Policy Learning and Policy Networks
in Theory and Practice:
The Case of Indonesian Biodiesel Policy Network

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Abstract
This paper examines how learning has been treated, generally, in policy network theories and what questions have been posed, and answered, about this phenomenon to date. We distinguish between instrumental, technical learning, social learning and institutional learning and examine to what extent network characteristics impede or facilitate these forms of learning. The paper consists of a theoretical and an empirical part. In the theoretical part the concepts we use are presented and related to the literature on policy and governance networks. In the second part we present a case study of palm oil certification processes in Indonesia over the past two decades. This case study focuses on sustainability-oriented policy learning in the Indonesian biodiesel governance network and illustrates how network features and especially forms of brokerage influence learning.

Keywords: policy networks, policy learning, brokerage, social network analysis, biodiesel policy, Indonesia

Introduction: Policy Learning and Policy Network Theory
The policy universe can be thought of as an all-encompassing aggregation of the possible international, state, and social actors and institutions that directly or indirectly affect a specific policy area. Each sector or issue area can be thought of as a subset of that universe, as a policy subsystem (Freeman, 1955; Cater, 1964; Freeman and Stevens, 1987; McCool, 1998). This subsystem is a form of network which encompasses the interrelationships existing between those elements of the policy universe which are actually involved in policy-making in the sector concerned on a more or less regular basis. Hence we can find, for example, a ‘health policy network” or subsystem, an “energy policy subsystem” and so on.

During the course of their interaction with other actors, subsystem actors engage in a variety of activities from bargaining with each other over specific interests and policy aims and measures, to developing and contesting policy ideas and concepts. These interactions occur in the context of particular institutional arrangements surrounding the policy process, which affect how the actors pursue their interests and ideas and the extent of their success (Knoke, 1996; Laumann and Knoke, 1989; Sabatier and Jenkins-Smith, 1993b). Some actors, for example, are members of knowledge- or idea-based discourse or ‘epistemic’ communities (Hajer, 1993; Fischer, 1993), while others are engaged in the active and ongoing formulation and consideration of policy options and alternatives and serve as members of advocacy coalitions (Sabatier 1988) or instrument constituencies (Voss and Simons 2014).

Identifying the key actors in policy subsystems, what brings them together, how they interact, and what effect their interaction has on a policy, are questions which have attracted the attention of many students of public policy-making and policy formulation (Timmermans and Bleiklie, 1999) and form the core of “policy network theory”. This theory has been used to examine the workings of many empirical subsystems and has been adapted and adopted in the study of subsystems at the local, sub-national, national and international levels of government.

Policy learning, however, has not usually been a central focus in policy or governance network theory which tends to concentrate on elucidating relationships of influence and the
direction of interactions which occur in policy-making processes. This literature traditionally has focused mainly on examining network structure, the effectiveness of various kinds of networks and especially upon disentangling the impact of network characteristics and network processes on policy-making. Although learning processes may contribute to both these outcomes, it has rarely received explicit attention.

In this contribution we discuss this issue. We establish the connection between network literature and the thinking on policy learning in theory and examine this theory in light of practice; utilizing a case study of network relationships and policy knowledge transfer in so doing. We do this on the one hand by building on the concepts and frameworks on policy learning, inspired by amongst others Argyris (1976; 1978), Sabatier (1988) and Hall (1993) and examining their relevance for and applicability in network contexts. We then examine to what extent network characteristics contribute to the occurrence of policy learning in the case study. The case study draws on a network analysis of palm oil biodiesel policy in Indonesia over the past two decades. It focuses on environmental sustainability-oriented policy learning in the Indonesian biodiesel governance network and illustrates the utility of linking an analysis of different network actors to that of learning.

The Origins of Network Theory: Using a Policy Subsystem as a Unit of Analysis

Over the years scholars have developed a variety of models to help address the impact of network structure and behaviour on policy-making. The oldest conception of a policy network, for example, was developed in the United States by early critics of pluralism, a theory which postulated policy-making as involving the free “open” competition of multiple actors. They developed the notion of the ‘sub-government’, understood as groupings of societal and state actors in routinized patterns of interaction (deHaven-Smith and Van Horn, 1984). This concept was based on the observation that interest groups, congressional committees, and government agencies in the United States had developed a system of mutual support in the course of constant mutual interaction over legislative and regulatory matters. This particular form or structure was argued to limit policy discourses and discussions to favored ‘inside’ groups, distorting policy-making in their favor.

These three-sided relationships in areas such as agriculture, transportation, and education were often dubbed iron triangles to capture the essence of their iron-clad control over many aspects of the policy process (Cater, 1964). Such groupings were condemned for having ‘captured’ the policy process, thus subverting the principles of popular democracy by ensuring that their own self-interests prevailed over those of the general public (Bernstein, 1955; Huntington, 1952; Lowi, 1969).

In the 1960s and 1970s, further research into the American case however revealed that many sub-governments were not all-powerful, and that in fact their influence on policy-making varied across issues and over time (Hayes, 1978; Ripley and Franklin, 1980). Soon a more flexible and less rigid notion of a policy subsystem evolved, called the ‘issue network’ by Hugh Heclo (1978). Heclo argued that while some areas of American political life were organized in an institutionalized system of interest representation such as a sub-government, others were not (Heclo 1974). The membership and functioning of many networks he suggested, were often not as closed or rigid as they were depicted to be and Heclo conceived of policy subsystems as existing on a spectrum, with iron triangles at one end and issue networks at the other. Issue networks were thus larger, much less stable, had a constant turnover of participants, and were much less institutionalized than iron triangles a structure which lent itself to a more open and fluid style of policy-making with less predictable and controllable outcomes.
Subsequent studies led to the identification of a large variety of subsystems, which in turn necessitated the development of alternate taxonomies to Heclo’s simple spectrum of issue networks and iron triangles. Thus, R.A.W. Rhodes (1988) argued that interactions within and among government agencies and social organizations constituted policy networks that were instrumental in formulating and developing policy. Rhodes argued networks varied according to their level of ‘integration’, which was a function of their stability of membership, restrictiveness of membership, their degree of insulation from other networks and the public, and the nature of the resources they controlled.

