COMPARATIVE NETWORK ANALYSIS OF

CONSERVATION ORGANIZATIONS AND THEIR STRATEGIES

THE SHAPE OF COLLABORATIONS IN FOUR AMAZON REGIONS

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GIA

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GIA

SUMMARY

The Governance and Infrastructure in the Amazon project (GIA), recognizes the challenges conservation organizations often have to navigate while adapting their strategies. To reflect on the strengths and weaknesses created by new and emergent issues related to infrastructure projects, the GIA project identified a group of focal conservation organizations fostering an ample set of relationships and experiences in the four Amazonian Regions: Bolivia (Alto Madeira), Brazil (Rondonia and Amazonas), Colombia (Caquetá) and Perú (Loreto), to conduct a comparative analysis in terms of their collaborative ties and conservation strategies.

The organizations working within these mosaics are all non-profit civil society organizations (NGOs), working within different foci on conservation. Most have a long trajectory working in the area, they show a high interest and influence over conservation development and adaptation in each of their mosaics, making them suitable for this comparative analysis.

We used Social Network Analysis (SNA) to understand how these organizations work

For this analysis, we examined the network of conservation organizations in four Amazon regions with emphasis in their collaborators and strategies collectively, thus going beyond the individual examination and recognizing the role of collective action and collaboration in complex socio-ecological systems.
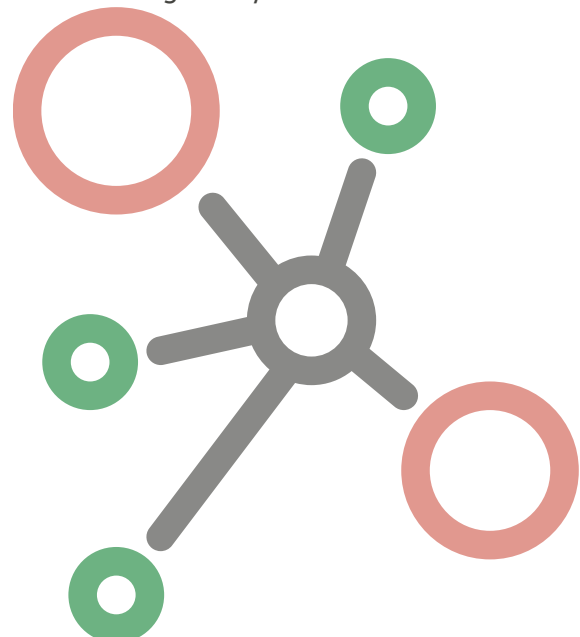
METHODS

We used information from an initial assessment conducted by the GIA project to identify the main strategies used by conservation organizations in four Amazon Regions. Which was validated with the GIA coordinators from each focal region. We contemplated three stages:

Stage 1: Delimiting network boundary
For the purpose of this analysis we considered only the focal organizations (egos) and their reported collaborators (alters).
We also collected data about the focal conservation's strategies.

Stage 2: Differentiating and categorizing
We built two matrices differentiating and categorizing the collaborators and strategies reported by the focal organizations in each mosaic:
- Collaborators: We listed and grouped them as reported by the focal organizations (funding agencies, academia, NGOs, government, grassroot organizations, etc.).
- Conservation Strategies: We listed all the

Stage 1: Delimiting network boundary
Stage 2: Differentiating and categorizing
Stage 3: Investigating relationships

strategies, and then we grouped them in broader topics, for example, if a focal organization mentioned they assisted local communities in timber management (either legal or technical support), it was registered as: "Supporting community-based timber management plans", and so on for other reported strategies.

METHODS

We also added attributes such as country and type of organization for each collaborators and strategies.

Stage 3: Investigating relationships
We used Social Network Analysis (SNA) (1) to examine the relationship between:

1) Focal organizations and their collaborators, and,
2) Focal organizations and their strategies.

We built for each a 2-mode matrix(2).
We calculated Density and Average Degree:

- Density: 2(T)/n, where "T" is the number of links also called edges in network analysis, and "n" is the number of nodes. The edges connect the nodes in a network. We also calculated the average degree to have an idea of the number of ties per focal organization.

- Average Degree: Total Edges/Total Nodes. This is a basic measurement of the number of collaborators and strategies each focal organization has.

We conducted surveys and exhaustive secondary data review to identify the collaborators and strategies of the focal organization.

We calculated the total number of ties between the focal organizations, thus obtaining a simple average.
For this study we removed the ties between the focal organizations in each mosaic to avoid redundancy for there is documented interaction between the focal organizations either formal or informal.

(1) We used the UCINET 6.652 software package for the analysis of social network data – developed by Lin Freeman, Martin Everett, and Steve Borgatti. It uses NetDraw as a network visualization tool.
(2)In a 2-mode the columns and rows represent different types of data.

