ANALYSIS OF PUBLIC POLICIES' IMPLEMENTATION FOR ENVIRONMENTAL MANAGEMENT IN BRAZIL: THE CONTRIBUTION OF SOCIAL NETWORK THEORY

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ABSTRACT

The paper discusses the implementation of agro-environmental policies in municipalities through concepts of social networks, and proposes a model to do research in the area. The basic assertion is that development, success, or problems of technical actions of implementation are directly influenced by social relationships among actors involved in the task. The article tries to reach two objectives. The first is the application of social network theory to public policies, which is unusual in the literature. The second, as a result, is to present a tool specifically designed to investigate the validity of assumptions that has been tested in four Brazilian municipalities, showing applicability and an ability to generate data for questions about networks.
Key words: social networks, agro-environment, public policy, methodological tool, Brazil.

RESUMEN

El documento analiza la implementación de las políticas agroambientales de los municipios a partir de los conceptos de redes sociales y propone un modelo para la investigación en el área. La afirmación básica es que el desarrollo, el éxito y los problemas de las acciones técnicas dependen de la aplicación de las relaciones sociales en las redes municipales. El trabajo busca dos objetivos. El primero de ellos es utilizar los conceptos de redes sociales en las políticas públicas, lo que hasta el presente no se ha realizado. El segundo, como resultado de lo anterior, es presentar una herramienta metodológica específicamente diseñada para investigar la validez de los supuestos y la herramienta fue probada en cuatro municipios brasileros, mostrando la aplicabilidad y la capacidad de generar datos para las cuestiones sobre redes.
Palabras clave: redes sociales, manejo agroambiental, políticas públicas, herramienta metodólogica, Brasil.

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RÉSUMÉ

Le document traite de la mise en œuvre des politiques agroenvironnementales des municipalités des concepts de réseaux sociaux et propose un modèle pour la recherche dans le domaine. L'affirmation fondamentale est que le développement, le succès et les problèmes de mesures techniques dépendent de l'application des relations sociales dans les réseaux municipaux. Le document vise deux objectifs. La première consiste à utiliser des concepts de réseaux sociaux dans les politiques publiques, qui jusqu'à présent n'a pas été réalisé. Deuxièmement, en raison de ce qui précède, est de présenter un outil méthodologique spécifiquement conçue pour étudier la validité des hypothèses et l'outil a été testé dans quatre villes brésiliennes, montrant l'applicabilité et la capacité à générer des données pour les problèmes des réseaux.

Mots-clé: réseaux sociaux, la gestion des agro environnementales, les politiques publiques, la outil méthodologique, le Brésil.

1. INTRODUCTION

Our objective is to analyze and discuss the relationships between actors in the implementation of agro-environmental policies that influence local development, applying the theories of social networks and having some Brazilian municipalities as field of study. To explore the explanatory power of the social networking approach when is applied to the phenomenon of public policy, a research tool was especially developed, since there were no similar validated tools. This instrument was used to collect data in four municipalities of São Paulo State.

The hypothesis of this paper is that social relationships of commitment, trust and power among the actors participating in the implementation of agro-environmental policies, influence the activities and decisions of these actors and therefore impact the success or the problems of implementation. Understanding this interface between social and technical activities of a network of public policies can be the starting point for the management of such policies. Insofar as, based on Vergara and Corrêa (2003) idea that society is complex and requires new explanatory and management models, this proposal seeks to go beyond the models of public management that are traditionally addressed in scholarly articles, which sometimes use the arguments of the theory of new institutionalism (Powell and Dimagio, 1991), and sometimes use the stakeholder theory (Freeman, 1984).

Evidences concerning the structure and dynamics of modern society, such as: the high complexity; the interdependence of phenomena; the technological capabilities allowing for information sharing; and the borderless economy, all indicate the need to use relevant theories in dealing with complexity, as the theory of social networks. Authors such as Paula (2001) have argued that models of public management in Brazil are still guided by statements of entrepreneurship, which are inadequate for the complexity of the joint participation of government and society.

According to the IBGE (2009), agriculture and pastoral activities stretch across almost 29% of Brazilian territory, counting as the human activity that occupies alone the largest area in the country. Brazil is one of the few countries worldwide with large areas of land suitable for agricultural activities not yet explored, while suffering increasing pressure from national and international associations for the preservation of its remaining natural areas, especially in the Amazon region.

On the other hand, growing local and global demand for food, fiber and energy from biomass pushes for increase in domestic production. To meet this demand for increased production there are only two choices: either to increment the acreage, or increment productivity of areas already occupied. Although there has been a substantial growth in productivity levels in most cultures along the last thirty years, the agricultural frontier continues to advance upon remaining natural areas, because of the magnitude of the increase in demand, as well as the loss of agricultural land to environmental degradation processes or other non rural activities in regions of higher population density.

One way or another, according to Rodrigues (2008), 90% of the 5,564 Brazilian municipalities have suffered some environmental impact, but the structure of environmental policies is not compatible with the severity of the problem. According to Feix *et al.* (2010), there are still questions that were not suitably answered, about the relationship between economic activities and environmental policies, and this affects the competitiveness of businesses and the country. The environmental issue is not effectively considered in production processes.

Thus, in the field of ideas this paper aims to valorize the social network theory as a support for analysis of

environmental policies and, in the field of actions, it aims to contribute in terms of methodology by offering an instrument that can be applied by both researchers and managers of public policies. However, before presenting the theory and method, we will be featuring the subject of agro-environmental policies.

2. CHARACTERISTICS OF AGRO-ENVIRONMENTAL POLICIES

The agro-environmental policies are composed of a set of principles and rules on the usage of land, water and other natural resources. Some of these policies have existed for decades and, until now, the environmental issue had been receiving increasing attention with regard to the negative impacts of polluting industries and home consumption, in urban areas. Concern about environmental problems in rural areas also began to acquire more importance recently.

