Network Analysis of the Contextual Influences on Consensus-based Decision Making

and Cooperation Among and Between Local Stakeholders and a Government Agency:

A Comparative Case Study of Community-based Forest Management in Ontario, Canada

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Co-management covers various degrees of integration and power-sharing between pure state and pure local community resource management systems, ranging from government consultation with user groups, through advisory group input into government management, to user group management with government assistance (Pomeroy & Berkes, 1997). Due to its potential to contribute to the efficiency, effectiveness, and legitimacy of forest management (Pretty, 2003; Singleton, 2000), co-management of forests has become globally acceptable, and some form has been reported from more than fifty countries (FAO, 1999).

Scholars of resource institutions have identified design principles associated with the sustainability of relatively pure user group systems (Baland and Platteau 1996; Ostrom 1990; Wade [1988] 1994) but research on the sustainability of the more integrated systems that lie in the middle of the spectrum have been overlooked. Consequently, the focus has either been on the community or the state and not the relationship between the two.

The benefits of co-management depend on cooperation (Baland & Platteau, 1996; Pinkerton, 1989) which, in integrated systems, depends on the nature of the deliberative interface among and between local user groups and the state as well as the context of deliberations (Innes & Booher, 1999; Shindler, Cheek, & Stankey, 1999). But neither cooperation nor the content and structure of the context factors that influence deliberations and cooperation have been a focus of past co-management research (Agrawal, 2002).

To understand how cooperation develops in integrated systems we need to understand what sustains and reproduces the conditions for rational communication (McCay, 2002) where decisions are arrived at in a consensual manner through consensus-building deliberations between all stakeholders who are equally empowered, fully informed and where statements are comprehensible, scientifically true and offered by legitimate and sincere stakeholder representatives (Habermas, 1981). Wilson (2004) also asserts that if all stakeholders are embedded in similar cultures, social structures and experiences, they are more likely to engage in rational communication and develop cooperation. If not, one or more stakeholders will use their money, power and/or influence to control deliberations and decision-making and undermine cooperation.

Similarly, Singleton and Taylor's (1992) reanalysis of Ostrom's (1990) case study of common property systems describes how the extent to which a group approximates a "community" of mutually vulnerable actors determines its ability to cooperate and resolve

collective action problems. "Community" is defined as a set of people with some shared beliefs, with a reasonably stable set of members who expect to continue to interact with each other into the future and whose relations are direct and multiplex. They argue that such groups will have low transaction costs and be more likely to agree on a solution. Their expectation is that as the strength of community varies, solutions would range from community self-governance where community is strongest to government management where community is weakest. Where insufficient community exists to resolve collective action problems without recourse to the state, but local subgroups possess sufficient community for local self-regulation, they add the hybrid solution of co-management.

Finally, researchers have relied on traditional textual analysis to interpret interview data. This has limited their ability to manage and analyse the complexity and subtle detail of participant thinking about causal relationships. In contrast, this study uses graphical techniques to display and analyse context criteria and their linkages or influences on the development of cooperation.

The study is based on the notion that the origins of conflict go beyond material dimensions and arise at a deeper cognitive level (Adams, Brockington, Dyson, & Vira, 2003). And that it is the differences in stakeholder and decision-maker knowledge and thinking that create policy conflict. A cognitive approach was also chosen since understanding the organizational functioning requires knowledge of participants' relevant cognitions (Barnard, 1938). Since evidence suggests that focusing on the right institutional form is not enough but that cooperation is generated when deliberations are embedded within a larger structure of social relations (Putnam, 1993) , cognitions were conceptualized in social relational terms.

An understanding of the key context criteria and of the structure of linkages between key context criteria and consensus-building criteria is critical to understanding how key context criteria ultimately influence the development of cooperation and to develop policy interventions that improve consensus-building performance. This paper's objective is to explore, identify, compare and explain the key context criteria that influence consensus-building and the development of cooperation among and between local stakeholders and a local government agency responsible for co-management of state-owned forest resources, and their structure of causation. Consensus-building is defined as the range of practices in which stakeholder representatives with different interests have long-term, face-to-face deliberations with each other

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and a coordinating authority and interact with represented and outside groups on common issues of concern[i]. In addition, context criteria in this study are identified and evaluated by stakeholders while local stakeholder-local stakeholder and local stakeholder-local agency cooperation criteria were pre-defined by the researchers.

