Subsystem interconnectedness as part of coalition strategies for policy change: mining and water management in Ecuador between 1991 and 2010.

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1. Introduction

The policy subsystem is the main unit of analysis in several theoretical frameworks that study policy processes including Punctuated Equilibrium, Social Construction and Policy Design and the Advocacy Coalition Framework (Jochim & May, 2009) . For over a decade, scholars refining these frameworks have focused on the emergence, change, and destruction of subsystems, paying little attention to interactions between subsystems as a potential avenue for policy change (Jones & Jenkins-Smith, 2009). More recently, scholars working within the research program of the ACF have expressed interest in exploring "subsystem interconnectedness and how exogenous drivers intervene with internal subsystem factors in producing policy change" Douglas, Ingold, Nohrstedt, and Weible (2014, p. 306). These studies show how coalitions use interactions between levels of governance to maintain their preferred policies in specific subsystems (Montefrio, 2014) and how opportunity structures impact coalition strategies in different types of subsystems (Gupta, 2014). Our study is inscribed in this emerging literature and explores subsystem interconnectedness as part of coalition strategies to attempt policy change.

In this paper we show that studying subsystem interconnectedness could be of particular importance to understand policy change in nascent subsystems in unstable political environments. Drawing from social movements literature (Meyer, 2005; Tarrow, 2011), we argue that regime instability opens opportunities for revisionist coalitions to strategize the interactions between new or existing subsystems and the macro system in order to advance their policy objectives. These strategies should be more prevalent where subsystems do not enjoy great autonomy and complex policy communities have not yet developed. Such dynamics can be seen, among others, in the recent episodes of policy change in relation to the regulation of glaciers and mining in Argentina and Chile (Bottaro, Latta, & Sola, 2014).

In this paper, we use the case of recent regime changes in Ecuador to study how policy coalitions attempt policy change via subsystem interconnections. Our study applies the heuristic contained in the "policy topography" model developed by Jones and Jenkins-Smith (2009) to study subsystem interactions. We discuss this model in section two. In the third section, we discuss how discourse network analysis can help us evaluate change in advocacy coalitions and subsystem interconnections in light of regime change. In section four we present the results of our study and discuss the main findings. We close with a brief discussion about the study of subsystem interconnections using discourse networks. The article contributes to refine the ACFs concern on how coalitions seek to alter the behavior of governmental institutions in a period of over a decade or more. It also provides evidence supporting some of the existing hypothesis in the ACF about policy change and offers insight on the application of the ACF in less stable democracies.

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2. Studying subsystem interconnectedness

Modern states use policy subsystems as units for the parallel management of several political issues (Howlett, Ramesh, & Pearl, 2009). The macro level creates, oversees, and interferes with the subunits as needed (Habermas, 1998), while subsystems accommodates most of the conflict and cooperation that define an arena amenable for public action (Lowi, 1964) (e.g. health, education, water management). The relative autonomy of subunits deepens along with growing specialization of the knowledge about issues (P. Sabatier, 1988) that are socially constructed and maintained as separate from others (Schneider & Ingram, 1997). Despite specialization, autonomy can be reverted by the macro level when interactions are activated through processes of politicization of new issues, redefinition of problems or the emergence of new solutions to old problems (Baumgartner & Jones, 1991).

After almost two decades of developing the ACF as a theoretical framework for the study of the policy process, scholars are starting to pay closer attention to subsystem interconnections as a factor intervening in the complex causal mechanisms leading to policy change (Jones & Jenkins-Smith, 2009). Since its inception, the ACF considered decisions and outcomes from one subsystem as one of the most important factors affecting subsystem politics on other subsystems (P. Sabatier, 1988). Nevertheless, interactions between subsystems were not explicitly presented as a political space for the activity of advocacy groups. We attribute this omission to the emphasis put on presenting subsystems as coherent and semi-autonomous units during the early development of the framework and to the influence of transaction cost theory therein.

The ACF was developed as an alternative approach to policy analysis centered on the study of specific institutions (governmental agencies) and their role in the regulation of a substantive issue in industrial polyarchies. The subsystem heuristic that is central to the ACF offers a more comprehensive form of differentiating specific arenas of policy activity placing greater attention to processes of learning within and across advocacy groups that include governmental authorities, scientists, members of the press and other actors grouped by their commonality of beliefs and resources rather by the role they have in relation to a specific institution (P. Sabatier, 1988). As the growing body of literature on the ACF shows, this heuristic has developed in a vibrant research program concerned with policy learning, coalition formation and policy change (Jenkins-Smith, Nohrstedt, Weible, & Sabatier, 2014; Sotirov & Memmler, 2012).

The ACF also argues that rival policy coalitions will devote most of their energy and resources to changing or maintaining the behavior of the agencies that have direct influence on the actors within a subsystem. Appealing to external sources of influence can be costly, particularly when government decision makers are not necessarily supportive or when decisions take a considerable time to be implemented and the probable efficacy of altering institutional behavior is low or unknown (P. Sabatier & Jenkins-Smith, 1993). Especially when subsystems are mature, that is, when coalitions recognize themselves as a community with some advantage in the management of a certain issue, coalitions face high barriers to enter other subsystems.

Despite the barriers, coalitions do venture outside subsystem boundaries. P. A. Sabatier and Pelkey (1987) argue that when coalition strategies cannot change the behavior of governmental institutions that underpin the policy subsystems where they operate, they will "shop around" among agencies and sovereigns (those controlling the agencies' resources) to influence receptive people. But venue shopping has not been explicitly presented as a strategy that links various subsystems, rather it still refers to the

mobilization of influences from system-wide institutions such as courts and the legislative, or even across nested scales of government and international actors (see Pralle, 2003). Interconnections between functionally overlapping subsystems with the same or different level of hierarchy require further exploration.

The emergence of more complex forms of governance poses challenges to the subsystem heuristic applied to policies that tackle contemporary problems such as climate change (Jochim & May, 2010). New polycentric arrangements demand attention be given to the interactions between scales or levels of government, as well as across issues and institutional structures that require some degree of coordination to effectively change behaviors and produce the desired policy outputs and outcomes (see Lubell, 2013).

Interconnections between subsystems – overlapped or clustered because of the relationship between the substantive issues they regulate- lay at the center of Jones and Jenkins-Smith (2009) model of "policy topography". In order to identify and characterize patterns of relationships across subsystems this model considers three elements; public opinion, clusters of linked subsystems, and a habitat of policy issue venues that advocacy coalitions actively use to promote or prevent change. Authors argue that policy subsystems operate in clusters that are networked by the transmission of information (possibly due to overlapping policy images), the strategizing activities of policy entrepreneurs[‡] (which connect policy venues) and public opinion disruptions.

In this model, public opinion is a foundational element of policy change that is used by elites to expand the scope of conflict (using some form of heresthetics) into several venues in order to increase the resources available to coalitions. Public opinion also constrains the development of strategies by policy actors establishing some sense of what is socially possible or acceptable at a certain conjuncture. If policy entrepreneurs successfully deconstruct the dominant policy image of a subsystem (or cluster) and create a new image connecting subsystems (or clusters), a change in policy will be likely. Deconstruction of policy images is possible due to general changes in public opinion initiated by large-scale events[§] (*salience disruptions*) or the release of new information about a problem that changes the public's perception (*policy dimension shifts*). The manipulation of public opinion can give entrepreneurs leverage to enter networks of actors and venues that have authority in the regulation of the targeted subsystems (or clusters).

In the "policy topography model", once public opinion has been disrupted, networks of actors from different subsystems engage in herestethic activities to advance their policy objectives, but the integrating role of the macro level acting as a unit above and beyond the subsystems is only implied. Michael Mintrom and Norman (2009) argue that the agency of entrepreneurs and coalitions must be approached in dialogic terms, that is, taking the conditions of the context where they operate into consideration. We know that actors participate in networks linking subsystems, but only a portion the intervening

[‡] Drawing from Jones and Jenkins-Smith (2009) and Mintrom and Vergari (1996), we define policy entrepreneurs as individuals embedded in social networks who strategically use herestethics to resolve collective action problems.

[§] Large events originate from changes in the basic characteristics of the political system and the regime within. We understand regimes following Tarrow "regular relations among movements, established political actors, challengers, and outside political actors […]" (2010: 183). Change in the political system will manifest as changes in the external events identified by the ACF.

agency will be captured by looking at the subsystems within their internal logics of stasis and change. Some of those same actors will also display macro level agency from the logic of systemic integration. Therefore, disruptions test the ability of macro-level actors to integrate a society by ordering subsystems so they maintain or assume certain desirable functionality that serves purposes larger than those pursued by subsystem alone (Habermas, 1998). Moreover, disruptions should be understood as moments where the relative autonomies of subsystems are renegotiated as the attention of the entire system is placed over the connection between the macro and meso levels.