Agriculture, livestock production and forestry are the activities that occupy most of the territory that has been changed by man. Unlike urban and industrial activities, highly concentrated, the impacts of rural activities are related to the extension of the disturbed area, not by the intensity of changes. In other words, while industrial and urban contamination are considered to be punctual (coming from the chimney, the exhaust pipe, or the landfill, for example), the contamination caused by agricultural activities is non-punctual (the millions of acres used for pasture, for example).

By definition, every agriculture activity causes environmental impact, because it is essentially modification of natural vegetation. Simple gathering or extraction does not fit into the definition, since it takes place in the natural environment. For example, the latex from *Hevea brasiliensis* can be obtained through gathering in the natural environment, in which case a worker walks through a large area of unchanged forest, visiting native rubber trees and extracting their sap. The latex can also be extracted from trees planted by man in an area where native vegetation was removed and an 'orchard' of rubber trees was formed with trees planted next to each other. The first case is an example of «*extrativismo*» (extraction), and the second is an example of agriculture.

The focus of this work is the confrontation between the human need to produce food, fiber and energy from biomass, and actions to preserve the intricate and complex ecosystems that support life on our planet. Public policies are the tools that seek to balance these conflicting interests and create conditions for joint actions. An example of contradiction and conflict, according to Quirino *et al.* (1999), is the difference between consumers' beliefs regarding environmental preservation and their behavior when purchasing food. While consumers claim to be concerned with environmental issues, they continue to support supply chains that impact the environment; chains that, in principle, they would disown if they knew their real impacts.

Furthermore, these are another kind of contradictions that are not intrinsic to a single class of actor such as consumers, but also occur among the actors of different classes inside a network, such as representatives of business, government and NGOs. The plans laid by the government's environmental policies may face barriers to their implementation, due to these conflicts and contradictions. How do actors perceive these policies? Who are the main actors involved in municipal networks, whose decisions influence the greater or lesser effectiveness of these policies? Why are certain policies adopted by these actors and others are forgotten, overlooked or ignored? Neves and Luiz (2006) stress the need for an institutional environment prepared to implement environmental policies, and say that results depend on the commitment of the related community. The issue of commitment is an important point of this work and will be addressed again in the section on theoretical basis. This variable means, in short, the willingness of actors to direct efforts to achieve collective results, even without obtaining personal advantages.

The implementation of environmental policies turns out to be contingent, since there are different economic, technological and personnel conditions at each site, and municipalities can make adjustments to the general rules. This adaptation seems to be related to the level of knowledge and involvement of social actors, who form groups that share values and codes of ethics, through well defined flows. Thus, it is the dynamics of specific groups in each municipality that provides for success or failure of implementation. According to Cavalcanti (2004), the efficiency of Municipal Councils for the Environment is very dependent on their political position in the municipal structure, *i.e.* on the network of relationships among stakeholders of the Council.

Given this scenario, a basic path of research in this field is the analysis of flows, values and meanings of relationships among actors in the municipal networks and their interfaces with the advances and obstacles to the implementation of government's plans. This is the line adopted by the model and the instrument detailed in the following items.

Put into practice, execute, direct, manage: these are some of the terms in common parlance, used

interchangeably to implement public policies (Meny and Thoenig, 1992). In specialized literature there is still no consensus on the concept of implementation. For some authors, implementation refers to the process since the establishment of a policy until and including its impact, while for others the implementation should not be confused with the scope of its product or with its impact, and is basically the process in which some governmental authority is putting into practice a series of decisions and actions (Lester *et al.*, 1987).

Thoenig (1985) states that «to implement» is «to apply a program of action to an established problem». Moreover, Pressman and Wildavsky (1984) conceive implementation as follows: if x is performed at time t_1, then y will result in time t_2. Thus, x is the program, y is the outcome, and implementation is what connects x to y. This reasoning implies the idea of implementation as the ability to engender subsequent links in the causal chain in order to obtain the desired results. By defining the implementation process as the interaction between goal setting and actions taken to achieve it, these authors highlight the way in which goals are identified (the program, the agenda) and actions are taken to achieve them, in contraposition to the interaction between goals and results.

The same Pressman and Wildavsky (1984) mark the beginning of the implementation process as the time when policy is transformed into program, *i.e.,* when the initial conditions necessary for implementation are created by action of some governmental authority. For these authors, an implementation should be seen as an evolving process, because whenever new circumstances are being addressed, it allows you to update the ideas behind that implementation. In other words, a policy itself can be changed while being implemented.

Bardach (1977) sees implementation as a process of strategic interaction among numerous interests, where each actor protects his own interest. For this author, therefore, an implementation develops in accordance with the concept of game, resulting in many relationships that are intertwined, involving a large number of players with their own strategies and tactics, resulting in varying degrees of uncertainty. We can see that this description is close to the social networking concept in its facets of cooperation and power.

Although there is no consensus on the concept, one can say that differences revolve around the same axes, namely, the conditions for conducting such activities, the actions themselves and the effects of these actions. The differences appear at the time of occurrence and in the value given to the causes, processes or effects. For the purposes of this study, this division is not

needed, since interest is on the relationship between actors at different times, in such a way that the collection tool does not prioritize any of them.