In the US, similar attributes were specified by Hamm (1983), who argued that subgovernments should be differentiated according to their ‘internal complexity, functional autonomy, and (levels of internal and external) cooperation or conflict’. Empirical efforts to clarify and reformulate the concept of policy networks were also undertaken. Salisbury, Heinz, Laumann, and Nelson (1987), for example, argued networks tended to have ‘hollow cores’ in that even the most institutionalized networks appeared to have no clear leadership.

Others, however, argued networks could be classified according to whether or not state and societal members shared the same goals and agreed on the same means to achieve those goals. Still others argued the number of discernible interests participating in the network was the crucial variable defining different types of networks (McFarland, 1992).

This insight that a policy subsystem might consist of a number of sub-components was developed at length in the 1980s in the works of Paul Sabatier and his colleagues and has proven to be the key facet of network thinking linking it to learning. The ‘advocacy coalition framework’ they developed was one of the most sophisticated subsystem or network approaches to policy-making and was notable not only for this but because it also first addressed specifically the role of learning in network behaviour.

In their work:
An advocacy coalition consists of actors from a variety of public and private institutions at all levels of government who share a set of basic beliefs (policy goals plus causal and other perceptions) and who seek to manipulate the rules, budgets and personnel of governmental institutions in order to achieve these goals over time.

Their model combined the roles of knowledge and interests in the policy process, as policy actors were seen to come together for reasons of common beliefs, often based on their shared knowledge of a public problem and their common interest in pursuing certain solutions to it. The core of a coalitions belief system, consisting of views on the nature of humankind and the ultimate desired state of affairs, was thought to be quite stable and to hold the coalition together. This elevated knowledge, at least in its normative aspects but also its cognitive components in terms of matching solutions to designated problems, as a core activity and determinant of network behaviour.

Similar to earlier work on understanding government centrality in the policy network, the case below generally indicates that the central position of government actors in a policy network affect policy learning outcomes (Emerson et al. 2012, Resh et al. 2014) (Figure 1).
It is possible to situate dominant coalitions within the schematic presented in Figure 1. Keeping in mind a coalition’s own endowment of policy actors, it is perhaps intuitive then that the greater the overlap a coalition has with a subsystem’s policy network, the greater its dominance and influence over the network and the more influence dominant actors have on learning relationships. The case that follows argues that, in a policy network dominated by a single coalition there is limited knowledge sharing with actors outside the coalition, and therefore, limited learning. Illustratively, the dominant coalition can be considered more dominant than the other advocacy coalition in Figure 1 due to the overlap it has in membership with the policy network. This distinction within coalitions is an important one when considering...
the impact that the dominant coalition can have on knowledge-based relationships in the network, and therefore on learning (Smith 2000; Mintrom and Vergari 1996).

**Policy network theory and policy learning**

From the nineties of the last century onwards network theory has taken a behavioral and managerial turn (Kickert et al, 1997). The focus has shifted from simply describing how interdependent actors within networks engage in interaction processes, but better understanding why they do what they do, and with what effect. The network approach is predominantly interested in the effectiveness and legitimacy of these interaction processes and understanding how do the actors succeed in arriving at a joined, co-produced outcome, be it a policy, a successful implemented policy or a coordinated public service, which is supported by the actors involved and the broader environment (Provan and Milward, 1995). Although often unrecognized, this implies at least one of the activities undertaken by network members is learning (Dunlop and Radaelli 2013). That is, arriving at joined-up co-produced outcomes involves learning about policy problems, learning about solutions, learning about other actors and learning how to influence them to move towards ones preferred policy outputs and outcomes.

Network theory does not explicitly address the issue of learning. Nevertheless some authors have applied ideas from policy learning approaches (e.g. Knoefler, 1998; Pemberton, 2000; Koppenjan and Klijn, 2004; Lieberman, 2000; Klijn and Koppenjan 2015) and it seems to be fruitful to examine how policy learning ideas relate to concepts and ideas used in network theory. It can be argued that the above assumptions regarding the effectiveness and legitimacy of networks require learning by actors within the network. But what is learning? Of what is it composed? What impact does it have on outcomes? And how is it facilitated?

As Bennett and Howlett (1992) have argued “policy learning” has several components, from an analytical standpoint. These include: who learns, what is learned and with what effect (Bennett and Howlett, 1992). In addition an important question is what are favourable conditions for learning. Each of these is addressed below both in the abstract and with respect to networks.

**Who is learning?**

With regard to who is learning most learning theory looks at specific types of policy actors, from politicians to administrators and tries to ascertain their propensities and capabilities to learn, as well as to match these groupings with specific types of learning – such as politicians learning about ‘what works’ electorally, while administrators learn about policy tool and programme designs (Bennett and Howlett 1992, Homans, Etheredge and Short 1983, Etheredge 1981).