Tarrow (2011) identifies two general conditions created by actors at the macro level that can have an impact on the ability of subsystem entrepreneurs and revisionist coalitions to change the path of politics. These conditions are created as macro-level elite responses to disruptions. The first one refers to the opening of institutionalized spaces for participation of challengers of the *status quo*. This option can change the internal balance of power in a subsystem because it affects mostly the meso level of policy and political activity. The second condition originates in deeper rifts between macro level elites that produce the formation of tacit alliances in which challengers are included as part of a vanguard of the process of change and elite realignment. These two conditions will change the position of entrepreneurs and coalitions in the network of actors that link policy venues, albeit in different ways.

Formal processes may slowly expand the ability of coalitions to access certain venues reflecting a relatively long-lasting increase in the openness of the political system and the development of the familiarity that breeds trust. On the other hand, alliances may catapult challengers to positions of political influence that may or may not survive the window of opportunity in which the entire system navigates change (Meyer, 2005). When the action (or reaction) of elites create conditions for short-term network expansion, dominant actors (or proximate entrepreneurs in Mintrom's terms) in a subsystem will be better positioned to steer change since they are likely to control formal legal authority to make policy decisions. Nevertheless, it is how this relational dynamic unfolds in face of the changing environment of a subsystem that can prevent or facilitate policy change.

Alliances may be grounded on belief compatibility at different levels of the belief systems making new networks lasting features of the new political regime. But alliances may also be the product of short-term convenience to achieve a secondary policy objective using the means available or mere instrumentalization (P. Sabatier, 1988). This is particularly important in political systems where democratic legitimacy is less determined by the influence of public opinion on public action and decision-makers enjoy social norms that concede greater autonomy to decide over public matters such as in the "delegative democracies" in Latin American countries (O'Donell, 1994).

Since change and stability co-exist in policy processes (Capano, 2009), the study of subsystem interconnectedness must acknowledge that changes in regimes also create threats or constraints to revisionist agendas. Opportunities and threats do not only emerge from the structures and rules of the venues being connected by policy entrepreneurs as presented in the "policy topography" model. They also arise from the repertoire of action developed historically in the confrontation between organized collectivities that compete among other things to define the boundaries of public action (Tarrow, 2011). These repertoires define what actions are appropriate to be taken when the *status quo* is questioned, as well as who is allowed to act and who is not (Meyer, 2005).

Since coalitions compete to control the institutions that underpin subsystems, their strategic action will be oriented towards establishing rules that change institutions' behaviors in a way that is compatible to their policy beliefs. Since coalitions deal with complex institutional systems, we can expect them to introduce direct payoff externalities between subsystems, establishing hierarchies between institutions, privileging the venue or venues where they exert more influence or those that they control directly.

Considering these elements, we push forward the research agenda on subsystem interconnectedness evaluating the following proposition: P1: *When episodes of regime change expand the network of revisionist coalitions that politicize the overlap between subsystems to positions of influence, rival coalitions will compete to introduce direct payoff externalities between overlapped subsystems in which they participate, in order to advance their policy agenda. Those more proximate to macro system actors will prevail.* In the following section we present the methodology and dataset used to evaluate this proposition.

3. Method

In this article we study the transformation of a policy network in Ecuador between 2006 and 2010 in order to assess the impact of the politicization of subsystem interconnections on policy change. Following P. Sabatier and Weible (2007) we define the dependent variable as alterations in the core concepts of the legislation regulating the subsystem of interest. That is, we are expecting a major policy change to emerge from coalitions engaging in a trans-subsystem strategy given that alterations in the political regime are involved in the process. Regime change, the necessary condition for network change, is defined here as modifications of at least one of the external conditions identified in the ACF as part of the environment where subsystems operate. Among others, the ACF includes the following conditions; the basic constitutional structure, socioeconomic conditions, and changes in systemic governing coalitions (Jenkins-Smith et al., 2014, p. 194).

The policy arena we study is the subsystem regulating large-scale mining at the national level in Ecuador. In order to identify what role subsystem interconnections play in policy change, we identify the conditions and reconstruct the process by which a national coalition opposed to large-scale mining links this subsystem with the water management subsystem that also operates at the national level. During the 1990s and early 2002s, actors that oppose large-scale mining made attempts to introduce direct payoff externalities over the mining subsystem politicizing the relationship between water and mining. These attempts started at the local level but did not change the existing policy, as we will see in section 4.

After episodes of regime change, we expect this politicization to escalate to the national level. We expect to find more actors (organizations) and institutions (venues) from the water management subsystem entering the dispute about the existing mining policy. Changes to the composition of the network that span both subsystems should be reflected in higher centralities actors and venues related to water management. If interconnections are effective, we expect that core elements of new policy would reflect a new form of hierarchical arrangement between the subsystems involved.

We use a discourse network as a proxy to the network of actors and beliefs that link the mining and water management subsystems. A discourse network is composed of utterances that policy actors make about their beliefs. This type of networks have been

elicited from transcripts of parliamentary hearings and newspaper articles convincingly avoiding problems of retrospective reporting of elites about processes of policy change (see Leifeld, 2013 and references therein). The core of our dataset consists of 816 online news reports from three major news sources in Ecuador covering the five years between 2006 and 2010. *Explored* is a news digital archive maintained by *Diario HOY*, which gives open access to news reports from all major newspapers since 1990. *EcuadorInmediato.com* is an online press agency with countrywide coverage that maintains an open database of its content since 2000. *El Comercio* is a newspaper with nation-wide reach that keeps an open digital database of its online content published since 1994. These reports were filtered using each media's online search tool and the keywords (in Spanish): *minería* (mining) and *mina* (mine). Duplicated articles were discarded from the dataset.

Quotes of utterances contained in the reports were inductively coded using Discourse Network Analyzer (DNA), a category-based content analysis software developed by Leifeld (2013). Codes were assigned following Sabatier's definition of the structure of belief systems (1988). Agreements and disagreements with the statement contained in the utterance were determined inductively and coded for each utterance. We also coded diagnostic utterances through which actors explained the reason for the existing conflicts or problems in the mining subsystem that justify the need for reform. These explanations serve as part of the framework from which actors derive causal explanations about how problems should be tackled (policy preferences) and serve to identify cleavages (Yearley, 2005; Zald, 2005). Four iterations of this discursive network were computed taking the episodes of regime change as cutoff points as shown in Table 1.

Table 1: Periods of analysis

	Start	**Ends**	**Description**
T0	31/03/2006	11/12/2006	Reports about conflicts before the reform agenda enters the public sphere.
T1	12/12/2006	29/11/2007	Reform agendas based on economic considerations enter the public sphere.
T2	30/11/2007	29/10/2008	New systemic governing coalition ruling under the 1998 constitution.
T3	20/10/2008	31/12/2010	New systemic governing coalition ruling under the 2008 constitution.

One researcher coded all the articles in three waves, one for each media outlet used. Stability was the (weak) criteria used to control the quality of the coding process (Krippendorff, 2004). All articles in each wave were coded and then recoded after a period of two weeks. Intra-observer inconsistencies were roughly 2% in average for all waves. Communicative validation, that is a consensus achieved discursively about the content of the analysis between researchers and the researched (Kohlbacher, 2006; Mayring, 2014) was used to assess validity. An in depth semi-structured interview was conducted with coalition elites (n=9) which represent the most active anti-mining (n=5) and pro-mining organizations (n=4). The objective of this interview was to establish a timeline of events leading to policy change in the mining subsystem identifying the main actors and main issues of contention. After the interview a first version of the

network iterations was individually presented to the respondents. During this interaction two elements were evaluated; the composition of the network elicited with newspaper articles in terms of actors involved and content of utterances and the adequacy of the cutoff point selected. No major changes were suggested by the respondents about the structure of the networks other than changes in the names of organizations that were wrongly reported by the media. Names were only changed if more than half the respondents suggested the same change. In total only three changes to the names of organizations were introduced. In terms of content of utterances, respondent did not disagree with the contents reported by media but about half (n=5) expressed an opinion along the following lines:

"I did not know that media reported this [mining conflicts]. At the time we felt they did not care about our struggle and we looked for alternative ways to make our voice heard but mostly at the local level. It is sad that they only present short reports of what is actually a complex battle. But on the other hand, people have so many problems to deal with that a pill of information is better than nothing" (R4, October 2014).

In depth interviews were used to "thicken" the narrative about the processes triggered by changes in the political regime and to verify the validity of the causal chains that emerged from reconstructing the processes from news reports.

Changes in the composition of the network were measured as changes in the centrality of actors and the number of factions (given by agreement with statements) in each period. The statements associated with each actor where computed as affiliation matrices in DNA and analyzed with UCINET 6 (Borgatti, Everett, & Freeman, 2002). All graphical representations of the networks were produced using the NetDraw package from UCINET 6 (Borgatti, 2002). The affiliation matrices presented in section 4 contain actors and statements represented as nodes, and agreements from actors to statements represent relationships or ties.

