

Environmental networks and the role of NGOs in the establishment of carbon sequestration projects: the case of Bananal Brazil

Redes Ambientales y el papel de las ONG en el establecimiento de los proyectos de captura de carbono: el caso de Bananal en Brasil

*Adriana Aguilar Rodríguez**

Abstract

The new demand for institutions to cope with both broadening and deepening interdependencies in the environmental global context has created the need for co-operation and co-ordination between individuals and social groups at the international level. In this context, local environmental needs are not easily incorporated into the global agenda, largely dominated by global organizations highly influenced by the governments of developed countries and large international NGOs. The domination of the international environmental agenda by strong global actors obviously limits the ability of poor countries and local communities to properly address their specific needs.

This paper assesses the role played by NGOs in environmental networks in the context of the implementation of a carbon reduction project in Bananal, Brazil. The analysis shows that NGOs can either help or hinder the incorporation of global and local issues into the environmental agenda. In particular, the case study analyzed here suggests that the nature of the links between participants in an environmental network is the main factor determining the benefits obtained by each member. The case of Bananal shows how by studying the nature of the links, it is possible to determine the distribution of power and the degree of dependence of each participant as well as his or her influence on the decision-making power of other network members.

Key words: environment, carbon projects, networks.

* PhD in sociology from the University of Manchester, UK. Research fellow at the Centro de Investigación en Geografía y Geomática "Ing. Jorge L. Tamayo," A.C. Research areas: environment, carbon capture, social network theory, Brazil. E-mail: aaguilar@centrogeo.org.mx

Resumen

La demanda de instituciones que enfrenten el amplio y profundo problema que representan las interdependencias en el contexto global del medio ambiente, creó también la necesidad de generar mecanismos internacionales de cooperación y coordinación entre los distintos individuos y grupos sociales. Sin embargo, las necesidades ambientales a nivel local no son integradas fácilmente a la agenda global, la cual está dominada en gran parte por organizaciones globales que están altamente influenciadas por los gobiernos de los países desarrollados y las grandes Organizaciones No Gubernamentales (ONG) internacionales. Claramente, el dominio de la agenda internacional por actores globales poderosos limita la capacidad de los países pobres y las comunidades locales para hacer frente a sus necesidades ambientales específicas.

En este trabajo se evalúa el papel que desempeña las ONG en las redes ambientales dentro del contexto de la implementación de un proyecto de reducción de carbono establecido en Bananal Brasil. El análisis muestra que las ONG pueden ayudar o impedir la conexión de los problemas globales y locales en la agenda ambiental internacional. En particular, el estudio de caso aquí analizado sugiere que la naturaleza de las relaciones (vínculos) entre los miembros es el principal factor que determina los beneficios que cada participante obtiene en una red ambiental. En otras palabras, el caso Bananal muestra cómo el análisis de la naturaleza de las relaciones o vínculos entre los participantes determina la distribución de poder y el grado de dependencia de cada participante, así como su influencia en la red.

Palabras clave: ambiente, proyectos de carbono, redes.

Abbreviations

Bananal	Ilha Do Bananal
FCCC	United Nation Framework Convention on Climate Change
IE	Instituto Ecológica Non Governmental Organization
NGO	Non Governmental Organization
OECD	Organisation for Economic Co-operation and Development
PPP	Polluter Pays Principle
AES	AES Barry Foundation

Introduction

The new demand for institutions to cope with both broadening and deepening interdependencies in the environmental global context has created the need for co-operation and co-ordination among individuals and social groups at the international level. In response to these needs, a global environmental governance system has been created through a series of multilateral environmental agreements. In this context, local environmental needs are not easily incorporated into the global agenda, largely dominated by global organizations highly influenced by the governments of developed countries and large international NGOs. The domination of the international environmental agenda by strong global actors obviously limits the ability of poor countries and local communities to properly address their specific problems and achieve sustainable development as well as democracy.

It is a well known fact that, by pooling their concerns and resources in networks, small civil organisations may achieve the required bargaining power to put their local environmental concerns on the international agenda. However, there is very little analysis of the impact of NGOs practices and behavior on the power and influence of local actors at specific times in the context of global environmental governance. In this context, it is unclear to what extent these networks have effectively influenced global policy making in environmental issues. This paper seeks to determine how far NGO networks have incorporated global and local issues into their policies regarding the environmental policy of carbon sequestration projects using network theory as the main analysis tool. In particular, this paper analyzes a carbon reduction project currently being implemented in Bananal, Brazil.

This paper's hypothesis suggests that the ability of NGOs to facilitate the incorporation of global and local issues depends on the nature of the links¹ between NGOs, local actors, and other participants. In particular, it is argued that the nature of the links between participants plays a key role in the distribution of power and the possibilities each actor has of effectively influencing the environmental agenda.

This paper is organized as follows: section 2 discusses the theoretical basis of the network analysis in order to clarify the concept of network and determine the methodological approach of this paper. Section 3 discusses the general issues involved in climate change in order to offer a better understanding of the topic. Lastly, section 4 describes the framework of the carbon projects and their implementation in the local context through the presentation and analysis of a study case in Bananal, Brazil.

¹ The nature of links refers to the intrinsic characteristics of the relationships that each actor has with other actors, v.g. the strength of the relationship/link (null, weak, strong); the opportunities to transmit information/resources (positive and negative links), the possibilities of accessing resources and so on.

Theoretical considerations

Emerging international political actors, equivalent to global NGOs are beginning to compete with governments in terms of influence and representation at the global level. Many scholars of politics argue that the existence of new political actors at the international level can create potential channels for local actors to influence the international agenda. However, in network theory, the existence of transnational actors such as NGOs does not in itself guarantee local actors' access to decision-making at the global level. For network analysis, the actions of transnational political actors can either help or hinder the potential participation of local actors in the international sphere. In this context, this section discusses the theoretical basis of network analysis in order to clarify the concept of networks and outline the methodological approach used in this paper.