The issue of implementation has become important since some European studies from the 1970s that were interested in the issue of organizational structure (Bressers and Ringeling, 1995). The guiding idea is that it is not only government action, but action by all stakeholders in the program. Academic interest in the topic inspired the use of other explanatory paradigms, going beyond the traditional approaches of instrumental rationality and institutional theory. Implementation has proved to be the «missing link» in discussions about the efficiency and effectiveness of government action (Silva and Melo, 2000). It is pointed out as the bottleneck of public policy in studies that examine sometimes the divergent interests, sometimes the communication problems, or even the synergy between plans and actions. Evidences seem to point that the lack of coordination, the lack of flow in communications and the imposition of strict and detailed plans all contribute to the failure of implementation. According to Bressers and Ringeling (1995), studies have shown that there were two major problems to be solved: the question of theory of implementation, and the issue of variables to be observed.

These settings are interesting for this work, since it purports to use a network theory rarely applied to the theme, and it presents a model that suggests the interface between variables and provides a data collection instrument that allows for the researcher to create inferences and interpretations on a given implementation. Answers to the questions posed by Bressers and Ringeling are sought along these lines.

3. THEORETICAL STARTING POINTS AND PROPOSAL OF A MODEL

Authors who have sought the essence of the phenomenon of networks (Oliver and Ebers, 1998; Giglio and Kwasnicka, 2005; Provan *et al.*, 2007) found a wide range of concepts and theories that can be somewhat inadequate to analyze a phenomenon of joint action, such as the theory of competition and the theory known as Resource Based Value (RBV). Across this diversity, however, it is possible to infer the great tracks guiding research. The works are organized around two major paradigms. On the one hand, the rational/functional/economic paradigm argues that networks would be the strategic responses of commercial and other organizations in order to diminish their weaknesses through the union and exchange of

resources. On the other hand, the social paradigm states that networks of organizations, whether commercial or not, are defined as manifestations of the current structure of society, organized in networks in which social relationships form a background that guides and influences the relationships in production. The social relationships of trust, commitment and cooperation facilitate the transmission of information, unlock bureaucracy, reduce transaction costs and create conditions for innovation in products and processes (Balestro, 2002).

Both paradigms converge to affirm that network format is the structure that replaces the old organization with its well defined limits, and that the object of study is now the relationship, and not resources. It is the relationship that can explain the success or failure of some networks that appear under different shapes and names, such as local clusters, industrial districts, or alliances. Although networks were born and evolved as issues of organizational formats in the world of business, today you will find articles on the application of network concepts to public action, where they take names such as policy networks.

In cases where economic objectives are not a priority, there is a tendency to use the social network paradigm, which is the perspective developed in this work. Areas where the action or influence of the government is more intense, such as health (Braithwaite, 2010), tourism (Paget *et al.,* 2010; Baggio *et al.,* 2010), education (Sandstrom and Carlsson, 2008) and family farming (Jarosz, 2008), have been increasingly studied through the application of network concepts. More recently, articles about cooperative market (Tulet, 2010), sustainable development (Glasbergen, 2010) and environmental preservation policies (Hunt, 2010; Cinner and Bodin, 2010) also developed their analyses using concepts of networks. It is therefore interesting to point out the basis of this reasoning.

Understanding networks as social relationships is a trend derived from human sciences, especially sociology, but social network paradigm ended up building its own domain, which transcends purely social principles and intertwines with business principles, strategies and production processes (Hakansson and Snehota, 1995; Granovetter, 1985; Nohria and Ecles, 1992). The basic assertion here is that there is a social background for production relationships in networks, whether or not they can be commercial.

Some authors present ideas that support the paradigm, as Castells (1999), who states that the current structure of society is the format of a network, replacing the structure of small groups such as family, which

prevailed in earlier decades. In this way, Granovetter (1985) discussed social embeddedness as being the mesh of social relationships in a business network that makes participants feel safe, but also limits their field of action. According to Larson (1992), social relationships facilitate exchanges between companies, but also exert a controlling function, for after all, an actor committed to collective goals is less likely to have an opportunistic behavior.

According to Powell (1987), even in a group united around shared goals there is a kind of selfish game that interferes with actions. These asymmetries and conflicts are resolved in one of two ways. In one, formal rules of behavior are established, constituting formal governance. In the other way which has already been described, social relationships create a mesh that inhibits opportunistic behaviors. If those two paths are not strongly established, processes fail and goals are not achieved. Therefore, social relationships play a role in the maintenance of processes and in the control of opportunisms.

In each network there are different arrangements, as stated by Nohria and Ecles (1992), which means that its structure and dynamics will be different. According to Gulati (1995), even within a particular network there is an instability that makes it difficult to draw a final map of its structure. Latour (2005) went further to say that non-human actors are also part of the network, since they convey meanings to human actors. This is the case, for example, of the meanings of a river to a farmer, or to an agronomist, or to a beverage producer.

The set of statements above converge into the acceptance that social variables form the context of decisions and behaviors of the actors. Because the networking field is founded on the idea of a relationship, the unit of study is the node, the connection between two actors, with its flows and decisions. The link may appear under other names such as dyad, lace, graph, connection, transaction, or translation. Flows are things transacted and decisions refer to what each actor does when he receives the flow (Ebers and Jarillo, 1998; Rowley, 1997).

According to Latour (2005), the interest of researchers in flows may be in communication codes, generating discussion about: how to construct the meanings of contents and actions in the flow; the social relationships of cooperation and power, dominated by the theme of governance; or the forms of organization indicated by the flows, with themes such as structure, dynamics, problems and advantages of the network format. The interest here is more focused on the signs of social relationships and their effect on decisions.

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Therefore, to analyze a network is to investigate flows and decisions on multiple nodes. From social theory we take the principle that the analysis of one node reveals the social network, that is, the structure of a node represents the social structure in which it is embedded (Castells, 1999). In other words, a business network or a public policy network is a symmetric substructure of the structure of society, all of it organized in the form of relationships in networks. The actors' behavior is determined by complex social interactions involved, including the commercial ones, in a process with unpredictable consequences. Thus, when working with network analysis, one must give up finding regularities and repetition in the flows, decisions and actions.