This is useful but in a network context there are only three types of ‘players’ or actors: individual network ‘nodes’, ‘clusters’ of such nodes and the overall network itself. Three levels of learning hence can be distinguished here. The first is similar to classic network theory in that individual actors are learning. The remaining two, however, go well beyond this level of analysis, as the propensity and capability of specific groups or coalitions to learn, as well as the overall network itself have to be examined (March and Olsen 1983, Agyris and Schön, 1978; Dowding, 1995 Provan, Fish and Sydow 2007)
What is being learned?
Within traditional learning theory a distinction is typically drawn between ‘government’ learning (Etheredge) and ‘social learning’ (Hall) in which some players focus on lessons about policy tools and programme (“government” learning) while others focus on larger areas of social and state-societal interactions such as the nature of socio-economic change, technological change processes, cultural development and the like.

This is a useful approach but again, network theory goes beyond the typical confines of traditional learning theory to highlight and distinguish three types of learning: cognitive, social and institutional. Cognitive or technical, instrumental learning is learning about the nature of the problem, the assumptions on the causal relationships involved and the pros and cons of measures aimed to address the problem. Within networks cognitive learning may occur in two directions. First of all actors may learn about the problem perceptions, frames, assumptions and beliefs of other actors. This may enrich their own ideas, but also help them to discover common grounds for negotiation and collaboration and the realization of innovative win-win solutions, that could not have realized by themselves (Koppenjan and Klijn, 2004; Dery, 1984; Axelrod, 1985).

Second cognitive learning may be about the use of scientific knowledge and expertise. This type of learning may at first sight be related with the ‘rationalist’ logic commonly found in studies of policy analysis, and the more recent idea of evidence based policies (Nutley et al al, 2007). Also it is related to the literature on knowledge utilization, that downplays the impact of scientific and social science research in government decision making (Oh and Rich; Rich 1997; Radaelli 1995; Weiss, 1977, 1986; Tenbensel, 2004). However policy network theory does not share the government centric orientation of these approaches (it is especially the government that should learn), nor the positivistic expectations of these approaches, namely that research produces conclusive knowledge on reality and that the mission of policy analysis therefore should be to ‘speak truth to power’(Wildavski, 1979). Rather is has a constructivist orientation, accepting that various perceptions of reality co-exist. Especially in the case of wicked problems contradictory truths may emerge, amplified by policy advocacy activities of experts and researchers (Hoppe, 1999; 2013). Nevertheless cognitive learning may be about the extent to which policy proposals are based on expertise and the results of scientific research. An import research question in this respect is how knowledge and expertise can become authoritative among the various actors within the network (Hufen and Koppenjan, 2013; Jasanoff 1995).

Social learning also takes on a different complexion in network settings. Here it implies that actors within the network learn about how to operate within a network setting. If social learning takes place at an individual level, it may be about actors learning to better realize their goals in network processes (Hall, 1995; March and Smith 2000). In case of mutual learning at the level of the network this learning may be about how to align strategies and to arrive at negotiations and collaboration, that help to transform zero-sum games into zero plus games, that allow for the realization of win-win outcomes (Klijn and Koppenjan, 2015).

Finally, networks also undertake institutional learning about the development of shared and lasting arrangements, procedures, rules, norms, values and trust that reduces the risks and costs of interactions and support negotiations and collaboration. This creation of institutional capital has a lasting impact and provides actors with ways to deal with future problems (Koppenjan and Klijn 2004; cf. Giddens, 1984; Ostrom, 1990; Goodin, 1996; Williamson 1996; Hood and Jackson, 1991.)
What are the effects of this learning?
The effects of these all these forms of learning, in traditional learning theory, is better policies, ones that are better able to incorporate and draw lessons from past experiences in order to better influence the present and future. In network contexts this again changes. The main impact or effects of learning in network settings are not just better policies in this sense but also that the effectiveness and legitimacy of networks are strengthened, and actors better succeed in realizing policies and delivering services that do justice the needs and values of a wider set of actors then traditional ways of policy making and service delivery. This is due to the fact that the solutions developed are based on the confrontation of various forms of knowledge and on the heightened use of the available expertise and scientific research. These inputs simultaneously both strengthen the effectiveness of policies and public services, and their legitimacy.

Factors influencing learning in network theory
A fourth key question is “what are the favorable conditions for learning”? In general the literature on policy networks considers five clusters of factors to be important in realizing outcomes: 1) the nature and behaviour of actors; 2) the dynamics of the interaction process; 3) the nature the network relationships; 4) management of those relationships, and 5) external factors which can alter network structure or behaviour.

As far as the characteristics of actors is concerned, their resources, perceptions and strategies are considered to be important. The set of resources actors control, determine their potential influence in the process (Scharpf, 1978; 1997). Their perceptions of the problem, the available solutions and the conditions under which they interact, determine the goals actors pursue and the strategies they will enact. Strategies are attempts of influencing the course of the process by investing or withholding their resources and by framing issues in certain ways (Rein and Schönb, 1996). These resources are equally important in affecting the learning potential of network actors. That is actors have different resource endowments in terms of their capacities at the analytical, operational and political levels. Their capacities at these levels is a significant determinate of their ability to draw lessons from their own and others experiences and incorporate them in their normative and cognitive beliefs and preferences.