Definition of network and links

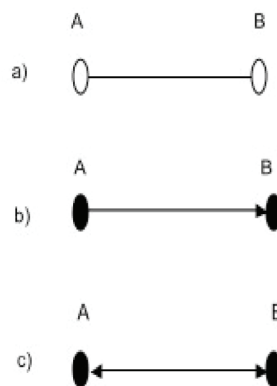
A network is a set of nodes linked by some form of relationship and delimited by certain specific criteria (Diani, 2003). According to Uzzi (1996), networks operate within an embedded logic of exchange that promotes better performance for actors through resource pooling, co-operation, and co-ordination. Moreover, the network is the social structure that embeds power relationships.

Emerson (1962) defines a node as an actor who has a series of reciprocal links with other actors. From this point of view, a node may be a person, a corporate group, an organization, a role-occupant, or other entities such as neighbourhoods or states. Most existing network theory assumes that the structure of the network is an exogenous factor² and that the types of networks in which actors are embedded define the set of available opportunities for the dissemination of information, and the flow of resources, and influence/power. In other words, the network structure is regarded as a given. Within this framework, network theorists attempt to identify the effect of a given network structure on individual behavior (Bala and Goyal, 2000). Given this objective, the relation between nodes is commonly described as Non Directed links. A Non Directed link refers to a link where information may flow in any direction. This concept, however, does not reveal the direction of the information flow in every instance of communication, nor does it specify how information actually flows. Furthermore, traditional network theory assumes that the emergence of a link only occurs if two neighbouring agents agree to connect each other. In other words, co-operation between individuals is necessary in order to connect with each another. Classic network theory also assumes that the cost and benefits of establishing a link are shared by both actors (Bala and Goyal, 2000). Figure 1a shows an example of a non directed link.

² The analysis of the structure of a network can be exogenous and endogenous. For more information see Bala and Goyal, 2000.

Recent research suggests that network structure is an endogenous factor and that the nature of the links between nodes determines the characteristics of the network. This new approach to network analysis seeks to explain why and how different kinds of network structure emerge, rather than assuming structure as a given fact. As a result, scholars emphasize that the entry of individuals into a given network is a decision subject to choice (Bala and Goyal, 2000). In the new perspective, networks may be formed with or without co-operation between individuals while the cost of maintaining links is not necessarily evenly distributed among participants. These assumptions imply that two types of directed links may exist: unilateral and bilateral. We can say that a unilateral link from A to B exists if the establishment of a link allows the flow of information from A to B but not from B to A. Likewise, a bilateral link exists if a single link suffices to convey information from A to B and from B to A. For example, if A sends an e-mail to B, information can only flow in one direction in a single letter. This is because the nature of the link (e-mail) does not allow the use of the same link to answer back. If B wants to answer A, she must send a different communication and pay for it. See Figure 1b for an example of unilateral links. Conversely, if A calls B by phone, the flow of information from B to A would be possible in the same phone call (bilateral). That is, A establishes a link with B whereby information can flow both ways; B can directly receive the information conveyed by A, and in return B can answer and convey information to A, regardless of the fact that A will pay for the whole cost of connection (remember, A initially made the call). Figure 1c shows an example of a bilateral link.

Figure 1: Non Directed Link, Unilateral Links and Bilateral Links



Source: developed by the author.

In this context, this paper assumes the network structure as an endogenous one. In other words, this paper considers the nature of the links between actors as the main factor determining the network structure (see Bala and Goyal 2000). As a result, this paper will consider five characteristics of the links as a determinant of the power relations in the network:³ (a) density, (b) centralization, (c) cost of connection, (d) degree of heterogeneity, and (f) strength of links. Density refers to the number of persons comprising a network. The density of a network is important in that it reflects the amount of resources available to different network partners. Snow et al. (1980) point out that the density of a network is a good measure of the power of the network. In other words, the author suggests that the power of a network increases with the number of its members. Snow et al. (1980) also argues that network power influences recruitment and obliges non members to behave in accordance with the network goals.

Centralization determines whether individuals are concentrated or sparsely distributed in the network space, where space does not necessarily refers to geographical space. Centralization in a network is a key factor because actions are more likely to thrive when individuals know each other well rather than vaguely. However, a decentralized network offers more opportunities because individuals are more heterogeneous and therefore have more information to exchange (Marwell et al., 1988). For Diani (2003), centralization or decentralization may create a difference in terms of influence and power. For instance, more centrally located actors can engage in a better exchange of resources and/or information than peripheral organizations and are therefore more powerful. Cost of connection can play a key role in an actor's decision to enter a network. In fact, high costs of establishing a link in a network may prevent the emergence or growth of a network (Marwell et al. 1988). Degree of heterogeneity refers to the relative difference between the characteristics of each individual/node in the network. It is important because different individuals may have different resources and interests. Obviously, the more homogenous a network, the less important the function of each particular node and vice versa (Marwell et al., 1988). Lastly, strength of links refers to the existence of weak, strong or non-existent links between individuals. According to Granovetter (1973), the strength of a link in the network depends on distance, resources, time, identity, reciprocal services, role, and in general all the benefits that give individuals more advantages in the network. The less benefits an individual obtains from a partnership in the network, the weaker or more powerless its link with such an actor/node and vice versa.

³ In other words, the nature of links refers to the intrinsic characteristics of the relationships. In this case we consider only five characteristics (density, centrality, cost of connection, heterogeneity, strength) not only in terms of the structure but also in terms of each actor.

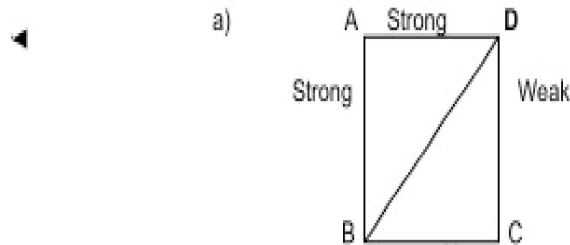
Network structure

Structure refers to the configuration of links and positions whereby actors are linked (Cook and Whitmeyer, 1992). The nature of links and the position of nodes may not only create opportunities and benefits but also determine the power of the actors in the network. This is because it affects the amount of information and the number of contacts available to actors (Diani, 2000). However, according to Collin (1981), network structure not only affects opportunities for participation but also restricts actors' capacity to act in the network. This is because actors are embedded in social relations beyond their control. Moreover, these social relations determine the consequences and conditions under which actors behave in the network. In this context, access, actors' positions, and the nature of the links are essential to shaping the network's power structure.