Only affiliation networks were used in the computations in order to maintain the fundamental duality inherent in the affiliation relation (Faust, 1997, pp. 165-177); that is, the centrality of actors and the centrality of the statements as function of each other. Actors that support more statements, which in turn have a high number of actors related to them, will have higher centralities and *vice versa*. In the presentation of results we use normalized eigenvector centrality as a measure of the extent to which actors are in a position of influence to others in a network (Prell, 2012). Other measures of centrality are reported in Annex 2 but not discussed in this paper. We expect that after episodes of regime change, network change will manifest as a higher number of actors from the interacting subsystems and macro level actors. These actors should also have higher centralities. Finally, we expect that utterances expressing policy images connecting subsystems will become more central and divide the coalitions during the process.

The number and composition of factions in each period were identified using the Girvan-Newman algorithm to analyze subcomponents incorporated in UCINET VI. We use the Girvan-Newman algorithm because other analyses of cohesive sub groups rely on the presence of substructures within the network (such as cliques) (Wasserman & Faust, 1994, pp. 199-200) for which we do not have accurate data. The Girvan-Newman routine yields the number of cohesive groups resulting from removing the edges with the highest betweenness centrality. That is, the edges with the highest frequency when we count the times they are crossed between two non-connected nodes. The routine reports modularities or Q values that are numerical scores reflecting "how good each partition is through comparing the number of internal links in the subgroups with how

many one would expect if these links were distributed at random. Higher values of Q mean that the algorithm has found more significant groupings, whereas negative values are possibly showing that the groups are worse than one would expect from a random process" (Prell, 2012, p. 161).

4. Setting the stage: mining development and water management in the 1990s

Up to 1991 the mining sector in Ecuador was regulated by a law enacted by the military dictatorship in 1972, which encouraged State-owned companies to directly, or in association with private capitals, engage in the extraction of resources. This policy did not produce the desired results. By the late 1980, there were no commercially significant operations in the country and less than 1% of the Gross Domestic Product was originated in the mining sector, predominantly in small-scale gold operations (Liebenthal, Dahan, & Babelon, 2003). In 1998, a reform was proposed to attract foreign capitals to develop the mining sector in order to increase State revenue from non-oil sources. The new law passed in 1991 closely aligned with the principles of the modern mining code developed by the World Bank during its experiences of sectoral privatization and liberalization in Africa. This reduced the participation of the State in the operation of mines eliminating State-owned mining companies and introduced incentives for foreign investment in the form of tax exceptions and low royalty payments. Interests from within the Ministry of Energy and Mines (national sectoral authority) opposed the disappearance of State owned mining companies that they controlled but quickly adjusted their interests to the minimalist-State model. The 1991 regulatory framework was completed in 1997 when regulations of environmental issues were introduced, two years after Ecuador created a national environmental authority. Along with the minimalist-State program, a succession of conservative and populist governments pushed a decentralization agenda (Jörg, Arneth, Goltz, Illerhues, & Schloms, 2008) that in this subsystem resulted in the transfer of competencies for environmental control of mining operations from the Ministry of Environment to the Ministry of Energy and Mines.

Opposition to the mining industry and its prospects of large-scale operations emerged soon after the new law was enacted. In 1993, the local non-governmental organization *Fundación Arco Iris* and Mining Watch UK launched a campaign against mining giant Rio Tinto and presented a petition before the Supreme Constitutional Tribunal to stop the construction of a road inside Podocarpus National Park. The Tribunal ruled against the mining project on the basis of protecting the long-term viability of the park and the ecosystems that would otherwise under threatened by colonization as occurred in most of the Amazon region of Ecuador after oil extraction began in the early 1970s (López, Torres, & Beltrán, 2003).

Between 1996 and 2001 the mining industry was virtually paralyzed due to the worldwide reduction of investments in exploration that followed the financial crisis in Southeast Asia. Nevertheless, these were active years in the water management subsystem were peasant and indigenous organizations and their allies rejected the privatization programs and stopped several attempts to reform the water law enacted in 1972. Between 1992 and 1994 the government introduced small reforms to the legal framework creating a subsystem with multiple venues that regulated several overlapping jurisdictions with weak division of competencies and a weak national authority (Global Water Partnership, 2003). By 2001, a great number of organizations opposing the privatizing agenda coalesced into the National Forum for Water Resources (FNRH for its initials in Spanish), a venue where civil society organizations, public

agencies and international cooperation agencies shared experiences for water management and build proposals for public policy to revert the problems with water distribution (Foro de los Recursos Hídricos, 2002).

The late 1990s was a period where legislation on social participation of resource governance and indigenous rights was at the center of political debates. Following decades of opposition to oil extraction and sustained political activity by indigenous organizations the National Congress ratified the 169 Agreement of the International Labor Organization on Free, Prior and Informed consultations to indigenous and tribal peoples, which mandates that governments should secure consent from indigenous leaders before moving ahead with projects that may affect local livelihoods. Broader consultations by mining operators to all local stakeholders were introduced in a constitutional reform in 1998 and regulated in the 1999 in the General Environmental Law as part of preliminary environmental assessments. In 2001, the Noboa government introduced partial reforms to the 1991 mining law increasing fiscal incentives for investment in mining projects. After the reform, the flow of petitions of new areas for exploration grew so fast that by 2003 the sectoral authority had dropped all oversight over the companies' activities (Liebenthal et al., 2003).

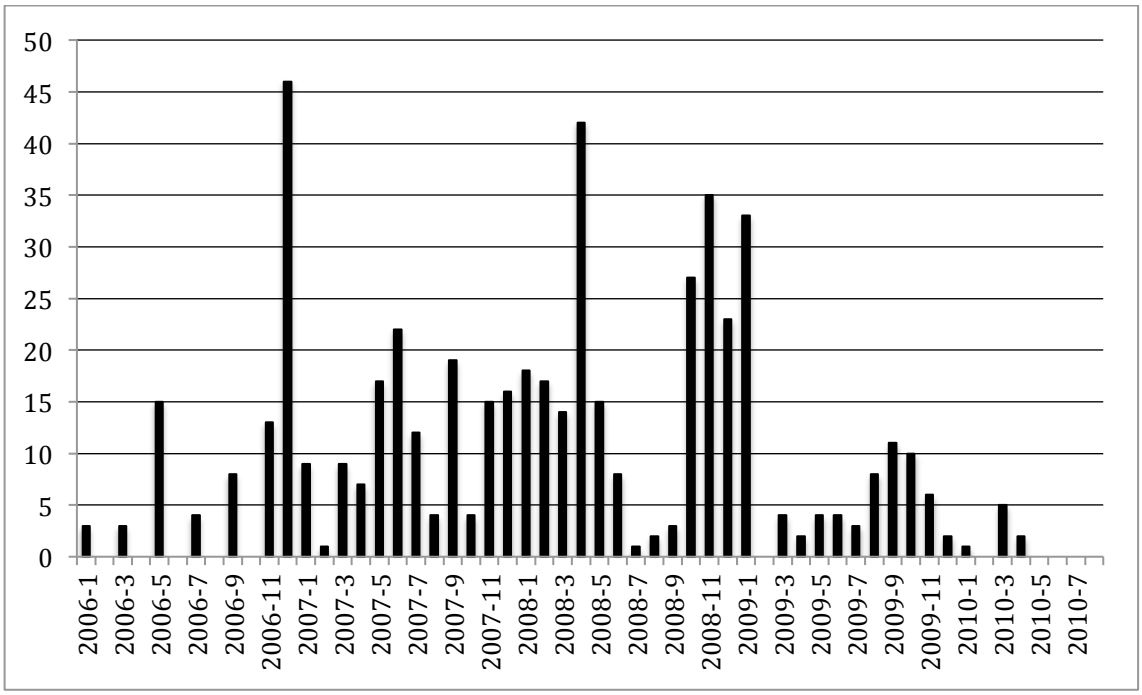
Discontent with the conduction of mining operations and the opportunities opened by decentralization and the integration of environmental objectives in the legislation transformed local governments in recipients of demands for regulation over mining activities. The most important case is that of the anti-mining organization DECOIN from the region of Íntag. This region is part of the Cotacachi municipality where in 1996 the first indigenous major; Auki Tituaña was elected with support from the indigenous political party Pachakutik with an agenda centered on strong participatory democracy to establish rules for land use planning and a local development program. Anti-mining interests saw an opportunity to introduce negative feedback on the mining subsystem. The emerging conflict about a large-scale copper and molybdenum mine in Intag during 1997 occupied a central place in the politicization of environmental issues in the local assembly and in 2001 it acquired support for a municipal decree banning the use of chemicals required in most large-scale mining operations (Bebbington et al., 2007). The municipal bill also declared that water management, food sovereignty and sustainable tourism were priorities for the development of Cotacachi and that all activities with potential to affect such objectives should be kept at bay. Other regional organizations struggling against mining attempted similar strategies with less success due to the particular conditions of their local polities, in particular, the lack of financial and technical resources that did not increase with decentralization (Cisneros, 2011).

