse study areas are involved in numerous collaborations in a balanced fashion.

Participants who declared to work in “Social Sciences” and in “Earth Sciences” have the most similar average number of relationships 13.8 and 14.0, respectively. Only five individuals declared that they worked in other areas of study (other than the areas suggested on the questionnaire); these included:

Environmental Sciences, Landscape Geography, Fisheries, Geography, Health and Environment and Law. This group maintains, on average, a high number of collaboration relationships compared to the rest of project participants.

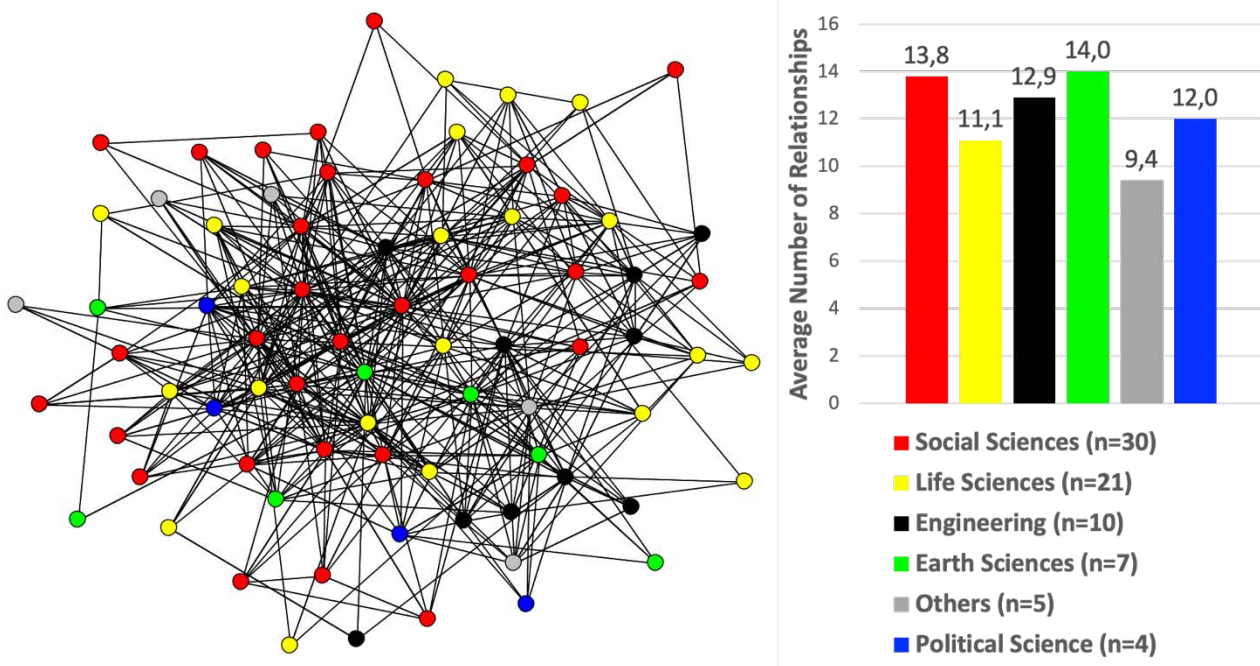


Figure 9. Collaboration Network – By Major Study Areas

Participants who declared to work in “Social Sciences” and in “Earth Sciences” have the most similar average number of relationships 13.8 and 14.0, respectively. Only five individuals declared that they worked in other areas of study (other than the areas suggested on the questionnaire); these included: Environmental Sciences, Landscape Geography, Fisheries, Geography, Health and Environment and Law. This group maintains, on average, a high number of collaboration relationships compared to the rest of project participants.

Social Network Analysis allowed us to analyze the interdisciplinarity on two distinct levels. On the individual level, interdisciplinarity is evaluated by the participant’s attribute characteristics. An individual is considered interdisciplinary when he/she works simultaneously in two or more study areas. On the collective level, interdisciplinarity is evaluated by relational patterns between the individuals, comparing disciplinary collaborations (between individuals who share the same main study area) with the distribution of interdisciplinary collaborations (between individuals who do not share the same main study area).

Figure 10 analyses the individual interdisciplinarity of the Phase 2 Collaboration Network. Individuals are differentiated according to the number of study areas within which they develop their studies.

Results show that the majority of participants work in multiple study areas. The average number of participant collaborations who work in two or more study areas is greater than the average of those who work in a single area. These data demonstrate that the collaborative processes of the project are preferentially anchored around people who connect different knowledge areas.

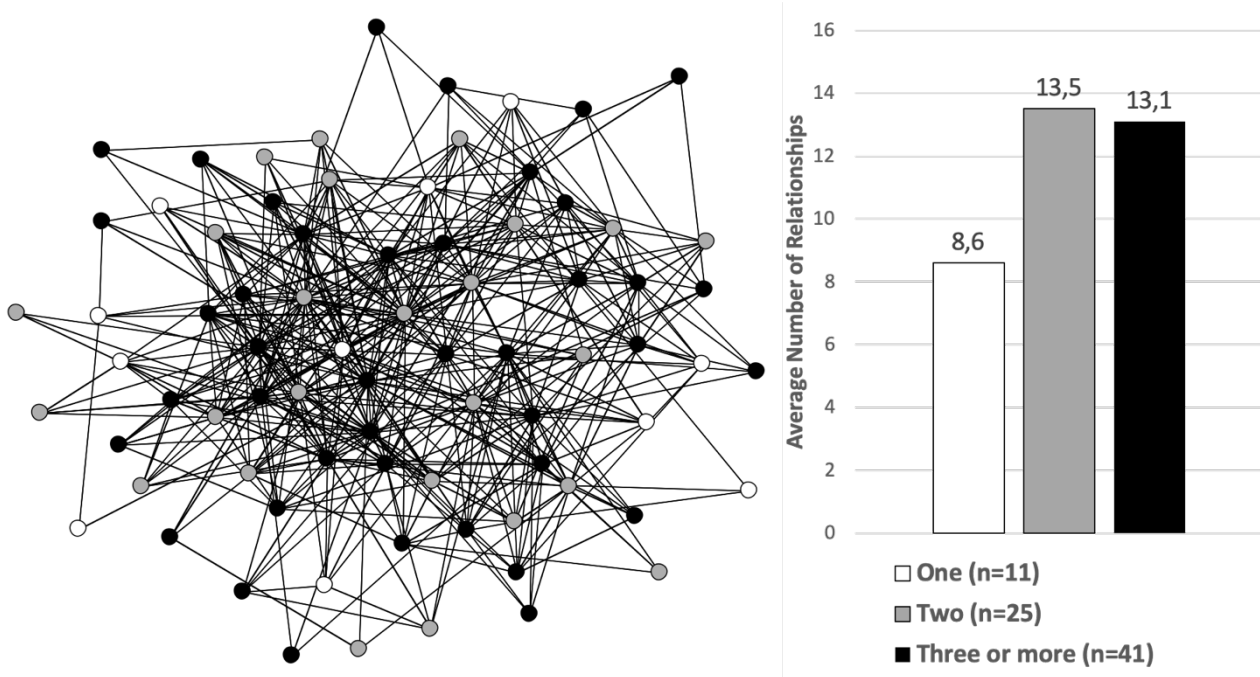


Figure 10. Collaboration Network – By Multiple Study Areas

Figure 11 analyzes the collective interdisciplinarity of the Phase 2 Collaboration network. The figure presents the distribution of the relationships between participants grouped according to their main study areas. All groups are interconnected, demonstrating the interdisciplinary character of the collaborative process of the ODYSSEA project. The Social Sciences group is the most disciplinary, displaying many more relationships between members of its own group as compared to members of other groups. The majority of collaborations within Life Sciences, Political Sciences and Earth Sciences are interdisciplinary, mainly associated with the Social Sciences group. The Engineering Sciences group collaborates in a balanced way internally and also works collaboratively with the Social and Life Sciences groups.

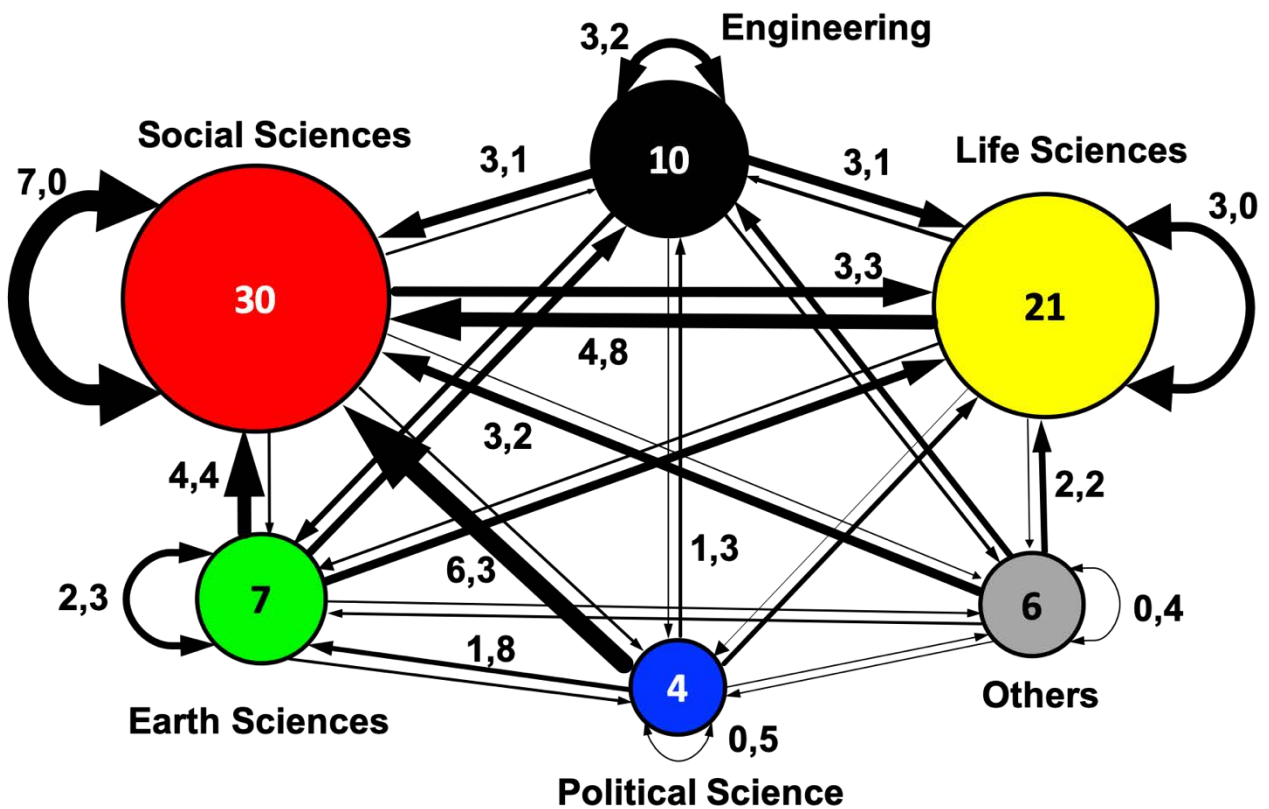


Figure 11. Collaboration Network grouped by Major Study Areas

6.3.2. Intersectoral Collaborations

The establishment of strategies and actions to bring together different institutions representative of the most varied sectors of society can facilitate the understanding of the contexts, needs and opportunities inherent to problems that depend on the interactions between social and ecological systems.

Cross-sector collaborations also have the potential to facilitate dialogue between knowledge generation and forming and implementing public policies. Thus, establishing intersectoral relations becomes essential to initiatives aiming to implement more effective intervention plans, seeking to find solutions to complex socio-environmental problems.

Figure 12 presents the Phase 2 Collaboration Network characterized by the following work sectors: academic, public, civil society. We observe that the majority of individuals work within academia. The average number of collaborations is equally distributed between the academic and public sectors. Only one participant of this study responded that his main work sector is “civil society”. However, it is important to underline that many members of the ODYSSEA project had connections with civil society actors that were not included in the network analysis.

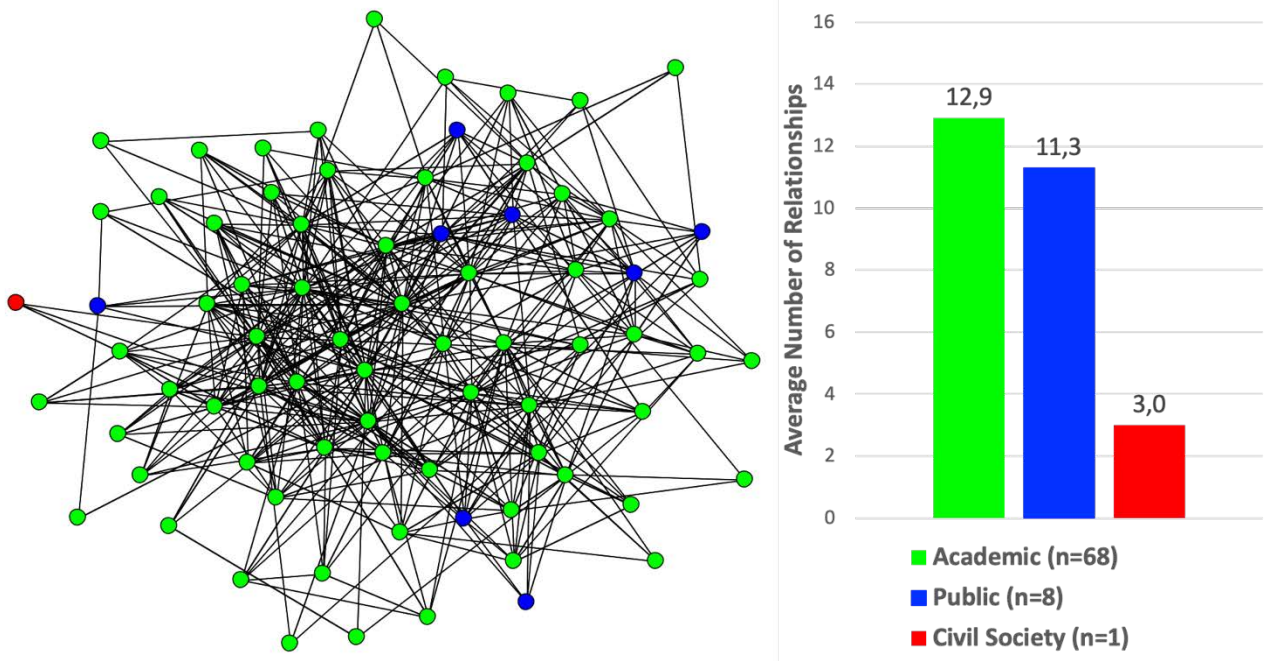


Figure 12. Collaboration Network – By Work Sector

Just as for interdisciplinarity, SNA, allow us to evaluate intersectorality at the individual and collective levels. On the individual level, intersectorality is evaluated by the participant's attribute characteristics. An individual is intersectorial when he/she works simultaneously in two or more sectors. On the collective level, intersectorality is evaluated by the relational patterns between individuals, comparing collaborations between individuals of the same sector with the distribution of collaborations between individuals who work in different sectors.