The paper is based on a comparative case study of two Local Citizens' Committees (LCCs) which advise the Ministry of Natural Resources (MNR) on the development of public forest management plans in their respective jurisdictions in the province of Ontario, Canada. It uses network, content and structural analyses to identify key context criteria, both social and physical, and analyse their content and structure of causation. Cognitive mapping and network analysis techniques are used to map context criteria and their linkages to identify key context criteria. Mapping was based on the decision maker choice perspective which considers context linkages to consensus-building to be through the beliefs of decision makers (Ford & Hegarty, 1984). Etiographic representations of the relative number of incoming links (indegree) as well as the relative number of outgoing links (outdegree) of key context criteria are then used to analyse the structure of causation among and between key context criteria and the consensus-building process for each case. This uncovers the perceived influence of MNR support staff over key context criteria and the performance and relative influence of key context criteria within a case. Key context criteria as well as their structure of causation are compared across cases and used to generate a cross-case explanation of how context influences consensus-building and the development of cooperation among and between local stakeholders and local government agencies.

The unit of analysis is the context of the consensus-building process that took place during the development of a 2001 forest management plan (FMP). This is defined as the influences that originated before or during the forest management planning process but outside of the consensus-building process. The consensus-building process is defined as the interactions that took place between LCC members, in their role as stakeholder representatives, and local MNR district office support staff; among LCC members; and between LCC members and their represented groups and the public during the 27 month period of the management plan development process and up to the renewal of the plan.

The paper begins with a description of the background of LCCs and the selection of the two LCCs. This is followed by the research methodology which includes a discussion of the

process of selecting pre-defined context criteria and methods of data collection and analysis. Next, the results of the study are discussed in terms of the features of cognitive maps, key context criteria and their incoming and outgoing links. This is followed by a comparative discussion of the above features with respect to the two LCCs. The paper concludes with five additional inferences regarding the context of consensus-building that have implications for consensus-building and co-management theory.

LCCs and Forest Management Planning

Following the most comprehensive public hearings ever held on forestry in Canada (Ross, 1997), MNR was mandated to provide local MNR administrative district publics with an opportunity to become meaningfully involved in decisions relating to local natural resources on Ontario's commercially viable public timberlands. This was to redress the historical precidence of timber over the non-timber values of local publics in forest management planning. Public timberlands comprise 45.3 million hectares or 64.3% of the forests of the Province of Ontario which incorporate or include parts of 21 districts, each of which has one or more LCCs (MNR 2002).

LCCs are community-based organizations comprised of local district citizens, who represent a range and balance of local interests and use consensus-based decision-making to arrive at decisions. They are typically comprised of local users such as naturalists and Crown land recreationists who have rights of access to public land for nonconsumptive recreation and noncommercial berry picking; local hunters, sports fishers, commercial baitfishers, bear hunting guides, fishing/hunting lodge operators, trappers and independent logging contractors who have additional rights to subtract from the resource; local aboriginal people who have Treaty rights mainly to hunt, fish, trap and gather, sometimes commercially and for subsistence use (Smith, 1996) [1]; as well as large forest products companies with long-term commercial logging or Sustainable Forest Management (SFL) licenses to the planning area (industry units) who have subtraction and limited management rights to timber. Users are granted subtraction and management rights by MNR who holds the sole right to exclude use and alienate public lands. In the two remaining areas where public timberlands are not managed under an SFL arrangement in

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[1] As a result, Aboriginal people do not consider themselves to be merely stakeholders.

Ontario, MNR is responsible for forest management and sub-contracting of access, harvest and renewal activities in the planning area (Crown units).