By 2005, several regional experiences of rejection to the mining policy converged in a melting pot of civil society organizations that formed around the rejection of the Free Trade Initiative for the Americas and later the Andean negotiations for a free trade agreement with the United States. The national NGO *Acción Ecológica*, which supported the Íntag campaign and the formation of many other local anti-mining organizations in southern provinces of the country, had a central role in articulating these anti-mining regional initiatives and articulating a negative policy image of the mining sector centered on the inherent unsustainability of the mining industry. Nevertheless, before the public sphere, the national indigenous organization CONAIE was in command of the countrywide mobilizations rejecting the Free Trade Agreements (FTAs) (see Jameson, 2010).

In March 2006, the Palacio government froze negotiations for the Andean FTA with the United States after months of sustained demonstrations on the streets. When attention

shifted away from these negotiations the salience of anti-mining activism grew in the mainstream media. Media reports gather emerging criticism to the existing policy that allows large-scale projects in national parks threatening local livelihoods and biodiversity and does lack of enforcement of consultations to local communities by mining companies. Illustration 1 shows the monthly frequency of news reports that explicitly cover mining-related events between January 2006 and December 2010. Within this period, the first peak in reports appears in May 2006 following the increase of violent clashes between anti-mining organizations and mining companies. The second peak appears in December 2006 when the Palacio government called all mining activities to a halt and announced a reform to the existing legal framework. The Correa government was installed in January 2007 and a few months later a new peak in reports signals the re-emergence of demands for audits of existing operations. The peak in mid 2008 is created by reports of conflicts between the government and anti-mining organizations and the mediation by the National Constitutional Assembly. The last peak appears right before January 2009 during discussions leading to the enactment of a new mining law. Reports of challenges to the new nationalistic law from anti-mining groups and members of the mining guild persisted through 2009. The cycle of media attention to events related to large-scale mining ended by mid 2010.

Illustration 1: Frequency of news reports about mining in mainstream media



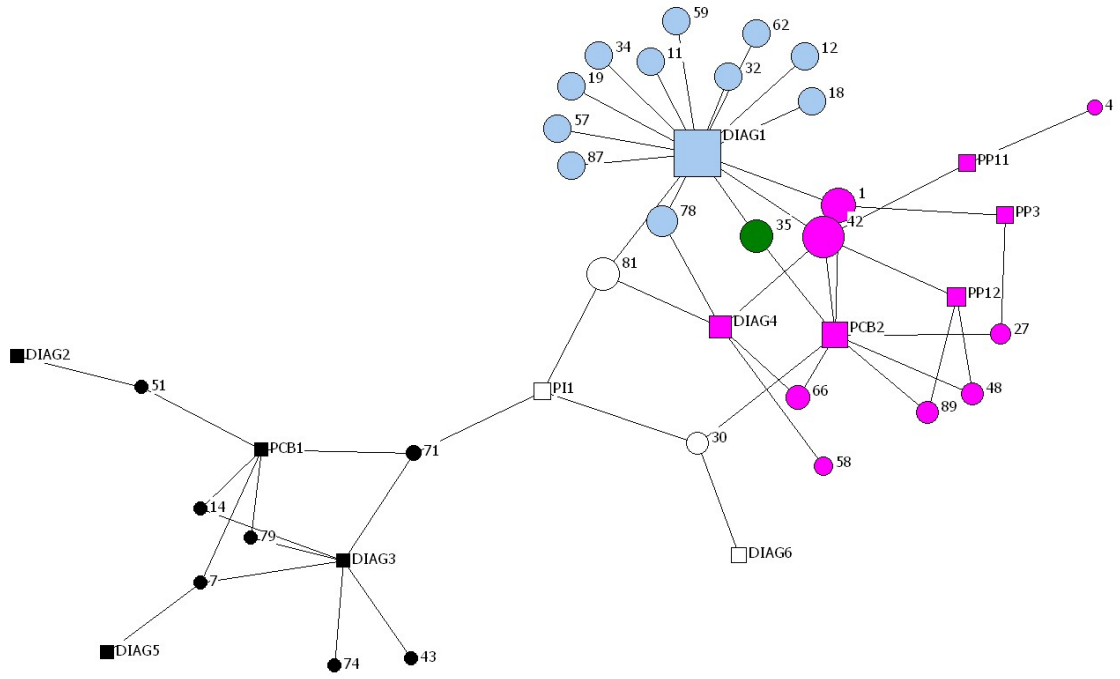
In order to study the discursive network during the emergence of anti-mining struggles we computed an affiliation network of organizations and utterances (the complete list of actors and utterances can be found in Annex 1). The digraph shown in Figure 1 represents a two-mode matrix for T_0, the period when politicization of mining issues acquired a national scope. Colors show the number of cohesive subgroups (n=5) identified using the Girvan-Newman algorithm for T_0. The parameter Q reached the maximum value (Q=0.549) with 5 clusters using the nodes coded as; deep policy core beliefs (PCB), policy preferences (PP), diagnostic utterances (DIAG) about the origins of conflicts in the mining sector, policy instruments (PI) and the nodes coded as organizations. This network can be broken in two main subgroups (Q=0.365) that differ on their opinion on whether mining creates wealth (PCB1) or undermines social and

natural capital (PCB2), which is the expected extremely polarized division between weak and strong sustainability that usually accompanies resource extraction dynamics. This division represents the core (ontological) discrepancy between the pro and the anti-mining coalitions in T_0 when mining conflicts entered the national public sphere.

The best partition of the network (Q=0.549) divides the group formed around the belief that mining undermines natural and social capital (PCB1) into four factions colored white, blue, green and magenta as shown in Figure 1. These factions represent subgroups of actors that defend core policy preferences PP3, PP11 and PP12, which refer to; banning large-scale mining from protected areas and headwaters, sanctioning binding consultations to local communities implemented by government agencies, and sanctioning collaborative forms of natural resource management respectively. The only belief on which there is agreement in T_0 is a policy instrument (PI1) proposing a halt to new concessions, auditing existing operations and reverting those found incompliant. The sectoral authority, the Ministry of Energy and Mines (MEM or node 71) is the only actor from the pro-mining coalition agreeing with the use of this instrument, which makes it the most central organization in the network (See Annex 2). Actors in the pro-mining coalition converge on the deep core belief (PCB1) that states that large-scale mining promotes development and support statements about the origin of the conflicts relating to distribution of benefits from mining operations (DIAG2), electoral tactics and manipulation by extremists (DIAG3) and lack of information about the characteristics of large-scale mining (DIAG5).

Evidence shows that the main utterance relating the mining and water subsystems is the demand to sanction some form of collaborative resource management system that could help prevent conflict for accessing water between local communities and mining companies (PP12). Nevertheless, only local actors directly involved in water management and conflicts with mining actively defended this position (nodes 27, 48 and 89 in Figure 1). None of the venues from the water management subsystem where attracted to the conflict about the mining subsystem.

Figure 1: Discourse network in T_0. Nodes are scaled by eigenvector centrality



4.1 Changes in governing coalition: the entrepreneurial period

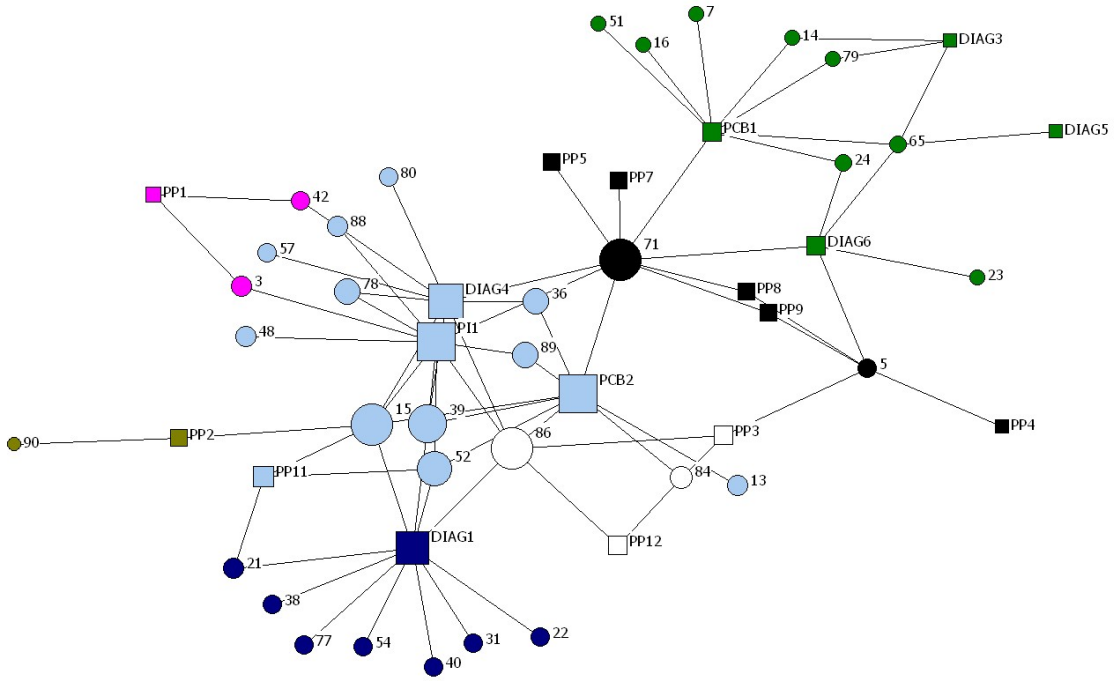
In December 2006, one month before the end of his term in office, President Palacio announced a reform to the existing mining law. The main argument was related to the potential benefits the State could receive from future operations if royalties and taxes were raised before extraction of resources started (PP9). Palacio did not achieve an agreement in Congress for his proposal to be considered but his reform agenda was resumed in early 2007 by the Correa government. Correa appointed Alberto Acosta, a long-time supporter of *Acción Ecológica*, one of the most central actors in T_0, as the head of the MEM[**].