Figure 13 analyzes individual intersectorality for the Phase 2 Collaboration Network. Individuals are differentiated according to the number of sectors they work in. Half of the participants work in more than one sector. The average number of participant collaborations who work in two or three sectors is higher than the average for those who work in a single sector. These results show that collaborative processes within the ODYSSEA project are significantly anchored around people who circulate in more than one work sector.

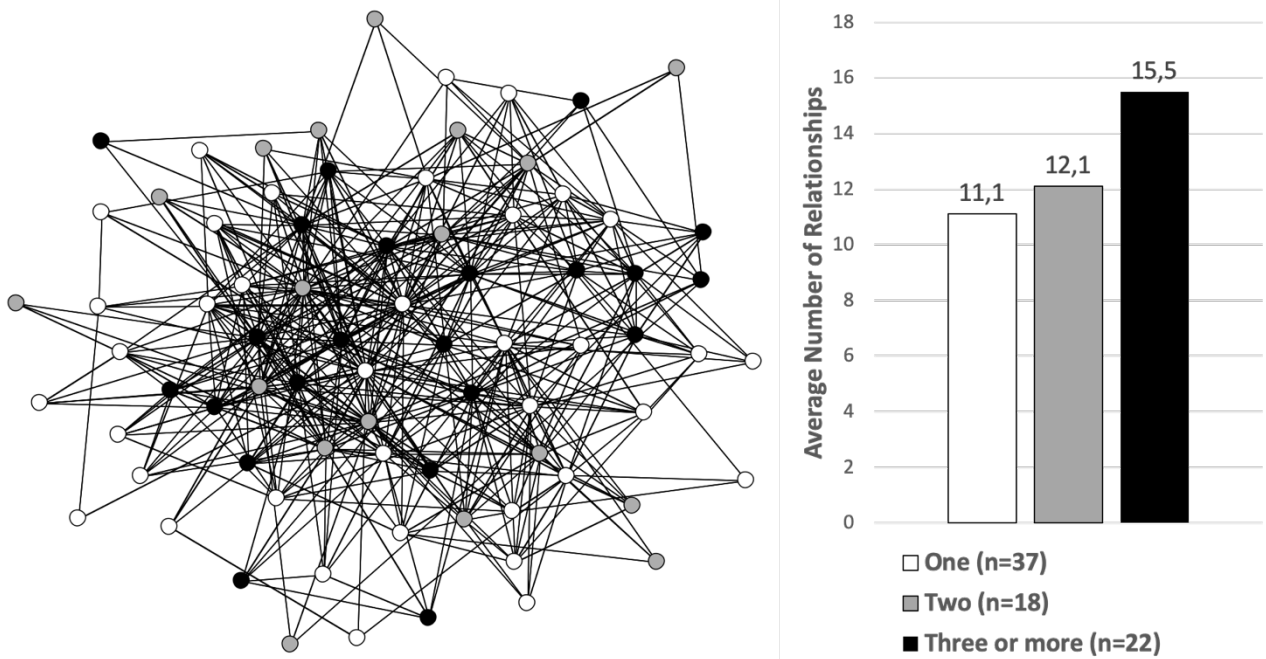


Figure 13. Collaboration Network – By Multiple Work Sectors

Figure 14 analyses the collective intersectorality of the Phase 2 Collaboration Network. The figure presents the distribution of the relationship between participants grouped together according to their main work sectors. The majority of participants declare “academia” as their main work sector. In this way most collaborations between individuals occur within this sector. It is worth noting, however, that individuals within the public sector on average have more relationships with actors from academia than actors of their same sector. Thus, even though actors from academia effectively collaborate with actors from the public sector, intersectoral collaboration appears limited due to the small number of actors from the public sector and from civil society present in the network.

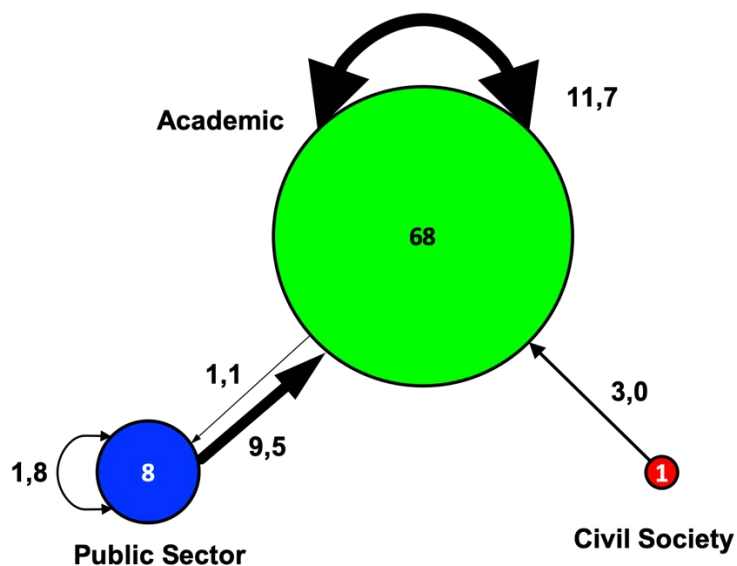


Figure 14. Collaboration Network grouped by Work Sector

6.3.3. Multi-level collaborations

Individuals who work on different levels offer distinct contributions when studying socio-environmental questions, according to their capabilities, specific institutional roles, and their respective access to resources. For example, community members frequently have profound local knowledge and are responsible for implementing actions to adapt to climate change. Diverse political actors, who are distributed on different administrative levels (municipal, state and federal) are customarily responsible for the management of financial resources necessary to implement public programs and actions. Relationships between actors who pertain to multiple levels are essential so that adjustments between ecological processes that cross administrative frontiers and those of management and territorial planning can be made. Relationships between local levels and higher levels are also necessary for peoples' voices to be considered when constructing public policies and for guaranteeing that public actions effectively reach communities.

Figure 15 presents the Collaboration Network in which individuals are characterized according to their "Work Level", from the local to the global level. The groups of individuals who work on local and municipal levels have on average more collaborations compared to other groups.

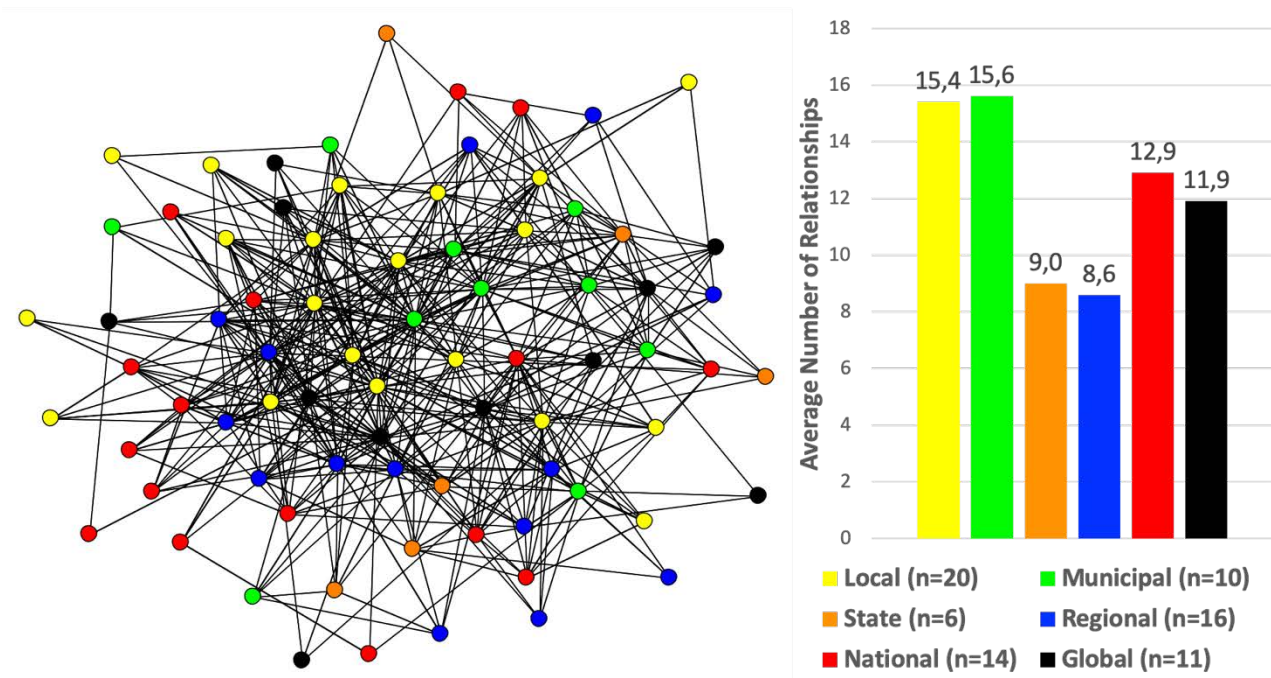


Figure 15. Collaboration Network – By Actor Work Level

As in the latter two cases, SNA allowed us to evaluate multi-level engagement on both individual and collective levels. On the individual level, multi-level engagement is evaluated by participants'

attribute characteristics. Individuals have a multi-level engagement when they work simultaneously at two or more levels. On the collective level, multi-level engagement is evaluated by relational patterns between individuals pertaining to the same distribution level, comparing collaborations between individuals from the same level with collaborations between individuals who work at different levels.

Figure 16 analyses multi-level work engagement of the Phase 2 Collaboration Network. Individuals are differentiated according to the number of work levels. A majority of participants work at more than one level, such that two thirds of these individuals work at three or more levels. The average number of collaborations for participants who work at two or more levels, but especially at three or more levels, is greater than individuals who work at a single level. These data show that the collaborative processes of the ODYSSEA project allow for connections between distinct work levels. This is compatible with research and management processes that are: i) adjusted to multi-level ecological processes, such as maintaining of ecosystem services and ii) capable of generating knowledge of broad academic relevance – both pertinent to local peoples and to public policy.

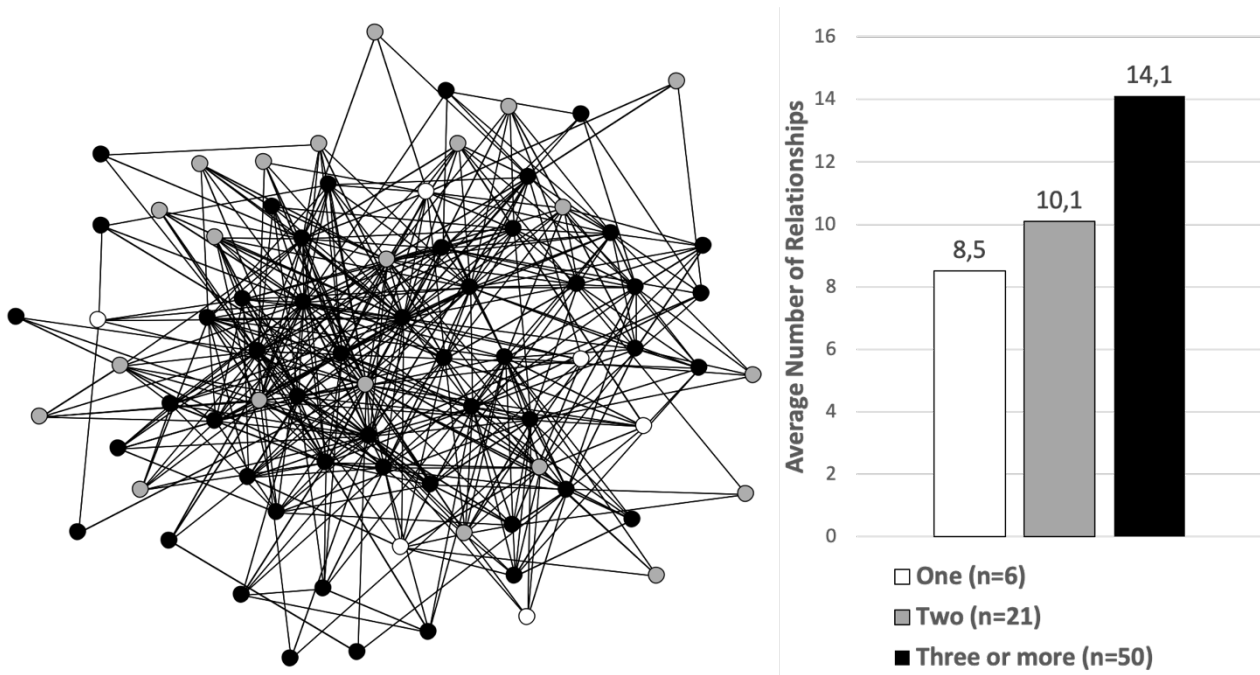


Figure 16. Collaboration Network – By Multiple Work Levels

Figure 17 analyses collective multi-level work engagement of the Phase 2 Collaboration Network. The figure presents the distribution of relationships between participants grouped together according to their principal work levels. Participant distribution between the different groups, and the distribution of collaboration relationships between groups, is relatively homogenous. This shows the intrinsically multi-level character of the project's collaborative network. Also, a greater density of relationships is

observed within the local level and between this one as compared to other levels. This may be related to the intensification of the field work during the last project year.