Many scholars have emphasized the problem actors face in accessing a network. According to Emerson (1962), a lack of institutional mechanisms for regulating fair exchange in a network may create incentives to establish barriers or restrictions on entry in order to preserve reciprocal trust between members. In this context, Marsden (1983) argues that network mechanisms that limit contact between individuals create a series of relations that determine an actor's position and the benefits of exchange. In particular, these access rules may influence issues such as resource control, number of contacts and interest satisfaction.

Supporting Marsden's idea, Emerson (Emerson, 1962) argues that power relations between actors must be defined by the relative dependence of the actors on each other. For Stevenson (2000), in order to explain why some actors are enabled or constrained by their network, it is necessary to understand an actor's position as a factor that determines power and inequality in the network. For instance, an actor who is centrally located may be more successful or powerful than peripheral actors because centrally located actors have a great influence. Conversely, peripheral actors may be powerless due to their dependent position and the difficulty of accessing network resources (Stevenson and Greenberg, 2000). Figure 2a shows an example of the relationship between centrally located and peripheral actors.

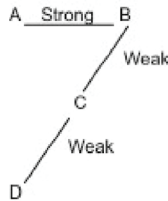
In contrast with Stevenson, Yamagishi (1988) stresses the nature of network connections as the main factor determining the locus of power in a network and the distribution of scarce resources rather than the actor's position per se. The author argues that both negative and positive connections involve different exchange processes. In this context, relations between members are not only determined as A-B or B-C, but there are also relations that imply A-B-C structures (Figure 2b shows an ABC Network Structure).

Figure 2: Central and Peripheral Actor and Network Structures

Source: developed by the author.

In figure 2b, A is only connected to C through B. We say that a positive connection exists if B allows the connection between A and C. In this case, B can benefit from the fact that it is between A and C and may charge a communication fee. We say in that case that B is not offering facilities for the relation between A and C, meaning that B is creating a negative connection between A and C (Yamagishi et al., 1988). If there are only negative connections, negative links determine the power distribution in the network. Conversely, if there are positive connections alone, local scarcity of resources determines the distribution of power in the network — where local scarcity is determined by the whole amount of resources in the network and the distance from one node to another in the network. Lastly, in a mixed network, the distribution of power is a joint function of network position and local scarcity (Yamagishi et al., 1988).

Diani (2003) agrees that nature of links rather than actor position determines relative power in the network. Moreover, Diani points out that position can affect the chances and forms of participation when strong and weak links are more important in terms of power. For instance, strong positions may hinder the exchange (of information and/or resources) in the network. Conversely, a weak position may facilitate, moderate, or allow the diversification of exchange. Granovetter (1973) stresses the idea that weak links may produce more cohesion in the network. Figure 3 gives an example of how weak links may erode the power of a strong link. In figure 3, A has a strong link with B. Given the strong nature of the link, A may extract a rent from its relation with B. Now if B creates a weak link with C, this is not enough to challenge the power of A in its relation with B. But if B is connected via a weak link to a third node, D, then the pooling of the weak links between B and C and C and D may be enough to reduce A's power in its relation with B. In other words, the power of weak links may help discipline A in its relation with B.

Figure 3: Power of Weak Links

Source: developed by the author.

However, Marsden (1983) says that weak links, with few possibilities of contact exchange, may lead to price-making behavior. In this context, individuals seeking to establish a weak link may be required to pay an entry fee before they are allowed to benefit from membership. In the case of figure 3, B has a preferential position with respect to C and D because B is the only network member who can facilitate the exchange of information and/or resources between A and C and D. If C and D have few opportunities to find other exchange partners in the network capable of connecting them with A, and the benefits of exchanging are high, B may request a fee from C and D for its connection services with A.

In short, network theory seeks to explain how and why actors connect with each other in a network of relationships where their capacity to act in the network depends on the nature of the links. The nature of these links may determine the locus of power between actors. This paper seeks to analyze the degree to which NGO networks have connected the global and local issues in their politics around the implementation of international Climate Change policy. In order to build up the network of analysis, this paper is based on descriptive works about the Ilha Do Bananal carbon project in Brazil. This paper uses key information to define the elements of the network (actors and links) and analyze this information using a Social Network Analysis approach.

This work begins by discussing general issues concerning the climate change convention in order to offer a better understanding of the subject. In order to achieve these objectives, section 3 discusses the negative effects of climate change and the problem of setting a climate change agenda at the global level.

Environment and climate change

It is a well-known fact that environmental pollution has become a global problem not only because natural resources such as water, soil, and air are being contaminated in many places around the world, but also because the negative effects of environmental degradation are felt in places other

than the location where pollution is actually created. This phenomenon is known in the literature as transboundary contamination (Figueres and Ivanova, 2002). The classic example of transboundary contamination is air pollution because this kind of contamination cannot be confined to a single space. Toxic gasses released into the atmosphere, such as lead, cadmium, copper and fluorocarbon, may travel long distances due to the action of wind and most of these toxic substances have the potential to alter the climate and environment in remote areas (Gay, 1994).

Industrial activity is undoubtedly the main factor causing global climate change. In the last century, the expansion of capitalism and production in the world dramatically increased the release of toxic gasses into the atmosphere, creating a major global problem.

Toxic gasses released into the atmosphere have direct and indirect negative effects on natural ecosystems. Direct effects are related to the modification of the flow of water and greenhouse gasses such as CO₂, CH₄, and N₂O that impact the composition of the climate and atmospheric systems. These flow modifications can result in immediate changes in climatic properties and influence the worldwide environment in ways such as global warming and the depletion of the protective ozone layer. Indirect effects refer to all the side effects produced by the speed of climate change that make it difficult for vulnerable ecosystems to cope with the new conditions. Alterations in the biological and physical properties of humidity, albedo and wind can drastically modify local, regional and global-scale vegetation, soil, water, and in general, all natural ecosystems (Ojima et al., 1991). Moreover, the indirect effects of climate change may reduce rainfall, runoff and soil moisture and exacerbate desertification and droughts. Lastly, climate change may increase the incidence of natural phenomena such as hurricanes, tsunamis, and the rise of sea levels at various latitudes. This not only threatens the survival of animal and plant species but also the security of human beings.