Reacting to demonstrations from regional anti-mining organizations demanding an audit of mining operations (PI1), Acosta announced that a dialogue between all parties will be convened by the MEM to look for reforms to the existing policy and that audits to existing operations will be carried out. He also made clear that the government could accept the anti-mining demand to revert concessions due to lack of provisions within the existing legal framework. The minister warned that reversions could "expose the country to international arbitrations" which, he argued "are known for favoring transnational companies over sovereign States". Acosta appointed Jorge Jurado as head of the Viceministry of Mines to coordinate the process of dialogue. Anti-mining organizations now grouped in the National Coordinator for the Defense of Life and Sovereingty (CNDVS or node 15 in Figure 2) rejected the dialogue arguing that Jurado had been part of the group consultants that helped design and implement the policy during the previous decade and was close to mining interests.

Mobilizations organized by the CNDVS pushed the government to audit the most conflictive concessions to verify if operators had consulted local communities to obtain environmental permits. Tri-partite commissions were appointed to investigate the Quimsacocha and Junin projects. After reports documented several violations to administrative procedures and consultations (Pérez, 2012) the government came to an agreement with the company operating the Quimsacocha project to turn part of the land in the area under concession back to the local government for biodiversity conservation. As for the Junín project, the government backed the municipality's opposition to validate the environmental review for the project. However, the violent acts deployed by the company Ascendant Copper against those in opposition remained unpunished by the government.

[**] Rafael Correa campaigned representing a newly formed coalition of self-identified leftist organizations called *Acuerdo País*, later *Alianza País*. Arguing that the political class or *partidocracia* were a decadent political class supported by rules that favored their interests *Acuerdo País* refrained from the competition to control Congress in the 2006 general elections and proposed to install a Constitutional Assembly.

Figure 2: Discourse network in T1. Nodes scaled by eigenvector centrality.



Despite the pro-mining attitudes of the new authorities, the mining guild represented by the Ecuadorian Chamber of Mining (node 14) protested what they feared will transform into a full-blown nationalization of the mining sector. Mining companies also alerted the government that the reversion of concessions will only delay projects and leave local communities without the resources needed for their development. The emergence of these contentious issues produced a more fractioned network in T1 (Figure 2) where seven factions can be identified (Q=0.518). The most salient characteristic of this network is the presence of a new faction (colored black) within the pro-mining coalition (composed by the black and green factions) centered on the MEM (node 71), and the emergence of *Alianza País* (node 5) as one of the most central actors in it. With Acosta heading the MEM, more connections between the authority and the anti-mining coalitions emerged and there was some institutional support to the view that mining can undermine social and natural capital (PCB2). *Alianza País'* objectives for reform were; to reform the 1991 law to capture more rent (PP9) and increase State participation in the operation of mines (PP8), and create a mining ministry independent from hydrocarbons management (PP4).

Alberto Acosta resigned from MEM to launch his candidacy for the Constitutional Assembly causing the anti-mining coalition to lose influence over decision-making and policy implementation. Under a new minister, the MEM released a policy proposal for the new law entitled "The ABC of Mining" in July 2007. The document largely resembles the pro-mining coalition belief that conflicts in the subsystem are related to lack of information about the nature of large-scale mining within local communities (DIAG5 in Figure 2), and manipulation by extremist attitudes that reject the need to pursue development (DIAG3 in Figure 2). It also breaks away from the orthodoxy of mining policy espousing the idea (PP8 in Figure 2) that greater State participation in the direct operation of the sector is needed to achieve better policy outputs (see Ministerio de Energía y Minas, 2007).

During the short period where the anti-mining increased its political influence in the subsystem the National Environmental Assembly (ANA for ins initials in Spanish is represented as node 3) was incorporated to the network linking the mining subsystem with the water management subsystem. ANA demanded a new distribution of competences for natural resource management (PP1) as a measure to strengthen controls over environmental and social practices by mining companies. ANA is composed by regional and local civil groups that advocate for better distribution and use of natural resources, in particular water and land, and is important in the water management sector because it links the FNRH and CONAIE. Despite the inclusion of ANA, and the local (node 84), regional (nodes 13 and 89) and even other networks (nodes 36 and 86) closely related to FNHR, no venues from the water management subsystem were attracted to the network during T_1.

4.2. *Alianza País* governing as a systemic coalition

Alianza País won the majority of seats to the Constitutional Assembly becoming the first governing systemic coalition since the return to democracy in 1979. Campaigning for a fair distribution of resources and a transition away from an extraction based economy to avoid the "resource curse"; Acosta received the majority of votes in the referendum that placed him as head of the National Constitutional Assembly. He appointed members and partners of *Acción Ecológica* as advisors to him and to close collaborators who held seats in commissions defining new provisions on natural resources management for the constitution (Acosta, 2008). Several members of the FNRH held similar positions.

With the presence of Acosta in a position of higher political influence, and the growing support by the government to mining companies, a faction within the anti-mining coalition radicalized its demands, pushing for a total ban for large-scale mining in the new constitution receiving ample support (PP2 in Figure 3). Their influence in the Constitutional Assembly through Acosta seemed to make this plausible. On the other hand, the pro-mining coalition pressured the government to tap the mining potential of the country on the face of dwindling revenues from oil (PP9). Mining interests also called on *Alianza País* to stop the potential excess of Acosta who was perceived as part of a radical group that hated the industry. A cleavage in the governing coalition became evident, while Acosta called for an open dialogue to establish limits to the expansion of the mining industry, the pro-mining faction in the government "[…] moved to engage industry in dialogue regarding foreign investment in Ecuador. This dialogue includes plans to re-work oil and mining agreements in place with multi-national and state-owned companies, which could include new royalty and/or windfall profit tax rates for these sectors." (Corriente Resurces, 2008). Our data show that during this period, *Alianza País* is the only organization that espoused contradictory utterances in the public sphere both agreeing and disagreeing with anti-mining statements.

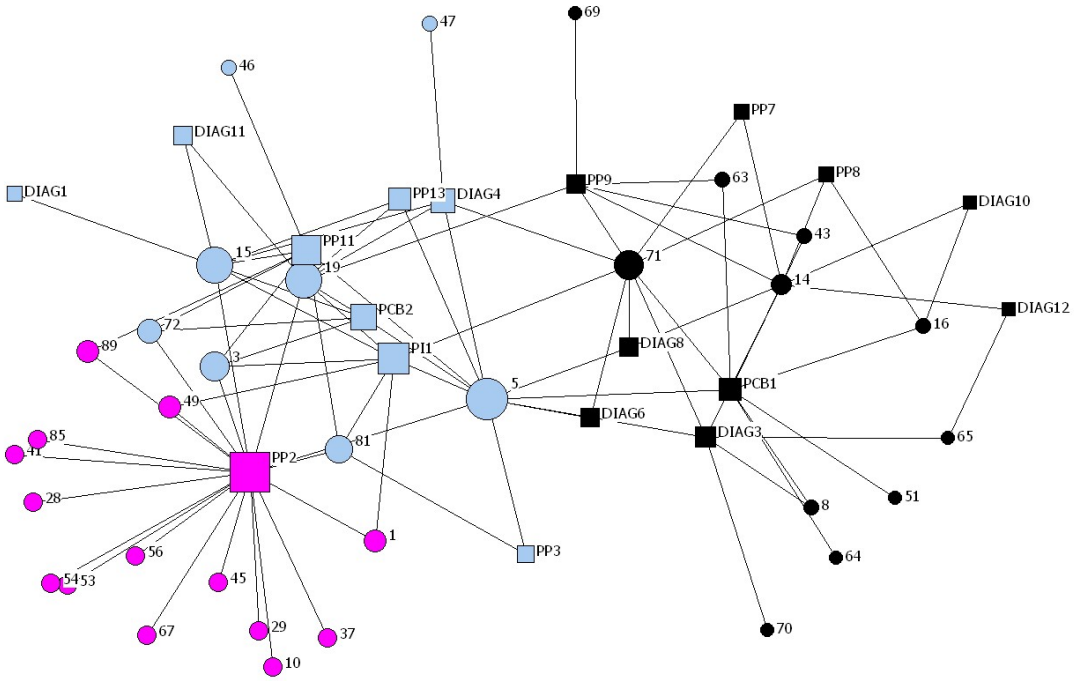
In spite of this level of agreement, the government's objectives to create a national mining company, raise royalties and windfall taxes, and to regulate company-community rations was not popular in the mining guild. Mining company representatives warned that an increase in transaction costs would result in venture capitals fleeing the country. In order to advance negotiations for projects to enter the extraction phase under new rules, the government reverted concessions that have not paid a yearly conservation fee but the measure had no effect on those projects entering advanced exploration.