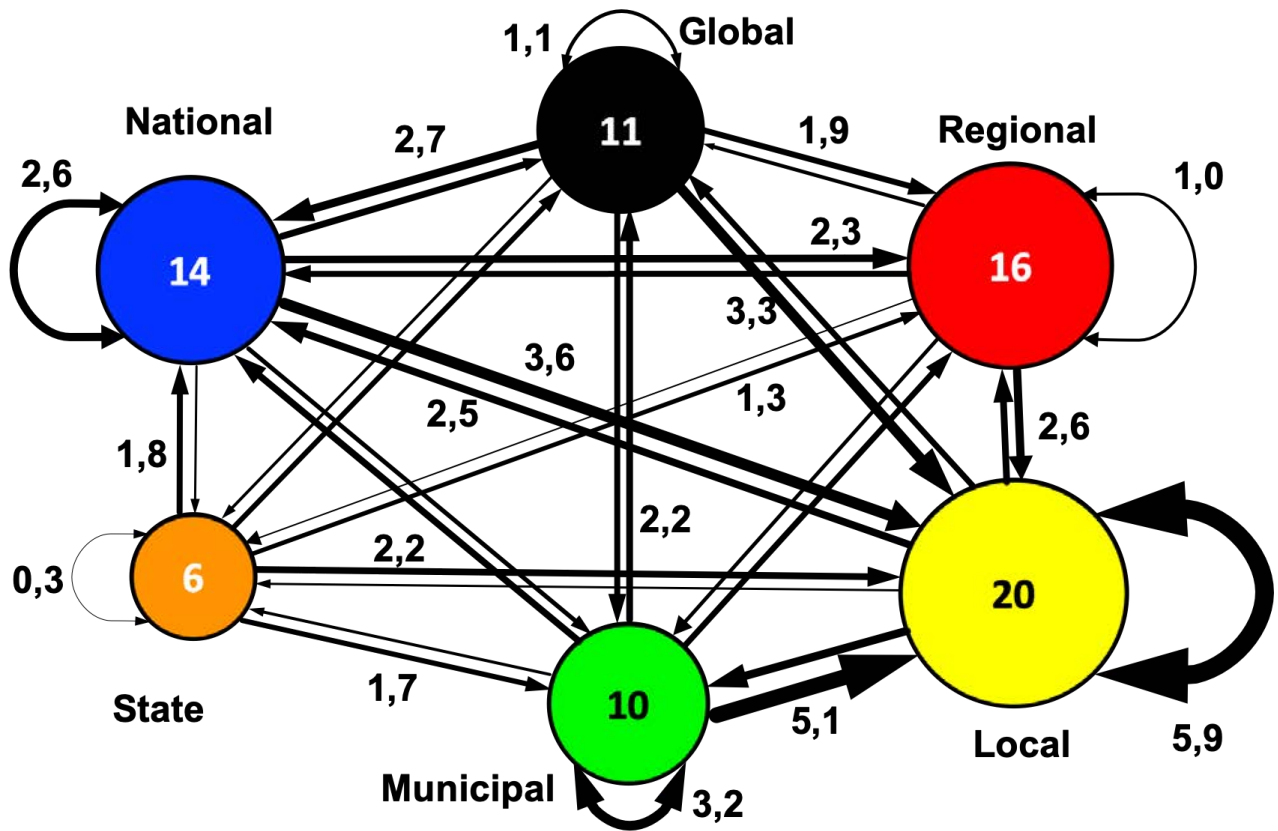


Figure 17. Collaboration Network grouped by Actor Work Level

6.3.4. Technical Relationships

Figure 18 presents the Collaboration network characterized by the different Work Package methodologies belonging to the ODYSSEA project (WP2 to WP5). Participants of WP2 to WP4 components display more collaborations than other groups.

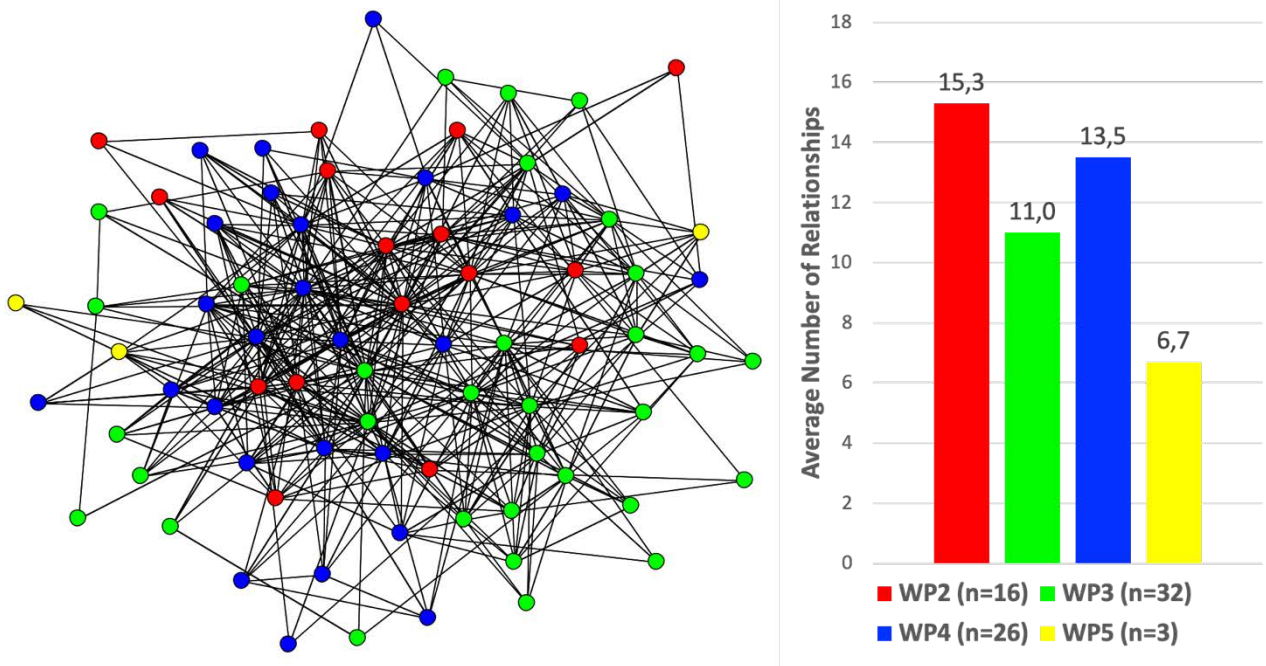


Figure 18. Collaboration Network by ODYSSEA Work Packages

On Figure 19, when we observe the relationships between the groups; WP2, WP3 and WP4 establish the most collaborative relationships between themselves; however, they also significantly establish collaborations between the three groups. WP2, related to co-construction of knowledge, plays a role in connecting WP3 and WP4. The WP5 component has few members and most of its collaborations are directed outside the group.

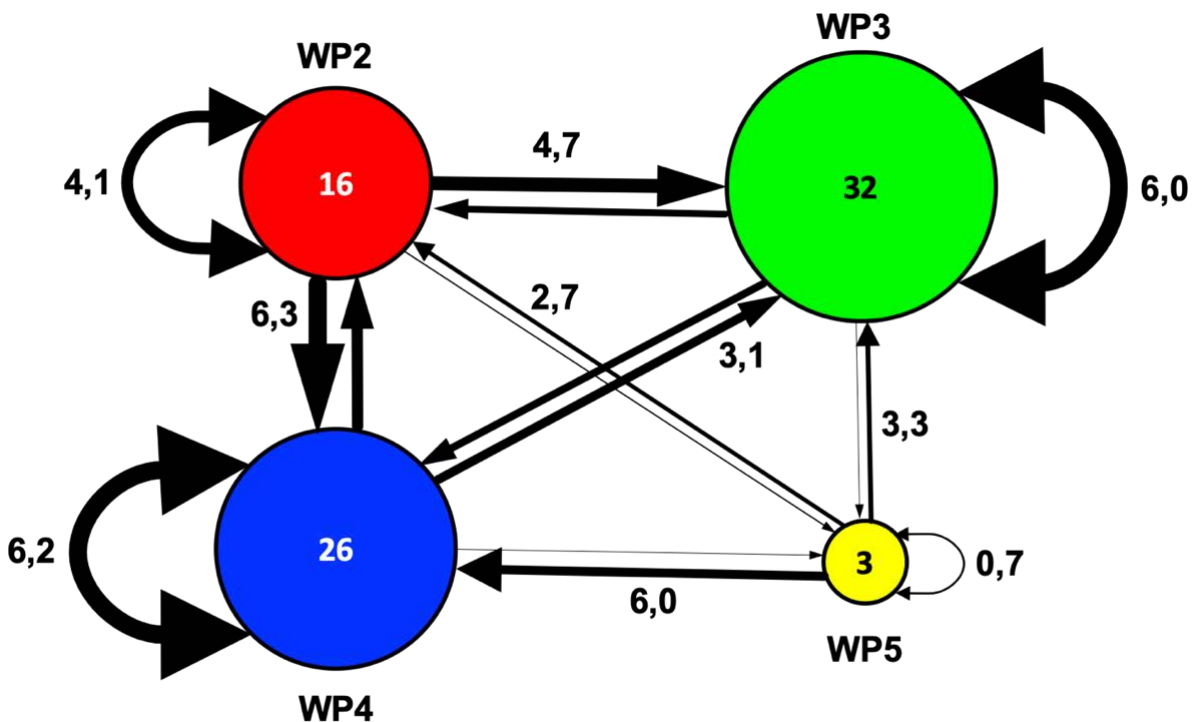


Figure 19. Collaboration Network grouped by Work Packages

Figure 20 presents the Collaboration network, showing the scientific and technical activities members considered most significant in fostering relationships with other project members.

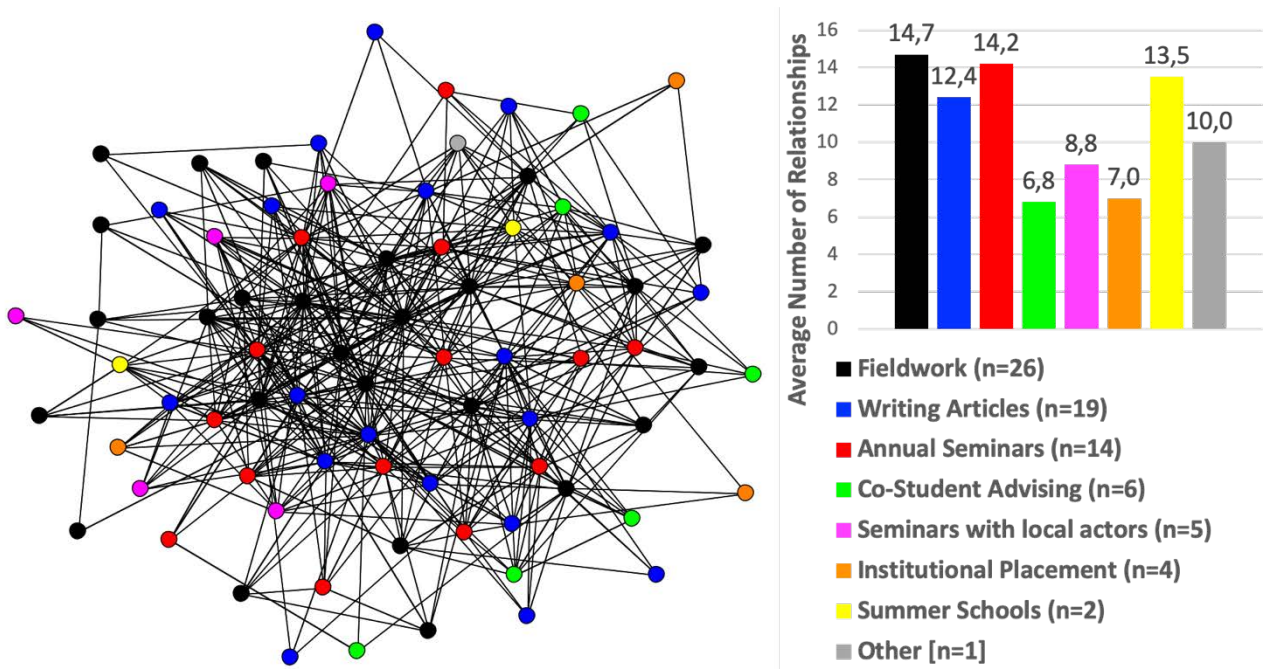


Figure 20. Collaboration Network – By events and activities promoted by the ODYSSEA Project

Figure 21 presents the Collaboration network showing the different regions where participants work within the ODYSSEA Project. All groups are actively involved in collaborations without a significant difference between them.

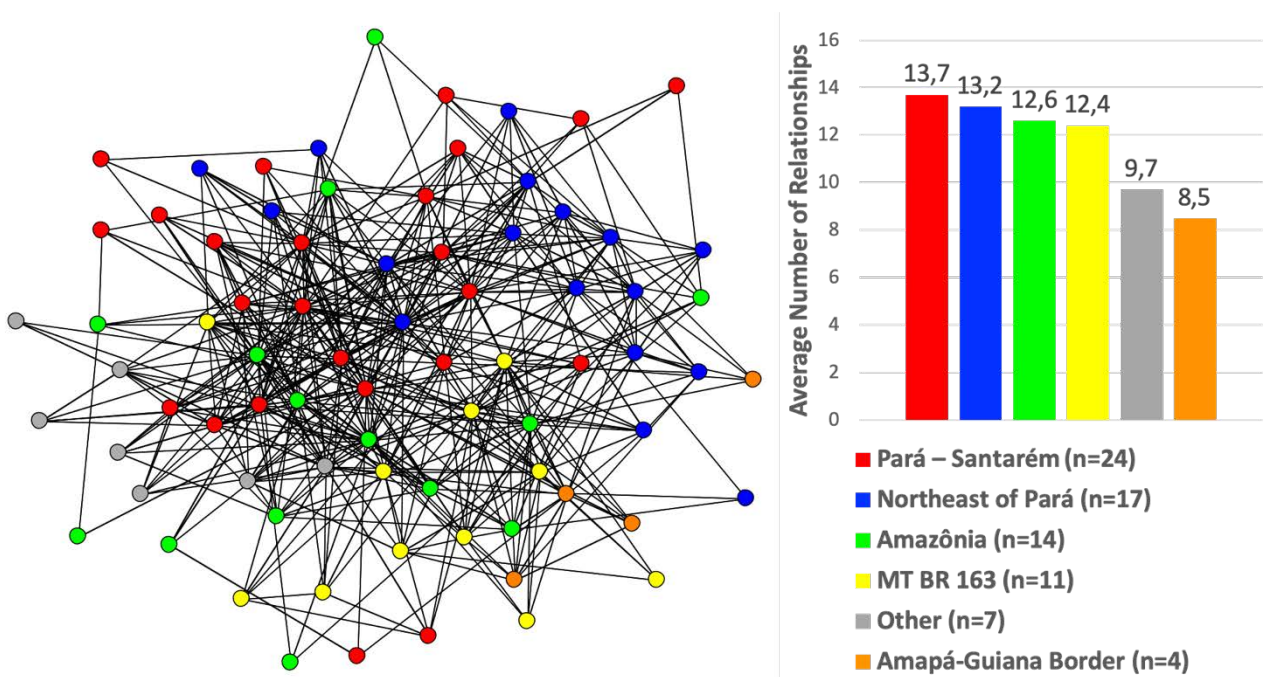


Figure 21. Collaboration Networks – By Work Region in the ODYSSEA Project

In relation to Figure 22 it is worth noting that collaborations exist between actors from all work regions. However, more collaborations exist between actors who work in regions close by to one another, such is the case for participants who work in Pará state.