LCCs can be established at the Forest Management Unit (FMU), area or district scale so LCCs can represent interests in one FMU (FMU scale) or two or more FMUs (area or district scale). They are standing advisory committees that advise interdisciplinary MNR planning teams of experts, which include commercial interests, the district manager and a representative from the LCC, during the preparation of FMPs. A representative from MNR and/or the SFL holder acts as the chair of the planning team, or plan author. LCCs begin advising on the preparation of an FMP 27 months prior to renewal which takes place before forest operations begin on April 1 in a renewal year. During plan preparation, LCCs nominate a member to represent the LCC on the planning team and joint meetings of the plan author and LCC are held at agreed-upon stages of the planning process. LCCs also assist in monitoring plan implementation and provide advice to district managers if amendments to FMPs are required[2].

LCC members can be selected by the groups represented, existing LCC members or the district manager, but all are approved by the district manager. They are to develop their own procedural rules such as election of chair, frequency of meetings and meeting agendas subject to the district manager's Terms of Reference for LCCs. Members are reimbursed for reasonable out-of-pocket expenses and MNR provides District Office (DO) support to assist in the conduct of committee affairs and provide information. LCCs are required to produce reports of their activities, including discussions of problems and issues addressed by the committee, assessments of the co-operation provided to the committee by MNR, assessments of the effectiveness of the committee structure and recommendations for changes at various stages during the planning process. These reports become part of the publicly available FMP (Ontario. EAB, 1994).

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[2] LCCs are intended to improve and not replace participation by the general public and native communities who also have opportunities for ongoing participation through a parallel five-stage public consultation process. As a result, LCC representatives are expected to attend all public information centres. Aboriginal communities have the additional option of participating through a separate native consultation process. When LCC members, the general public or aboriginal communities are not satisfied with the planning process, they can trigger a conflict resolution process within MNR or initiate a "bump-up" request to a full environmental assessment administered by the Ontario's Ministry of Environment. The conflict resolution process was not initiated nor was a "bump up" request granted for either of the cases analysed here.

Selection of LCCs

Purposive sampling was used to select the two LCCs that would provide the information needed to address the study objectives. LCCs were selected from one region and had to have advised on an FMP that was renewed on April 1, 2001 so that interviewee ability to recall past events would be maximised at the time of the interviews and to ensure case comparability. LCCs with the most experience that operated at the highest scale were selected to ensure consistency in scale. This resulted in the selection of LCC1 (District level) and LCC2 (Area office level). The difference in scale between the two cases was not considered a problem since each LCC was responsible for advising on the development of the same number of FMPs (two) and would have the same level of experience.

Background to the Case Studies

LCC1 had been meeting for almost three years but had not been fully involved in the development of an FMP prior to the beginning of the study period. There had also been a substantial turnover of members immediately prior to the study period so most members were new to the forest management planning process. The only reasons that could be identified for the large turnover was that the previous district manager was not supportive of the previous LCC1 and that previous LCC1 members had become exhausted due to involvement in conflict resolution processes during the period of the previous plan.

LCC1 members were selected as official represenatives of or due to their affiliation with local stakeholder groups. During the study period, LCC1 advised on the development of Forest Management Plan 1 (FMP1), the FMP for Forest Management Unit 1 (FMU1). The FMU was a Crown unit in that it was operated and managed by District Office 1 (DO1) of MNR during the study period. However, its operation and management was transfering to a forest company under a SFL arrangement following plan renewal.

Forty-one per cent of FMU1 is managed productive timber land with the balance being either non-forested land (water (40%), private land) or non productive forest land (muskeg, rock). Except for two areas managed for wildlife, recreation and remote tourism, most of FMU1 is road accessible. FMU1 contains several aboriginal and non-aboriginal communities. In the

2001 census, the largest community had an overall population of 15,838 and an average age of 39.3 years (Statistics Canada, 2002). The primary economic sectors served by FMU1 are forestry and tourism. The largest community has 14% of its workforce employed in the forest sector with timber from FMU1 supplying five local sawmills and one paper mill during the period of the study.

LCC2 had been meeting for more than three years and had been involved in the development of one FMP prior to the beginning of the study period. There had been no significant turnover and LCC2 members had been selected to represent local sectors and not stakeholder groups, although they could be affiliated with them. Members represented public, trapping, small independent logger, forest industry trade union, forest industry, recreation, local business, trapping, environmental, mining, aboriginal, baitfishing and bear hunting interests. During the study period, LCC2 had advised on the development of FMP2, the plan for MU2. FMP2 is an SFL that is leased by a Forest Management Company (FMC) and administered by DO2. The FMC is a cooperative of small and locally-owned independent contractors which is responsible for forest management planning, operations, renewal, maintenance and self-compliance to certain specified standards.