Discontent with the proximity of Correa's government with mining companies intensified anti-mining demonstrations but this time the government and the companies responded together initiating judicial processes against anti-mining leaders, which were charged -and in some cases processed- for terrorism and sabotage (CEDHU, 2010). In order to contain this strategy, the Constitutional Assembly issued a mandate granting amnesty to those prosecuted for defending natural resources against extractivism. The Assembly also issued a mandate to the executive to revert all concessions operating in protected areas and headwaters. This decision bended the arm of the mining guild, whose in the CME (14) now expressed support for new State owned companies to responsibly develop the industry. The government abided to the Constitutional mandate about reversions only partially. Even though it reverted a great number of concessions, it also modified environmental regulations to allow companies with the most advanced projects to retain their concessions despite their non-compliance with the Assembly's mandate (see Velástegui, 2010).

During T_2, *Alianza País* (node 5) replaced the MEM (node 71) as the most central actor in the network. This was caused by the importance of the political movement in the Constitutional Assembly and the growing presence of Correa in media supporting the reform and endorsing Canadian mining companies. Correa also initiated a campaign against the anti-mining coalition targeting the most notable leaders of CNDVS who had to share their position in the network with other organizations such as FRESMIGE (node 49), a regional coalition that connected some anti-mining organizations of CNDVS with the indigenous movements to which organizations supported by *Acción Ecológica* did not have an organic relationship. The indigenous movement as a whole gained salience in news reports with the presence of CONAIE, Pachakutik and FRESMIGE (nodes 19, 81 and 49 respectively) increasing their centrality, in particular through the figure of Salvador Quishpe, a former legislator for Pachakutik.

During T_2, connections between the mining and water management subsystems grew with the presence of CEDENMA (node 10), a platform that connects national NGOs working on environmental issues. Anti-mining actors also incorporated a policy proposal to include regulations of extractive activities in headwaters through a new water law (PP13) to their discourse. Nevertheless, venues from the water subsystem were still not attracted into the discussions about mining. Moreover, the government embarked in institutional reform of the water management subsystem concentrating authority and resources from existing agencies into the recently created National Secretary of Water (SENAGUA). SENAGUA absorbed regional development corporations that built and managed major infrastructure projects, the agencies that produce information about water resources, the agency in charge of provision for human consumption and the former national authority CNRH. Jorge Jurado, former Viceministry of mines was appointed first head of SENAGUA.

Figure 3: Discourse network in T2. Nodes scaled by eigenvector centrality



4.3 The 2008 Constitution and the post entrepreneur period

The 2008 Constitution became effective after a national referendum, which also ratified Rafael Correa in the presidency. Anti-mining and water management actors introduced provisions that prohibit extractive activities in protected areas and headwaters and mandate watershed management as a form of land use planning and resource management with ample participation. Nevertheless, as shown above, the coalition ruling the Assembly also showed support for continuing with these activities. These actors introduced provisions that give the government the ability to pursue extractive activities in protected areas and headwaters by declaring them as strategic projects.

Without members in positions of influence, the anti-mining coalition resumed mobilizations headed by CONAIE and Pachakutik (nodes 19 and 81), which became more central to the network as CNDVS disappeared from it. This organizations demanded a correct implementation of the Assembly´s mandate on reversions in order to participate from the process that will enact a new mining law. While it rejected the opposition of anti-mining groups in Intag and Quimsacocha, the government opened channels for dialogue with CONAIE about the new mining and water laws. Old cleavages between CONAIE and FNRH emerged about the potential content of the new water policy. For FNRH one of the main issues at hand was the establishment of binding decision making for water management at the local level. CONAIE on the other hand, rejected the watershed approach and pursued the establishment of a national decision-making body for water policy with representation of indigenous organizations therein.

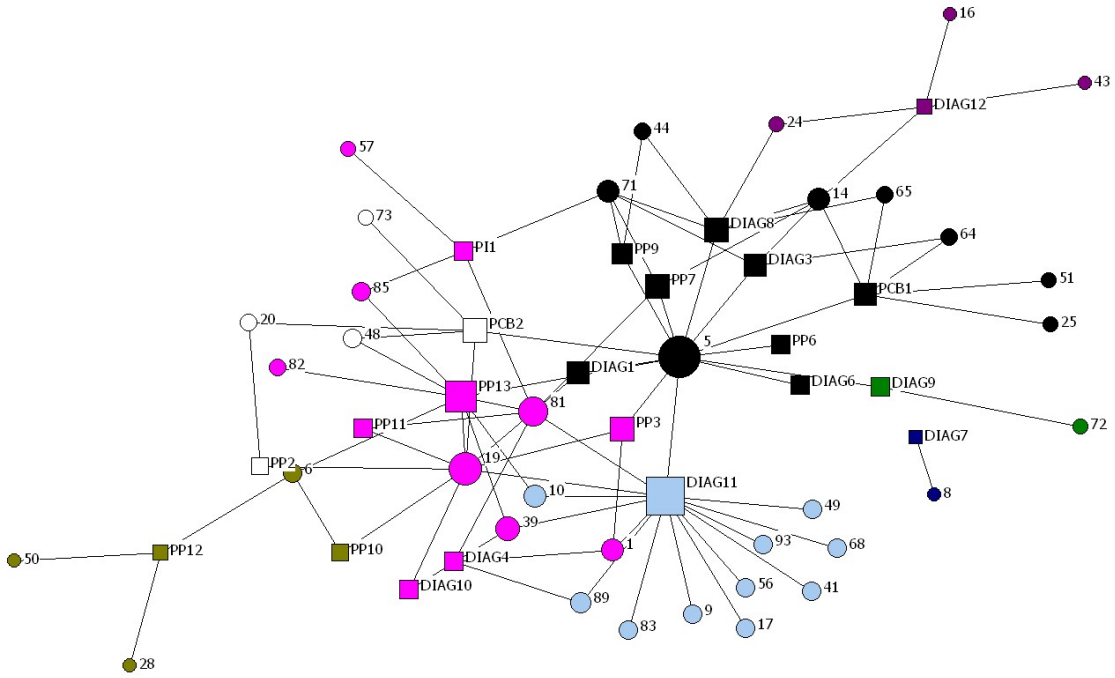
Between CONAIE and other anti-mining actors and the government, the biggest disagreement referred to the priority in which the new laws, for mining and water management, should be elaborated and how they should interact with each other. The government proposal presented the new mining law as pertaining to the highest category in the legal framework, that is, an organic law (PP6). The anti-mining coalition challenged this idea arguing that the mining law does not regulate the exercise of any

basic right, therefore has less hierarchy than the water management law, which should regulate the exercise of the human right to water and establish clear restrictions to mining in certain areas of interest for water catchment (PP13).

Despite the increasing relevance of the discussion about subsystem interconnectedness the presence of actors from the water management sector only diminished during T_3. The challenges elevated by CONAIE and other organizations to the new mining policy did not include organizations from the water management subsystem and venues from the water management subsystem did not enter the dispute about legislative process to enact the new mining law.

The government and CONAIE formed with a bi-lateral commission to examine the draft for the new mining law and demanded a cease in mobilizations but did not reach agreements before the government submitted its proposal to the National Assembly in late 2008. CONAIE and Pachakutik pressured the Assembly to prioritize the reform to the water law but the majority of *Alianza País* argued it was economically disadvantageous for the country to continue operating under the existing mining law (DIAG6), which was approved in January 2009.

Figure 4: Discourse network in T3. Nodes scaled by eigenvector centrality.



The new mining law includes some preferences pursued by the anti-mining coalition. An independent agency that oversees environmental and social practices of mining operations was created. Consultations to local communities can now only be implemented by the State and resources for local development will be distributed through State-wide programs and not directly by the companies (Cisneros & Christel, 2014). Nevertheless, the results of consultations are only informative for the sectoral authority and mining projects can still be implemented in protected areas and headwaters.

The anti-mining coalition presented a demand before the Constitutional Court against the new mining law for not having obtained consent of the indigenous collectivities in the process of decision-making. In March 2010 the Constitutional Court concluded that

the process conducive to the law did not comply with the constitutional mandates on consultations but refrained from declaring the law unconstitutional. Moreover, the Court requested the legislative to implement a process of consultation before enacting a new water law, which was being actively challenged by CONAIE and other organizations from the FNRH on the streets. The process to enact the new water law was resumed in 2013.