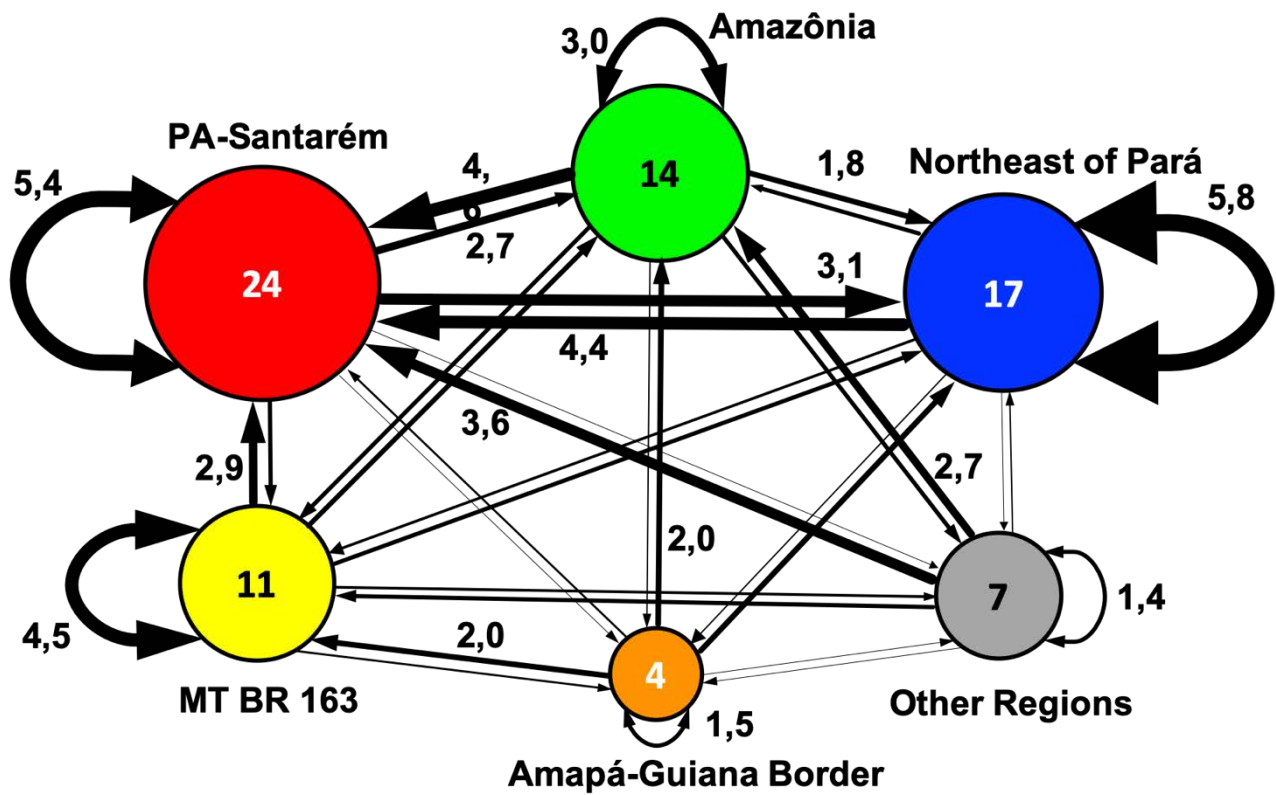


Figure 22. Collaboration network grouped by Work Region in the ODYSSEA Project

Keeping in mind that ODYSSEA is an “umbrella” project, which sought to integrate knowledge from different ongoing regional projects, Figure 23 shows the distribution of actors’ participation in different “Networks and Projects” that are associated with ODYSSEA. In addition to the 11 projects identified on the questionnaire by project participants, 10 people stated that they participate in “Other projects” who also work with themes specific to Amazonia, among them: APUREZA, BIOMAP, CAPES-COFECUB, CARBIOCIAL/CARBIOMA, Guyamazon, JEAI-SITES, LMI-SENTINELA, GAPAM, Fighting Malária, Projeto Babaçu, TmF.

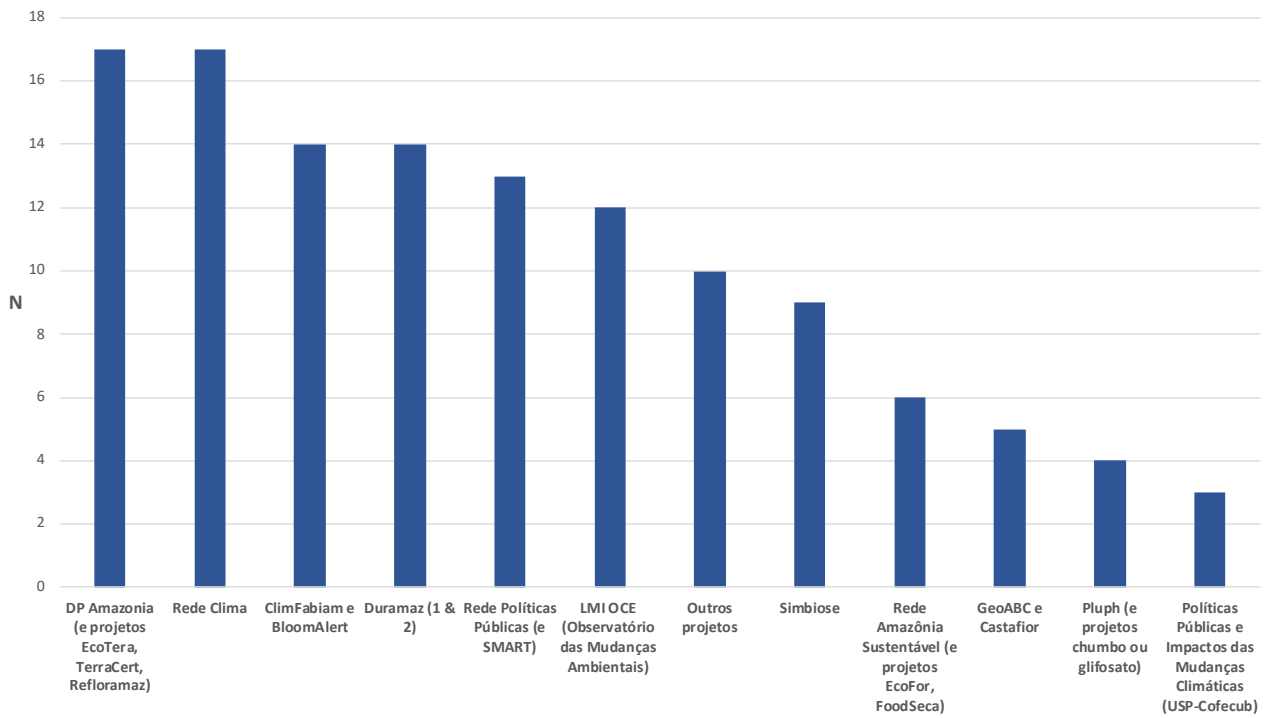


Figure 23. Distribution of actors' participation in different networks and projects associated with ODYSSEA

Figure 24 presents the Collaboration Network characterized participation in multiple "Networks and Projects" related to ODYSSEA, as well as the average number of relationships in each group.

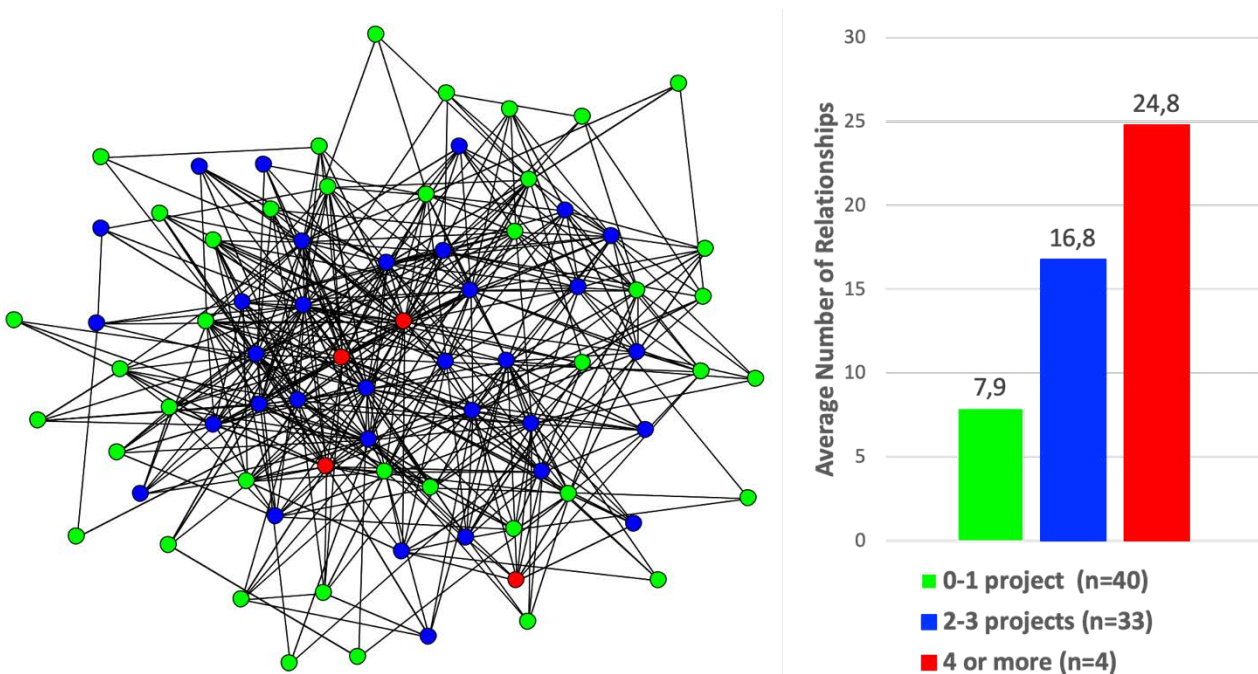


Figure 24. Collaboration Network – By multiple networks and projects

We observe in the figure that individuals who participate in 0 to 1 project are found in the network periphery, while members who participate in more than two projects are more central. Another

aspect that should be considered is the fact that a greater number of projects is associated with a greater number of collaborations and that there is a significant difference between the average number of relationships between groups (ANOVA $p < 0,0001$).

6.4. The future of the ODYSSEA network

6.4.1. Network turnover

This longitudinal study showed that the network structure is dynamic. Over time, new collaborations were established, and old ones were undone. Figure 25 presents the ODYSSEA project collaboration network with all study participants from Phase 1 to Phase 2. In total, 105 people responded to the questionnaire at some point during the study. In terms of turnover, actors entered during the two study phases; twenty-eight individuals who were counted in Phase 1, left the project during Phase 2 (identified in blue); meanwhile, 27 new individuals entered the network in Phase 2 (identified in red). The actors who participated in the two study phases are identified in blue ($n=50$). The relationships are also characterized with the same colors, according to the study participation phase. We observe that actors who were present since the beginning of the project on average established more collaborative relationships, compared to those present during just one study phase.

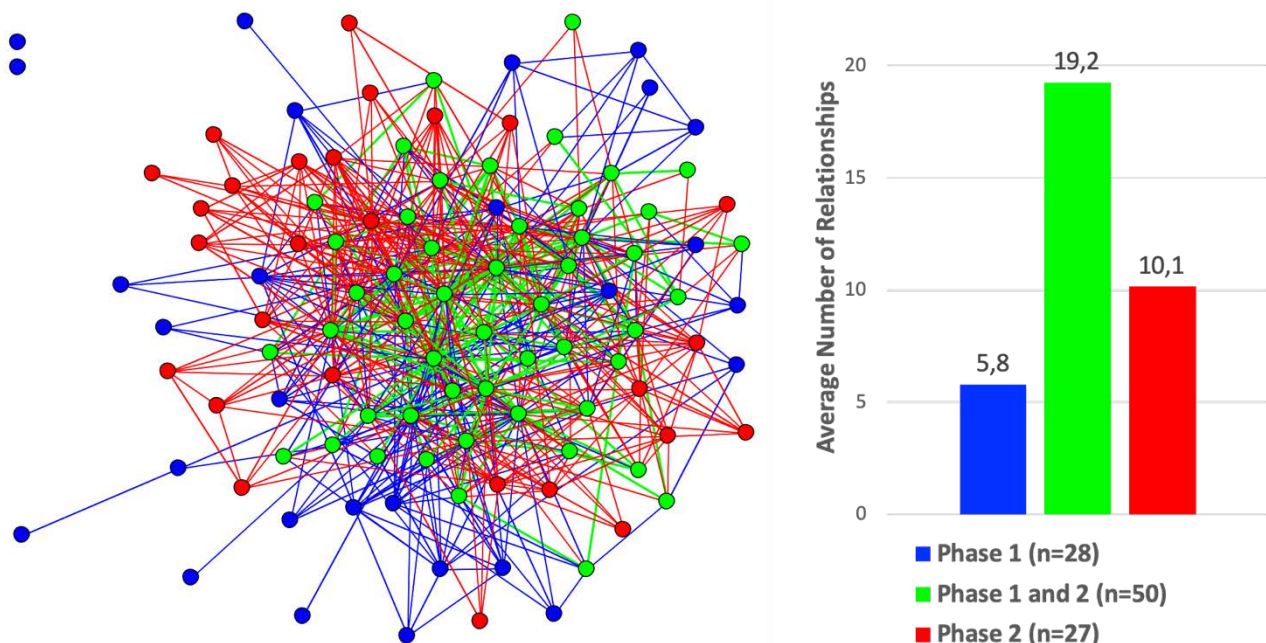


Figure 25. Longitudinal Collaboration Network of the ODYSSEA Project, characterized by Participation Phase in the Project

Given these findings, what can we say regarding the future of the ODYSSEA project collaboration network? Diverse factors can play a role in the future evolution of the network. Some factors may

prove favorable to maintaining collaborations, such as, for example, the existence of a new project phase. Exemplifying this is the case of the National Institute for Science and Technology called “INCT Odisseia” (financed by the Brazilian government). Other examples include new research calls and opportunities that could involve members from the present network. Factors that may limit future collaboration include cuts to research funding and changes in the career paths and interests of current project coordinators.

6.4.2. Network robustness

Social Network Analysis allow us to trace future scenarios for collaborative networks based on the study of networks’ structural characteristics. One fundamental characteristic used in these studies is robustness, which describes the capacity of a social network to maintain its functioning despite variations in external conditions or changes to internal organization (Albert & Barabási, 2000; Albert *et al*, 2000). The robustness concept is related to the idea of resilience, which describes the capacity of a socio-ecological system to absorb perturbations and still maintain its structure and function (Berbés-Blázquez *et al.*, 2014).

Social network robustness has been evaluated using modelling where determined network actors are removed, simulating situations in which diverse actors no longer collaborate for different reasons. In response to actors’ removal, the network is characterized as to its capacity to maintain connectiveness between the set of remaining individuals. This is analyzed through its fragmentation into small groups, the variation between the average distance between individuals, or even still, the evolution of network density, or the average number of relationships maintained for each actor (Albert *et al.*, 2000; Mertens *et al.*, 2008).