RESULTS
WHAT THE NETWORKS SHOWED US
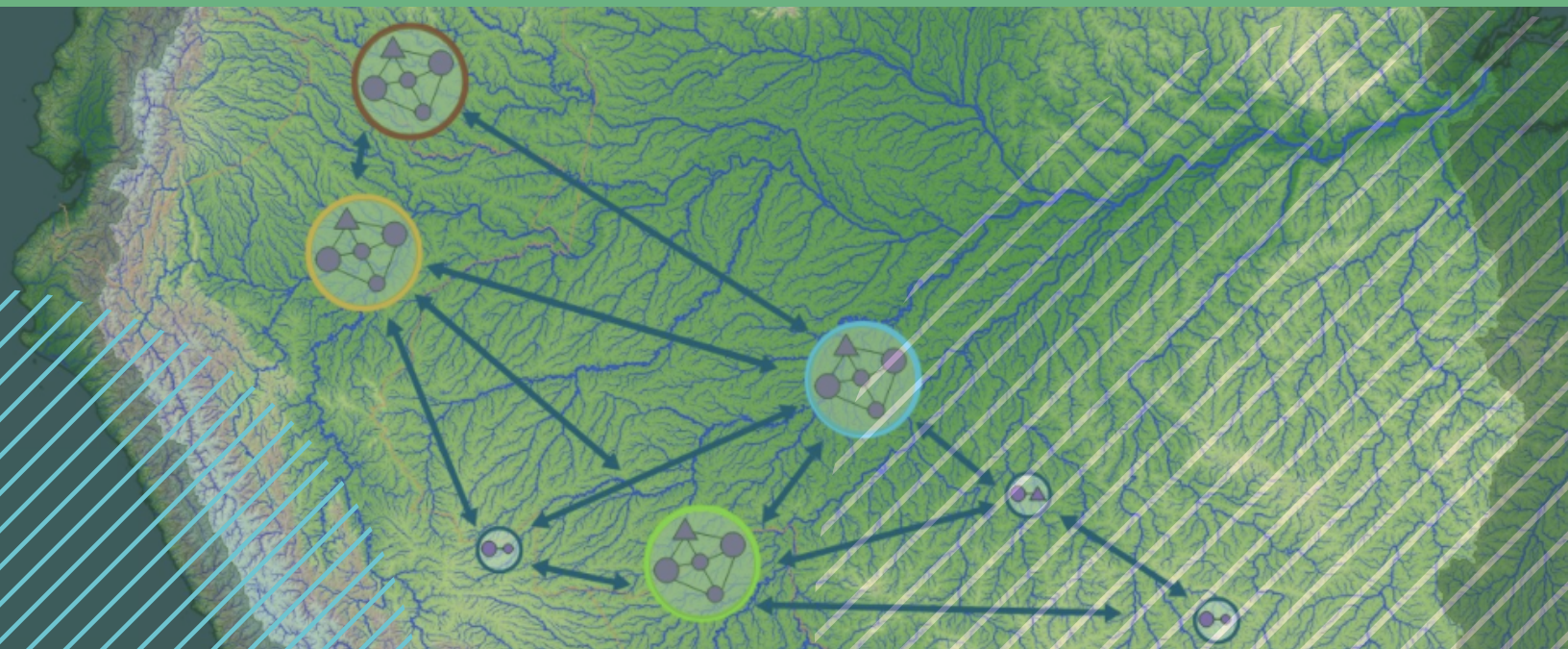
NETWORKS IN NUMBERS

COLLABORATORS

PERU 94
BRASIL 220
COLOMBIA 145
BOLIVIA 53

512
COLLABORATORS

TIES

PERU 129
BRASIL 289
COLOMBIA 150
BOLIVIA 58

626
TIES

STRATEGIES

PERU 25
BRASIL 17
COLOMBIA 26
BOLIVIA 27

95
STRATEGIES

COLLABORATORS

FOCAL ORGANIZATIONS AND THEIR COLLABORATORS

The graphics are a snapshot of the affiliations between the focal organizations and their reported collaborators.

FOCAL ORGANIZATIONS= 5
COLLABORATORS= 94
TIES = 129
DENSITIY = 0.277
AVERAGE DEGREE = 26

PERU

TYPE	COLOR	TYPE	COLOR
ONG		LOCAL GOV.	
FUNDING AGENCIES		CENTRAL GOV.	
REG. GOV.		TOURISM OPERATOR	
INDIGENOUS ORG.		PRIVATE SECTOR	
ACADEMIA			
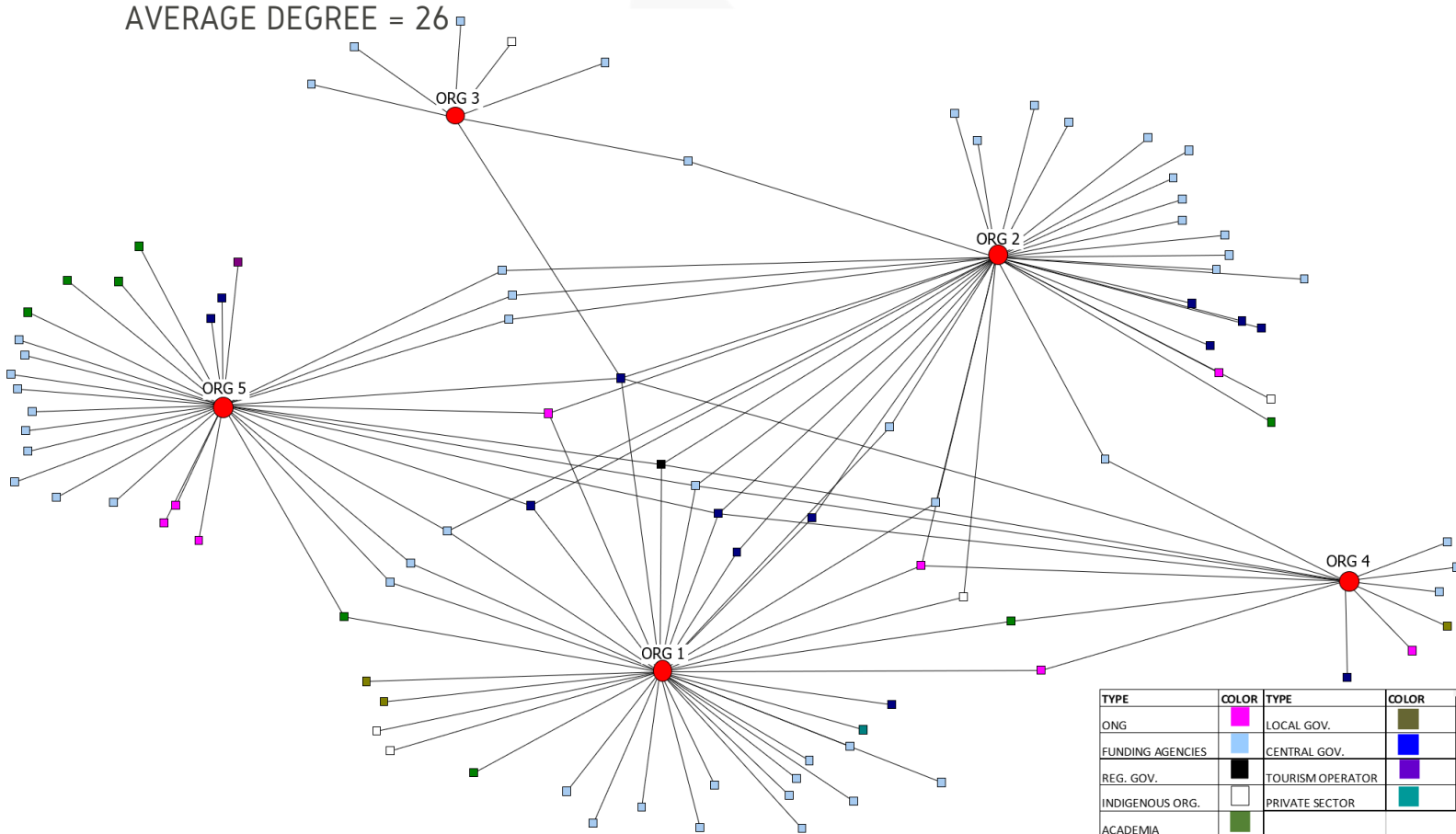
Highlights

Most of the collaborators are categorize as funding agencies, and the analysis shows each focal organization has overall their own source of funding.