It is important to note that the negative effects of climate change are not felt in the same way throughout the world. This implies that ecological and human vulnerability varies by area. The level of vulnerability of a region is determined by three main factors: a) the social and environmental factors that determine the level of impact; b) the degree of regional and local exposure to risk; c) the timing, magnitude, and duration of the risk; and d) the capacity to respond and recover (Wohl et al., 2000).

Developed countries, for instance, are less vulnerable to climatic and environmental stress due to their large economic and political capacity. Conversely, developing countries are more vulnerable because most of their population depends on agriculture and the use of natural resources.

A major environmental event may therefore produce a sharp decline in standards of living and jeopardize people's future opportunities (UNDP, 2002).

Environmental stress affects the poor more than the rich for many reasons. First, poor people typically live in ecologically vulnerable zones that are extremely prone to environmental disaster. Second, due to their lack of financial resources, the poor are not well equipped to provide a swift response in order to minimize the damage caused by environmental stress or disruption. Third, ecological shocks commonly destroy the only assets of the poor such as houses and crops and lead therefore to serious economic stress. Finally, the poor have less capacity to recover from contingencies in the short run. All these factors increase the vulnerability of the poor (UNDP, 2002).

The reduction of environmental resources may affect different groups and/or individuals in different ways. For example, in the case of women and children, a shortage of natural resources may entail substantial time costs since these groups of persons spend a large proportion of the day on activities such as fetching water and chopping firewood. Moreover, ecological disruptions may lead to a shortage of resources and gender and racial conflicts over access and control (Davidson et al., 1992).

Linking the local and the global in carbon projects

Carbon sequestration projects are one of the main mechanisms created by global environmental institutions, such as the Organisation for Economic Co-operation and Development (OECD) and the United Nation Framework Convention on Climate Change (UNFCCC) to solve the problem of climate change. The main idea is to build a system that adopts the “Polluter Pays Principle (PPP)”. This economic approach considers that market prices fail to reflect the true social cost of producing a commodity because they do not take into account the pollution costs their production entails for society as a whole. This, in turn, gives private firms an incentive to produce more pollutants than is socially optimum. The “PPP” avoids this market failure by obliging firms to pay, and internalize, the full social cost of their actions (Baldwin, 1978). The idea of internalizing pollution costs has led to the establishment of many international agreements that oblige or encourage governments, industries, and society as a whole, to comply with PPP. The principal mechanism has been the creation of an environmental market whereby polluters are compelled to buy pollution rights if they exceed their given allowance. Implementation of PPP in the forestry sector has led to the development of an environmental service sector dedicated to the implementation of tree planting projects that supply carbon sequestration certificates.

Within this context, international climate change initiatives have established a series of agreements designed to incorporate local actors into international carbon markets. Indeed, the main aim of tree planting projects is the inclusion of smallholders or communities that have difficulty accessing economic benefits by allowing the participation of a third party such as an NGO

to help incorporate people into the scheme and ensure the provision of information and the proper management of resources – natural, economic, and human capital.

In other words, tree planting carbon projects involve the creation of ecological projects to reduce emissions and/or projects to sequester carbon through reforestation or afforestation activities. One of the key ideas behind tree planting schemes is to bring international investment to the forestry sector. Even more importantly, tree planting projects are expected to yield a series of benefits not only at the international level by reducing carbon emissions into the atmosphere; but also at local level by improving the living standards of local people (Aune, 2003).

It is assumed that the intervention of national and international NGOs to encourage actors to participate in the international environmental policy may provide unprecedented opportunities for local actors to put forward their interests. Most literature in politics points out the potential of NGOs for delivering more services at the local level such as facilitating decision making, capacity building, and co-operation (Lipschutz and Mayer, 1996) (Young, 1994). However, there is very little analysis of the impact of NGO practices and behavior on power and influence in specific local actors at set times.

This section attempts to determine the extent to which NGO networks have facilitated the incorporation of global and local issues regarding Climate Change policy using network theory as the main analysis tool. In particular, this section will analyze a carbon reduction project implemented in Brazil known as the Bananal project.

Methodology of the carbon mitigation projects in Brazil

The methodology of these works is based on many descriptive works about the Ilha Do Bananal Carbon project in Brazil but analyzed using the network approach. In particular, this analysis used the information on the Bananal case. Indeed, through a bibliographic review, this paper gathered relational data on the ties, contacts, and other kinds of attachments each actor has with the others in the Bananal project. Through this technique, this paper builds the structure of the network and identifies: i) the main actors participating in the project; ii) the role of each actor in the network; iii) the actors' actions and strategies; iv) the work supported by information obtained from the Instituto Ecológica (IE), a non governmental organization (NGO) responsible for the information in the project during 2004-2005; and lastly v) the collected relational data was analyzed using a Social Network Analysis design.

The case of carbon mitigation projects in Brazil

A carbon mitigation project was implemented on Bananal Island in 1997. Bananal is located in Tocantins State located in the northeast of Brazil that forms part of the Amazon region. Bananal has an enormous range of biodiversity comprising savannah bush land, tropical rainforest and marshlands. For this reason, Bananal is regarded as one of the most important ecological reserves not only in the region but also in the world (May et al., 2004).

For centuries, the only inhabitants of Bananal Island were indigenous people who engaged in the sustainable management of natural resources not only because their economic activity was primarily based on fishing activities that allowed them to exert less pressure on forests, but also because the indigenous view of nature allowed them to have greater synergy with the environment. However, the recent exploitation of mineral resources and the establishment of agriculture projects in the region have encouraged the migration of non indigenous people to the zone. This situation has led to two main problems. On the one hand, the establishment of new settlements has driven indigenous communities to more ecologically vulnerable areas. This situation impacted negatively on indigenous communities, who were forced to abandon their traditional livelihood and begin trading forest goods as the only means of survival. Moreover, the newly settled groups have implemented a subsistence agriculture system where the lack of sustainable management practices has led to the deforestation of vast areas (Viegas and Doppler, 2004). In fact, deforestation rates in the Amazon region have dramatically increased over the past thirty years and nearly 44 % of the total forest area has been lost during this period (Abad, 2004).