The frequency of the distribution of the number of relationships actors have in the network is key to defining robustness. Scale-free networks, where a small minority of individuals have many connections, while the vast majority have low connectivity, appear to be very sensitive to the loss of the most connected nodes, but relatively robust when the individuals removed are randomly chosen (Barabási & Albert, 1999). On the other hand, “single scale” networks, where the distribution of the number of connections is relatively homogeneous, have a tendency to fragment no matter what nodes are removed (Albert & Barabási, 2000).

The robustness of the ODYSSEA project collaboration network was studied by identifying the individuals with the highest Degree Centrality – that is individuals with the highest number of

relationships (Wasserman & Faust, 1994). A person with many collaborations is considered a key player in the network, while individuals with few relationships are considered peripheral. If we show that the project's collaboration network is robust even when the most important people fail to collaborate, we can be assured that it will be robust when less connected individuals leave the network. This is the most rigorous way to assess network robustness.

Figure 26 shows the distribution of the number of relationships of individuals who make-up the ODYSSEA project collaboration network. The network presents a heterogeneous distribution of collaborations. This a relative dispersion of relationships that we can sort into two groups: i) one with a few highly connected individuals (more than 20 relations), ii) an intermediate group with some relationships (between 10 and 20 relations), iii) and many network members with few connections (up to 10 relations).

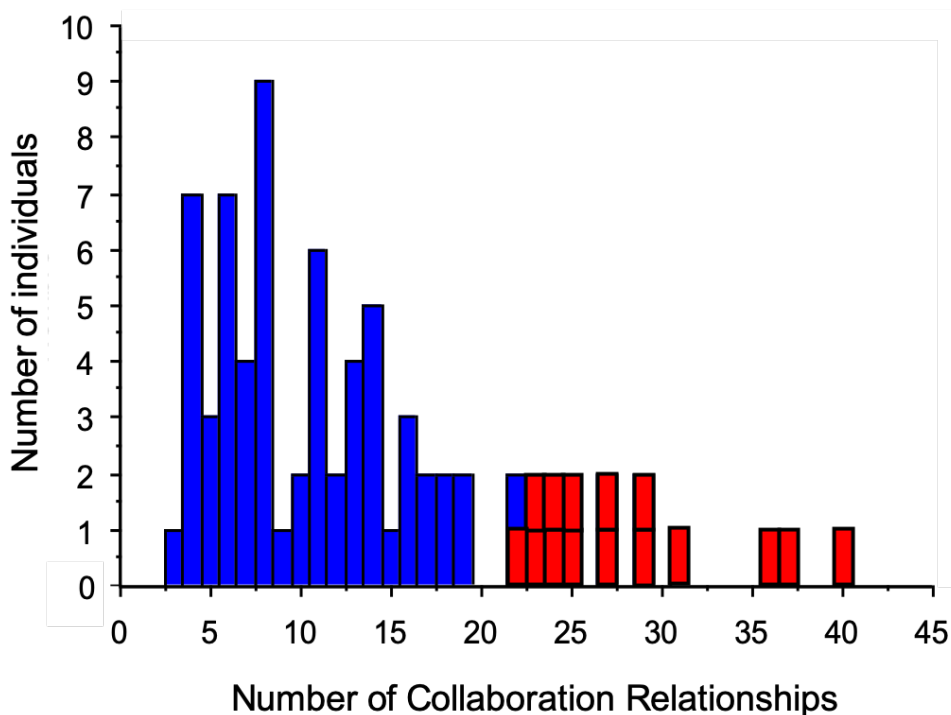


Figure 26. Distribution of the frequency of the number of collaboration relationships in the ODYSSEA Project network

The most connected people identified in red on Figure 26, also stand out on Figure 27. Node size is proportional to the number of relationships (Degree Centrality) and institution names of each participant are also presented. The most connected group includes the two project coordinators and WP coordinators, the INCT Odisseia coordinators who were already present in the ODYSSEA network since Phase 1, and some researchers most involved in the activities in the Santarém-PA region which was a pilot for the observatory.

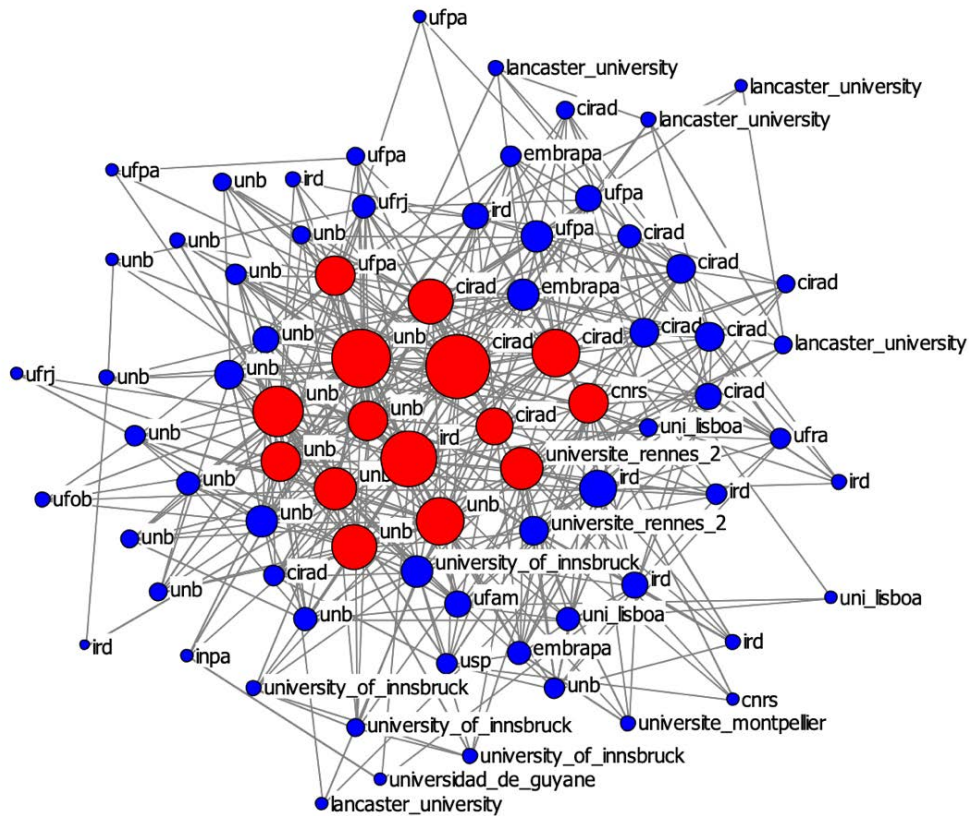


Figure 27. The ODYSSEA Project's Collaboration Network, with the 15 most central individuals

After calculating the Degree Centrality of network participants, we removed the 15 most central people, one by one in decreasing order of centrality. After each removal, network fragmentation was calculated; this was measured by the percentage of nodes remaining connected in the largest network group (Figure 28), the average distance between individuals (Figure 29), and network density. Network density was measured by average number of collaborations per individual (Figure 30). Removed individuals are shown in red on Figures 26 and 27. Figure 31, shown on page 49, shows the Collaboration network after each of the five removals of most central individuals.

6.4.3. Network fragmentation

The first measure of network robustness is its fragmentation. If the network splits into subgroups, collaboration will be limited to the people in each group without interaction between all members of the network. Figure 28 shows that the Phase 2 ODYSSEA collaboration network is quite robust, as the percentage of actors who remained connected in a large collaborative group stayed above 95% even after the removal of the 15 most central people.

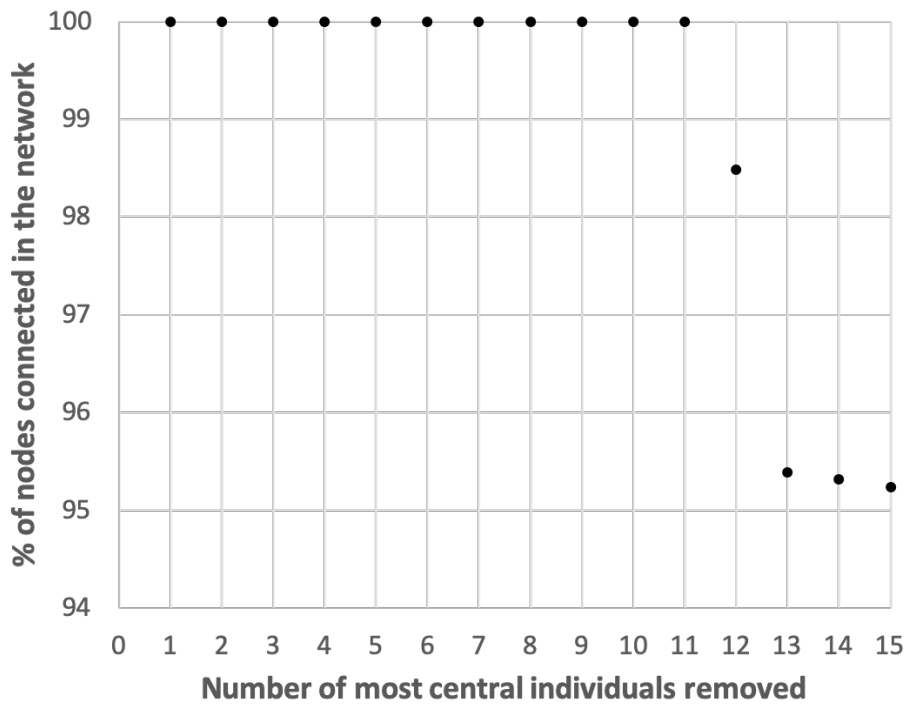


Figure 28. Robustness test of the ODYSSEA Project’s Collaboration Network

6.4.4. Average distance between network participants

Another measure associated with robustness is the average distance in a network. Distance calculates the number of nodes between any pair of individuals in the network (Wasserman & Faust, 1994). Average distance of a network is the average of the distances between each pair of individuals in the network. It is a global measure of separation and can be used to evaluate the efficiency of the communication process at the entire network level. Short average distances on social networks can promote more efficient communication, allowing information to be transmitted between two individuals involving a small number of intermediaries.

As noted in Table 2, the average distance from the Phase 2 Collaboration Network is 2.1. This indicates that there are on average 2.1 steps required for individuals to reach others in the network. In other words, for collaboration or exchanges to occur between any pair connected to the main component of the network, on average only 1.1 intermediaries are required. Thus, we can say that information and experiences can potentially circulate very quickly – over very short distances – within the current ODYSSEA collaboration network. When we phase out the 15 most central people, the average distance increases to 3.6. This is still a relatively short distance, but it signals that communication and exchange of experiences could be less efficient (Figure 29).

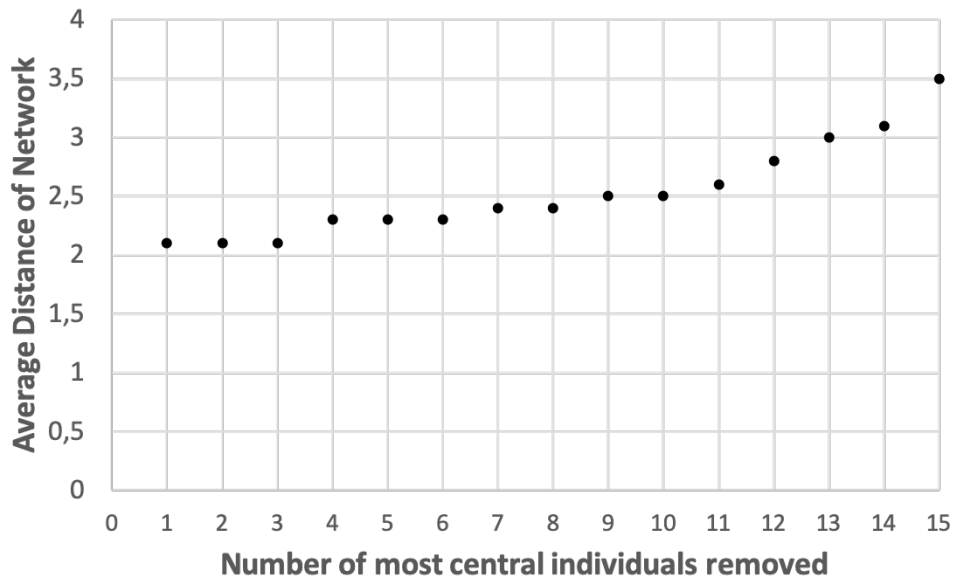


Figure 29. Average Distance of the ODYSSEA Project’s Collaboration Network

6.4.5. Network density

The density of the ODYSSEA collaboration network can be measured by the average number of relationships each individual maintains. The higher this number, the greater the intensity of collaboration. After each removal, the average number of collaborations per individual was calculated.

Figure 30 shows the result of the sequential removal simulation of the 15 most central individuals, and the degree to which the average number of relationships varied per individual. When the network is intact, individuals have an average of 12.57 relationships. When the 15 most central individuals are removed successively, this number decreases gradually and significantly. The average number of collaborations per individual drops below five when all 15 core individuals are removed. These results demonstrate that the most central actors are responsible for maintaining a high density of relationships in the network.

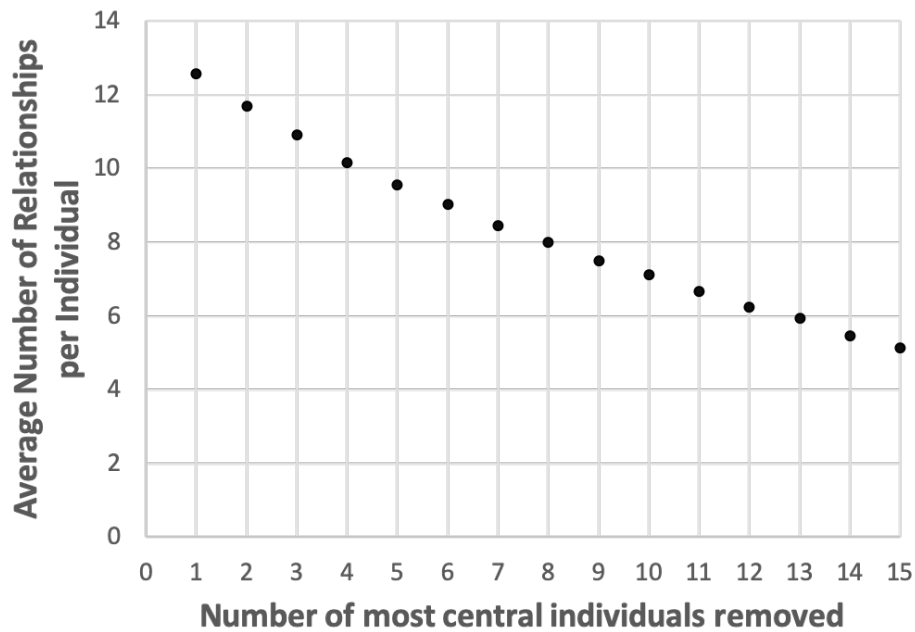


Figure 30. Evolution of the average number of Relationships per Individual

Simulation results of this type allow us to understand how the collaboration network may respond to external and internal changes. Data here demonstrate that the collaboration network is robust and shows resilience when the most connected members are eliminated. This is significant because we would generally expect a greater impact on network structure given actors' centrality. Thus, the network will likely sustain collaborative processes, even if a relatively high portion of individuals cease to be involved in the future, for example when European funding ends. This must be considered since of the most 15 connected people, seven are European and eight are Brazilian. Additionally, we should consider the fact that new individuals can join the network and new collaborations may form. However, results demonstrate some vulnerability regarding the density of relationships, indicating that current collaborative processes are highly dependent on a small group of people.