The interaction process in a network is made up of the strategies that are enacted by the various actors that are participating in the process, during specific periods in the process. The exchange of strategies and resources and the discourse that emerges from framing by participants results in series of actions and reactions, that may converge to a joined outcome - or not (Koppenjan and Klijn, 2004; Hajer and Versteeg, 2005). Again, learning is affected or can be affected by these processes. Some interactions, such as joint development of initiatives over a relatively long period of time can promote learning while others, such as short-term inter or intra.Actor conflicts, do not. Network characteristics enhance or hinder the way interaction processes evolve. Some patterns of interaction may make it easy for some centrally located actors to exchange resources and more difficult for peripheral ones. The existence of various competing coalitions may hinder collaboration, while a high level of trust is assumed to be beneficial. Shared beliefs with regard to values, norms, rules and instruments may support some problem perceptions and affiliated solutions and make it more difficult for others to gain support.

Network generally may be self-governing, but conscious attempts at network management, or the management or direction of interaction processes also occur (Agranoff and McGuire, 2003; Mandell, 1990; 2001; soerensen and Torfing (eds) 2007). Sometimes networks have specific coordination structures and a formally assigned network manager (Provan and Kenis, 2008). Network theory assumes the presence of network management enhances the effectiveness of networks and this activity can be geared or aimed towards
learning or not. Attempts at changing the network characteristics may enhance collaboration, but they also may have different intentions and effects, e.g. strengthening certain actors or values at the expense of other.

Finally, external conditions also may influence processes within networks. Technological, economic, demographic, political and societal developments may influence the distribution of resources within the network or the network’s autonomy and legitimacy, or impact upon perceptions of actors within the network and the consensus they share. Conditions such as ‘absorptive capacity’ of a network come into play in this regard, especially as concerns learning (Cohen and Levinthal etc).

Enhancing Conditions for Learning in Policy Networks: The Role of Knowledge Brokers

In general, conditions to support a variety of learning, such as cognitive, societal or institutional learning among others, can depend on actors within policy networks and can be created or supplied by skilled management and leadership. Most influential, are those individuals who serve as instrumental links, or function as brokers between diverse groups or coalitions. The role of policy brokers has been explored by scholars of policy change and policy learning alike. While Sabatier (1988), attributes a distinct conflict resolution or mediating role on the part of policy brokers whose ‘dominant concern is with keeping the level of political conflict within acceptable limits’ (141), Hall (1988) contends that the main agents of learning within a policy network, who structure the flow of information are those who ‘work for the state itself or advise it from privileged positions at the interface between bureaucracy and the intellectual enclaves of society’ (281). While policy brokers have been identified as key in policy learning theories, their interactions vis-à-vis the various members of a policy network and the particular positions of influence they occupy in the structure of the network itself has seldom been examined (Bennett and Howlett 1992). Methods such as social network analysis (SNA) which explicitly espouses an agent-centric view of a policy area, may be able to reveal specific positions of information brokerage that actors of a network occupy, thereby forging various types of learning relationships within the network.

SNA allows examination and measurement of several different types of brokers (Hanneman and Riddle 2005). These measurements pertain to positions that network actors can inhabit as intermediaries between different parts of the policy network position. Also known as ‘betweenness centrality’ this measure assumes an actor to be in a powerful position in the network if this actor falls between the shortest paths connecting other actors. Among the brokerage functions that can be calculated by SNA, Coordinators are those who bridge connections within their own group. Consultants control the flow of information between members of a group without being members themselves. A gatekeeper is a member of a group at the group’s boundary, controlling how outsiders link to the group. A representative is the member of one group that forges ties to others on behalf of that group. And lastly, a liaison brokers ties between two groups without being a part of either. Each of these different brokerage roles can be important in creating enabling conditions in the network for the various different kinds of learning discussed in this paper.

Firstly, in order to create a network learning environment that is conducive to cognitive or technical learning regarding the policy problem at hand, dominant actors of the policy network need to enhance the openness of the network in order to allow for a variety of problem perceptions and alternative solutions to be discussed, and allow for multiple underlying norms and values to coexist. These conditions, of course also necessitate a sense
of urgency among central policy actors of a network that a problem is grave enough to warrant consideration and action. In terms of the above network broker definitions, in order to optimize the conditions for cognitive learning, coordinators within the dominant coalition and representatives are most influential in fostering urgency regarding a policy dilemma and a resulting discussion of solutions.

Similarly, the conditions to facilitate social learning also have to do with important network actors. Social learning conditions may be favorable with the presence of entrepreneurs who emphasize the need for change as well as suggest alternative approaches. The active involvement of experts, academics and researchers also create a network environment that is conducive to social learning, indicating a degree of transparency and openness of the knowledge production process. Heclo (1974), propounding on the role of political brokers and societal learning, identified them as “middlemen at the interfaces of various groups [with] access to information, ideas, and positions” (308). While Heclo’s work does not outline clear criteria about what qualifies certain actors to be brokers of societal learning (Bennett and Howlett 1992), network analysis may be able to reveal these actors as liaisons or consultants, who act as knowledge entrepreneurs, brokering knowledge ties among diverse groups within a policy network which would otherwise be limitedly connected (Hanneman and Riddle 2005).

Institutional learning conditions may be enhanced within a policy network situation which forges highly interconnected interaction patterns. Furthermore, a set of procedures, rules norms and values that improve openness and innovation also enable institutional as well as managerial learning. Liaisons and gatekeepers become important conduits of these types of learning within the network by linking different sections and enhancing the interconnectedness of the entire network.

Contextual conditions for in a policy network involve an environment that is neither completely ossified nor completely turbulent is necessary in order for the policy conditions to be receptive of the sense of urgency for change. Such an environment can also be source of cognitive and social variety allowing for enriching exchange and interaction of actors, ideas and values.