In this network most of the collaborators are unique for each focal organization, except for ORG1 that has a close number of unique and shared collaborators.

ORG1 and ORG4 work with local governments.

The common collaborators are from the regional government of Loreto, central government offices*, and one funding agency.

Only one focal organization - ORG5 - shows a tie with a tourism operator.

*In this network it encompasses offices from the government managed and centralized in Lima.

COLLABORATORS

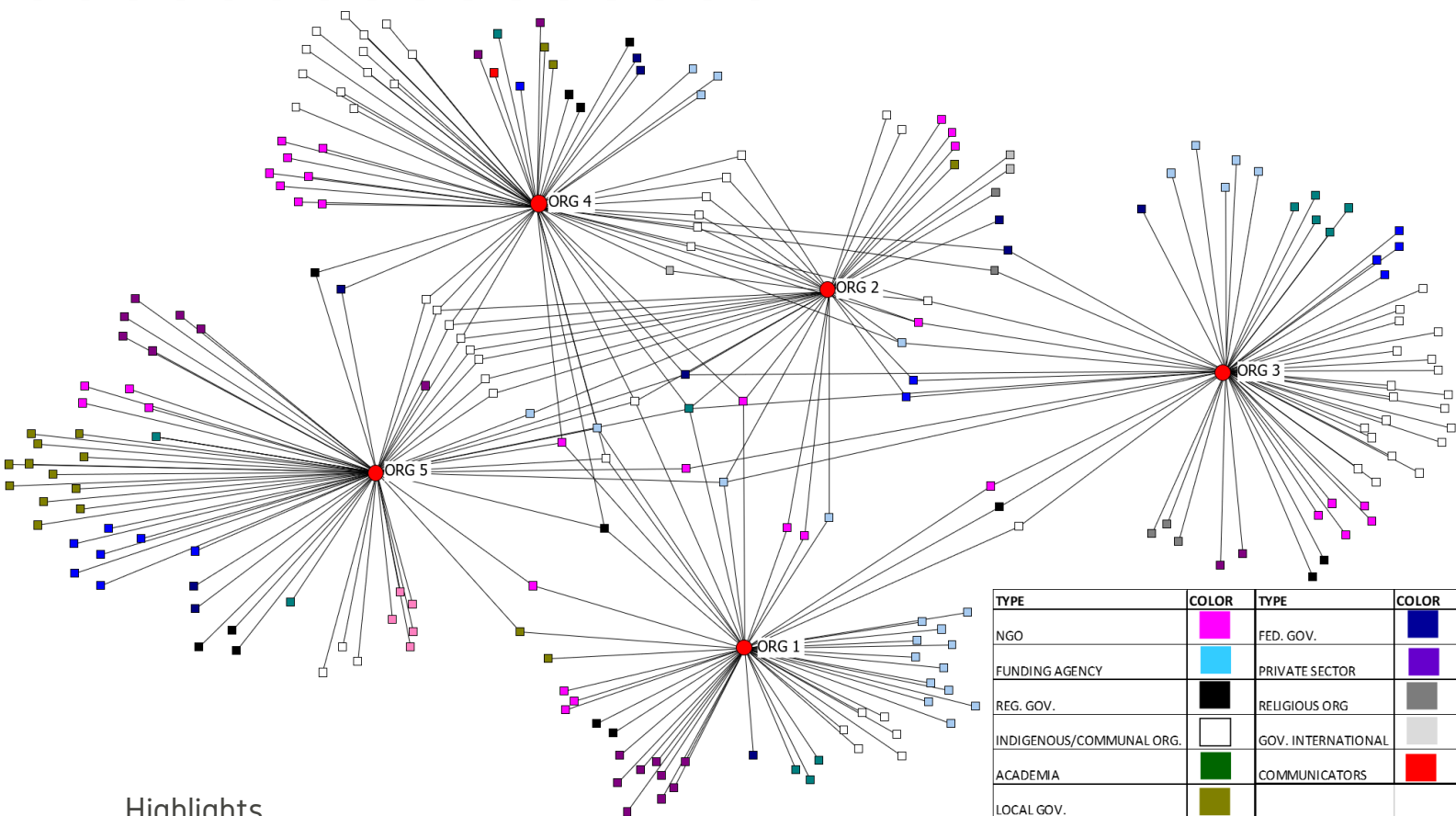FOCAL ORGANIZATIONS= 5
COLLABORATORS = 220
TIES = 289
DENSITIY = 0.259
AVERAGE DEGREE = 58

BRASIL

TYPE	COLOR	TYPE	COLOR
NGO		FED. GOV.	
FUNDING AGENCY		PRIVATE SECTOR	
REG. GOV.		RELIGIOUS ORG	
INDIGENOUS/COMMUNAL ORG.		GOV. INTERNATIONAL	
ACADEMIA		COMMUNICATORS	
LOCAL GOV.			

Highlights

Most of the collaborators are categorized as indigenous/communal organizations. either shared or unique for each focal organization.

This network shows a more diverse set of collaborators with 11 categories. It shows religious organizations, international governments and communicators.

The common collaborators are categorized as indigenous/communal, and shared between two focal organizations at most. There is one organization from academia collaborating with all the focal organizations.