4. THEORETICAL MODEL AND ITS APPLICATION IN PUBLIC POLICIES

The principles adopted in this work which guide the design and execution of research can be summarized as follows:

1. Analyzing networks means the same as researching the flows, dispensing with the goal of seeking order and predictability;

2. Social variables are a backdrop for production relationships of any kind, including public policy actions;

3. In a network, the unit of study is a node, and the network is the set of nodes;

4. The analysis of one node allows inferences about the entire network, following a holographic principle;

5. To analyze one node implies to investigate flows and decisions of the actors. Flows are the elements and meanings that run between actors, such as technical information, materials, money, objects, social and emotional information. Decisions relate to the processing, storage and movement of data received by each actor.

The social networks approach is grounded in social relationships, but there is a wide range of variables in the literature. The work of analysis that indicated the principles to be used also indicated that some variables are most often investigated, which allowed for us to choose only the most interesting ones, that is, the variables of trust, cooperation, commitment and power games.

When dealing with environmental policy research, it is also appropriate to include the concept of territorial use, which refers to the specific relationships between human actors and the physical resources addressed by environmental policies. As the field survey was limited to some municipalities of São Paulo, not too far from each other, it was assumed that homogeneity was acceptable in terms of natural resources and agricultural activities. This uniformity is even greater in predominantly agricultural areas driven by market forces and agricultural policies (Luiz *et al.,* 2002).

The set of statements and guiding principles organized in a chart that puts social variables in the background of the node, can be seen in Figure Nº 1.

Lavertu and Weimer (2009) suggest that policy theories draw on knowledge of political behavior or institutions in an effort to explain at an aggregate level the manner in which a government system interacts with society to produce policy output. The authors agree with others who say that theories ought to incorporate factors such as conflicting values and interests, information flows, institutional arrangements, and variations in the socioeconomic environment. It is believed that the concepts of social networks accomplish this task. The principles of social network theory are apt to include social values, to monitor a network along time (in the formation of social and production' relationships), to describe the activities of the network, and to build interpretations of its dynamics and structure.

Of course, actors have different interests, which give rise to flows that have some content of power and control, with conflicting relationships, constant change, and the aim of controlling resources and activities. This dynamics, with games and partnerships, is what characterizes a network as a phenomenon of cooperation and conflict at the same time. According to the hypothesis guiding this work, it is this game of social relationships that determines the path of success or failure in policy implementation.

A support for this proposal comes from the work of Kenis and Schneider (1991), who state that political actions are best understood through the paradigm of networks than through the institutional paradigm, because complexity and interdependence have become dominant. The authors also claim, as we do here, that network approaches such as ANT (actor-network theory) seem to be advantageous when addressing the significance of relationships between human and nonhuman actors.

Santos and Varvakis (1999) affirm that when the State coexists with the interests of non-governmental organizations, which is the case with agroenvironmental policies, new conditions of action are needed. A new field is required for inclusion, with local, regional and global spaces, and other criteria of sameness and differences. In the language of the network theory, we would say it requires a different arrangement of actors' positions, and a set of rules for

Figure 1
Model for research on networks that considers social variables such as a backdrop for relationships of production
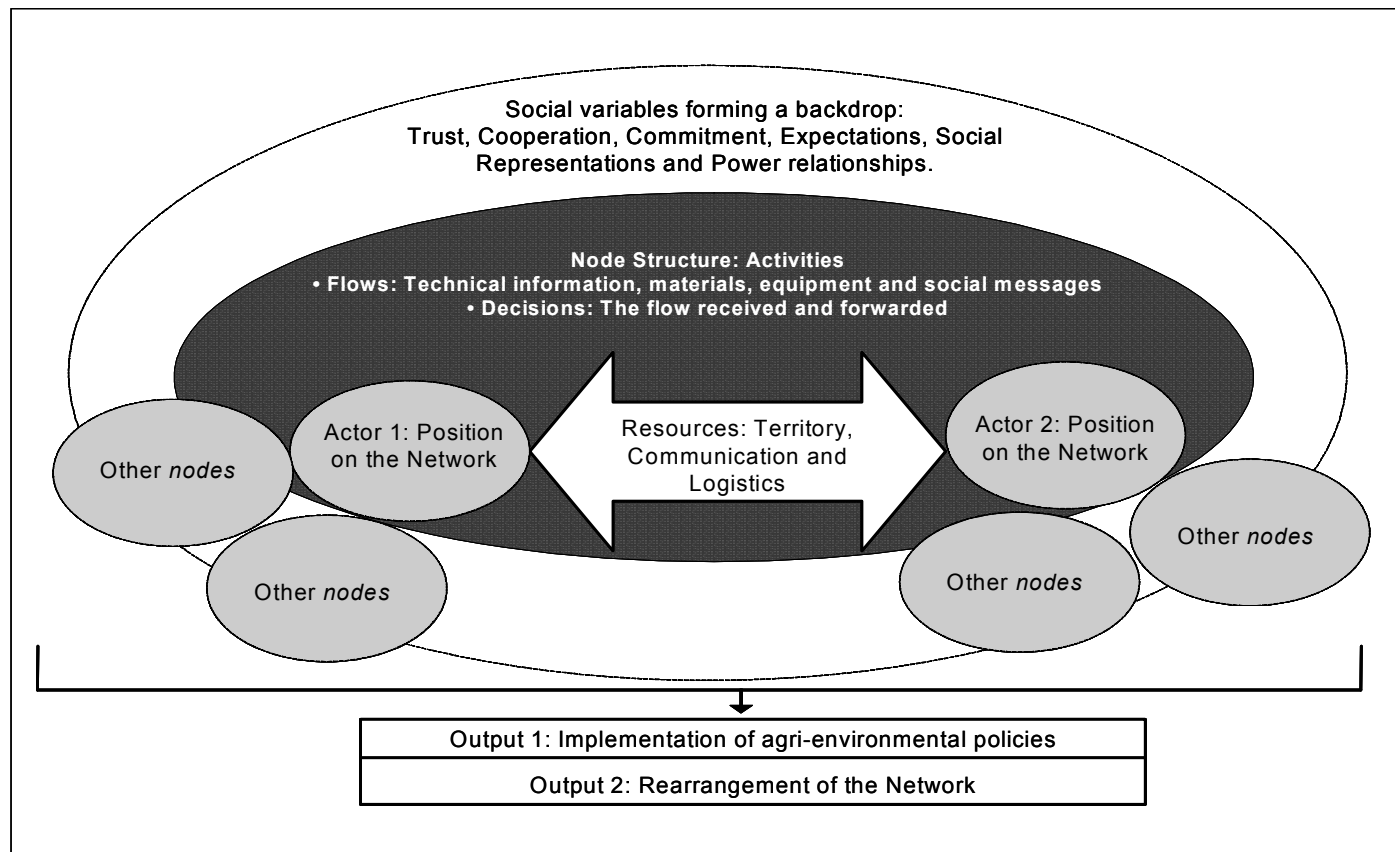
Source: Own elaboration.