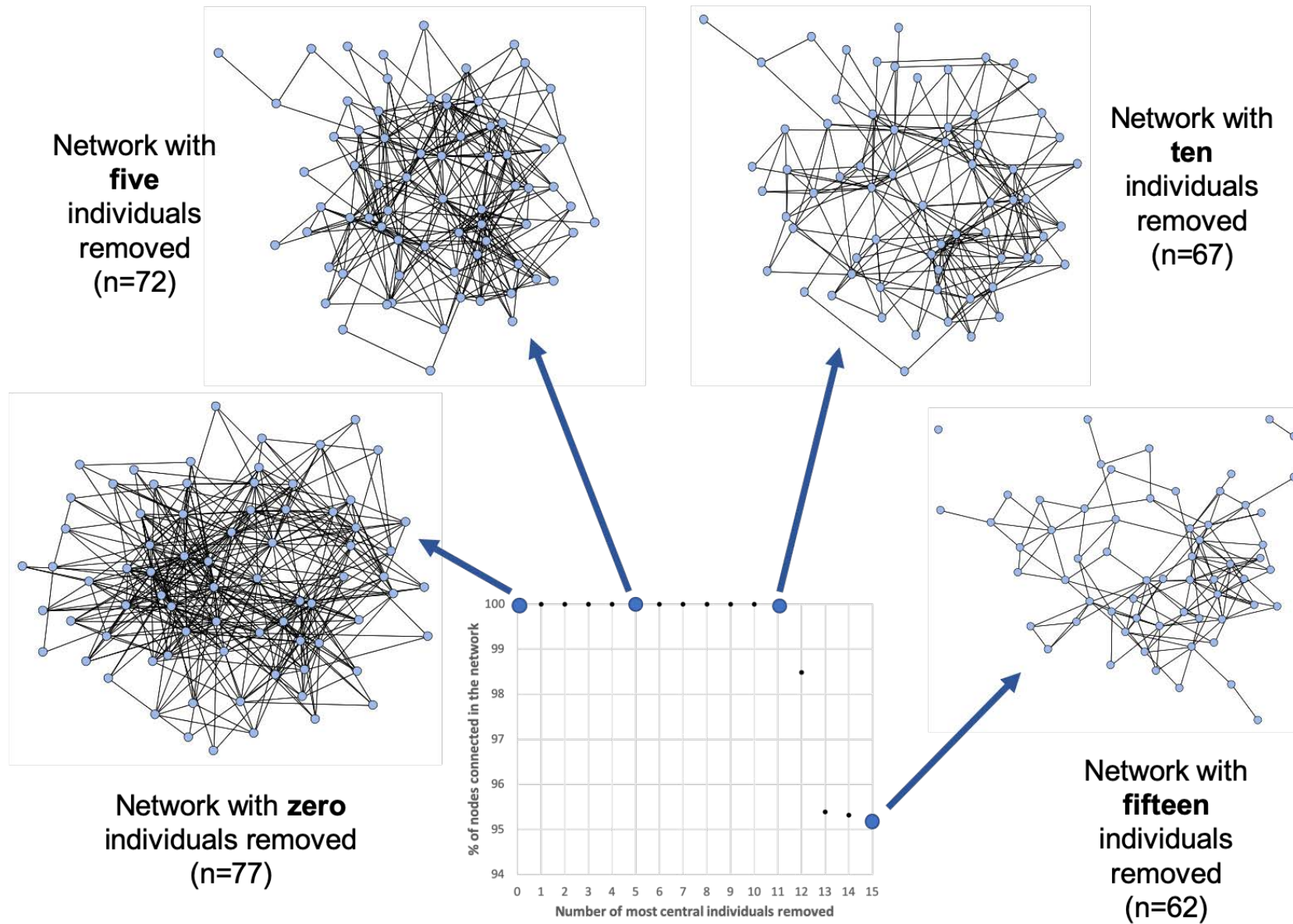


Figure 31. The ODYSSEA Project's Collaboration Network with and without the removal of the most central actors

7. Conclusions and recommendations

This report aimed to understand the structural and functional properties of the ODYSSEA collaboration network and its evolution over time. The longitudinal character of this study, conducted between 2016 and 2019, allowed us to understand how the collaborative processes between the many actors involved in research and intervention projects may be differentiated according to the ODYSSEA engagement year and the social, administrative and political organization level of these actors.

This report was organized in four main axes, that respond to the two first specific objects of this study: 1. To understand the structural and functional properties of the ODYSSEA collaboration network and its evolution overtime; 2. To understand the role of the ODYSSEA Project in fostering a collaboration network between academic fields, research projects, participant institutions, work sectors (academic, public, civil society, etc.) and study regions. The third and last specific objective of this study sought to propose recommendations for strengthening relationships and collaboration between the actors and to guide academic and political activities related to the ODYSSEA project. These recommendations are presented according to the priorities, objectives, and actions proposed by the ODYSSEA project.

Next, we describe the main conclusions of each one of the four analytic axes and the recommendations stemming from our analyses for the next phase of ODYSSEA.

7.1. A strong collaborative basis before the beginning of the ODYSSEA Project

In its original installment, the ODYSSEA Project (*Marie Skłodowska- Curie grant agreement Nº 691053*) was based on the premise that participant organizations would reunite renowned European and Brazilian specialists who were already developing research in many regions of Amazonia. Doing so, the project would bring together various research networks, each of them with longtime cooperation experiences in the Amazon. Phase 1 of this study mapped the collaboration relationships already existing before the beginning of the project, as well as the active collaborations existing early into the project (in 2016 and 2017). We observed that the actors and institutions integrated from the project onset already formed a very interconnected group, in a network with high density of the relationships, having the potential to diffuse knowledge and establish more collaborations.

With a deeper analysis of these connections, we untangled previous relationships from the ones within the initial ODYSSEA network (2016-2017) to understand how these collaborative bases were

active and connected in Phase 1, and how they facilitated the emergence of new relationships, established after the beginning of the project. The results presented on the Figures 2 and 3 (pages 14 and 16), illustrate how much the ODYSSEA Project strengthened pre-established connections, as well as fostered the emergence of new collaborations between researchers and their institutions. Additionally, collaborations that had existed previously and remained active in the first years of the project showed a relatively high reciprocity rate (52%) – meaning these relationships were recognized by both network pairs. The strength of these relationships also allows us to conclude that ODYSSEA favored an intense collaborative process since its early years of activity. These results correspond to the premise cited in the item 3.2 of the ODYSSEA Project proposal (*Marie Skłodowska- Curie grant agreement Nº 691053*), of “Creating opportunities of reinforcing existent collaboration and create several new collaborations between European institutions and across European and Brazilian institutions” (p20).

7.2. The evolution of member participation in the ODYSSEA project

The methodological approach proposed by the ODYSSEA Project was based on the development of collaborative, integrative and interdisciplinary research, aiming for the exchange of different points of view regarding socio-environmental issues in Amazonia. Therefore, the project foresaw the use of participative and interdisciplinary approaches and methodologies, stemming from the involvement of different parties, including researchers and students involved in the project through direct beneficiaries (local populations and stakeholders).

This study analyzed the different categories of actors who directly participated in the ODYSSEA project and the evolution of this participation over time. Table 1 presented in the item 6.2.1. of this report showed that the project involved a diversity of actors who work within a multiplicity of themes and fields of study. Individuals’ engagement is also diverse at administrative level, where people work on local to global/international levels. We also observed gender balance, where participants were 50% men/50% women during Phase 2 of the project.

Furthermore, we emphasized actor involvement in the different Work Packages. This last aspect is relevant because it allows for the integration of the methodologies and results in each component - as well as their sharing with final users. However, we observed a low participation rate for actors from the public sector and civil society during both Phase 1 and 2. This is mainly due to the fact that these specific social actors, who worked with researchers, were not contacted for SNA study, as it would have highly expanded the number of individuals in the network. In each site, researchers work

with many different social actors and it would have been difficult to target who would enter or not the sample. We preferred to limit the analysis to the researchers who participated in the Odyssey project. Nonetheless, we emphasize the importance of involving representatives of these groups in the project activities, as was done in Santarém; this is fundamental to guarantee the collective construction of knowledge and practices and allow achieved results to be appropriated by both actor groups.

In relation to the evolution of collaboration of project participants and their institutions, this study revealed that the individuals from French institutions had a larger average number of collaborations during all study phases, followed by Brazilian researchers (Figure 7, page 26). We also analyzed relationship distribution within the same group (bonding ties) and between different groups (bridging ties) (Figure 8, page 28). We observed that during all study phases, most of collaborations occur between people of the same country – with the French having the most internal collaborations. However, during the project execution, the average number of relationships within the Brazilian group increased considerably from Phase 1 to Phase 2. The relationships between different countries varied little over the project duration, with actors belonging to French and Brazilian institutions being those with the most collaborations among themselves. Researchers from Portugal and Austria mainly joined the project during Phase 2 – not possessing previous collaborations. As such, the project allowed for new activities headed by researchers from these countries and taking place in Amazonia.

Our results show that the arrangements and collaborations between participant countries of the ODYSSEA Project could have been more diversified, aiming to strengthen the relationships between the different participant countries, such as the other European countries and eventually other Amazonian countries. Diversification in the structural patterns of collaborations is important since bonding type relationships favor information exchange, promoting collective action, and managing internal conflicts; on the other hand, relationships of the bridging type facilitate access to new ideas and the mobilization of resources not available within the same group. This said, in the ODYSSEA Project a more balanced distribution of inter and intragroup relationships may be important to broaden the collaborative efforts and integration of the results of different research endeavors and activities related to the project.

7.3. Consolidating and diversifying collaboration in the ODYSSEA Project

This axis of analysis focused on deepening our understanding of the ODYSSEA collaboration network during Phase 2 of the study. By studying how collaboration relationships are distributed in relation to

main attributive categories, we sought to evaluate the existence of interdisciplinary, intersectorial, multilevel, and technical collaborations. Results show that project actors who have multiple affiliations, participate in different activities and Work Packages, have multiple study interests and act in more than one region tend to possess more collaborative relationships than others. Result according to the various premises of the ODYSSEA Project are described below.

The first premise recognizes that to respond to questions regarding socio-environmental problems in Amazonia, common representation of these systems is necessary and must include all of its components – be they natural, social or political. To do this, the results presented in item 6.3.1 of this study reinforce the importance of interdisciplinary and multi-thematic collaborations. These relationships are essential to building new shared methods and tools that allow for understanding diverse feedback loops on the pressures exercised on the environment and the factors that determine the vulnerability of local populations; they can also help develop adaptation strategies to environmental changes.

The second premise aims to develop new and lasting research collaborations, which are both intersectorial and multi-level, allow for the monitoring of the dynamic interactions between Amazonian societies and their environments and aim to foster regional public policies. To this end, the results presented in the items 6.3.2 and 6.3.3 confirm the idea that when actors engage in multiples sectors and work at different administrative levels, they have more collaboration relationships with other members of the ODYSSEA Project. Collaborations between actors of different sectors (public, academic and civil society), as well as different administrative levels (from local to global) may allow for the sharing of participative knowledge and methods for the development of public policy that integrate social, environmental, political-economic and human health dimensions.

Another important premise of the ODYSSEA Project aims to promote the interchange between various independent networks of Brazilian and international researchers, with experience within the Amazon region, who work with environmental and social issues, each one with its own specificity. The results presented in item 6.3.4 highlight the importance of collaboration between the members of ODYSSEA that also act on different projects and networks, in several regions of Amazonia, and participate in various methodological components of the project. These results reinforce that the more integrated and diversified are their participations, the bigger the number of collaborations between them. The multiplicity of these networks, in the components and regions fomented by the

ODYSSEA Project offer a unique opportunity to capitalize a broad know-how and expertise about different facets of the social and environmental interface in Amazonia.

7.4. The robustness of the ODYSSEA Collaboration Network

The ODYSSEA Project proposal foresaw strategies to guarantee partnership sustainability after project termination, especially since the group had the support of the Brazilian Project, the INCT Odisseia. Other strategies included strengthening institutional relationships through common financial support – as a result of new projects between the European and Brazilian Institutions. Additionally, the proposal highlights the importance of “Secondments” of European researchers and students hosted by Brazilian institutions, which were made possible by already existing and new partnership agreements.

This last axis of analysis sought to evaluate the robustness of the ODYSSEA Project collaboration network by modeling scenarios where certain actors in the network are removed, simulating situations in which several members would stop collaborating in the future (whatever the reasons). The analyses measured the network's ability to maintain connectivity between the remaining individuals, the variation in the average distance between individuals, the evolution of network density, and the number of relationships maintained on average by each actor (Albert et al., 2000; Mertens et al., 2008).

By calculating the number of relationships between individuals, we observed that the network presented a heterogeneous distribution of collaborations (Figure 26, page 44); that is, there is a relative dispersion of these relationships, with a few highly connected individuals and many members with few relationships. By simulating the removal of the 15 most connected actors, the network proved to be quite robust, as 95% of the actors remained connected in a large collaborative group (Figure 28, page 46). This allows us to infer that even with the eventual exit of key actors, i.e. the most connected and central, the network is not as vulnerable to fragmentation.

Calculating the average distance between participants in the project's collaboration network in Phase 2 indicated a short distance of 2.1. Even excluding the 15 most central individuals, the average distance increased slightly to 3.6, which is also a relatively short distance, but already indicates that communication and exchange of experiences could be less efficient (Figure 29, page 47).

The density of the ODYSSEA collaboration network was measured by the average number of individuals' relationships. The higher this number, the greater the intensity of collaboration. After the

removal of the most central individuals, this number gradually and significantly decreases from 12.57 to 4.77 relationships on average. This result showed that the most central actors are responsible for maintaining a high density of relationships in the network (Figure 30, page 48).