This network has the highest average degree (58); that is, each focal organization has on average more ties, and it is slightly denser.
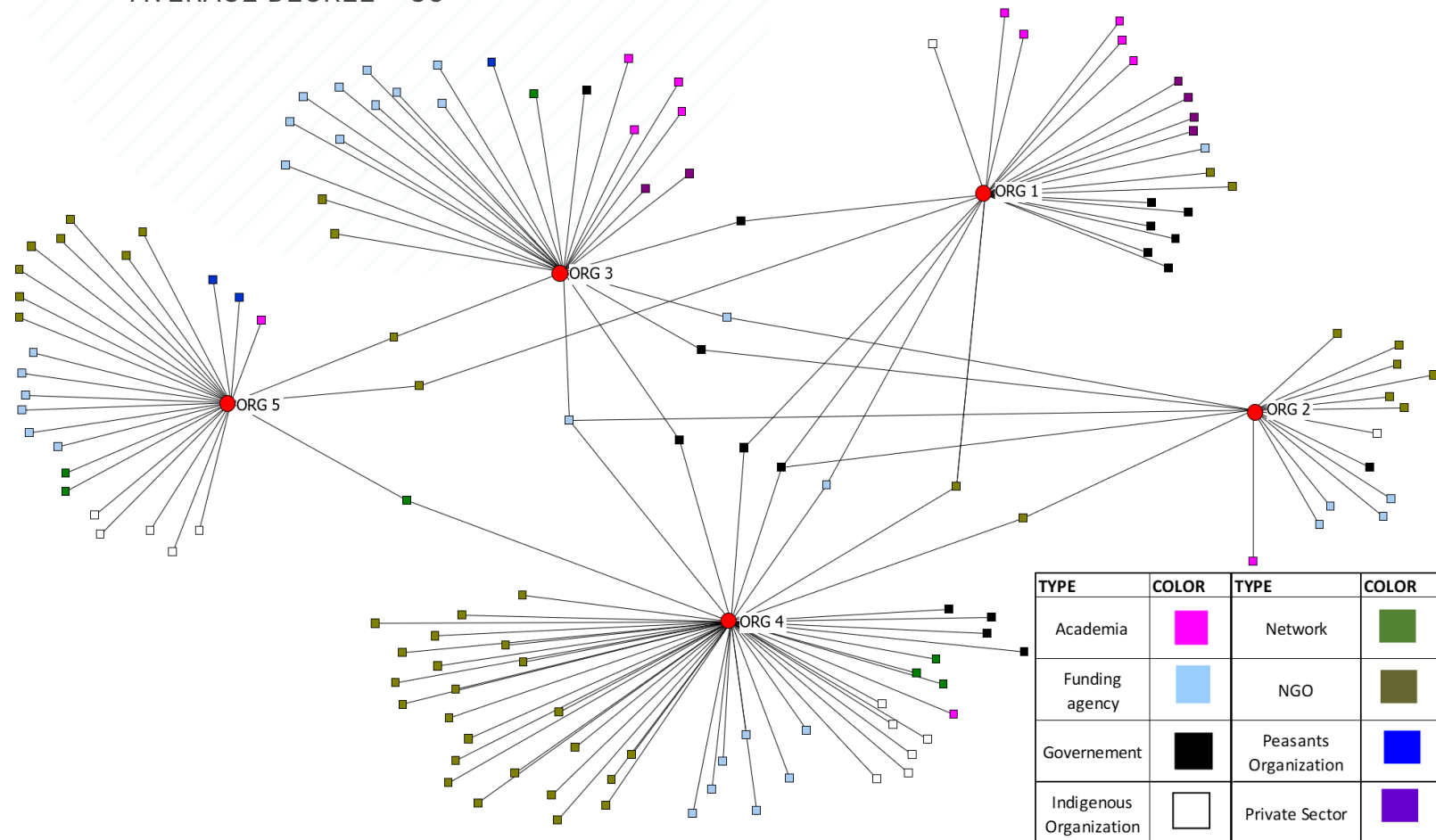
This network has a total of 220 collaborators, the highest from all the analyzed networks.

One focal organization - ORG 4 - shows a tie with a communicator.

COLLABORATORS

COLOMBIA

FOCAL ORGANIZATIONS = 5
COLLABORATORS = 145
TIES = 150
DENSITIY = 0.221
AVERAGE DEGREE = 30

TYPE	COLOR	TYPE	COLOR
Academia	(magenta)	Network	(dark green)
Funding agency	(light blue)	NGO	(olive)
Governement	(black)	Peasants Organization	(blue)
Indigenous Organization	(white)	Private Sector	(purple)

Highlights

Most of the collaborators in this network are NGOs and unique for each focal organization.

This network shows similarities with the Peruvian network in average degree: 30 (Colombia) and 26 (Peru). It also has similar categories and overall structure.
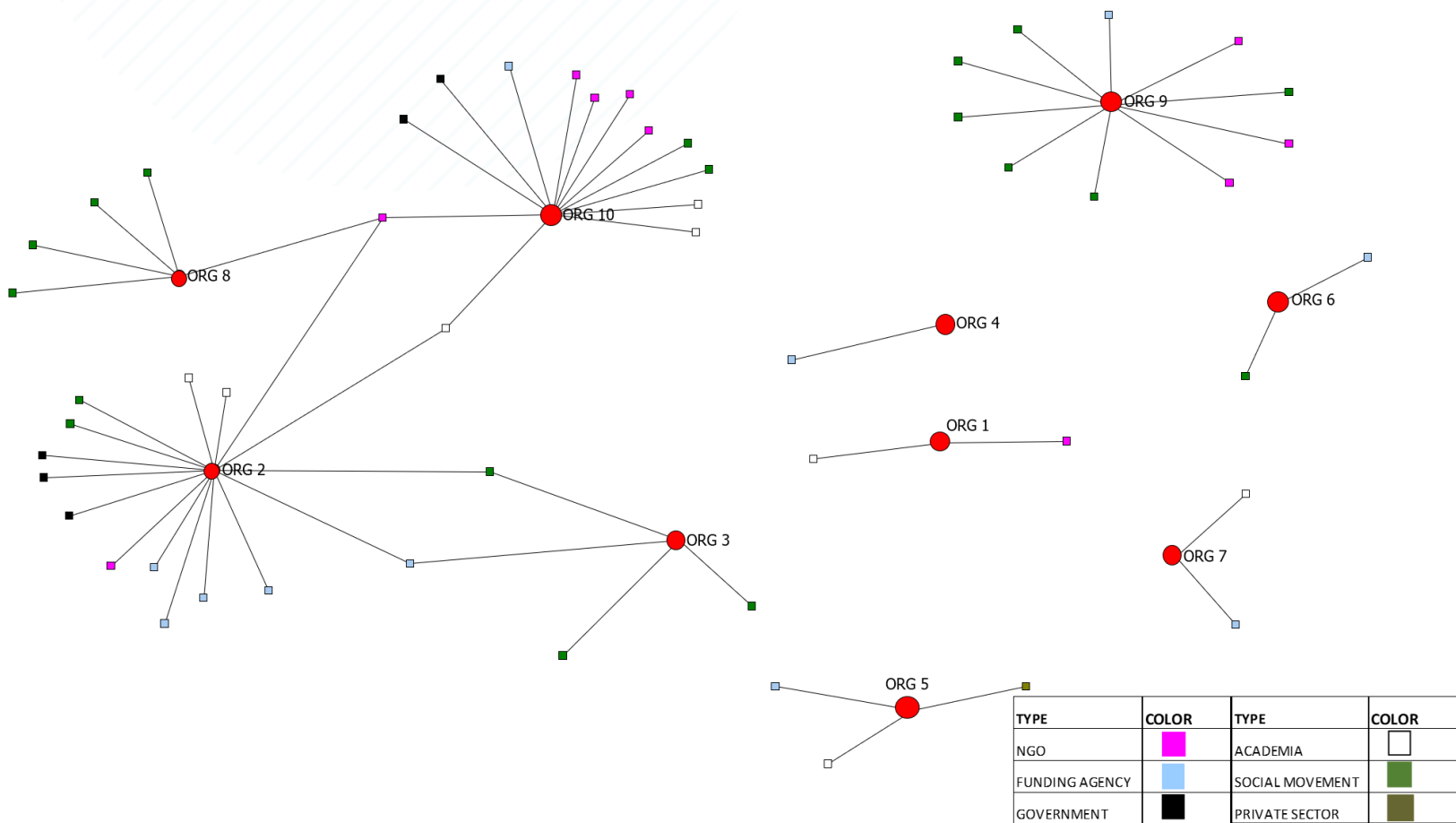
The common collaborators are mostly from the government and shared between two focal organizations at most. This network does not show common collaborators to all the focal organizations.