cooperation, rather than obedience. It is a case where there must be a network of flows creating possible mediations for project implementation. A necessary articulation of governance arises from the dynamic balance between social demands and responsive government.

Thus we have established the theoretical foundation on networks, based on concepts of social networks that are accepted in scientific circles. A unit of study is defined: the node; and its components are also defined: the flows and decisions. Figure Nº 1 graphically displays the interface between social relationships and relationships of production. Therefore, it is possible to begin the discussion of the proposed methodology to guide studies in this area.

5. STARTING POINTS OF THE METHOD
The initial path adopted was an exploratory research in order to gain knowledge from descriptions and interpretations to a first mapping of 'complexities'. The

operation was based on consultation of secondary data sources, from which a rough map of the themes and structures of networks was drawn. After a first analysis of data, interviews could then be made to get answers about the actions regarding implementation of an agro-environmental policy. The criterion for selecting interviewees was their involvement in the formulation of such policy, or their responsibility in implementing it, so that the sum of information collected was large enough to give an overview of processes in the network.

To Quivy and Campenhoudt (1998), the interview method is particularly suitable for the analysis of specific problems, and the reconstitution of processes of actions, experiences or events. According to Latour (2005), in an interview about the networking phenomenon one seeks traces left by events.

A third movement is proposed in this exploratory research: the monitoring of network flows. This is possible by starting research from one node, preferably one that has a more central position. Additionally,

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it is recommended to attend meetings, or gain access to communications on the network, such as e-mails.

These three movements of exploratory research (secondary data, interviews and monitoring) will allow the initial construction of contents shown in Figure N° 1. Because the figure is presented as a system, and theoretical principles affirm unpredictability and uncertainty, it is then understood that research of this type have the following characteristics and consequences:

1. Research is not designed to find strict causal relationships, although some relationships may be indicated;

2. Research design indicates a preference for descriptive and inferential paths, rather than statistical analytical paths;

3. Variables are chosen for their participation in the system's tissue (complexity); their isolation or factor loading, in statistical sense, are not sought;

4. Because phenomena are multifaceted, it is preferable to use multiple techniques, such as the triangulation defended by Flick (2009), since each technique has defined objectives and limits;

5. Depending on the nature of the problem investigated, the chosen approach for treatment of data is phenomenological, which focuses on qualitative research procedures;

6. Content analysis is a coherent method for addressing complex phenomena.

The reasoning is interpretative and relativistic, according to statements on content analysis by Bardin (1977). This means that the fluidity of a phenomenon does not allow generalizations and prescriptions, although the researcher can create hypotheses and new research developments. Phenomenology, which is different from positivist methodology, states that something can only be understood from the perspective of people who are experiencing it. The beliefs, assumptions, paradigms and values of participants are present in the way they look to the phenomenon studied. Based on their life stories, they seek to understand the phenomenon, interpret it and understand its meaning (Vergara, 2000).

Thus, the proposition of an exploratory and qualitative approach as a method of research on the topic of agro-environmental policy is backed by Tobar and Yalour (2001), who present a comparative table expressing the particularities of the use of qualitative and quantitative methodologies. Among these characteristics, the ones that most fit and justify the use of qualitative methodology in this work are: a) the subject or the object is unfamiliar; b) some flexibility of approach is needed to allow for unexpected discoveries; c) the goal relates more to understanding the meaning of a phenomenon than to achieving its quantitative aspects; and, d) the purpose is to investigate a particular topic more deeply.

When analyzing the claims of Silverman (1994), we conclude that content analysis is indicated for the present work. According to the author, it is particularly suitable for the purpose of analyzing things that are at stake in a conflict, the aspects of a problematic situation, the interpretations of an event or the impacts of a measure. To Freitas and Janissek (2000), content analysis is a

Table 1

Variables that drive the data collection tools for research on the implementation of agro-environment policies		
Categories	**Variables**	**Summary of the concept**
i. Social	i1. Cooperation	Perform tasks together and provide the resources, like information.
	i2. Trust	Putting yourself in dependence on others.
	i3. Power relations	Seek a better position in the network.
	i4. Commitment	Acting as what is expected as a result of the three previous variables.
ii. Resources	ii5. Territory	Geopolitical boundaries of the region of influence of actors conjoint.
	ii6. Production	Production technologies.
	ii7. Communication	Media used in the flows.
iii. Node structure	iii8. Flows	Are known and take place without resistance.
	iii9. Decisions	The points of action choices of the actors.
iv. Output responses	iv10. Agro-environmental policies implementation	Achievements and problems.
	iv11. Network rearrangement	Changes in the structure and functioning of the network depending on the dynamics of the network.
v. Unpredictable complex variables	v12. Uncertainty and unpredictability	What unexpected happened and what the actors decided.