A Case Study: Dominant Policy Actors, Brokers and Learning in the Indonesian Biodiesel Governance Network

These general observations and principles can be illustrated in a case study. Energy is a large-scale exemplar of networks active in policy-making and their dynamics (Sovacool). In the last decade, energy and climate change concerns have occupied the attention of national and international policymakers worldwide. Compounding these issues, volatile prices for traditional fuels such as oil, coal, and natural gas have augmented national concerns about energy security and eroding balances of payment by escalating the cost of energy imports.

From national interests such as securing critical supplies of energy to meet development goals and improving trade balances, to international concerns of mitigating climate impacts, a veritable web of priorities has emerged in the energy sector requiring the coordinated action of a wide range of policy actors. Energy networks have engaged in both small, medium and large-scale learning efforts in attempting to adapt or respond to these concern. One concrete result of such activity has been a large increase in global production of alternate fuels - particularly those derived from plant sugars and oil crops. These efforts have flourished over the last decade with the help of government investment, national mandates and lucrative global trading opportunities. In 2012, a total of 105.6 billion liters of fuel from biomass was produced globally (REN21 2013).
In the rapidly developing countries of Asia, biofuels have been viewed by national governments as a vehicle for realizing multiple goals, a major one being energy security (Zhang 2008, Zhou and Thomson 2009, Sorda et al. 2010, Koizumi and Ohga 2007). With a distinct comparative advantage in producing certain biofuel feedstock, Asian producers are poised to carve a substantial niche in the world biofuel market.

This policy debate has affected all national networks in this area. This is true of Indonesia, for example, where a biodiesel policy network has evolved since 2006, the year marking the Indonesian government’s formal involvement with the product. Nested within this complex policy network are a core group of policymakers constantly engaging and learning about the state of biofuel research and the policy reactions the product has elicited.

This particular subsystem concerns a large range of actors from producers of agricultural raw materials to those influencing the use of an energy end product. The involvement of the Indonesian government with biofuels began in 2006 with Presidential Regulation No. 5 outlining the national interest in biodiesel development as part of the new national energy policy. Since then, numerous roundtable discussions, conferences, forums and ad hoc commissions have occurred concerning biodiesel development. These meetings represent important venues where multiple policy actors have been able to assemble and present their perspectives, and therefore all records and meeting minutes were analyzed in order to compile a list of organizations and individuals who participated. (Howlett and Maragana 2006).

Table 1. **Actors in Indonesian Biodiesel Policy Network (2006-2012)**

<table>
<thead>
<tr>
<th>Organization Name</th>
<th>Abbreviation</th>
<th>Organization Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Energy and Mineral Resources</td>
<td>ESDM</td>
<td>Government</td>
</tr>
<tr>
<td>State Ministry of Research and Technology</td>
<td>RISTEK</td>
<td>Government</td>
</tr>
<tr>
<td>Ministry of Forestry (DEPHUT)</td>
<td>DEPHUT</td>
<td>Government</td>
</tr>
<tr>
<td>Ministry of Agriculture (DEPTAN)</td>
<td>DEPTAN</td>
<td>Government</td>
</tr>
<tr>
<td>Ministry of Trade (DEPDAG)</td>
<td>DEPDAG</td>
<td>Government</td>
</tr>
<tr>
<td>State Ministry of Environment (MENLH)</td>
<td>MENLH</td>
<td>Government</td>
</tr>
<tr>
<td>National Biofuel Development Team (TimnasBBN)</td>
<td>TimnasBBN</td>
<td>Government</td>
</tr>
<tr>
<td>Indonesian Palm Oil Commission (IPOC)</td>
<td>IPOC</td>
<td>Government</td>
</tr>
<tr>
<td>World Bank Group (IBRD-IDB, IFC, MIGA)</td>
<td>WBG</td>
<td>International</td>
</tr>
<tr>
<td>Asian Development Bank (ADB)</td>
<td>ADB</td>
<td>International</td>
</tr>
<tr>
<td>Ford Foundation</td>
<td>FF</td>
<td>International</td>
</tr>
<tr>
<td>Indonesian Palm Oil Producers Association (GAPKI)</td>
<td>GAPKI</td>
<td>Producer/Private</td>
</tr>
<tr>
<td>Organization</td>
<td>Type</td>
<td>Category</td>
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<tr>
<td>Association of Indonesian Biofuel Producers (APROBI)</td>
<td>APROBI</td>
<td>Producer/Private</td>
</tr>
<tr>
<td>Roundtable for Sustainable Palm Oil (RSPO)</td>
<td>RSPO</td>
<td>Producer/Private</td>
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<td>PT Eterindo group</td>
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<td>Producer/Private</td>
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<tr>
<td>PT. Indo Biofuels Energy</td>
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<td>Producer/Private</td>
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<tr>
<td>PT Wilmar</td>
<td>-</td>
<td>Producer/Private</td>
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<tr>
<td>PT Sumi Asih</td>
<td>-</td>
<td>Producer/Private</td>
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<tr>
<td>PT Musim Mas</td>
<td>-</td>
<td>Producer/Private</td>
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<tr>
<td>Sinar Mas</td>
<td>-</td>
<td>Producer/Private</td>
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<tr>
<td>Salim/Indofood</td>
<td>-</td>
<td>Producer/Private</td>
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<tr>
<td>Indonesian Institute of Sciences (LIPI)</td>
<td>LIPI</td>
<td>Academic</td>
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<td>Bogor Agricultural University (IPB)</td>
<td>IPB</td>
<td>Academic</td>
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<tr>
<td>CGIAR (Including CIFOR and ICRAF)</td>
<td>CGIAR</td>
<td>Academic</td>
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<tr>
<td>Indonesian Bioenergy Experts Partnership (IKABI)</td>
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<td>Renewable Energy Forum of Indonesia</td>
<td>METI</td>
<td>Academic</td>
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<td>Wahana Lingkungan Hidup Indonesia</td>
<td>WALHI</td>
<td>NGO</td>
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<td>Sawitwatch</td>
<td>-</td>
<td>NGO</td>
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<td>World Wildlife Fund (WWF)</td>
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<td>NGO</td>
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<td>Conservation International (CI)</td>
<td>CI</td>
<td>NGO</td>
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<tr>
<td>Non-Timber Forest Products/SETARA</td>
<td>NTFP</td>
<td>NGO</td>
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<td>University of Papua - Tanjung Pura</td>
<td>-</td>
<td>Academic</td>
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<tr>
<td>Indonesian Palm Oil Research Institute (PPKS/IOPRI)</td>
<td>IOPRI</td>
<td>Academic</td>
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<tr>
<td>Institute of Technology Bandung (ITB)</td>
<td>ITB</td>
<td>Academic</td>
</tr>
<tr>
<td>Gaikindo (automobile association)</td>
<td>-</td>
<td>Producer/Private</td>
</tr>
<tr>
<td>PT Mutuagung Lestari (certification)</td>
<td>-</td>
<td>Certification Agency</td>
</tr>
<tr>
<td>Pertamina (Persero)</td>
<td>-</td>
<td>State Owned Entrp.</td>
</tr>
<tr>
<td>PT Bayer</td>
<td>-</td>
<td>Producer/Private</td>
</tr>
<tr>
<td>LINKS</td>
<td>LINKS</td>
<td>NGO</td>
</tr>
<tr>
<td>PT Sai Global</td>
<td>-</td>
<td>Certification Agency</td>
</tr>
<tr>
<td>PT TUV Nord</td>
<td>-</td>
<td>Certification Agency</td>
</tr>
<tr>
<td>PT Sucofindo</td>
<td>-</td>
<td>Certification Agency</td>
</tr>
<tr>
<td>APKASINDO (Palm Oil Smallholder Association)</td>
<td>APKASINDO</td>
<td>Producer/Private</td>
</tr>
<tr>
<td>GPPI (association of plantations)</td>
<td>GPPI</td>
<td>Producer/Private</td>
</tr>
<tr>
<td>Indonesian Palm Oil Society</td>
<td>MAKSI</td>
<td>Academic</td>
</tr>
<tr>
<td>Ministry of Transport</td>
<td>MENTRAN</td>
<td>Government</td>
</tr>
<tr>
<td>National Development Planning Agency</td>
<td>Bappenas</td>
<td>Government</td>
</tr>
</tbody>
</table>
As the standard method of SNA data collection investigation proceeded by presenting the roster to every actor in the network and asking them to identify those organizations on the list (or any other) with which theirs share six types of relations when it comes to biodiesel policy. These, in turn, are the six network variables that were considered in this study.