ORG 3 and ORG 5 have peasants organizations as collaborators.

COLLABORATORS

FOCAL ORGANIZATIONS = 10
COLLABORATORS = 53
TIES = 58
DENSITIY = 0.109
AVERAGE DEGREE = 5.8

BOLIVIA

TYPE	COLOR	TYPE	COLOR
NGO		ACADEMIA	
FUNDING AGENCY		SOCIAL MOVEMENT	
GOVERNMENT		PRIVATE SECTOR	

Highlights

Most of the collaborators in this network are categorized as social movements, and they are unique for each focal organization.

ORG2 has the largest number of collaborators (16), followed by ORG10 with 13; ORG9 with 10; ORG8 with 5; ORG3 with 4; ORG% with 3; ORG1, ORG6 and ORG7 with 2, and ORG4 with one.

This network shows the largest number of focal organizations (10); it also has the smallest number of average degree - ties per organization - (5.8), and density (0.109). This is the most sparse network from all the analyzed.
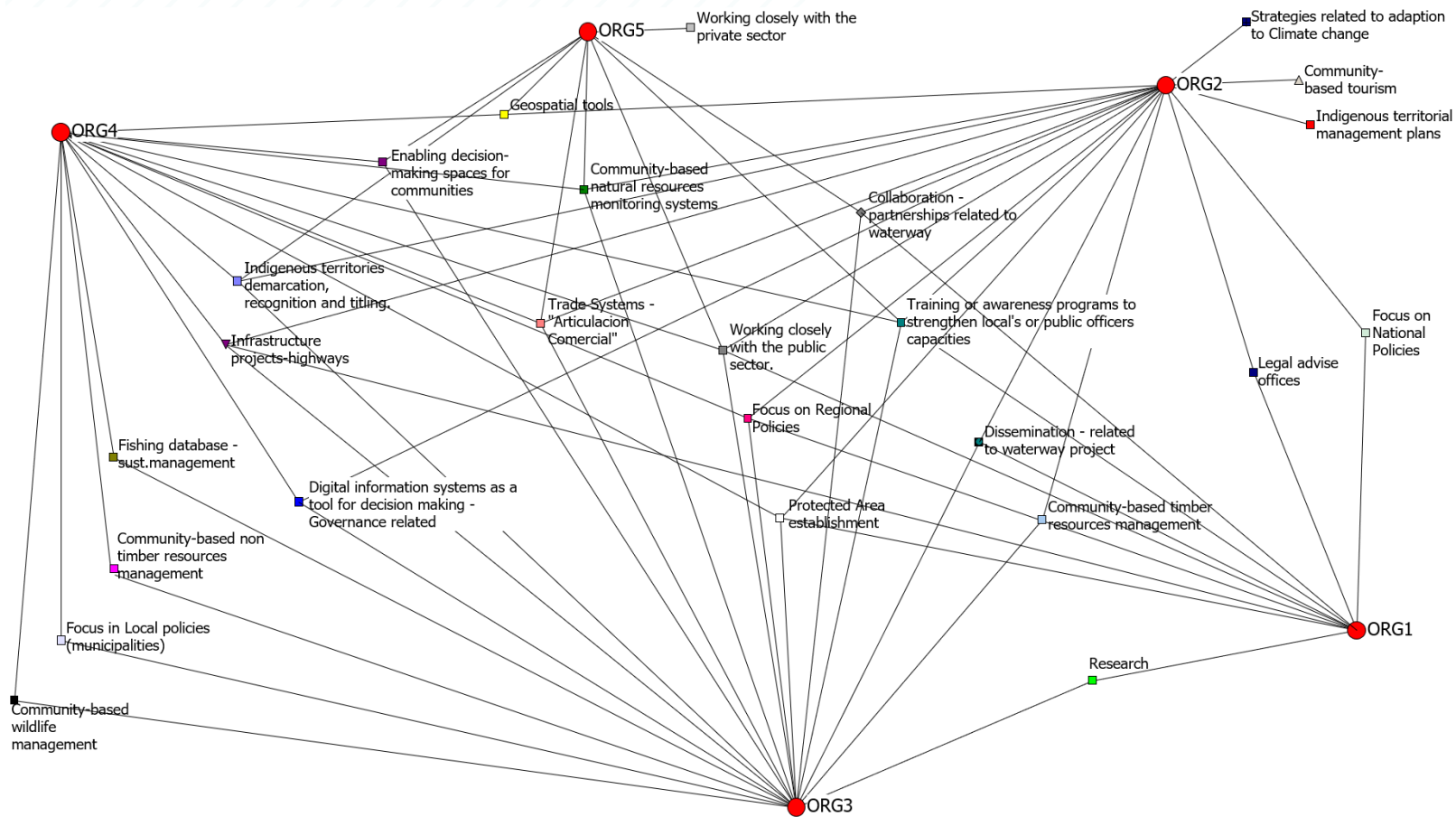
This can be visualized in the graphic, the overall structure of the network is partitioned.