Source: Own elaboration.

thorough reading of the responses and their code in order to get an idea of the whole situation.

Table N° 1 shows the variables that drive this research. They were grouped into five categories, following the structure of Figure N° 1.

A tool for data collection and analysis, with indicators, is proposed in Table N° 2 to verify and apply the model: namely, that the development, success and problems of implementation of agro-environment policies depend on social relationships present in the municipal network.

6. EXAMPLES ALIGNED TO THE PROPOSED MODEL

According to Kenis and Schneider (1991), studies that use the policy network concepts are not new, with records existing since the 1960s. These studies indicate decentralized and informal public actions, some of which are more geared to the behavior of private actors and more oriented to the actions of entities such as corporations and nongovernmental organizations. The applications of network concepts in government policies appear more strongly in the 1980s with the emergence of the theme of environment preservation.

Also according to Kenis and Schneider (1991), what led to the increase of public policy studies from the perspective of networking, were changes along three axes.

The first axis is social change. It is characterized by phenomena such as: the emergence of an organized society with network relationships; the birth of interests of actors who need to relate to the government to achieve their goals; the shortage of financial and human resources given the complexity of government demands; decentralization of the State; the fuzzy boundaries between State and society, with citizens taking parts of government tasks; increasing access to government information by society; and globalization of public affairs such as the environment issue.

The second axis refers to the development of social sciences, embracing the concept of complexity and a methodology for studying complex phenomena, assisted by the development of technology for data processing. This new scientific paradigm diminished the power of the previous paradigm of strict causal relationships and behavior control. Evidence of failures of government policies based on control contributed to this change. This support has created a new agenda for research on public policies and actions, this time without a rigid division between planning and political action.

The third axis is related to the emergence of a set of tools that allowed the analysis of complex structures, which were being systematically tested and applied in various fields of businesses and groups of interest.

Table 2

Indicators that constitute the instrument of research on environmental policy implementation in the municipalities	
Dimensions	**Indicators**
1. Ability to influence of social actors in the implementation of agro-environmental policies at the municipal level.	1.1. Presence of social actors in decision-making and advisory bodies responsible for implementing these policies; 1.2. Contributions of social actors to implement these policies.
2. Ability of actors to organize themselves into social networks.	2.1. Impact of the activities performed by actors; 2.1.1. Flows: technical information, materials, money, objects, social and affective information; 2.1.2. Decisions: processing, storage and movement of data received by the actors; 2.2. Impact of resources controlled by the actors-territories, materials, instruments, structures, codes, language; 2.3. Position occupied by the actors-importance in the network structure (N° of nodes involved), the contents of their responses (forms of relationship within the network).
3. Influence of social variables that form the backdrop of the social network being analyzed.	3.1. Impact of trust; 3.2. Impact of cooperation; 3.3. Impact of commitment; 3.4. Impact of power games.

Source: Own elaboration.

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However, their use in the area of public actions is still not intensive.

According to Börzel (1998), it is necessary to clarify the meaning of the term 'policy network'. While British and American scholars usually conceive it as a model for State/society relationships in the area of a given issue, German works tend to treat policy network as a form of governance, something different from hierarchies and markets. However, when dealing with relationships between State and society, there is some agreement that it is appropriate to understand the phenomenon as a network, which supports our proposal. If in this network there are some stable relationships, such as the absence of hierarchy, interdependence and mutual exchange, there may be flows of power and interests between the two parties. When discussing the concept of policy network as a form of governance, we can see that the idea is quite similar to the concept of networks, understanding that the relationship between State and society can occur in an interdependent and cooperative way, as in business networks. Some features of this notion would be: the network is capable of generating collective responses, in spite of private interests; and, the network creates informal relationships based on trust.

Analyzing the failure of implementation of environmental policies in Rio Grande do Norte State, Najberg and Barbosa (2007) argue that there were two reasons: inefficiency of the State and lack of articulation among actors. One of the findings showed that society was not articulated with actions of social control, and moreover it actually did not reckon on a channel allowing actions in this regard. The local context (problems of the State of Rio Grande do Norte) was pointed out as one of several explanations for this lack of participation. Another explanation is that there was a hegemonic social actor, the Institute for Sustainable Development and the Environment (*Instituto de Desenvolvimento Sustentável e Meio Ambiente – IDEMA*), which centralized plans and budgets, discouraging the actors.

Martins (2006), in analyzing the municipality of Barra Bonita, considered it to be in critical condition because of soil erosion and high demand for water. The author defined the main actors of that municipality's network and conducted interviews focusing on the watershed committee in the region, to find that there is a dominance of private local interests, such as those held by managers of tourism and small farmers. This creates then a field of territorial complexity, with different values and meanings assigned to natural resources, where the watershed committee cannot act as a catalyst of democratic management. The conclusion is that there is a lack of collective action.

According to Frey (2003), the State has no tools for collective participation and coordination toward common goals. In Brazil the situation is complicated because there is still strong social exclusion and the middle class tends to maintain an active status, which was not the case in Italy, studied by Putnam (1993). In Italy there were the conditions for a strong civic participation creating social capital, *i.e.,* a set of rules, shared knowledge, and trust. The important point in this study by Putnam (and later) is that a relationship exists between civic engagement and institutional performance. Technical action does not occur in isolation. Despite not using the technical terms of network theory, the points raised by Frey are aligned with this theory.