The dominant coalition contains those actors who are central to the biodiesel collaboration matrix and that these actors also form a clique in the agreement matrix. In order to do this, the case looked at the formal collaboration ties to reveal the most central organizations of the biodiesel policy network. A clique analysis followed to figure out how these prominent network actors band together based on agreement on matters of biodiesel sustainability. Results of these two analyses lead to specifying which organizations make up the dominant coalition. With the above definition, the network analysis revealed six organizations to be members of the dominant coalition of the biodiesel policy network (Table 2).

Table 2: Dominant Coalition in Collaboration Matrix

<table>
<thead>
<tr>
<th>Organization Name</th>
<th>Type</th>
<th>InDegree</th>
<th>Outdegree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Energy (ESDM)</td>
<td>Government</td>
<td>17 (36.17%)</td>
<td>12 (25.53%)</td>
</tr>
<tr>
<td>State Ministry of Research and Technology RISTEK</td>
<td>Government</td>
<td>30 (63.83%)</td>
<td>33 (70.21%)</td>
</tr>
<tr>
<td>Ministry of Agriculture (DEPTAN)</td>
<td>Government</td>
<td>15 (31.92%)</td>
<td>10 (21.28%)</td>
</tr>
<tr>
<td>National Biofuels Team (Timnas BBN)</td>
<td>Government</td>
<td>10 (21.28%)</td>
<td>13 (27.66%)</td>
</tr>
<tr>
<td>APROBI</td>
<td>Producer/Pvt</td>
<td>17 (36.17%)</td>
<td>19 (40.43%)</td>
</tr>
<tr>
<td>PT Musim Mas</td>
<td>Producer/Pvt</td>
<td>15 (31.92%)</td>
<td>20 (42.55%)</td>
</tr>
</tbody>
</table>

Figure 1 displays the full knowledge matrix and Figure 2 summarizes the measures of those actors who exhibit above average betweenness centralities in the knowledge matrix.
Figure 1: Structure of knowledge network (node size corresponding to relative betweenness centrality)
The actors displaying above average betweenness centrality measures are tabulated in Table 5 alongside those who showed high degree centrality in the collaboration matrix. The common organizations of the dominant coalition, are shaded. This exercise indicated that four government organizations from the dominant coalition - the GOI Ministry of Energy (ESDM), the GOI State Ministry of Research and Technology (RISTEK), GOI Ministry of Agriculture (DEPTAN) and the national biofuels taskforce (Timnas BBN) - have all been influential channels of knowledge in the biodiesel policy network.