The structure of Ilha Do Bananal carbon project in Brazil

A carbon project called Ilha Do Bananal (Bananal) began in 1997. The project was an initiative launched by the AES Barry Foundation (a gas-energy facility),⁴ which wanted to offset its carbon emissions for its expected life. The aim of the project was carbon sequestration in a terrestrial ecosystem through forest preservation, the regeneration of degraded woodland and reforestation. The principal objective was to prevent deforestation in the Bananal region.

The strategy was based on two main initiatives. First, the establishment of an international, interdisciplinary research program to provide scientific information and technology for carbon

⁴AES Barry, now Centrica Energy, is a company that owns and operates six gas-fired power stations in England and Wales. The company sponsors the emergence of the Bananal project as parts of its own environmental obligations to reduce carbon emission from its economic activity. In general, these carbon sequestration initiatives were also part of the UK's obligations to reduce its carbon emissions according to the Clean Development Mechanisms (CDMs) established by the Kyoto Protocol. CDMs are designed to reduce carbon emission through the establishment of carbon sequestration projects in developing countries.

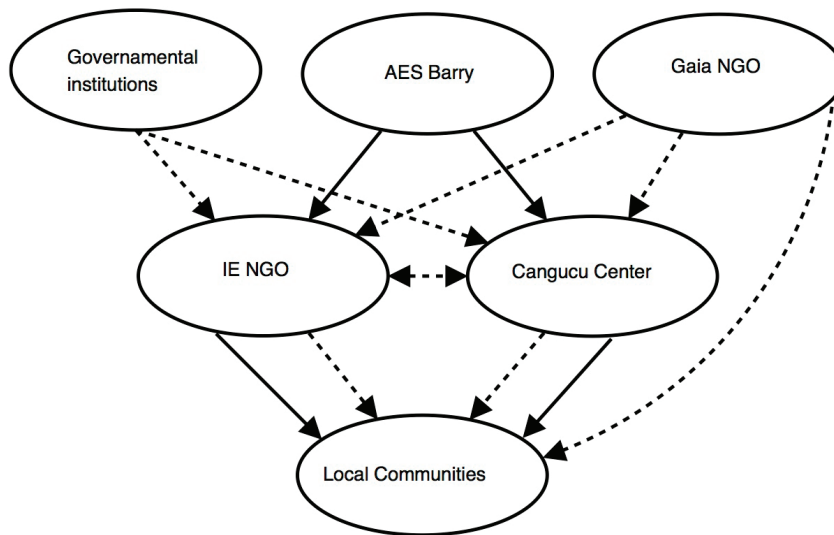
sequestration. Second, the establishment of an educational environmental program in the communities based on the creation of school networks (May et al., 2004: 53-55).

The project was structured as follows: a) AES Barry Foundation, a company located in Wales which provided founding for the project; b) IE responsible for implementing the project and co-ordinating the actions of the partnerships; c) Two government partnerships, IBAMA, a Federal Agency responsible for Araguaia National Park and Naturatins, a state agency responsible for two natural reserves in Do Cantao State Park and the Cantao area. Both governmental organizations (OG) were responsible for collaborating in the project's environmental preservation goals; d) Gaia, an NGO experienced in environmental education, responsible for providing environmental knowledge and sustainable alternatives in local communities; and lastly, e) Cangucu Center, a new research institution formed and financed by AES Barry Foundation in order to generate environmental knowledge of the region (May et al., 2004). In this context, actors such as AES Barry Foundation are seen as international firms.

Mapping networks in the Ilha Do Bananal project

If the Bananal carbon project is regarded as a network, then this project can be said to be a network with six nodes: a) AES Barry Foundation; b) IE; c) Government institutions such as IBAMA and Naturatins; d) Gaia NGO; e) Cangucu Center; and f) Local communities that were not incorporated into the project as active participants yet played a special role.

Giving the density of the Bananal network due to its large number of participants, it was difficult to determine the nature of the links between members. In this context, we can say that the Bananal project had two kinds of network: a financial resource network and a knowledge network. On the one hand, there was a network with direct influence, determined by the amount of resources of each organization/node (Figure 4 describes the Bananal Project Network). In this case, AES Barry Foundation has a direct influence on all organizational/nodes since it financed the whole project. This fact allowed AES Barry Foundation to have total control of the objectives and organizational matters. This situation reduced the scope for decision making of all the participants, but especially IE and the Gangucu Center, which rely directly on BF decisions. In this context, local communities had no possibility of influencing the project due to the lack of capital and links with the central node (AES Barry Foundation). As a result, AES Barry Foundation's financial capital determined its central position due its centralized power in the network where the decision-making and resources flowed unilaterally from the center to the peripheral nodes (See the black unilateral links in figure 4).

Figure 4: Bananal Project Network

Source: developed by the author.

On the other hand, since part of the Bananal project involved providing environmental education, the Bananal project was also a network of information or indirect influence (See the dotted links in figure 4). In this network, the nature of the links was determined by the dissemination of knowledge between organizations/nodes. Although the AES Barry Foundation played a key role due to its control of the project, the transmission of information in the network followed another dynamic. In this context, the transmission of knowledge in the network not only depended on its dissemination but also on its adoption by individuals.

On the basis of this idea, each heterogeneous organization/node in the Bananal network were seen as a decision unit that chose whether or not to participate in the sequestration project and to adopt innovative environmental management behaviour.

In this context, IBAMA and Naturatins, which served as facilitators, could choose whether to participate and expand their participation in the Bananal project. In that context, IBAMA and Naturatins, as a government institution, decided to only contribute to the transmission of information when their activities matched the aims of the Bananal project. This meant that IBAMA and Naturatins' aims were not subordinated to the Bananal project. On the contrary, IBAMA and Naturatins only shared key information with the Bananal project because they pursued similar goals. Figure 4 show how the links between governmental institutions (IBAMA and Naturatins)

were connected to the Bananal project in a unilateral form whereby influence and information only could flow from IBAMA and Naturatins to the Bananal Project. The same was true of Gaia, another independent organization/node in the network with unilateral links with other organizations/nodes (See the dotted links of Gaia in figure 4). Within this scenario, Gaia's contribution to the network also depended on the extent to which the Bananal project shared objectives with Gaia (transmission of environmental education).