These results allow us to conclude that the ODYSSEA Project Collaboration Network is robust and shows resilience to the exclusion of its most connected members. In other words, the network may be able to sustain collaborative processes, even if a relatively high fraction of individuals no longer engages within it in the future. In addition, it is important to consider that new individuals can join the network and new collaborations can form. Finally, the results showed that there is some vulnerability regarding the density of relationships, indicating that current collaborative processes are highly dependent on a small group of people.

The results of this report highlight how the ODYSSEA project has created opportunities both for the development of new and lasting collaborations, as well as for strengthening existing links between the different participating institutions based on project work and networking activities. Thus, this study illustrates the relevance of including SNA as an integrated component in social and environmental governance projects, as it allows for a discussion of quantitative data on the evolution of stakeholder participation and qualitative perspectives, which explain the processes in more detail. We hope that this Social Network Analysis conducted at different times of the project can be useful in addressing new growth strategies and the diversification of future ODYSSEA project research and activities.

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9. Appendixes

9.1. Questionnaire applied during the first study phase (2016-2017, in Portuguese).

Part 1 –Word Document

Estudo de Redes Sociais – Projeto ODYSSEA (Parte 1)

As informações recolhidas por meio deste questionário serão utilizadas para a avaliação do Projeto ODYSSEA e tem como **objetivo principal** compreender a estrutura de cooperação já existente entre os indivíduos (e suas organizações) e analisar a evolução dos processos colaborativos, a partir de projetos de pesquisa e intervenção na região amazônica.

Os objetivos específicos buscam:

- Analisar as trocas de informações (rede de contato) entre os participantes do projeto e sua evolução ao longo do tempo, a fim de compreender a estrutura e os padrões de comunicação para orientar as atividades do Projeto ODYSSEA;
- Analisar as relações de colaboração (rede de colaboração) entre os participantes do projeto e sua evolução ao longo do tempo, a fim de compreender o papel do Projeto ODYSSEA no fomento de colaborações entre disciplinas acadêmicas, projetos de pesquisa, instituições, setores de atividade (acadêmicos, público, sociedade civil, etc.), níveis de organização e regiões de estudo;
- Propor atividades para fortalecer as relações entre os atores, a difusão das informações, das atividades de colaboração, a fim de orientar as atividades acadêmicas e de incidência políticas do Projeto ODYSSEA e garantir a sustentabilidade dos seus resultados ao longo do tempo.

Informamos que o estudo tem caráter confidencial e tratamento anônimo dos dados. Um informe será enviado a todos os participantes com um resumo dos resultados.

Para dúvidas e outras considerações, por favor entre em contato com Renata Távora: projeto.odyssea@gmail.com

Este questionário deve ser respondido individualmente.

1. Dados Pessoais

Nome: _____ Sexo: M F
Nacionalidade: _____ Data de Nascimento: _____

2. Dados Profissionais

Instituição: _____
Cargo: _____
Cidade: _____ País: _____

3. Indique sua formação universitária para cada nível indicado abaixo:

Graduação (se aplica): _____
Mestrado (se aplica): _____
Doutorado (se aplica): _____
Outro (Especifique): _____

4. Indique qual disciplina de aplicação dos seus conhecimentos.

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Ciências da terra: hidrologia, geociências, geografia física, climatologia
- Ciências da vida: ecologia, botânica, microbiologia, agronomia
- Ciências sociais: antropologia, sociologia, economia, geografia humana, psicologia
- Ciências políticas: ciência política, economia política, geografia política
- Ciências de engenharia: Sensoriamento remoto, modelagem e banco de dados
- Outra (Especifique): _____

5. Indique qual dos temas abaixo você atua profissionalmente

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Uso da terra, biodiversidade e carbono
- Ecossistemas aquáticos e recursos hídricos
- Meio ambiente e saúde
- Outro (Especifique): _____

6. Indique qual tipo de atividade você desenvolve atualmente

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Pesquisa
- Docência
- Capacitação, extensão
- Gestão e coordenação de projetos
- Gestão Pública
- Outra (Especifique): _____

7. Indique qual dos setores abaixo você desenvolve suas atividades profissionais

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Sociedade Civil (Organizações e instituições cívicas voluntárias, ONG)
- Setor Público (Entidades governamentais de gestão pública)
- Setor Acadêmico (Instituições de ensino e pesquisa)
- Setor Privado (Entidades da iniciativa privada, corporações, trabalhadores autônomos)
- Outro (Especifique, ex. Organ. Internacionais): _____

8. Indique qual nível você desenvolve suas atividades profissionais

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Local (atividades com comunidades, bairros)
- Municipal (atividades no âmbito de um município)
- Estadual (atividades no âmbito de um estado federativo e DF)
- Regional (atividades no âmbito de uma região que envolve mais de um estado)
- Nacional (atividades no âmbito de um país)
- Global (atividades no âmbito de mais de um país)

9. Indique qual componente do Projeto ODYSSEA você participa

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- WP2. Interaction with society: from demand to operational knowledge and tools

WP3. Environmental dynamics: Observation & understanding

WP4. Vulnerability, adaptive capacity and governance related to environmental changes

WP5. Platform of integration and sharing of knowledge

10. Indique quais eventos ou atividades promovidas pelo Projeto ODYSSEA você considera mais importante para permitir trocas entre pesquisadores e reforçar a rede de colaboração

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

Seminários anuais entre pesquisadores

Escolas de verão

Seminários com os atores locais

Lotação em outras instituições

Trabalho de campo em comum

Co-orientação de estudantes

Outro (Especifique): _____

11. Utilize esse espaço para fazer as observações que você considera pertinente.

Part 2 – Excel Document

Estudo de Redes Sociais - Projeto ODYSSEA (PARTE 2)	
Identificação do Participante	
Nome:	
Instruções para completar o questionário (Parte 2)	
Esta segunda parte do questionário tem o objetivo de identificar as relações de contato e colaboração entre todos os membros do Projeto ODYSSEA.	
Na coluna "Nome" abaixo estão listados os nomes dos participantes do Projeto Odyssea.	
As palavras "Contato Anterior", "Contato Atual", "Colaboração Anterior" e "Colaboração Atual" representam diferentes tipos de relações, descritas na legenda abaixo.	
Para cada coluna de relação, você deve indicar com um "X" qual resposta descreve melhor sua relação com cada pessoa da lista.	
Para as pessoas que você não conhece e também para o seu próprio nome, não marque nada.	
Se você tem alguma pergunta ou outras considerações, por favor entre em contato com Renata Távora: projeto.odyssea@gmail.com	
LEGENDA DAS PERGUNTAS DE REDES SOCIAIS	
Contato Anterior: Com esta pessoa já mantinha contato ANTES DO INÍCIO do Projeto ODYSSEA (VER ABAIXO AS OPÇÕES POSSÍVEIS PARA ESSA RELAÇÃO).	
Contato Atual: Com esta pessoa passei a ter contato POR INTERMÉDIO do Projeto ODYSSEA (VER ABAIXO AS OPÇÕES POSSÍVEIS PARA ESSA RELAÇÃO).	
Colaboração Anterior: Com esta pessoa já desenvolvia colaborações profissionais ANTES DO INÍCIO do Projeto ODYSSEA (VER ABAIXO AS OPÇÕES POSSÍVEIS PARA ESSA RELAÇÃO).	
Colaboração Atual: Com esta pessoa passei a desenvolver colaborações profissionais POR INTERMÉDIO do Projeto ODYSSEA (VER ABAIXO AS OPÇÕES POSSÍVEIS PARA ESSA RELAÇÃO).	

Relações	Tipos	Assuntos/Temas
Contato	Troca de e-mails sobre:	Publicações, reportagens, eventos, projetos de pesquisa
	Discussões em encontros pontuais sobre:	Trabalhos acadêmicos, questões institucionais
	Comunicação/divulgação sobre:	Resultados de pesquisas, reuniões
Colaboração	Elaboração, organização de:	Projetos de pesquisa, disciplina conjunta, eventos
	Co-orientação, co-direção de:	Estudantes, grupos de pesquisa (laboratórios)
	Publicação em co-autoria de:	Artigos Científicos, livros, outros trabalhos

OBSERVE OS EXEMPLOS ABAIXO QUE DEMONSTRAM DIVERSAS FORMAS DE COMPLETAR AS RELAÇÕES								
	Nome	Instituição	Contato Anterior	Contato Atual (no âmbito do ODYSSEA)		Colaboração Anterior	Colaboração Atual (no âmbito do ODYSSEA)	
				Sím	Quais informações? Indicar ao menos uma		Sím	Quais colaborações? Indicar ao menos uma
1	Ana X.	Ministerio X	x			x		
2	Benjamin Y.	Agencia Y						
3	Carlos Z.	Asociación Z	x	x	discussões sobre eventos, conferências			
4	Daniela B.	Fundación B						
5	Fernanda G.	Universidad G	x	x	discussões sobre eventos, conferências	x		
6	Horacio H.	Secretaria D						
7	Jorge D.	Organización D	x	x	troca de e-mails sobre projetos de pesquisa	x	x	co-orientação de dois estudantes de mestrado
8	Luciana W.	Empresa W						

Na lista de nomes abaixo, marque com um "X" as pessoas com quem você mantém as relações de contato e colaboração conforme a legenda acima.

	Nome	Instituição	Contato Anterior	Contato Atual (no âmbito do ODYSSEA)		Colaboração Anterior	Colaboração Atual (no âmbito do ODYSSEA)	
				Sim	Quais informações? Indicar ao menos uma		Sim	Quais colaborações? Indicar ao menos uma
1	Adrien Paris	CNRS						
2	Amanda Estefania de Melo Ferreira	UFOPA						
3	Ana Isabel Rosa Cabral	ISA						
4	Andréia Cavalcante Pereira	UFOPA						
5	Angela May Steward	UFPA						
6	Anne Elisabeth Laques	IRD						
7	Antonio Pinheiro	UFOPA						
8	Beatriz Abreu dos Santos	UnB						
9	Carlos Hiroo Saito	UnB						
10	Carlos Jose de Sousa Passos	UnB						
11	Christophe Le Page	CIRAD						
12	Cleber Kraus	UnB						
13	Cristiane Barreto	CDS-UNB						
14	Dalva Maria da Mota	Embrapa AO						
15	Damien Arvor	URZ						
16	Danielle Mitja	IRD						
17	Danielle Kasanoski	CDS-UNB						
18	Denise Machado Duran Guttierrez	INPA						
19	Diego Ricardo Xavier Silva	FIOCRUZ						
20	Domitila Pascoaloto	INPA						
21	Doris Sayago	UnB						

Continue indicando as relações de contato e colaboração para as pessoas listadas abaixo.

	Nome	Instituição	Contato Anterior	Contato Atual (no âmbito do ODYSSEA)		Colaboração Anterior	Colaboração Atual (no âmbito do ODYSSEA)	
				Sim	Quais informações? Indicar ao menos uma		Sim	Quais colaborações? Indicar ao menos uma
22	Édna Alencar	UFPA						
23	Eleneide Doff Sotta	EMBRAPA						
24	Emilie Coudel	CIRAD						
25	Emilie Stoll	IRD						
26	Emmanuel Roux	IRD						
27	Eric Delaitre	IRD						
28	Eric Sabourin	CIRAD						
29	Erika Berenguer	LU/ULANC						
30	Esther Katz	IRD						
31	Eudes de Oliveira Bomfim	UnB						
32	Frederic Mertens	UnB						
33	Frederique Seyler	IRD						
34	Gina Fausin	LU/ULANC						

35	Guillaume Marchand	UFAM						
36	Gustavo Melo	Ambiente social						
37	Helen Gurgel	UnB						
38	Henrique dos Santos Pereira	UFAM						
39	Henrique Lacer Roig	UnB						
40	Herve Thery	USP						
41	Hilândia Brandão da Cunha	INPA						

Continue indicando as relações de contato e colaboração para as pessoas listadas abaixo.

	Nome	Instituição	Contato Anterior	Contato Atual (no âmbito do ODYSSEA)		Colaboração Anterior	Colaboração Atual (no âmbito do ODYSSEA)	
				Sim	Quais informações? Indicar ao menos uma		Sim	Quais colaborações? Indicar ao menos uma
42	Izildinha de Souza Miranda	UFRA						
43	James Fraser	LU						
44	Jean-François Tourrand	CIRAD						
45	Jérémie Garnier	UnB						
46	Joecila Santos da Silva	UEA						
47	Joice Ferreira	EMBRAPA						
48	Jos Barlow	LU						
49	Juliana Lins	INPA						
50	Laurent Durieux	IRD						
51	Lilian Blanc	CIRAD						
52	Livia de Freitas Navegantes Alves	UFPA						
53	Louise Cabral	UnB						
54	Lucieth Cruz Vieira	UnB						
55	Ludivine Eloy	CNRS						
56	Luis M. F. Catarino	IICT / ISA						
57	Luke Parry	LU						
58	Marc Lucotte	UQAM						
59	Marc Piroux	CIRAD						
60	Marcel Bursztyn	UnB						
61	Margareth Simões	EMBRAPA SOLOS						
62	Maria José A. do Rio P. de Vasconcelos	IICT						
63	Marie-Gabrielle Piketty	CIRAD						
64	Marie-Paule Bonnet	IRD						

Continue indicando as relações de contato e colaboração para as pessoas listadas abaixo.

	Nome	Instituição	Contato Anterior	Contato Atual (no âmbito do ODYSSEA)		Colaboração Anterior	Colaboração Atual (no âmbito do ODYSSEA)	
				Sim	Quais informações? Indicar ao menos uma		Sim	Quais colaborações? Indicar ao menos uma
65	Marielle Gosset	IRD						
66	Marina Hohl	IRD						
67	Marina Padrão Temudo	ISA / IICT						
68	Martin Coy	UIBK						

70	Milton Kanashiro	Embrapa AO						
71	Nadine Dessay	IRD						
72	Neli Aparecida de Mello Théry	USP						
73	Olivier Tamarin	IRD						
74	Oriana Almeida	UFPA						
75	Patrick Montfor	IRD						
76	Patrick Seyler	IRD						
77	Paulo Peiter	FIOCRUZ						
78	Paulo Roberto Cunha	USP						
79	Pierre Bommei	CIRAD						
80	Pierre Couteron	IRD						
81	Plinio Sist	CIRAD						
82	Rejane Ennes Cicerelli	UnB						
83	Ricardo Theophilo Folhes	Embrapa AO						
84	Sandra Damiani	UnB						
85	Saulo Rodrigues Filho	CDS-UNB						
86	Sergio Rivero	UFPA						

Continue indicando as relações de contato e colaboração para as pessoas listadas abaixo.