Sixty-three per cent of FMU2 is managed productive timber land with non-forested and non-productive land making up the balance of the area. It is heavily interspersed with private land and an extensive network of primary-secondary forest access roads. FMU2 also contains two First Nations communities. In the 2001 census, the largest and only incorporated community had a population of 8,198 and an average age of 38.2 years (Statistics Canada, 2002). The primary and secondary economic sectors served by FMU2 are forestry and tourism respectively. Presently, 43 tourist outfitters and lodges exist within the FMU2 and sport fishing capacity for tourism has been fully committed. However, the largest community also has 24% of its workforce employed in the forest sector with timber from the FMU2 supplying two local sawmills and a paper mill and three non-local sawmills and a paper mill during the period of the study.

Research Strategy and Approach

An exploratory case study strategy was used since case studies are more capable than survey and experimental strategies for explaining the causal links in real-life interventions such

as an LCC. Yin (1988:23) defines a case study as, "an empirical inquiry that: investigates a contemporary phenomenon within its real-life context; when the boundaries between the phenomenon and context are not clearly evident; and in which multiple sources of evidence are used."

Qualitative methods of evaluation were selected over quantitative methods to explore, identify and explain criteria and their influences because: insufficient baseline data existed on the variables relevant to the phenomenon; context and consensus-building criteria and their influences on the development of cooperation do not easily lend themselves to quantification; and qualitative methods were considered the best means to measure stakeholder thinking and uniquely suited to exploring the dense and multiple chains of causation in changing organizational settings (Miles & Huberman, 1994). However, qualitative methods are time consuming and so limit the number of cases that can be analysed, which limits their generalizability. The qualitative approach was primarily in-depth individual interviews with all of the LCC members and DO support staff that were involved in the development of a 2001 FMP since each represented a different source of knowledge and point of view. Individual interviews were also selected over group interviews to protect the confidentiality of interviewees and enable them to divulge potentially politically sensitive details of deliberations and triangulate responses. Interviews were supplemented by a review of LCC meeting minutes, LCC reports and participant observation at LCC meetings.

The qualitative data analysis approach followed that of Miles and Huberman (1994) who argue that deductively driven designs are considered to be appropriate when research sites are familiar and a range of well-defined concepts is available. The selection of particular settings, problems and a conceptual framework are viewed as a form of "anticipatory data reduction" that gives direction and focus to the research.

Miles and Huberman suggest a start list of codes should be created prior to the research. This orients the researcher to the study's conceptual purpose but remains provisional and open to change and modification as the study progresses. The aim is to steer a course between developing highly coherent codes that only address the bare bones of the research and a disorganized collection of disparate codes that are incomprehensible. Codes should also be clearly defined and recognizable representations of segments of text.

While qualitative analysis relies on careful description, Miles and Huberman argue that this does not provide explanation. They assert that qualitative researchers should go further and explore causal relationships. Data therefore needs to be systematically arranged in a form that allows for detailed interrogation. Displaying data in a network form adds iterative momentum to the analytic process. It makes a potentially difficult and cumbersome process easier to manage and ensures the emerging analysis is firmly based on the data with irrelevant material excluded and the impact of dramatic material reduced. It also documents the process, making judgements and decisions more visible and explicit than traditional textual approaches. This generates greater confidence in a study's findings and makes secondary data analysis and auditing procedures possible.

Finally, Miles and Huberman acknowledge the growing importance of multiple case studies. Cross-case studies enhance external validity and enable the researcher to identify elements and configurations that are replicated or occur in some cases and not others (Fielding & Lee, 1998). Therefore, this study was a comparative case study of two LCCs. More than one case study was also needed to build a strong general cross-case explanation for causation that would fit each case.