Lastly, although local communities had no financial or human capital to offer the network, local communities' role in the projects was crucial to achieving its aims. This is because the Bananal project was designed to prevent deforestation but, since human activity is the principal factor in deforestation, the project's goals could only be achieved if local communities' behaviour was modified. The decision by local communities whether to maintain their current environmental management behavior or to adopt innovative environmental management behavior was a key factor in the project's development. This factor strengthened the position of local communities in the network to such a degree that the main needs of local communities were taken into account in the Bananal project in order to encourage change in their behavior in a more sustainable manner. Simply put, local communities had indirect control over natural resources in the Bananal region due to their potential capacity for deforestation.

In this scenario, the interaction between the direct influence network (financial resources) and the knowledge network made the AES Barry Foundation change its strategies. Initially, the project's strategy was based on providing environmental education for the community. In this initial approach, the problem of deforestation was approached as a cultural problem —i.e., the idea was that a lack of environmental education prevented local communities from achieving sustainable use of their natural resources. However, the dissemination of knowledge in the network did not suffice to bring about change in local communities. In fact, it was also necessary for local communities to adopt new, ecological forms of natural resource management. In this context, AES Barry Foundation had to devise a strategy that would encourage local communities to participate in into Bananal project. The solution would only be possible if local communities obtained more benefits from entering the Bananal project than from staying out of it. This led to the reorganization of the Bananal project.

The network of information in the Bananal project created social network effects from the bottom to the top and AES Barry was forced to consider local actors if it wanted to stop the deforestation of the Bannanal region and achieve its carbon sequestration target. For this reason, AES Barry launched an initiative of integrating a sustainable livelihood approach into the Bananal project that involved taking local community needs into account in the design of new strategies for

preventing deforestation (May et al., 2004: 60). That initiative also implied greater commitment by IE and the Cangucu Center to local communities. In this context, the Cangucu Center established more contact with local communities through the creation of tree nurseries where local communities were tasked with collecting seeds and distributing them among communities. Furthermore, IE established training activities for local communities to create sustainable management projects and alternative forms of income generation. A women's sweet factory project and indigenous bee-keeping project were also established. Lastly, Gaia introduced an environmental education project to provide training for local schoolteachers and an environmental guide for local students.

However, there are also organizations that participate informally in the project. This is the case of government organizations that had been participating in the Bananal project in the information and knowledge flow under the principles of reciprocal exchange. This means that some actors participate in the network without an explicit agreement about their contributions. That is, actors participate in the network through unilateral acts of giving and receiving that do not necessarily involve reciprocity. Most of the time such organizations do not share the same aims as the carbon project but their targets are the improvement of local communities. This is the case of IBAMA and Naturatins, which usually work with communities as part of their role as government facilitators. Given that they are not part of the formal structure of the Bananal project, they are free to decide whether or not to participate, and to determine the extent of their participation in the project.

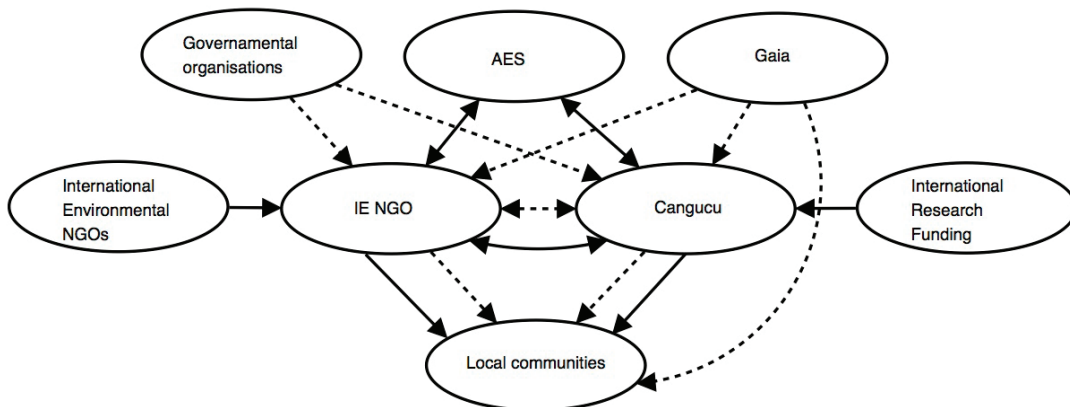
For example, certain local communities in the Bananal area are under the supervision and authority of IBAMA and participate in the Bananal project. In this case, IBAMA and the Bananal project organizations work in the same communities. Thus, when both organizations are in a position to co-operate and co-ordinate their actions, they usually do so informally. In this context, co-operation emerges as a way of both reducing the cost of organizations and of increasing their efficiency in the delivery of human capital at the local level. In this context, IBAMA only shares relevant information and activities with other members of the network because they pursue similar goals.

As a result, there are no power relations between OG and ONG in the knowledge network because actors/organizations who have a central position in the network or better access to resources tend to co-operate in the transmission of knowledge to local communities living in the Bananal region. This paper considers that this co-operative behavior emerges because human capital is not an end but a means for IE and the Cangucu Center and other organizations, whose main goal is to improve local capacities in the Bananal region. Furthermore, local actors are well

connected with all the organizations that contribute knowledge and information to the Bananal network.

However, AES Barry, the main sponsor of sponsor the Bananal project, was unable to provide all the financial capital, which threatened the continuity of the Bananal project. In this context, IE and the Cangucu Center expanded their links with other international actors in order to obtain funding. For instance, the Cangucu Center managed to secure funding from the Large Scale Biosphere-Atmosphere Experiment in the Amazon while IE also acquired funds from other NGOs such as Natura Foundation (May et al., 2004). In this scenario, the nature of links in the resource network changed so that IE and Cangucu Center reduced the centralized position of AES Barry Foundation due to the fact that each of them now controlled some of the resources in the network. Although AES Barry Foundation continued to manage the project, the existence of bilateral links in the resource network provided major incentives for participants to co-operate and participate more actively in the decision-making of the project. In this context, the indirect control of resources by local communities meant that capacity building began to be seen as the main focus of the Bananal project (See black nodes in figure 5).