	Nome	Instituição	Contato Anterior	Contato Atual (no âmbito do ODYSSEA)		Colaboração Anterior		Colaboração Atual (no âmbito do ODYSSEA)	
				Sim	Quais informações? Indicar ao menos uma	Sim	Quais colaborações? Indicar ao menos uma	Sim	Quais colaborações? Indicar ao menos uma
87	Stéphane Calmant	IRD							
88	Stephane Guéneau	CIRAD							
89	Stephanie Nasuti	UnB							
90	Tatiana Deane de Abreu Sá	EMBRAPA							
91	Tayline Walverde	UnB							
92	Toby Gardner	SEI							
93	Vincent Dubreuil	UR2							
94	Vincent Heurteaux	GEOMATYS							
95	Vincent Nedelec	UR2							
96	Vivian Zeidemann	UFPA							

9.2. Questionnaire applied during the second study phase (2018-2019, in Portuguese).

Part 1 – Word Document

Estudo de Redes Sociais – Projeto ODYSSEA (Parte 1)

As informações recolhidas por meio deste questionário serão utilizadas para a avaliação do Projeto ODYSSEA e tem como **objetivo principal** compreender a estrutura de cooperação já existente entre os indivíduos (e suas organizações) e analisar a evolução dos processos colaborativos, a partir de projetos de pesquisa e intervenção na região amazônica.

Você foi solicitado a contribuir com esta pesquisa porque realizou intercâmbios ou participou de eventos realizados no âmbito do Projeto ODYSSEA.

Os objetivos específicos buscam:

- Analisar as relações de colaboração (rede de colaboração) entre os participantes do projeto e sua evolução ao longo do tempo, a fim de compreender o papel do Projeto ODYSSEA no fomento de colaborações entre disciplinas acadêmicas, projetos de pesquisa, instituições, setores de atividade (acadêmicos, público, sociedade civil, etc.), níveis de organização e regiões de estudo;
- Propor atividades para fortalecer as relações entre os atores, a difusão das informações, das atividades de colaboração, a fim de orientar as atividades acadêmicas e de incidência políticas do Projeto ODYSSEA e garantir a sustentabilidade dos seus resultados ao longo do tempo.

Informamos que o estudo tem caráter confidencial e tratamento anônimo dos dados. Os dados serão agregados e utilizados para análises em relação ao país da instituição, à área de pesquisa e ao gênero. Ao responder a este questionário, concordo em disponibilizar meus dados para análise e publicação. Antes da publicação, posso pedir a qualquer momento que os meus dados sejam retirados da amostra. Estou ciente de que os dados serão guardados por 10 anos pelos organizadores da pesquisa. Um informe será enviado a todos os participantes com um resumo dos resultados.

Para dúvidas e outras considerações, por favor entre em contato com Renata Távora: projeto.odyssea@gmail.com

Este questionário deve ser respondido individualmente.

1. Dados Pessoais

Nome: _____ Sexo: M F x

Nacionalidade: _____ Data de Nascimento: _____

2. Dados Profissionais

Instituição: _____

Cargo: _____

Cidade: _____ País: _____

3. Indique sua formação universitária para cada nível indicado abaixo.

Graduação (se aplica): _____

Mestrado (se aplica): _____

Doutorado (se aplica): _____

Outro (Especifique): _____

4. Indique qual é a disciplina de aplicação dos seus conhecimentos.

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

_____ Ciências da terra: hidrologia, geociências, geografia física, climatologia

- Ciências da vida: ecologia, botânica, microbiologia, agronomia
- Ciências sociais: antropologia, sociologia, economia, geografia humana, psicologia
- Ciências políticas: ciência política, economia política, geografia política
- Ciências de engenharia: Sensoriamento remoto, modelagem e banco de dados
- Outra (Especifique): _____

5. Indique com qual dos temas abaixo você atua profissionalmente.

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Uso da terra, biodiversidade e carbono
- Ecossistemas aquáticos e recursos hídricos
- Meio ambiente e saúde
- Outro (Especifique): _____

6. Indique qual tipo de atividade você desenvolve atualmente.

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Pesquisa
- Docência
- Capacitação, extensão
- Gestão e coordenação de projetos
- Gestão Pública
- Outra (Especifique): _____

7. Indique em qual dos setores abaixo você desenvolve suas atividades profissionais.

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Sociedade Civil (Organizações e instituições cívicas voluntárias, ONG)
- Setor Público (Entidades governamentais de gestão pública)
- Setor Acadêmico (Instituições de ensino e pesquisa)
- Setor Privado (Entidades da iniciativa privada, corporações, trabalhadores autônomos)
- Outro (Especifique, ex. Organ. Internacionais): _____

8. Indique em qual dos níveis abaixo você desenvolve suas atividades profissionais.

Você pode indicar mais de uma opção (**no máximo 3 opções**), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Local (atividades com comunidades, bairros)
- Municipal (atividades no âmbito de um município)
- Estadual (atividades no âmbito de um estado federativo e DF)
- Regional (atividades no âmbito de uma região que envolve mais de um estado)
- Nacional (atividades no âmbito de um país)
- Global (atividades no âmbito de mais de um país)

9. Indique em quais dessas redes e projetos você participou/participa (indique quantos achar necessário**).**

- ClimFabiam e BloomAlert
- DP Amazonia (e projetos EcoTera, TerraCert, Refloramaz)
- Duramaz (1 & 2)
-

- GeoABC e Castafior
- LMI OCE (Observatório das Mudanças Ambientais)
- Políticas Públicas e Impactos das Mudanças Climáticas (USP-Cofecub)
- Rede Amazônia Sustentável (e projetos EcoFor, FoodSeca)
- Rede Clima
- Rede Políticas Públicas (e SMART)
- Pluph (e projetos chumbo ou glifosato)
- Simbiose
- Outros projetos que envolvam mais de 3 pessoas da rede ODYSSEA: _____

10. Indique em qual componente do Projeto ODYSSEA você participa.

Você pode indicar mais de uma opção (no máximo 3 opções), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- WP2. Interaction with society: from demand to operational knowledge and tools
- WP3. Environmental dynamics: Observation & understanding
- WP4. Vulnerability, adaptive capacity and governance related to environmental changes
- WP5. Platform of integration and sharing of knowledge

11. No âmbito do ODYSSEA, indique em qual região você atua regularmente.

Indique quantos achar necessário, em ordem de importância com os números de 1 a 5, sendo "1" a opção mais importante.

- Amazonas
- Fronteira Amapá-Guiana
- Mato Grosso e BR-163
- Pará, região de Santarém (incluindo várzea e municípios até Itaituba)
- Pará, região do Nordeste do Pará (próximo à Belém, incluindo Paragominas e excepcionalmente Marabá)

12. Indique quais atividades e/ou momentos você considera importante para permitir trocas entre pesquisadores e reforçar a rede de colaboração ODYSSEA.

Você pode indicar mais de uma opção (no máximo 3 opções), identificando a ordem de importância com os números de 1 a 3, sendo "1" a opção mais importante.

- Seminários anuais entre pesquisadores
- Redação de artigos ou relatórios em co-autoria
- Elaboração de disciplina
- Escolas de verão
- Seminários com os atores locais
- Lotação em outras instituições
- Trabalho de campo em comum
- Co-orientação de estudantes
- Outro (Especifique): _____

13. Utilize esse espaço para fazer as observações que você considera pertinente.

Part 2 – Excel Document

Estudo de Redes Sociais - Projeto ODYSSEA (PARTE 2)

Identificação do Participante

Nome: _____

Instruções para completar o questionário (Parte 2)

Esta segunda parte do questionário tem o objetivo de identificar as relações de colaboração entre todos os membros do Projeto ODYSSEA.

Na coluna "Nome" abaixo estão listados os nomes dos participantes do Projeto Odyssea.

A palavra "Colaboração Atual" representa o tipo de relação, descrita abaixo.

Você deve indicar com um "X" quando considerar que estabelece esta relação com cada pessoa da lista.

Para as pessoas que você não conhece e também para o seu próprio nome, não marque nada.

Se você tem alguma pergunta ou outras considerações, por favor entre em contato com Renata Távora: projeto.odyssea@gmail.com

PERGUNTA DE REDES SOCIAIS

Colaboração Atual: Com esta pessoa **passei a desenvolver colaborações profissionais POR INTERMÉDIO** do Projeto ODYSSEA.

Exemplos de Relação de Colaboração

Elaboração, organização de projetos de pesquisa, disciplina conjunta, eventos

Co-orientação, co-direção de estudantes, grupos de pesquisa (laboratórios)

Publicação em co-autoria de artigos científicos, livros, outros trabalhos

OBSERVE OS EXEMPLOS ABAIXO QUE DEMONSTRAM DIVERSAS FORMAS DE COMPLETAR AS RELAÇÕES

	Nome	Instituição	Colaboração Atual (no âmbito do ODYSSEA)
1	Ana X.	Ministerio X	x
2	Benjamin Y.	Agencia Y	
3	Carlos Z.	Asociación Z	x
4	Daniela B.	Fundación B	x
5	Fernanda G.	Universidad G	
6	Horacio H.	Secretaria D	
7	Jorge D.	Organización D	x
8	Luciana W.	Empresa W	

Na lista de nomes abaixo, marque com um "X" as pessoas com quem você mantém relações de colaboração.

	Nome	Instituição	Colaboração Atual no âmbito do ODYSSEA (marque com um "X")
1	Adriane Michels	UnB	
2	Agnès Begue	CIRAD	
3	Alessandro Roberto de Oliveira	UnB	
4	Ana Isabel Rosa Cabral	ISA	
5	Ana Luiza Violato Espada	Univ. Florida	
6	Angela May Steward	UFPA	
7	Anne Elisabeth Laques	IRD	
8	Antonio Cesar Pinho Brasil Junior	UnB	
9	Beatriz Abreu dos Santos	UnB	
10	Beatriz Funatsu	CNRS	
11	Carlos Hiroo Saito	UnB	
12	Carlos Jose de Sousa Passos	UnB	
13	Carolina Milhorange de Castro	UnB	
14	Christophe Le Page	CIRAD	
15	Cleber Kraus	UnB	
16	Clément Bourguin	CIRAD	
17	Cristiane Barreto	UnB	
18	Cristoph Hubert	UIBK	
19	Dalva Maria da Mota	EMBRAPA	
20	Damien Arvor	CNRS	
21	Daniela Nogueira Soares	UnB	
22	Danielle Mitja	IRD	
23	Daniessa Kasanoski	CDS-UNB	

24	Danny Lo Seen	CIRAD	
25	Denise Machado Duran Gutierrez	INPA	
26	Domitilia Pascaoloto	INPA	
27	Doris Sayago	UnB	
28	Driss Ezzine de Blas	CIRAD	
29	Edna Alencar	UFPA	
30	Eleneide Doff Sotta	EMBRAPA	
31	Emilie Coudel	CIRAD	
32	Emilie Stoll	CNRS	
33	Emmanuel Roux	IRD	
34	Eric Delaitre	IRD	
35	Eric Sabourin	CIRAD	
36	Erika Berenguer	ULANC	
37	Esther Katz	IRD	
38	Eudes de Oliveira Bomfim	UnB	
39	Fabrice Papa	IRD	
40	Frank Zirkl	UIBK	
41	Frederic Mertens	UnB	
42	Frederique Seyler	IRD	
43	Gabriela Litre	UnB	
44	Gina Frausin	ULANC	
45	Guilherme Monteiro Santos	UFRJ	
46	Guillaume Marchand	UFAM	
47	Gustavo Melo	Ambiente social	
48	Harley Silva	UFPA	
49	Helen Gurgel	UnB	
50	Helene Dessard	CIRAD	
51	Henrique dos Santos Pereira	UFAM	
52	Herve They	USP	
53	Izildinha de Souza Miranda	UFRA	
54	James Fraser	ULANC	
55	Jean-Christophe Desconnets	IRD	
56	Jean-François Faure	IRD	
57	Jean-François Tourrand	CIRAD	
58	Jérémie Garnier	UnB	
59	Joecila Santos da Silva	UEA	
60	John Oswald	UR2	
61	Joice Ferreira	EMBRAPA	
62	Jos Barlow	ULANC	
63	Julie Betbeder	CIRAD	
64	Krishna Naudin	CIRAD	
65	Larisa Ho Bech Gaivizzo	UnB	
66	Laurent Demagistri	IRD	
67	Laurent Durieux	IRD	
68	Lilian Blanc	CIRAD	
69	Lívia de Freitas Navegantes Alves	UFPA	
70	Louise Cabral	UnB	
71	Lucas Moreira de Souza	UFRJ	
72	Luis M. F. Catarino	ISA	
73	Luis Otavio do Canto Lopes	UFPA	
74	Luke Parry	ULANC	
75	Marc Piraux	CIRAD	
76	Marcel Bursztyn	UnB	
77	Margareth Simões	EMBRAPA	
78	Maria José A. do Rio P. de Vasconcelos	ISA	
79	Marie Opplert	CIRAD	
80	Marie-Gabrielle Piketty	CIRAD	
81	Marielle Gosset	IRD	

82	Marie-Paule Bonnet	IRD	
83	Marina Padrão Temudo	ISA	
84	Martin Coy	UIBK	
85	Melissa Volpato Curi	UnB	
86	Michael Klingler	UIBK	
87	Michelle Morimura	UnB	
88	Milanya Ribeiro da Silva	UnB	
89	Milton Kanashiro	EMBRAPA	
90	Nadine Dessay	IRD	
91	Neli Aparecida de Mello Théry	USP	
92	Ollivier Tamarin	UG	
93	Patrícia dos Santos Mesquita	UnB	
94	Patrick Montfor	CNRS	
95	Patrick Seyler	IRD	
96	Pierre Bommel	CIRAD	
97	Pierre Couteron	IRD	
98	Priscylla Dayse Almeida G. Mendes	UnB	
99	Rafael Moraes Reis	UnB	
100	Renaud Marti	IRD	
101	René Pocard-Chapuis	CIRAD	
102	Ricardo Theophilo Folhes	UFPA	
103	Romero Gomes Pereira da Silva	UnB	
104	Sandra Damiani	UnB	
105	Saulo Rodrigues Filho	UnB	
106	Sávio Barros Mendonça	UM	
107	Stephane Guéneau	CIRAD	
108	Stephanie Nasuti	UnB	
109	Tatiana Deane de Abreu Sá	EMBRAPA	
110	Thibault Catry	IRD	
111	Tobias Töpfer	UIBK	
112	Toby Gardner	SEI	
113	Valery Gond	CIRAD	
114	Venícus Juvêncio de Miranda Mendes	UnB	
115	Véronique Michot	UR2	
116	Vincent Dubreuil	UR2	
117	Vincent Heurteaux	GEOMATYS	
118	Vincent Nedelec	UR2	