STRATEGIES

FOCAL ORGANIZATIONS AND THEIR STRATEGIES

The following graphics display the focal organizations and their reported strategies.

PERU

Strategies

- Community-based non timber resources management
- Community-based timber resources management
- Community-based wildlife management
- Protected Area establishment
- Community-based natural resources monitoring systems
- Fishing database - sust.management
- Legal advise offices
- Enabling decision-making spaces for communities
- Training or awareness programs to strengthen local's or public officers capacities
- Working closely with the public sector.
- Working closely with the private sector
- Indigenous territorial management plans
- Research
- Geospatial tools

- Digital information systems as a tool for decision making - Governance related
- Trade Systems - "Articulacion Comercial"
- Indigenous territories demarcation, recognition and titling.
- Focus on National Policies
- Focus on Regional Policies
- Focus in Local policies (municipalities)
- Community-based tourism
- Strategies related to adaption to Climate change
- Infrastructure projects-highways
- Dissemination - related to waterway project
- Collaboration - partnerships related to waterway

STRATEGIES

BRASIL

ORG 4

ORG 3

Support for land title regularization in UCs, TIs and other areas

Support for livelihoods through sustainable use of natural resources

Territorial management and protection

Promotion of macro-zonings (ZEEs), integrated territorial management and ethno-environmental corridors
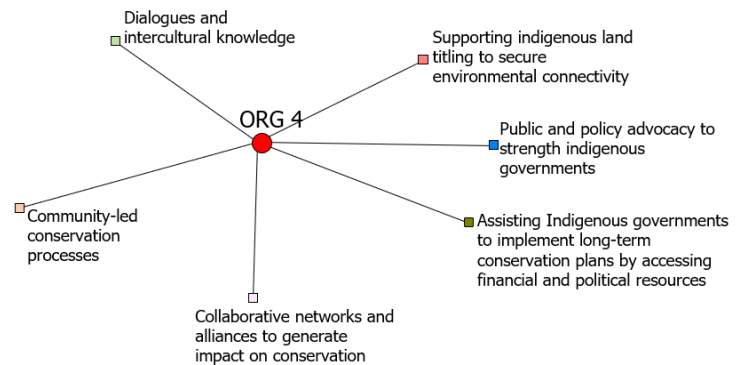
Supporting to individuals/organizations and indigenous communities

Support the creation of management plans, PGTAs, ethnozoning, etc.

Wildlife management and monitoring

Support of programs, public policies and legal frameworks

Capacity building to individuals/organizations and indigenous communities

Social and environmental studies

ORG 2

Mobilization through coordination and participation in forums

Financial support for conservation

Support for the creation or approval of TIs and/or UCs

Communication, ethno-environmental awareness, training and social-political mobilization

Promoting multi-sector partnerships and alliances

Legal defense of indigenous communities and their territories

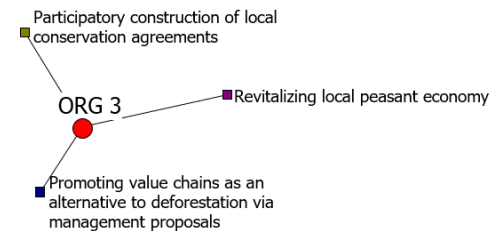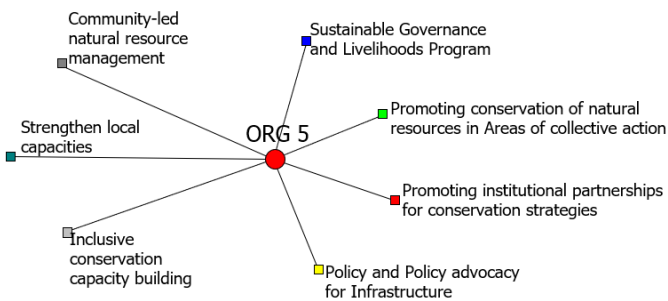Climate change adaptation and mitigation

ORG 5

ORG 1

Strategies

- Capacity building to individuals/organizations and indigenous communities
- Climate change adaptation and mitigation
- Communication, ethno-environmental awareness, training and social-political mobilization
- Financial support for conservation
- Legal defense of indigenous communities and their territories
- Mobilization through coordination and participation in forums
- Promoting multi-sector partnerships and alliances
- Promotion of macro-zonings (ZEEs), integrated territorial management and ethno-environmental corridors
- Social and environmental studies
- Support for land title regularization in UCs, TIs and other areas
- Support for livelihoods through sustainable use of natural resources

- Support for the creation or approval of TIs and/or UCs
- Support of programs, public policies and legal frameworks
- Support the creation of management plans, PGTAs, ethnozoning, etc.
- Supporting to individuals/organizations and indigenous communities
- Territorial management and protection
- Wildlife management and monitoring

STRATEGIES

COLOMBIA

ORG 2
- Community forest management
- Strengthening environmental governance
- Promotion of green road infrastructure
- Promoting sustainable use of the territory
- Strengthening regional collaboration to address the impacts of mercury pollution

ORG 1
- Sustainable use of natural resources
- Promoting food security
- Supporting legal aspects of indigenous territories
- Strengthen Biological connectivity
- Supporting Protected areas declaration establishment

ORG 5
- Community-led natural resource management
- Sustainable Governance and Livelihoods Program
- Strengthen local capacities
- Promoting conservation of natural resources in Areas of collective action
- Inclusive conservation capacity building
- Promoting institutional partnerships for conservation strategies
- Policy and Policy advocacy for Infrastructure

ORG 3
- Participatory construction of local conservation agreements
- Revitalizing local peasant economy
- Promoting value chains as an alternative to deforestation via management proposals