This and other articles on business networks and community networks have converged on the following points: 1) social ties are dense and demanding; 2) social attachment and involvement are provided through common institutions; 3) ritual occasions are present; 4) groups are of small size; 5) there are perceptions of one's similarity with the physical characteristics, style of expression, way of life, or historical experiences of others; and 6) there are common beliefs in an idea system, a moral order, an institution, or a group (Brint, 2001).

In a paper mentioning methodological guidelines close to the ones proposed here, Cezar *et al.,* (2000) mapped the network of farmers in Mato Grosso. Differently, Kageyama (2004) discussed the concept of 'rural' and analyzed the development of municipalities by means of indices that include conservation practices.

The short panel of papers presented above shows that a sedimented knowledge on the study of environmental policies based on theories of networks is not yet available, although authors depict situations that have characteristics of networking events, such as cooperation, interdependence, integration, conflicts of interest, governance and interconnectivity. The analysis shows that this is a field still in development, both regarding theoretical models - dominated by institutional theory- and management guidelines, where there is a directive to the participation of civil society but there are no resources to do so.

Specifically on the use of networking theories, little material was found, although characteristics described, such as interdependence, constitute fields of interest of the network approaches. Concerning the present work this is favorable evidence, since the phenomenon seems to have characteristics that enable the use of network theories.

7. RESULTS

A survey of the type of structure in the Administration of Brazilian municipalities that deal with the environment (IBGE, 2009), recorded six types whose frequency can be seen in Table Nº 3, where one realizes that many municipalities do not even have a specific/institutional structure to deal environmental issues.

When that data were crossed with other secondary data regarding the 645 municipalities of the São Paulo State, a relationship appeared between the existence of an exclusive structure dedicated to environmental issues in the hierarchy of city government, and a larger percentage of areas occupied by natural vegetation remaining in the municipalities. Also, we have noticed that the relative value of agricultural production to GDP tends to be lower in municipalities where concern for environmental issues has resulted in the existence of an exclusive agency. Municipalities where there is a greater contribution of agricultural production to GDP tend to give less prominence to environmental issues in the municipal structure, and also to have lower percentages of areas with remaining natural vegetation.

What do these data suggest? That is there a model of economic action opposed to a model of environmental issues management? We consider that this opposition does not hold. The model of cooperation networks is an approach capable of explaining the results. It relies on the assumption that social relationships among actors participating in the implementation of agro-environmental policies in the municipalities have an important role in the decisions of these actors, and also on the success or the problems of such implementation in conjunction with the actions of economic production.

Those municipalities where the network of local actors elects the Environment as a priority have in result a well-defined related structure in the municipal hierarchy, which concurs for greater preservation of natural vegetation and a low rate of primary sector in the economy. A strict causal relationship cannot be established, but it can be said that environmental, economic and rural managements are interconnected. The connection can result in a reverse causal relationship ($\uparrow$preserving = $\downarrow$production) or a direct causal relationship ($\uparrow$preserving = $\uparrow$oriented production).

To check the explanatory power of the model and the instrument, and their efficiency in collecting data to respond to the problem, we will present some data collected in municipalities of São Paulo State in order to discuss this ability and validity, not aiming to exhaust analysis of the municipalities.

In the first municipality studied, which has a privileged geographical position, agro-environmental policies are undervalued because the municipality's motto is urban economic development. This small section of speech (of one individual) illustrates the point of convergence of the interviews:

> «In urbanization, everything was done: sidewalks, clean water... but without analysis of environmental impacts. Rural areas have become urban and smallholders are not assisted, having problems with taxes: ITR (rural) or IPTU (urban). The current industrial development deprived my neighborhood so much of its characteristics that I decided to enter public life».

The model was able to show that the control of social relationships (in this case primarily political relationships) determines the flow of relationships between actors, *i.e.,* the dominance of technical and

Table 3

Types of structure in environmental area in Brazilian municipalities, characterized by managing agency			
Type of structure	**Number of Municipalities**		
	Brazil	**Southern Region**	**Sao Paulo**
City Office in conjunction with other policies	2,470	601	205
Exclusive City Office	1,124	385	155
Inexistence of specific structure	860	305	113
Sector responds to another City Office	752	173	45
Sector reporting directly to Executive	321	196	122
Agency of Indirect Administration	38	8	5
Total	**5,565**	**1,668**	**645**

Source: Own elaboration.

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economic flows. The municipal network isconfigured as a centralized one, with the political coalition called 'developmentalist' determining the course of projects. The government majority exerts control, which inhibits and rejects the efforts of rural and environmental organizations. Economic growth stands above everything. The model was able to show the interfaces of two subsystems -the social and economic- and instruments proved suitable for collection and analysis.

The second municipality neighbors the one studied first. Application of the model has shown a policy that values the environment and takes actions to preserve it, such as warranting self-sufficiency in water supply and complete treatment of sewage, unlike the neighboring municipality.