The subsystem surrounding biodiesel development in Indonesia exhibits the dynamics of a contested discourse community. However in the governing system characterizing biodiesel planning in Indonesia, instead of eliciting a contested form of knowledge exchange where evaluative studies from several sides of the debate are pitted against each other by ‘dueling experts’, the dominant coalition has the power to perpetuate an internal yet exclusive policy discourse and to choose which scientific evidence may inform the policy process. The dominant coalition in this case may have a comparatively different capacity for technical evaluation than external assessors, but can further limit learning within the subsystem by exercising its power to exclude information from other policy evaluations in favor of its own internal expertise.

The Key Role of Brokers in Network Learning

As shown in Table 3, important network activities were collaboration, conflict, knowledge sharing, perceived influence, perceived agreement and perceived disagreement, in

Table 3: Network Variables and Definitions

<table>
<thead>
<tr>
<th>Network Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration</td>
<td>Formal and/or informal professional collaboration and sharing of information during biodiesel policy development.</td>
</tr>
<tr>
<td>Conflict</td>
<td>Conflicutive relations during biodiesel policy development</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Exchange of scientific knowledge and findings concerning biodiesel policy sustainability</td>
</tr>
<tr>
<td>Perceived Agreement</td>
<td>Having the same opinion regarding prioritizing sustainability in biodiesel policy</td>
</tr>
<tr>
<td>Perceived Disagreement</td>
<td>Having a different opinion regarding prioritizing sustainability in biodiesel policy</td>
</tr>
<tr>
<td>Perceived Influence</td>
<td>Believed to be influential in biodiesel policy development.</td>
</tr>
<tr>
<td>Affiliation</td>
<td>Being members of the same Multi-stakeholder associations</td>
</tr>
</tbody>
</table>

Technical or cognitive learning involves official working relationships among various organizations of the network that lead to formal knowledge sharing in the form of reports and sanctioned scientific findings among others. This knowledge sharing is seen as an important indicator for technical learning. If there is a collaboration tie present between two organizations in the network, it increases the likelihood of a knowledge tie being present by almost half. In other words, pairs of organizations that formally collaborate on biodiesel policy also share knowledge approximately 0.5 times more often with each other than those organizations that do not share collaboration ties.

As is apparent in Table 4, RISTEK, occupies the dominant position in the knowledge matrix in terms of betweenness centrality. Approximately 43% of the number of all possible technical knowledge sharing paths that can go through RISTEK as a node in the network, are present and its centrality measure is roughly 5 times greater than the next largest node, which is the Roundtable for Sustainable Palm Oil (RSPO). The implications of RISTEK’s presence in the knowledge network are that, it is an organization that plays a significant information bridging or brokerage role within different groups within the network, without which these groups (who possess different sets of knowledge) may not be connected and instead contain disjointing structural ‘holes’. Individual nodes in the network that bridge these holes are understood in SNA to be in advantageous positions for impacting the flow of intra-network information.
The previous analysis confirmed the influential role that dominant coalition members, and especially RISTEK, play as brokers forging technical learning ties within the biodiesel network. This last section sheds light on what type of brokering role these organizations assume, and which other organizations (not part of the dominant coalition) also are important knowledge brokers.

In Figure 4, the biodiesel policy network members are organized by type and number of brokerage ties is specified. RISTEK, again, has the highest amount and diversity of broker activity in the network. Most of its brokerage occurs in the role of liaison, meaning that it is one government organization that facilitates knowledge exchange between other, non-state groups. Its second highest brokering role is that of a representative that is almost singularly responsible for forging government ties of knowledge exchange with other groups.

### Table 4: Dominant Coalition in Knowledge Matrix: Betweenness Centralities

<table>
<thead>
<tr>
<th>Organization</th>
<th>Betweenness</th>
<th>Organization</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>RISTEK</td>
<td>892.2297363 (43.10%)</td>
<td>ESDM</td>
<td>17     (36.17%)</td>
</tr>
<tr>
<td>RSPO</td>
<td>171.0459747 (8.26%)</td>
<td>RISTEK</td>
<td>30     (63.83)</td>
</tr>
<tr>
<td>ESDM</td>
<td>164.8691711 (7.96%)</td>
<td>DEPTAN</td>
<td>15     (31.92%)</td>
</tr>
<tr>
<td>Timnas BBN</td>
<td>128.5689087 (6.21%)</td>
<td>Ministry of Trade</td>
<td>9      (19.15%)</td>
</tr>
<tr>
<td>CGIAR</td>
<td>104.8019257 (5%)</td>
<td>Timnas BBN</td>
<td>10     (21.28%)</td>
</tr>
</tbody>
</table>
Timnas BBN, as a group, is the second most powerful broker in the government group with its highest role as that of liaison between other groups, like RISTEK. Its second highest role is that of gatekeeper, controlling the flow of scientific and technical knowledge entering state agencies from non-state communities within the network. Together then, the results show that RISTEK and the members of Timnas BBN control the flow of information that goes out of and comes into the dominant coalition, and thus gets considered during biodiesel policymaking.

From outside the dominant coalition, the non-governmental organization Sawitwatch is also an important broker of knowledge. As an NGO significantly involved in sustainability and palm oil discussions, this organization influences the network firstly as a knowledge liaison between other groups. It also has some impact as a knowledge consultant to other groups, as a gatekeeper of knowledge entering the NGO group and as an important representative for the knowledge generated by the NGO group. Among academics, the Consultative Group of International Agricultural Research (CGIAR) and Bogor Agricultural University (IPB) are important liaisons between other groups while other academic agencies such as the Institute of
Technology at Bandung (ITB) and the bioenergy experts’ association (IKABI) function as gatekeeper and coordinator roles among researchers. The international/multilateral organizations do not have a strong role in information exchange within the network. And the certification agents purely act as consultants as they carry out sustainability audits on behalf of the ISPO.