ORG 4
- Dialogues and intercultural knowledge
- Supporting indigenous land titling to secure environmental connectivity
- Public and policy advocacy to strength indigenous governments
- Community-led conservation processes
- Assisting Indigenous governments to implement long-term conservation plans by accessing financial and political resources
- Collaborative networks and alliances to generate impact on conservation
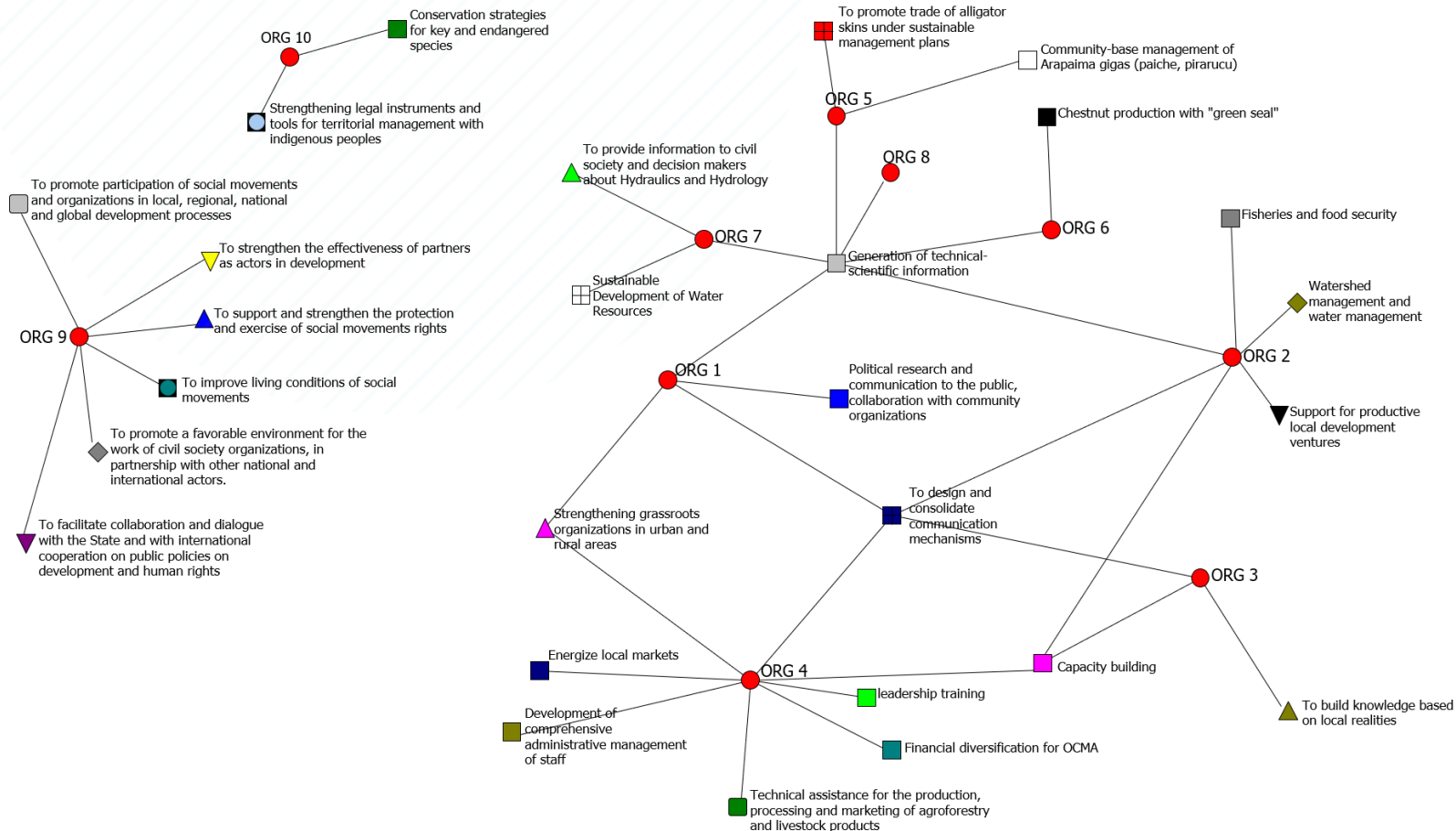
Strategies

- Promoting sustainable use of the territory
- Supporting legal aspects of indigenous territories
- Strengthen biological connectivity
- Supporting protected areas declaration establishment
- Sustainable use of natural resources
- Promoting food security
- Participatory construction of local conservation agreements
- Promoting value chains as an alternative to deforestation via management proposals
- Revitalizing local peasant economy
- Strengthen local capacities
- Community-led natural resource management
- Inclusive conservation capacity building
- Promoting institutional partnerships for conservation strategies
- Promoting conservation of natural resources in areas of collective action

- Policy and policy advocacy for infrastructure
- Sustainable governance and livelihoods program
- Supporting indigenous land titling to secure environmental connectivity
- Public and policy advocacy to strength indigenous governments
- Collaborative networks and alliances to generate impact on conservation
- Dialogues and intercultural knowledge
- Community-led conservation processes
- Assisting Indigenous governments to implement long-term conservation plans by accessing financial and political resources
- Strengthening regional collaboration to address the impacts of mercury pollution
- Community forest management
- Promotion of green road infrastructure
- Strengthening environmental governance

STRATEGIES

BOLIVIA

ORG 10 — Conservation strategies for key and endangered species; Strengthening legal instruments and tools for territorial management with indigenous peoples

ORG 9 — To promote participation of social movements and organizations in local, regional, national and global development processes; To strengthen the effectiveness of partners as actors in development; To support and strengthen the protection and exercise of social movements rights; To improve living conditions of social movements; To promote a favorable environment for the work of civil society organizations, in partnership with other national and international actors.; To facilitate collaboration and dialogue with the State and with international cooperation on public policies on development and human rights

ORG 5 — To promote trade of alligator skins under sustainable management plans; Community-base management of Arapaima gigas (paiche, pirarucu)

Chestnut production with "green seal"

ORG 8

To provide information to civil society and decision makers about Hydraulics and Hydrology

ORG 7 — Generation of technical-scientific information

ORG 6

Fisheries and food security

Sustainable Development of Water Resources

ORG 1 — Political research and communication to the public, collaboration with community organizations

ORG 2 — Watershed management and water management; Support for productive local development ventures

To design and consolidate communication mechanisms

Strengthening grassroots organizations in urban and rural areas

ORG 3 — To build knowledge based on local realities

Energize local markets

ORG 4 — leadership training; Capacity building; Financial diversification for OCMA; Technical assistance for the production, processing and marketing of agroforestry and livestock products