Network mapping showed that there is a more operative group and little expansion of the network, *i.e.,* the system is almost closed. Interestingly enough, in this example the instruments were able to show that the flow inside the network on the environment is essentially technical, with actors saying that social relationships could disrupt the functioning of the system. Government actors are attuned to the discourse of instrumental rationality, acting in a logical manner and within the law. There are no social forces in defense of private concerns; there is no intensification of actions for trust, commitment, friendship or other social varia-bles. In this case, the instruments are proving to be adequate, but data contradict the statement of the basic model, since social relationships are perceived as barriers. The following excerpt of the speech of one individual illustrates our conclusion:

> *«At the meetings of Condema (Environment Council) no one is at the center of decision, since each topic generates different dynamic leadership. Final opinion is decided by simple majority. The meetings are technical. They begin and end there, because a social extension could be a disturbance. Counselors are pretty straightforward; there is no social influence and no game interest. If project is controversial, it just goes back for clarification.»*

In the third example there is a central actor, the major, who determines what should be done in environmental policy, with other players lined up and servile. As the situation of the municipality is financially comfortable because of large industries, there is no political opposition or dissent in civil society. An example is the lack of a local syndicate of farmers. Data support the assertion that social power relationships determine the course of actors' technical actions. The aptitude of the municipality is industrial, with strong urban development. The rural environment issue boils down to trying to develop tourism in old coffee farms. The following speech of an individual exemplifies the conclusions:

> *«The city seeks a conciliatory course of action, for example, negotiating with small farmers a minimum area of protection, even outside the legal norm. For us, it is preferable to have 10 meters than to have nothing. As the municipality is geared towards industrialization, and as the urban area is growing, there may be some environmental problems, such as the indiscriminate growth of capybaras[4].»*

The fourth municipality is considered a resort town, very near the capital city of São Paulo. After two decades of stagnation, there were moves to increase tourism based on the famous regional wineries. In parallel, the Secretary of Environment, who actually runs several departments at the same time, seeks to approximate the various sectors (wineries, hotels, livestock farmers, church, trade unions, and civil society) to implement a development plan for the region. The greatest resistance is based on the moral value of individual competition. The second point is the political dispute. Thus, while some seek integration, as the Secretary and some businessmen, others such as syndicalists and businessmen not linked to the wine sector criticize these efforts of conciliation.

In this context, we conclude that the guiding statement holds. Data show a close connection between the social relationships among those involved, whether cooperation or struggle for power, and the patterns and results of production. Family relationships facilitate the birth of business groups, while power relationships defeat other groups. The theme of environmental policies in this situation is quite neglected.

All four examples show the applicability of the proposed model and also its explanatory power, even when data collected do not support the basic hypothesis. Therefore, the instrument is able to discriminate the structures and dynamics of different networks.

8. CONCLUSIONS

The aim of this paper was to discuss the implementation of agro-environmental policies in municipalities of São Paulo State and present a model of theoretical and methodological framework that would serve as a guide to research in the area. The basic assertion is that the development, success and problems of technical implementation actions are directly influenced by the

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4 *Hydrochoerus hydrochaeris,* also known as capibara, chigüire, ronsoco, chigüiro, carpincho and capivara, is the largest living rodent in the world.

social relationships between actors involved in the task. The responses received to date, the data collected from four cities and their interpretation, all indicate that the statement holds. Relationships of power, political influence, trust and commitment are interwoven with the environmental decisions and actions in rural areas.

The work achieved two objectives. The first was to value the application of social network theories to public policy, which is uncommon in the Brazilian academy. The second was to present an instrument specifically designed to investigate the validity of the assumptions, which was tested in four cities having shown its applicability and ability to generate data for questions about networks.

As intended, we went beyond the traditional models of public management that use arguments of the institutional theory and the theory of stakeholders, by using the social network theory and directing our focus to the complexity of the human need to produce food, fiber and energy from biomass combined with actions to preserve the intricate ecosystems that support life on our planet. In this context, we confirmed that public policies are the tools that seek to resolve conflicting interests and create conditions for joint actions.

Our results made it clear that, also with regard to agro-environmental policies -the actions of interest in this work- the implementation is the «missing link», as pointed out by Silva and Melo (2000). Evidences collected in the present case also pointed out that the lack of coordination, the lack of flow in communications, and the imposition of strict and detailed plans contribute to the failure of implementation. And like was said before (Bressers and Ringeling, 1995), there were two major problems to be solved: the question of the theory of implementation and the issue of variables to be observed. This paper has sought to contribute to solve these two problems.

The network architecture is a structure that replaces organizations having well-defined limits. In a network in which economic goals are not priorities, the tendency is to use more the social networking paradigm, and this is the perspective from which this work developed. The affirmative of this paradigm is that there is a social background to the relationships of production within a network, whether commercial or not. Today's society is organized as a network and business networks are substructures that reproduce the social structure (Castells, 1999).

Based on analyses of secondary data, on field surveys, and on reflections of the authors of the texts dealing with the implementation of agro-environmental policies, combined with the fundamentals of networks, we proposed a model of research design and interpretation of data that places social variables in the background of the node, as seen in Figure Nº 1. The proposal came from a research design in the form of a system indicating the interrelations between subsystems, and resulted in a qualitative methodology that seeks the convergence of the flows. Research strategy was exploratory, and data were collected and interpreted using the methods of content analysis.

Previous works on business networks (Giglio and Kwasnicka, 2005; Bazanini *et al.,* 2006) have shown that this approach offers some advantages over the commonly used theories in the field of public policy, since it is capable of dealing with uncertainty, unpredictability, rearrangements, and the inclusion of social and technical factors. In this paper the social theory of business networks has been shown to explain the success and failure in the implementation of agro-environmental policies, discriminating distinct networks in different municipalities in São Paulo State.

Secondly, we presented a data-collecting tool specially constructed for the case of agro-environmental policies, which proved effective in collecting data that allow analysis of conjunctions and differences; that is, it can separate social from technical factors, and at the same time can indicate their conjunctions.

Despite its innovative character, or perhaps for this reason, we must recognize the limits of the proposed model: for example, that there is some difficulty in separating social flows from technical flows. We expect, however, that this model will be improved as it is tested and applied, both by researchers and managers of public policies.

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