Disagreements in the pro-mining coalition produced the reversion of several important concessions to the State. Mining companies argued that conditions to operate in Ecuador did not comply with regional standards and some of them left the country. The 2009 law was amended twice until 2014 but this time the anti-mining coalition had no participation in the process of reform which reduced the participation of local governments from the royalties paid by the operators and reduced administrative steps towards granting concessions and reduce the tax burden approaching regional standards.

Conclusion

In this article we showed that subsystem interconnections are part of long-term strategies of advocacy groups and coalitions that seek policy change. During a period of half a decade, the revisionist anti-mining coalition positioned utterances about the effects of mining over water resources and policy preferences that relate the mining and water subsystems in the public sphere. It was only until the external conditions to the subsystem that these utterances became more salient or central. Revisionists attempted to overlap the mining and water management subsystem but the expansion of conflict was rather limited. Actors from the overlapped subsystem joined the process but venues from the water management subsystem were not attracted in the conflict limiting the mobilization of resources to pursue policy change. Moreover, the rivals of the anti- increased their control over the water management subsystem upon signals of the growing politicization of the interconnectedness.

This study shows that when episodes of regime change occur, macro and meso level actors negotiate conditions for subsystem autonomy. Nevertheless, the experience of the anti-mining coalition in Ecuador shows that revisionist coalitions can be instrumentalized by macro level actors looking to form a new coalition to impose a new policy core in a given subsystem because of the function that subsystem plays for a project of integration of the entire society. The disputes in the orientation of policy show us that cognitive compatibility seem to be less important than anticipated by Jones and Jenkins Smith to allow for network change and policy change. Coalitions beliefs are heresthetically used by actors in the macro-system due to their ability to choose legitimate interlocutors and change the rules of the game as it unfolds.

More studies using newspaper articles to elicit discourse networks using different forms of reliability and validity assessment are necessary to learn about the limitations of using agreements on statements as proxy to relationships between actors. Nevertheless, the case analyzed here using a communicate validity check provides some evidence supporting the quality of the outcome of this procedure.

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Annex 1A. List of actors (nodes)

1	AE
2	AJPR Íntag
3	ANA
4	AUC Cotacachi
5	Alianza País
6	Alianza Progresista Demócratica de Izquierda
7	Ascendant Copper
8	Aurelian Resources
9	CECONDEM
10	CEDENMA
11	CEDES
12	CEDHU
13	CG Paute
14	CME
15	CNDVS
16	CNM
17	CODECONO
18	CONAICE
19	CONAIE
20	CONFENIAE
21	CPC
22	Cabildo Mujeres Cuenca
23	Cámara de Minería de Zamora
24	Cámara de Minería del Azuay
25	Cámara de Producción Azuay
26	Canadian Government

27	Cantón Naranjal
28	Comité Defensa Naturaleza Salud Vida Pangui
29	Comité Defensa Vida Encuentros
30	Comité Defensa Vida Morona
31	Comité Defensa Vida Yantzaza
32	Comité Interprovincial Defensa de la Vida
33	Consejo Cantonal de Girón
34	Consejo de Comunidades de Garcia Moreno
35	Consejo de Comunidades de Intag
36	Coord Agua Tierra Vida Ecuador
37	Coord Defensa Vida Limon Indanza
38	Coord Intercanton SI SF Pucara
39	Coordinadora Zonal de Íntag
40	Coordinadora cantonal de Pallatanga
41	Coordinadora del Jubones
42	DECOIN
43	ECSA
44	FENOCIN
45	FEUE
46	FISCH
47	FNSZCH
48	FOA
49	FRESMIGE
50	FEINE
51	Federación Shuar de Zamora Chinchipe
52	Foro de los Pueblos Afectados por la Minería
53	Frente Mujeres Defensa Pachamama
54	Frente Mujeres Vic Portete

55	Frente Popular
56	Frente de Defensa por la Vida Cañar
57	Frente de Mujeres de Íntag
58	Fundación Natura
59	Fundación Pueblo Indio
60	Governor of Azuay
61	Governor of Imbabura
62	INREDH
63	Iamgold
64	Influential Analist
65	Ingenieros
66	Junta Parroquial de Penaherrera
67	Junta de Riego de Santa Isabel
68	Juntas de Agua de Jerusalem
69	Kinross
70	Lowell Minerals
71	MEM
72	MPD
73	Mancomunidad Jubones
74	Military
75	Ministry of Labor
76	Mov Nac Mujeres Luna Creciente
77	Municipality of Cotacachi
78	Organizacion Desarrollo Intag
79	Orgs Indigenas Camp Echeandia

80	PACHAKUTIK
81	PACHAMAMA
82	PRIAN
83	Proyecto Nero
84	RED
85	Red Defensa Naturaleza Dignidad Vida
86	Red Ecologista Popular
87	Seguro Social Campesino
88	UNAGUA
89	UNE
90	UNORCAC
91	Undersecretary of government
92	Zamaskijat

Annex 1B. List of statements

PP1	Assign environmental control to other authority
PP2	Ban Large Scale Mining
PP3	Ban Large Scale Mining from protected areas and headwaters
DIAG1	Companies and Government target dissent
DIAG2	Conflicts are related to distribution of benefits
DIAG3	Conflicts are related to electoral tactics and manipulation by extremists
DIAG4	Conflicts are related to lack consultation by companies
DIAG5	Conflicts are related to lack information about large-scale mining
PP4	Create a Mining Ministry independent from MEM
PI1	Halt audit and revert non compliant concessions
PCB1	LSM promotes development
PCB2	LSM undermines natural and social capitals
PP5	Mantain consultations by companies
DIAG6	Neoliberal law is detrimental to capitals
PP6	New mining law should be organic
PP7	Reform 01 law to increase environmental controls
PP8	Reform 01 law to increase State participation
PP9	Reform 01 law to increase revenue
PP10	Reform 09 law to ban LSM
DIAG7	Reform to 01 benefits jobs
DIAG8	Reform to 01 improves env performance
DIAG9	Reform to 01 increases State income
DIAG10	Reform to 01 law is not the product of dialogue

DIAG11	Reform to 01 law threatens headwaters and protected areas
DIAG12	Reform to 01law undermines sectoral competitiveness
PP11	Sanction binding consult by government
PP12	Sanction collaborative natural resource management
PP13	Water law should regulate mining

Annex 2. Centralities for each period of time

Annex 2A. Measures of centrality for T_0

Node	Degree	N-Degree	Eigenvectorcentrality	Closenness	Betweenness
42	0.122	0.02	0.421	1.008	0.046
1	0.073	0.015	0.315	0.945	0.016
35	0.049	0.014	0.291	0.931	0.006
81	0.073	0.014	0.289	1.1	0.074
78	0.049	0.012	0.264	0.877	0.003
11	0.024	0.009	0.197	0.84	0
12	0.024	0.009	0.197	0.84	0
18	0.024	0.009	0.197	0.84	0
19	0.024	0.009	0.197	0.84	0
32	0.024	0.009	0.197	0.84	0
34	0.024	0.009	0.197	0.84	0
57	0.024	0.009	0.197	0.84	0
59	0.024	0.009	0.197	0.84	0
62	0.024	0.009	0.197	0.84	0
87	0.024	0.009	0.197	0.84	0
66	0.049	0.008	0.161	0.818	0.002

48	0.049	0.007	0.132	0.786	0.001
89	0.049	0.007	0.132	0.786	0.001
30	0.073	0.007	0.126	0.945	0.041
27	0.049	0.006	0.118	0.786	0.003
58	0.024	0.003	0.067	0.729	0
71	0.073	0.008	0.031	0.903	0.094
4	0.024	0.001	0.025	0.617	0
7	0.073	0.007	0.006	0.63	0.013
14	0.049	0.007	0.006	0.624	0.001
79	0.049	0.007	0.006	0.624	0.001
43	0.024	0.004	0.003	0.605	0
51	0.049	0.004	0.003	0.611	0.012
74	0.024	0.004	0.003	0.605	0

STATEMENTS

DIAG1	0.366	0.134	0.837	1.152	0.127
PCB2	0.195	0.038	0.4	1.034	0.062
DIAG4	0.122	0.015	0.283	0.953	0.026
PP12	0.073	0.005	0.161	0.781	0.004
PI1	0.073	0.005	0.105	1.052	0.103
PP11	0.049	0.002	0.105	0.771	0.012
PP3	0.049	0.002	0.102	0.733	0.001
DIAG6	0.024	0.001	0.03	0.725	0
DIAG3	0.146	0.021	0.013	0.752	0.044
PCB1	0.122	0.015	0.012	0.752	0.044
DIAG2	0.024	0.001	0.001	0.511	0