Figure 5: Bananal Project



Source: developed by the author.

The existence of two kinds of networks in the Bananal project made it possible to take local communities basic needs into account in the implementation of the Climate Change Convention. If the nature of links had merely been determined in terms of financial resources, local communities needs would not have been addressed in the project. This is because AES Barry Foundation directly influenced the participation and actions of all the organizations/nodes where IE and the

Cagucun Center had very little influence over the decision-making in the project and local communities were incorporated into the project merely as receptacle of environmental education without any negotiating power or active participation. However, the existence of a knowledge network incorporated another dynamic into the network.

In this context, the role of local communities as a potential factor of deforestation in the Amazon was not only perceived as a problem of disseminating environmental information but also as a problem of adopting new techniques for the sustainable management of natural resources. In this scenario, local communities had an asset that was equivalent to the resources of other participants. Thus, local communities' incorporation into the Bananal project (network) was essential and became the central aim of the Bananal Project. NGOs such as IE and Gaia played a key role in incorporating local communities' concerns into the project and ensuring a change of behaviour as regards resource management.

Conclusions

The analysis of the carbon reduction project established in Brazil shows that NGOs can either help or hinder the incorporation of global and local issues into the environmental agenda. The nature of the links between members seem to be the main factor determining the potential benefits available to each participant in the network. The case study shows how, by acknowledging the importance of the nature of links, one can determine the distribution of power and the degree of dependence of each organization/node in the network as well as their influence on the decision making of other actors.

The cases studies analyzed in this dissertation show that if an organization/node provides the largest amount of resources in the network, it tends to dominate the network (See Figure 4). Moreover, they suggest that a lack of horizontal connections implies that peripheral nodes have little scope for influencing the network due to their weak position. In addition, these situations seems to encourage rent seeking behavior for well connected nodes. For instance, during the first phase of the carbon reduction project in Brazil, AES Barry Foundation was the only sponsor and financial resources flowed vertically to other members. In this context, the IE and the Cagucun Center occupied an intermediate position between the provider of financial capital such as AES Barry Foundation and the potential receiver (local communities). This situation created incentives for the AES Barry Foundation to create access restrictions to the network and to charge the remaining actors an access fee. Furthermore, the prevalence of AES Barry Foundation as a strong node and its direct influence over the actors made it impossible for local communities to take part

in the decision making in the project. As a result, the carbon project focused on carbon goals rather than local community needs.

The experience of the second strategy in the Bananal project was different. The initial network was dominated by AES Barry Foundation, the sole provider of financial resources. This situation restricted the ability of the IE and the Cagucun Center to influence decision making in the project process. However, AES Barry Foundation's inability to provide all the funding required allowed IE and the Cagucun Centre to seek links with other international actors to secure resources for the project. The pooling of resources by various actors in the network resulted in a more decentralized network and greater co-operation.

Brazil's experience in the implementation of carbon projects points to a need to foster connections with local actors in the network so that local actors can influence international environmental policy. This fact not only benefits local actors but can also guarantee the viability of projects in the long term. For instance, the tree planting project in Brazil can benefit local actors in the short term due to the fact that they obtain an income from planting trees. However, in the future, it may be that the benefits of cutting down a tree will exceed the benefits of keeping it. In such a context, local communities will have incentives to cut down trees and withdraw from the project. Thus, the only guarantee for the continuity of the carbon project is to pay more attention to the inclusion of local actors in the project's decision making process since this will help place their real needs on the environmental agenda and address their specific problems. Moreover, the inclusion of local actors will enable them to have a direct influence on the project, fostering transparency and avoiding abusive behavior on the part of powerful or well-connected actors.

The case study focuses on the analysis of key aspects of the interactions between such organizations/nodes due to the lack of primary information on how organizations/nodes are created. Studying how nodes are created is an interesting and relevant issue that undoubtedly warrants further research.

References

- Abad Meireles de Mendoca, Ricardo (2004). "The Use of Landscape Metric on Multi-Temporal Forest-Non Forest Maps of Northeast Mato Grosso, Central Brazil". University of Kingston, United Kingdom, master's thesis.
- Adede O, Andronico (1995). *Digesto de Derecho Internacional Ambiental*. Mexico: Secretaría de Relaciones Exteriores, 556 p.
- Aune, Jens (2003). "Desertification Control, Rural Development and Reduce CO2 Emission Through the Clean Development Mechanism of the Kyoto Protocol-An Impasse or a Way For-