Evaluating Context

Selection of Pre-defined Context Criteria

Consensus building cuts across agencies and brings bureaucrats and citizens together for joint learning and decision making (Innes 1996). While the increase in consensus building has resulted in several attempts at identification and measurement of evaluation criteria (Conley & Moote, 2001), Shindler, Cheek and Stankey's (1999) criteria include the only known attempt to identify the context criteria that can influence public involvement processes and outcomes related to forest management. Criteria are based on the notion that agency-stakeholder interactions are tied to previous interactions and overlap concurrent ones. They are designed to provide public forest agencies with the information required to improve existing public involvement programmes and maintain successful agency-stakeholder relations. Since the criteria are the most specified and theoretically relevant to this research, the 21 context criteria used in the study were derived from Shindler, Cheek and Stankey (1999) and compiled into Table 1.

TABLE 1 Context Criteria Derived from Shindler, Cheek and Stankey (1999) that were used for Evaluation

Criterion	This Study
**History of relationship between local agency office and local communities with respect to the forest	✔
**Unique characteristics of the forest	✔
**Unique characteristics of local communities	✔
**Ongoing conflicts regarding management	✔
**Primary concerns of community members related to management	✔
**Recent events that might have affected management	✔
**Local citizen understanding of agency processes	✔
**Local agency personnel understanding of agency processes	✔
Kinds of support provided by local agency office	✔
* Skills, experience and knowledge of support personnel	✔
Additional support personnel skills, experience and knowledge that would be useful	✔
Adequacy of skills, experience and knowledge of local stakeholders related to local communities	✔
Adequacy of skills, experience and knowledge of local stakeholders related to forest management	✔
Adequacy of skills, experience and knowledge of local stakeholders related to working with local agency office	✔
Adequacy of skills, experience and knowledge of local stakeholders related to working on a consensus committee	✔
Continuity of support personnel	✔
Incentives/disincentives for support personnel to be flexible, creative or take risks to support local stakeholders	✔
Relevant policy changes that might have affected local stakeholders	✔
* Financial constraints	✔
* Time constraints	✔
* Existing relationship between local citizens and local agency office	✔

* Addressed in both DO support staff and LCC questionnaires   **Addressed by one DO1 and all DO2 support staff

Shindler, Cheek and Stankey's (1999) criteria incorporate management setting and community characteristic criteria, agency and institution criteria and criteria that address agency and stakeholder attitudes, skills and relations. For analysis purposes, these context criteria were re-grouped as either social or physical criteria, with the former comprising the majority of criteria. Since context criteria were loosely specified, they were used to develop open-ended study questions that provoked DO support staff and LCC members to identify and describe context criteria and explain the thinking that led to their response. They were developed on the basis that when interviewees are prompted with questions on context criteria, they will provide the details they believe to be the most important, including additional criteria.

All LCC members involved in the development of a 2001 FMP for both cases were interviewed since each LCC member represented a different point of view. All relevant DO support staff were also interviewed to triangulate LCC member responses[ii].

Data Analysis to Evaluate, Identify and Compare Key Context Criteria

N5 (QSR International Pty Ltd., 2000) was used to code each case's transcripts in social relational or physical terms. Criteria were coded to capture relations within MNR and the capacity of MNR as were social relations that operated immediately beyond the phenomena. Criteria that addressed the physical setting were also part of the context and coded as physical context criteria. Criteria were also scored based on a review of the text that was represented by a criterion. When 50% of more of the interviewees that commented on a specific criterion was positive, the criterion received a positive or high score and negative or low score otherwise. Text that addressed a pre-defined criterion was represented by a variation of the name of the pre-defined context criterion and text that expressed distinct ideas identified by one or more interviewees was represented by phrases and emergent criteria that best conveyed these distinct ideas. This inductive approach was used to balance the deductive approach of pre-defined criteria.

Criteria could represent the comments of one or more interviewees within a case. This was done to allow both the peculiarities of each case to emerge and the regularities between cases to be identified for cross-case comparison. The intent was to retain all of the criteria identified rather than limit the analysis to only shared criteria (criteria identified by all or a majority of respondents) since all points of view are to be included in a consensus process.