DIAG5	0.024	0.001	0.001	0.524	0

Annex 2**B**. **Measures of centrality for** T_1

15	0.118	0.017	0.415	1.162	0.041
86	0.118	0.017	0.412	1.18	0.036
71	0.176	0.018	0.402	1.302	0.119
39	0.078	0.015	0.366	1.11	0.015
52	0.078	0.013	0.312	1.063	0.013
89	0.039	0.007	0.198	0.944	0.001
78	0.039	0.007	0.187	0.956	0.001
36	0.039	0.007	0.184	0.944	0.001
84	0.059	0.005	0.144	0.921	0.003
21	0.039	0.005	0.114	0.763	0.001
3	0.039	0.005	0.108	0.921	0.005
48	0.02	0.004	0.1	0.899	0
88	0.02	0.004	0.1	0.899	0
13	0.02	0.003	0.098	0.878	0
42	0.039	0.004	0.094	0.91	0.005
5	0.098	0.005	0.09	0.899	0.015
57	0.02	0.003	0.086	0.888	0
80	0.02	0.003	0.086	0.888	0
22	0.02	0.004	0.081	0.755	0
31	0.02	0.004	0.081	0.755	0
38	0.02	0.004	0.081	0.755	0
40	0.02	0.004	0.081	0.755	0
54	0.02	0.004	0.081	0.755	0

77	0.02	0.004	0.081	0.755	0
65	0.078	0.007	0.055	0.83	0.017
24	0.039	0.005	0.049	0.812	0.001
14	0.039	0.004	0.029	0.778	0.002
79	0.039	0.004	0.029	0.778	0.002
7	0.02	0.003	0.025	0.77	0
16	0.02	0.003	0.025	0.77	0
51	0.02	0.003	0.025	0.77	0
23	0.02	0.002	0.024	0.763	0
90	0.02	0.001	0.017	0.668	0

STATEMENTS

PI1	0.196	0.038	0.511	1.269	0.063
PCB2	0.176	0.031	0.498	1.228	0.049
DIAG4	0.176	0.031	0.439	1.248	0.055
DIAG1	0.216	0.047	0.414	1	0.064
PP11	0.059	0.003	0.165	0.863	0.003
PP3	0.059	0.003	0.127	0.974	0.01
PCB1	0.157	0.025	0.125	1.027	0.062
DIAG6	0.098	0.01	0.122	1.013	0.03
PP12	0.039	0.002	0.109	0.863	0.001
PP8	0.039	0.002	0.097	0.95	0.003
PP9	0.039	0.002	0.097	0.95	0.003
PP2	0.039	0.002	0.085	0.853	0.01
PP5	0.02	0	0.079	0.915	0
PP7	0.02	0	0.079	0.915	0

PP1	0.039	0.002	0.04	0.744	0
DIAG3	0.059	0.003	0.022	0.665	0.001
PP4	0.02	0	0.018	0.696	0
DIAG5	0.02	0	0.011	0.654	0

Annex 2C. Measures of centrality for T2

Node	Degree	N-Degree	Eigenvectorcentrality	Closenness	Betweenness
5	0.216	0.027	0.474	1.541	0.087
19	0.157	0.022	0.397	1.325	0.032
15	0.157	0.02	0.381	1.198	0.021
3	0.078	0.016	0.271	1.11	0.003
71	0.176	0.017	0.264	1.18	0.031
80	0.078	0.015	0.243	1.11	0.004
72	0.059	0.013	0.206	1.049	0.001
1	0.039	0.011	0.163	1.063	0.001
49	0.039	0.011	0.163	1.063	0.001
88	0.039	0.011	0.158	1.034	0.001
14	0.157	0.013	0.145	1.049	0.024
10	0.02	0.008	0.098	1.007	0
28	0.02	0.008	0.098	1.007	0
29	0.02	0.008	0.098	1.007	0
37	0.02	0.008	0.098	1.007	0
41	0.02	0.008	0.098	1.007	0
45	0.02	0.008	0.098	1.007	0

56	0.02	0.008	0.098	1.007	0
53	0.02	0.008	0.098	1.007	0
54	0.02	0.008	0.098	1.007	0
67	0.02	0.008	0.098	1.007	0
84	0.02	0.008	0.098	1.007	0
46	0.02	0.003	0.061	0.868	0
8	0.039	0.006	0.06	0.932	0.001
43	0.039	0.006	0.059	0.944	0.001
63	0.039	0.006	0.059	0.944	0.001
16	0.059	0.005	0.051	0.921	0.002
47	0.02	0.002	0.043	0.858	0
51	0.02	0.003	0.033	0.899	0
64	0.02	0.003	0.033	0.899	0
65	0.039	0.003	0.033	0.878	0.001
70	0.02	0.002	0.028	0.868	0
69	0.02	0.002	0.026	0.868	0
PP2	0.392	0.154	0.587	1.495	0.112
PI1	0.157	0.025	0.392	1.248	0.022
PP11	0.157	0.025	0.365	1.208	0.019
PCB2	0.098	0.01	0.288	1.153	0.005
DIAG4	0.098	0.01	0.259	1.189	0.016
PP13	0.059	0.003	0.208	1.119	0.002
PCB1	0.176	0.031	0.196	1.269	0.047
DIAG3	0.118	0.014	0.167	1.208	0.029
PP9	0.118	0.014	0.158	1.208	0.025

DIAG8	0.059	0.003	0.147	1.153	0.005
IAG11	0.039	0.002	0.129	0.95	0
DIAG6	0.039	0.002	0.123	1.102	0.001
PP3	0.039	0.002	0.119	1.041	0.001
PP8	0.059	0.003	0.076	0.893	0.002
PP7	0.039	0.002	0.068	0.883	0
DIAG1	0.02	0	0.063	0.863	0
IAG10	0.039	0.002	0.033	0.791	0
IAG12	0.039	0.002	0.03	0.791	0.001

Annex 2D. Measures of centrality for T_3

Node	Degree	N-Degree	Eigenvectorcentrality	Closenness	Betweenness
5	0.224	0.018	0.594	1.496	0.117
19	0.155	0.012	0.411	1.17	0.036
80	0.103	0.011	0.316	1.186	0.025
39	0.052	0.008	0.216	1.055	0.005
10	0.034	0.007	0.192	1.042	0.002
71	0.086	0.006	0.189	0.94	0.008
1	0.052	0.006	0.18	0.972	0.002
14	0.086	0.007	0.18	0.961	0.022
88	0.034	0.005	0.135	0.961	0.001
48	0.034	0.004	0.129	0.95	0.001
9	0.017	0.004	0.111	0.95	0
17	0.017	0.004	0.111	0.95	0
41	0.017	0.004	0.111	0.95	0

49	0.017	0.004	0.111	0.95	0
56	0.017	0.004	0.111	0.95	0
68	0.017	0.004	0.111	0.95	0
82	0.017	0.004	0.111	0.95	0
92	0.017	0.004	0.111	0.95	0
6	0.052	0.004	0.105	0.961	0.025
84	0.034	0.004	0.105	0.95	0.002
65	0.034	0.004	0.083	0.882	0.001
81	0.017	0.003	0.081	0.92	0
64	0.034	0.003	0.078	0.864	0
44	0.034	0.003	0.077	0.856	0
20	0.034	0.002	0.065	0.839	0.001
24	0.034	0.003	0.054	0.873	0.004
73	0.017	0.001	0.047	0.831	0
25	0.017	0.002	0.038	0.831	0
51	0.017	0.002	0.038	0.831	0
57	0.017	0.001	0.024	0.738	0
72	0.017	0.001	0.023	0.778	0
16	0.017	0.001	0.01	0.612	0
43	0.017	0.001	0.01	0.612	0
28	0.017	0.001	0.004	0.608	0
50	0.017	0.001	0.004	0.608	0
8	0.017	0	0	172	0

STATEMENTS

DIAG11	0.259	0.067	0.57	1.354	0.084

PP13	0.155	0.024	0.418	1.293	0.058
PP7	0.069	0.005	0.249	1.154	0.014
PCB2	0.086	0.007	0.242	1.124	0.02
PP3	0.052	0.003	0.23	1.11	0.005
DIAG8	0.103	0.011	0.229	1.154	0.026
DIAG3	0.069	0.005	0.202	1.124	0.01
PCB1	0.103	0.011	0.197	1.124	0.027
DIAG1	0.034	0.001	0.195	1.082	0.002
PP9	0.052	0.003	0.167	1.068	0.005
PP11	0.034	0.001	0.141	0.95	0.001
DIAG4	0.052	0.003	0.123	0.891	0.001
PI1	0.069	0.005	0.123	0.961	0.011
DIAG10	0.034	0.001	0.122	0.864	0
DIAG9	0.034	0.001	0.12	1.03	0.008
DIAG6	0.017	0	0.116	1.018	0
PP6	0.017	0	0.116	1.018	0
PP10	0.034	0.001	0.1	0.891	0.003
PP2	0.034	0.001	0.093	0.864	0.002
DIAG12	0.069	0.005	0.049	0.758	0.017
PP12	0.052	0.003	0.022	0.751	0.016
DIAG7	0.017	0	0	172	0