- ward". Document, URL: <http://www.drylands-group.org/noop/file.php?id=295>. Last accessed: January 23, 2015.
- Bala, Venkatesh and Goyal Sanjeev (2000). "A Non cooperative Model of Network Formation", in *Econometrica* (68, 5), pp. 1181-1229.
- Boyd Emily, Maria Gutierrez and Mangu Chang (2005). "Adapting Small-Scale CDM Sink Projects to Low Income Communities". Document, URL: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.136.3500&rep=rep1&type=pdf>. Last accessed: January 23, 2015.
- Caruso, Emily and Reddy Vijay Bhaskara (2005). "The Clean Development Mechanism-Issues for Adivasi Peoples in India". Document, URL: <http://www.forestpeoples.org/sites/fpp/files/publication/2010/08/cdmadivasipeoplesindiaapr05eng.pdf>. Last accessed: January 23, 2015.
- Collins, Randall (1981). "On the Microfoundations of Macrosociology", in *American Journal of Sociology*, 86, pp. 984-1014.
- Cook, Karen and Whitmeyer Joseph (1992). "Two Approaches to Social Structure: Exchange Theory and Network Analysis", in *Annual Review of Sociology*, 18, pp. 109-127.
- Davidson, Joan, Dorothy Myers and Manab Chakraborty (1992). *No Time to Waste: Poverty and The Global Environment*. United Kingdom: Oxfam, 224 p.
- Diani, Mario (2003). "Social Movements, Contentious Actions, and Social Networks: From Metaphor to Substance?", in Dani Mario and McAdam Dough (coords.). *Social Movements and Networks: Relational Approaches to Collective Action*. New York: Oxford University Press, pp. 1-18.
- Emerson, Richard (1962). "Power-Dependence Relations", in *American Sociological Review*, 27, pp. 31-41.
- Figueres, Christiana and Ivanova Maria (2002). "Climate Change: National Interest or Global Regime? Global and Environmental Governance: Options and Opportunities". Document, URL: http://works.bepress.com/maria_ivanova/5. Last accessed: January 23, 2015.
- García Valdés, Antonio (1992). "Instrumentos Económicos para Ejecutar Políticas Ambientales Gubernamentales", in Hurtado Huerta (coord.). *Los Instrumentos Económicos Aplicados al Medio Ambiente*. Mexico: SEDESOL, pp. 44-52.
- Gay García, Carlos (1994). "El Agua y El Aire, Recursos Amenazados", in Glender Alberto & Víctor Lichtinger (coords.). *La Diplomacia Ambiental: México y la Conferencia de las Naciones Unidas sobre el Medio Ambiente y Desarrollo*. Mexico: Secretaria de Relaciones Exteriores and FCE, pp. 118-152.
- Granovetter, Mark (1973). "The Strength of Weak Ties", in *The American Journal of Sociology*, (78, 6), pp. 1360-1380.
- Klooster, Dan and Omar Masera (2000). "Community Forest Management in Mexico: Carbon Mitigation and Biodiversity Conservation through Rural Development", in *Global Environmental Change*, 10, pp. 259-272.

- Lipschutz, Ronnie and Judith Mayer (1996). *Global Civil and Global Environmental Governance: The Politics of Nature from Place to Planet*. New York: State University of New York Press, 369 p.
- Marsden, Peter (1983). "Restricted Access in Networks and Models of Power", in *The American Journal of Sociology*, (88, 4), pp. 686-717.
- Marwell, Gerald, Pamela Oliver and Ralph Prahl (1988). "Social Network and Collective Action: A Theory of the Critical Mass III", in *The American Journal of Sociology* (94, 3), pp. 502-534.
- May, Peter, Emily Boyd, Fernando Veiga and Manyu Chang (2004). "Local Sustainable Development Effects of Forest Carbon Project in Brazil and Bolivia: A View from the Field". Document, URL: http://www.cifor.org/publications/corporate/cd-roms/bonn-proc/pdfs/papers/T6_FINAL_May.pdf . Last accessed: January 23, 2015.
- Montoya, Guillermo (1995). "Desarrollo Forestal Sustentable: Captura de Carbono en las Zonas Tzeltal y Tojolabal del Estado de Chiapas", in Guillermo Montoya (coord.). *Cuaderno de Trabajo, Volumen 4*. Mexico: El Colegio de la Frontera Sur, pp.1-50.
- Nelson Kristen, Jong Ben (2003). "Making Global Initiatives Local Realities: Carbon Mitigation Projects in Chiapas, Mexico", in *Global Environmental Change*, 13, pp. 19-30.
- Ojima, Dennis, Timothy Kittel, Thomas Rosswall and B. Walker (1991). "Critical Issues for Understanding Global Change Effects on Terrestrial Ecosystems", in *Ecological Applications* (1, 3), pp. 316-325.
- Patterson, Matthew and Michael Grubb (1992). "International Affairs", in *The International Politics of Climate Change*, (68, 2), pp. 293-310.
- Snow, David, Louis Zurcher and Sheldon Ekland-Olso (1980). "Social Network and Social Movements: A Microstructural Approach to Differential Recruitment", in *American Sociological Review* (45, 5), pp. 787-801.
- Stevenson, William and Danna Greenberg (2000). "Agency and Social Networks: Strategies of Actions in a Social Structure of Position, Opposition, and Opportunity", in *Administrative Science Quarterly*, (45, 4), pp. 651-678.
- Streck, Charlotte (2002). "Global Public Policy Networks as a Coalition for Change,' Global environmental Governance: Options and Opportunities". Document, URL: <http://environment.research.yale.edu/documents/downloads/o-u/streck.pdf>. Last accessed: January 23, 2015.
- United Nations Development Programme (UNDP) (2002). "Linking Poverty Reduction and Environmental Management: Policy Challenge and Opportunity". Document, URL: <http://www.unpei.org/sites/default/files/publications/Linking-poverty-red-env.pdf> . Last accessed: January 23, 2015.
- Urquidi, Víctor (1994). "Economía y Medio Ambiente", in Alberto Glender and Víctor Lichtinger (comps.). *La Diplomacia Ambiental: México y La Conferencia de las Naciones Unidas sobre el Medio Ambiente*. Mexico, D.F.: Fondo de Cultura Económica, pp. 47-67.

- Uzzi, Brian (1996). "The Sources and Consequences of Embeddedness for Economic Performance of Organizations: The Network Effect", in *American Sociological Review* (61, 4), pp. 674-698.
- Viegas, Herta (2004). "Socio Economic Development in Indigenous and Non-indigenous Systems in Brazil: The Case of West Tocantins", in *Farming and Rural Systems Economics*, 58, 174 p.
- Wohl Ellen, Roger Pulwarty and Jun Zhang (2000). "Assessing Climate Impacts", in *Proceedings of the National Academy of Science of the United States of America* (97, 21), pp. 11141-11142.
- World Commission on Environment and Development (1987). *Our Common Future: The Brundtland Report*. Oxford and New York: Oxford University Press, 343 p.
- Yamagishi, Toshio, Mary Gillmore Mary and Karen Cook Karen (1988). "Network Connection and the Distribution of Power in Exchange Networks", in *The American Journal of Sociology* (93, 4), pp. 833-851.
- Young, Orang (1994). *International Governance: protecting the environment in a Stateless Society*. New York: Cornell University, 233 p.

Recibido: 27 de mayo de 2014

Aceptado: 21 de noviembre de 2014