Criteria were phrased in "action-oriented" terms where active verbs are used to describe how concept "A" leads to concept "B". Criteria were then exported into Decision Explorer (DE) (Banxia Software Ltd., 2002a), a cognitive mapping program designed to capture an individual or group's thinking about the causal links between criteria in a graphical representation (Eden & Ackermann, 1998). DE enhances the capabilities of N5 and enhanced our ability to manage and statistically analyse the complexity and subtle detail provided by interview information. Cognitive mapping has been extensively used in the policy analysis, administrative and management sciences and DE has been specifically used as an aid to defining the nature of conflicting and qualitative policy problems (Wang, 1996).

A cognitive map is comprised of numbered concepts - short phrases that express an idea about an issue – and links – the connections between concepts, which together capture the logic of an argument within a network of concepts and linkages (Figure 2-2). In causal cognitive maps, links are read as "may lead to", "supports" or "causes" (Banxia Software Ltd., 2002b). All links in the study were identified from a close interpretation of the interviewee transcripts.

Concepts can be unipolar or bi-polar. Bi-polar concepts are variables that express ideas in the form of contrasting poles (eg. "increase in confidence in FM Planning rather than no increase in confidence in FM Planning"). Links in a map can be positive or negative. Positive links are the default and link the first pole (eg. "increase in confidence in FM Planning") of a "from" concept at the "tail" of a directional arrow to the first pole of the "to" concept at the "head" of the directional arrow ("increase in cooperative relations"). Conversely, negative links connect the first pole of the "tail" concept (eg. "DO inability to simplify FMP information") to the second pole of the "head" concept (eg. "no increase in confidence in FM Planning") (Brightman, 2003) (see Figure 1).

Links were identified and criteria were modeled and mapped hierarchically with "head" criteria placed at the top as outcomes or goals, means-to-goals criteria placed in the middle, and "tail" criteria that "cause" the outcomes or goals placed at the bottom of the map (see Figure 1). Head criteria tended to be part of the consensus-building process, tail criteria tended to be part of the context and means-to-goals criteria could be either.

To facilitate comparison, common codes and numbers were assigned to the criteria and emergent criteria that were shared across cases. DE's domain, central and cluster analysis functions were used to identify the most cognitively central context criteria for interviewees,
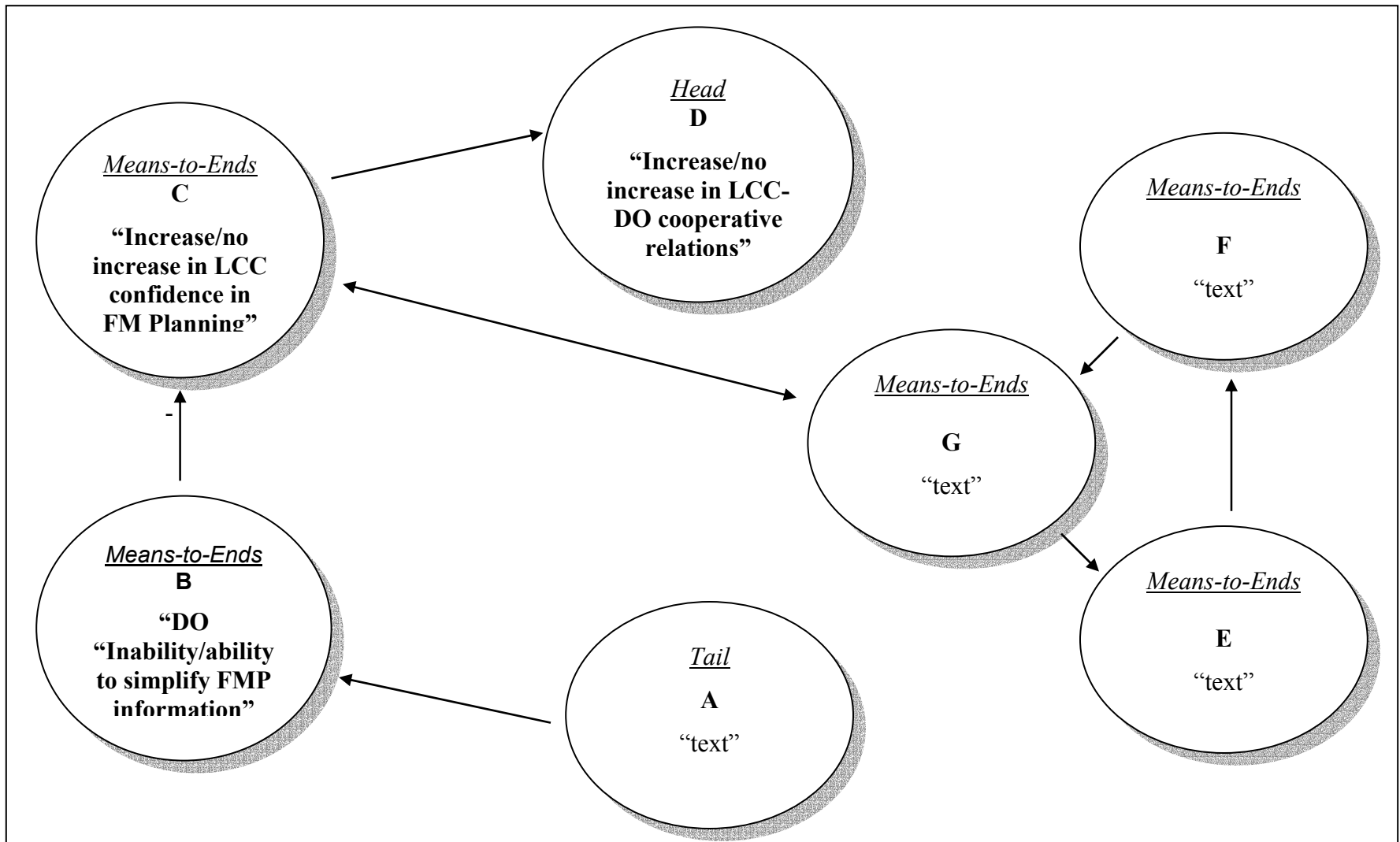
Symmetric link: C-G & G-C   Circular pathway: E-F-G