Conclusions

The relationships presented in this case points to several findings about the interconnectedness and knowledge sharing relationships found in networks.

First, the ‘core’ of the biodiesel network consists mostly of government, some industry and few academic/research organizations. No international, multilateral or non-government organizations are found in the core, these instead make up the network ‘periphery’. The Ministry of Agriculture (DEPTAN) and RISTEK share the longest history of collaboration as co-members of almost all of the associations that are relevant to palm oil and biodiesel (1998 onwards). The Ministry of Energy and Mineral Resources (ESDM), joins DEPTAN and RISTEK as a significant co-member from 2002 onwards. This corresponds to the network principle that it is overall network structure and not agency type that is most important in the analysis of learning.

Second, The dominant coalition consists of four government organizations/ministries: ESDM, RISTEK, DEPTAN and Timmas, and two industry members, APROBI and PT Musim Mas. Collaboration between these groups has a positive and significant effect on technical knowledge exchange. The four government organizations of the dominant coalition have highly influential, information sharing positions in the knowledge matrix. In order of highest to lowest impact: RISTEK, Timmas BBN, ESDM and DEPTAN. The RISTEK and Timmas BBN have the most control of the knowledge and information that enters and leaves the dominant coalition and gets included during biodiesel policy making. This highlights the role played by brokers in network learning. This analysis results in several observations pertinent to the role of policy brokers in policy learning. The case illustrates that in governing systems such as that in Indonesia, with a heavy reliance on authority-based instruments, authoritative government officials are key to technical policy learning, by forming the core of policymaking and knowledge transfer connections within the network. The dominance of RISTEK, and to a certain extent Timmas BBN, in terms of betweenness centrality and brokerage indicates a general consistency with Hall’s contention of expert, ‘elite’ facilitators in a network, who, as agents of learning are the ‘officially-sanctioned expert’ members of the government (Hall 1988). The positions of RISTEK and Timmas BBN as liaisons indicate there influence in controlling the learning regarding biodiesel sustainability that circulates and is absorbed by the policymaking mechanisms of the network. While both Sabatier and Hall do not address the nature of state-society relationships of learning within a policy network, this finding is interesting in that it situates a government agency as a learning intermediary between various and otherwise disconnected actors of the network.

In general, the network structure suggests that the dominant coalition, and RISTEK and Timmas BBN in particular, are in positions to impact conditions for social and institutional learning, but limitedly so. Together these two actors exhibit a strong influence over the network as liaisons, consultants and gatekeepers whereby, they are in positions to enhance interconnectedness between members of the network and help perpetuate the rules, norms and values necessary for institutional learning. However, the magnitude of this influence, which dwarfs other liaisons, consultants and gatekeepers, possibly hinders the openness and limits the scope for innovation stemming out of other research, academic and non-state organizations.
Even though non-state actors such as Sawitwatch, CGIAR and academic organizations such as ITB do reveal some knowledge brokering roles, they are eclipsed entirely by RISTEK and Timnas BBN who are revealed as much stronger as intermediaries in the network. For, cognitive and technical learning, even though these two actors are revealed as strong representatives of knowledge ties originating from the government, they are not equally strong coordinators that are needed to allow for a variety of problem perceptions and alternative generation, while perpetuating a sense of urgency about the sustainability problems associated with biodiesel production.

From this study we can see that learning enriches policy network research and vice-versa and many avenues for furthering research on learning in networks and more specifically on brokerage and knowledge ties, exist. In this paper we undertook a preliminary attempt we developed a framework for conceptualizing learning in networks. Further research and theoretical work is required to bring this framework further. While methods such as quantitative social network analysis can be revealing of some general patterns, it can only provide a simple tool for displaying a broad 'snapshot' of the policy learning architecture of a subsystem. Deeper and perhaps, more qualitatively is necessary to better understand the politically-informed, strategic use of policy learning may result in a particular policy arena. Systematic network enquiry in this regard, can reflect the existence of formal relationships of collaboration or knowledge sharing between policy actors. While ties based on collaboration open channels for the transfer of substantive, technical knowledge and cognitive learning, others based on perceived agreement of policy beliefs or perceived influence may also indirectly indicate evidence of network conditions that prohibit the transfer of cognitive learning while dominating institutional learning about the permissible ideas, norms and values that eventually inform policy formulation.

References


Policy learning and policy networks in theory and practice: The role of policy brokers in the Indonesian biodiesel policy network. Article. Full-text available. This case study focuses on sustainability-oriented policy learning in the Indonesian biodiesel governance network and illustrates how network features and especially forms of brokerage influence learning. View. Show abstract. Key words: evidence based policy; evidence based practice; research utilisation. Acknowledgements This work was supported by the Economic and Social Research Council (ESRC Award Reference: H141251001), for which we are duly grateful. However the views expressed are those of the authors and should not be attributed to any other agency or individual. Activities. Some titles may subsequently appear in peer reviewed journals or other publications. In all cases, the views expressed are those of the author(s) and do not necessarily represent those of the ESRC. Evidence based policy and practice: cross sector lessons from the UK. Introduction. There is nothing new about the idea that policy and practice should be informed by the best available evidence.