Development of comprehensive administrative management of staff

Strategies

- Generation of technical-scientific information
- Capacity building
- To promote participation of social movements and organizations in local, regional, national and global development processes
- To promote trade of alligator skins under sustainable management plans
- Political research and communication to the public, collaboration with community organizations
- Strengthening legal instruments and tools for territorial management with indigenous peoples
- Brazil-nut production with "green seal"
- Technical assistance for the production, processing and marketing of agroforestry and livestock products
- To support and strengthen the protection and exercise of social movements rights
- Community-base management of Arapaima gigas (paiche, pirarucu)
- To build knowledge based on local realities
- Sustainable Development of Water Resources
- Conservation strategies for key and endangered species
- To design and consolidate communication mechanisms

- Support for productive local development ventures
- Fisheries and food security
- Watershed management and water management
- Energize local markets
- Strengthening grassroots organizations in urban and rural areas
- Development of comprehensive administrative management of staff
- Financial diversification
- Leadership training
- To improve living conditions of social movements
- To strengthen the effectiveness of partners as actors in development
- To facilitate collaboration and dialogue with the State and with international cooperation on public policies on development and human rights
- To promote a favorable environment for the work of civil society organizations, in partnership with other national and international actors.
- To provide information to civil society and decision makers about hydraulics and hydrology

REFLECTIONS

The COLLABORATORS networks show information about the nature and structure of collaborations in the four mosaics.
We observe specific types of collaborators tend to be more abundant in each mosaic. In the case of Peru, funding agencies; in Brazil indigenous/communal organizations; in Colombia NGOs, and in Bolivia social movements.
The presence or absence of specific type of organizations influences the composition of the networks, consequently how focal organizations shape their niche, exchange information and/or generate knowledge.
In Peru and Colombia, the focal organizations have their own set of collaborators (not shared with the rest of focal organizations in each mosaic). They have unique partners exclusively working with them.
Further studies could bring some light into how patterns of ties can enhance or inhibit the management of natural resources, and conservation and infrastructure governance (Alexander et al., 2016; Mills et al., 2014).
Additionally, Network theory suggests that denser networks exhibit conditions to improve sharing and learning. In these types of networks

"Such dense, cohesive affiliation networks are generally characterized by high redundancy, trust and social support"

                    Lin et al., 2001

information flows faster, it is easier for organizations to achieve common goals. On the other hand, sparse networks tend to harvest innovation and are able to respond with more flexibility to change (Alexander et al., 2016; Mills et al., 2014; Lin et al., 2001; Hanneman, el at., 2011; Adger et al., 2007; Bodin et al., 2000; Borgatti & Halgin, 2015; Mannetti et al., 2015)
Of all the mosaics, Peru has the highest density with 0.277; followed closely by Brazil with 0.259; Colombia with 0.221, and the more sparse one in this analysis is Bolivia with 0.109.

REFLECTIONS

The density measures are very close from each other, we could argue Peru has more conditions to share information and achieve common goals. However, Brazil and Colombia are slightly less dense but they show greater average degrees of 58 and 30 respectively, while Peru has 26, less ties per focal organizations. In this case, even though the Peru network is denser, its average degree of 26 sheds some light on the structure when comparing it other networks, plus Brazil has a total of 220 collaborators making it the largest network from all.

Bolivia registered the highest number of focal organizations (10), nevertheless it shows a partitioned structure, with less diverse categories of collaborators (6), and with density of 0.109 making it the most sparse network. Thus, according to network theory, the Bolivian network could be more conducive to harvest innovation and to provide more competitive information (Granovetter, 1973).

Overall, both types of network structures - dense and sparse - produce distinctive practical implications in terms of operational efficiency and confidence (Kadushin, 2002; Stohl and Stohl, 2007; Borgatti & Halgin, 2011).

"Brokerage - sparse networks - promotes the dissemination of new information and resources across groups or social circles, which creates benefits and change."
Granovetter, 1973

For example, dense networks are more responsive to working for a common goal or to disseminate information faster; the sparse ones to input new information and react faster when changes take place.

However, these measurements need careful interpretation as each mosaic has unique features shaped by socio-political context and influenced by their interactions. Knowing these features allows to design better strategies for effective collaboration.

REFLECTIONS

The STRATEGIES networks showed different pattern and structure from the COLLABORATORS.

Brazil reported the highest number of ties and collaborators, here all the focal organizations draw upon the same set of strategies. Similarly, in Peru, the focal organizations made use of the same set of strategies.

However, even if Colombia and Bolivia's COLLABORATORS network shows different overall structure and composition, their STRATEGIES network is similar, as both show a partitioned structure, and the strategies they use are mostly unique for each focal organization.

In terms of the strategies they use and structure both Colombia and Bolivia networks potentially host new information not fully distributed across the network (as the collaborators network is partitioned).

This is unlike what we observe in Peru and Brazil, where the strategies are apparently well known and used by all the organizations, with their distinctive institutional traits.

CONCLUSIONS

- Studying interactions of diverse organizations is necessary to understand and enhance the current flow of information, knowledge generation and learning processes in conservation projects.

- Knowing the network structure and its fundamental characteristics can assist network managers in identifying and encourage innovative ideas and initiatives accumulated within the network. These analyses contribute on how to address specific challenges or opportunities the network is faced.

- The Peruvian and Colombian networks of collaborators exhibit structural similarities, with average degrees of 26 and 30, respectively. However, the comparative analysis of the STRATEGIES displayed a very different structure and content.

- The Bolivian network of collaborators and strategies displayed a partitioned structure. However, the Bolivian network of strategies reported the largest number of strategies (27).

- The Brazilian network of collaborators was the most diverse in terms of categories (11) and has the largest number of collaborators (220).

- The results indicate all mosaics would greatly benefit from having either a mosaic-specific or across-mosaic space (physical/virtual) to foster innovation and to facilitate new ideas and information sharing. Each mosaic would have slightly distinctive purposes. For example, the Peruvian and Colombian networks would promote innovation as their main goal, and the Bolivian and Brazilian networks would focus on training and enhance the flow of information.

- Additional examination should incorporate: team composition, funding available for the strategies, the time assigned for each strategies, collaborations (formal or informal, etc.), and other variables influencing effective collaboration, conservation and infrastructure governance.

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