Figure 1 Model of a Cognitive Map, Type of Criteria and Elements of a Cognitive Map

forming the core of context map themes, and their relative rankings. Domain and central analyses were respectively used to identify the criteria with the most direct links and that were most highly linked into each overall map. Cluster analysis was used to identify the clusters of criteria that delineated distinct map themes. The most highly ranked domain and central analysis criterion within each cluster was used to represent the cluster. These are referred to as key criteria (for methodological details, see Robson (2004)).

The regularities across the two cases and the peculiarities of each case were identified to develop an overall explanation for the key context criteria that influenced consensus-building and the development of cooperation. Since no regularities were identified, only the differences between idiosyncratic key criteria were compared across cases. Consequently, the node ranking and text of an idiosyncratic criterion in one case was compared to the ranking and text of the most similar idiosyncratic criterion in the other case.

Data Analysis to Evaluate, Identify and Compare How the Structure of Causation of Key Context Criteria Influence Cooperation

Key context criteria were subjected to a consequence analysis to identify whether they were directly or indirectly linked into the development of cooperation among LCC members criterion or the development of cooperation between LCC stakeholders and the co-management agency criterion or both. This was followed by a loop analysis which revealed the existence of a large number of symmetric - links from "A" to "B" and back to "A" - and circular pathways - links from "A" to "B" to "C" to "D" and back to "A" (Eden & Ackermann, 1998) - among both consensus-building and context criteria for each case (see Figure 1). This indicated that both maps were non-hierarchical (Bougon, Weick, & Binkhorst, 1977).

The prevalence of loops as well as positive and negative linkages and the need to analyse a case's respondents together, signaled the need to use Bougon et al.'s (1977) Given Means Ends (GME) analysis of generalized indegree. Ford and Hegarty's (1984) Context, Structure and Performance (CSP) analysis was also needed to analyse generalized outdegree.

GME and CSP analysis allows the analyst to sort through the tangle of intersecting loops and interpret the flow of causality in a looped cognitive map. In GME analysis, the flow of causality is based on the extent to which a criterion is seen to be directly influenced by other criteria. The criteria with the most incoming links (high indegree criteria) are the "Ends" or the

goals of a process since they receive the largest number of influences from other criteria so they tend to reflect the informal aims of participants. Consequently, they are placed at the right side of an indegree graph. In contrast, criteria with the least incoming links (low indegree criteria) are the "Givens" of a process since they receive the smallest number of influences from other criteria so they are relatively stable. Consequently, they are placed on the left side of a graph. Criteria with an intermediate number of incoming links (medium indegree criteria) are therefore the "Means" between the other two types and so are placed in the middle. Key consensus-building criteria were interpreted as either means or the informal goals of the process since they and how they were influenced by the context was the focus of the study. Consequently, key context criteria were interpreted as either the givens or the means of the situation.

In CSP analysis, the flow of causality is based on the extent to which a criterion is seen to be a direct cause of other criteria. The criteria with the most outgoing links (high outdegree criteria) are "Context" concepts since they are the source of the largest number of causes or influences on a process and so they are placed at the left side of an outdegree graph. In contrast, criteria with the least number of outgoing links (low outdegree criteria) are "Performance" concepts since they have the smallest number of influences on other criteria and so they are at the end of sequences of causality and tend to represent actual achievements. Consequently, they are placed on the right side of the graph. Criteria with a medium number of outgoing links (medium outdegree concepts) are "Structure" concepts that lie between the other two concepts and so are placed in the middle. Key consensus-building criteria were interpreted as either structure or performance concepts and key context criteria were interpreted as either context or structure concepts for the reasons mentioned above.

Generalized indegree is defined as the number of heads leading into, and generalized outdegree is defined as the number of heads leading out of a concept from other concepts for the "average" participant's cause map. Generalized indegree has been correlated with a participants' sense of control over a concept. If many incoming links lead into a concept, participants feel they have a greater influence over that concept compared to a concept with fewer incoming links. Bougon et al. (1977) also propose that participants either learn how to control these concepts so concepts retain their incoming links and remain achievable goals or participants lose control over them so concepts have few incoming links and are dropped as goals because the concepts cannot

be achieved. These definitions were adapted for the study as the number of heads leading into and tails leading out of a criterion respectively, for all participant cause maps added together.

Generalized indegree was calculated, ranked and analysed separately from generalized outdegree for each key context criterion. Indegree and indegree rankings were also displayed in ordered cause graphs or etiographs in a flow of causality from highest to lowest ranking, where rankings were reversed (the highest rank was assigned to the lowest indegree criterion and the lowest to the highest indegree criterion). In contrast, generalized outdegree and outdegree rankings were displayed in ordered cause graphs in a flow of causality from highest to lowest ranking, where the highest rank was assigned to the highest outdegree criterion and the lowest to the lowest outdegree criterion.

Cognitive Map Characteristics, Idiosyncratic Key Context Criteria and GME and CSP Analysis of Key Context Criteria for the Two LCCs

All district support staff (five DO1 and and four DO2) and members of each LCC (nine in Case #1 and eleven in Case #2) participated in the interviews. The average length of interviews for DO1 support staff was 1.5 hours while for DO2 support staff it was 1.9 hours.

Cognitive Map Characteristics

Cases #1 and #2 differed in terms of the number of context criteria identified. Case #1 had 137 context criteria, five (3.7 %) of which were physical context criteria, and Case #2 had 127 context criteria, four (3.2%) of which were physical context criteria. Cases #1 and #2 also differed in terms of the number of key context criteria identified. Case #1 revealed six key context criteria. Case #2 revealed two key context criteria. Each of the key context criteria identified in each case were idiosyncratic to that case (Table 2).

Key Context Criteria

The six key context criteria ranked from highest to lowest that only made the rankings for Case #1 were: "limited potential for the public to have a say in forest management planning", ranked first; "low LCC member trust in forest management planning pre-plan", ranked second; "insufficient time for DO to keep LCC updated on policy", tied for third with "lack of LCC trust in new computer models based on faulty inventory data"; "local stakeholder group's

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TABLE 2 Rankings of Key Context Criteria Whose Importance was Idiosyncratic to One Case
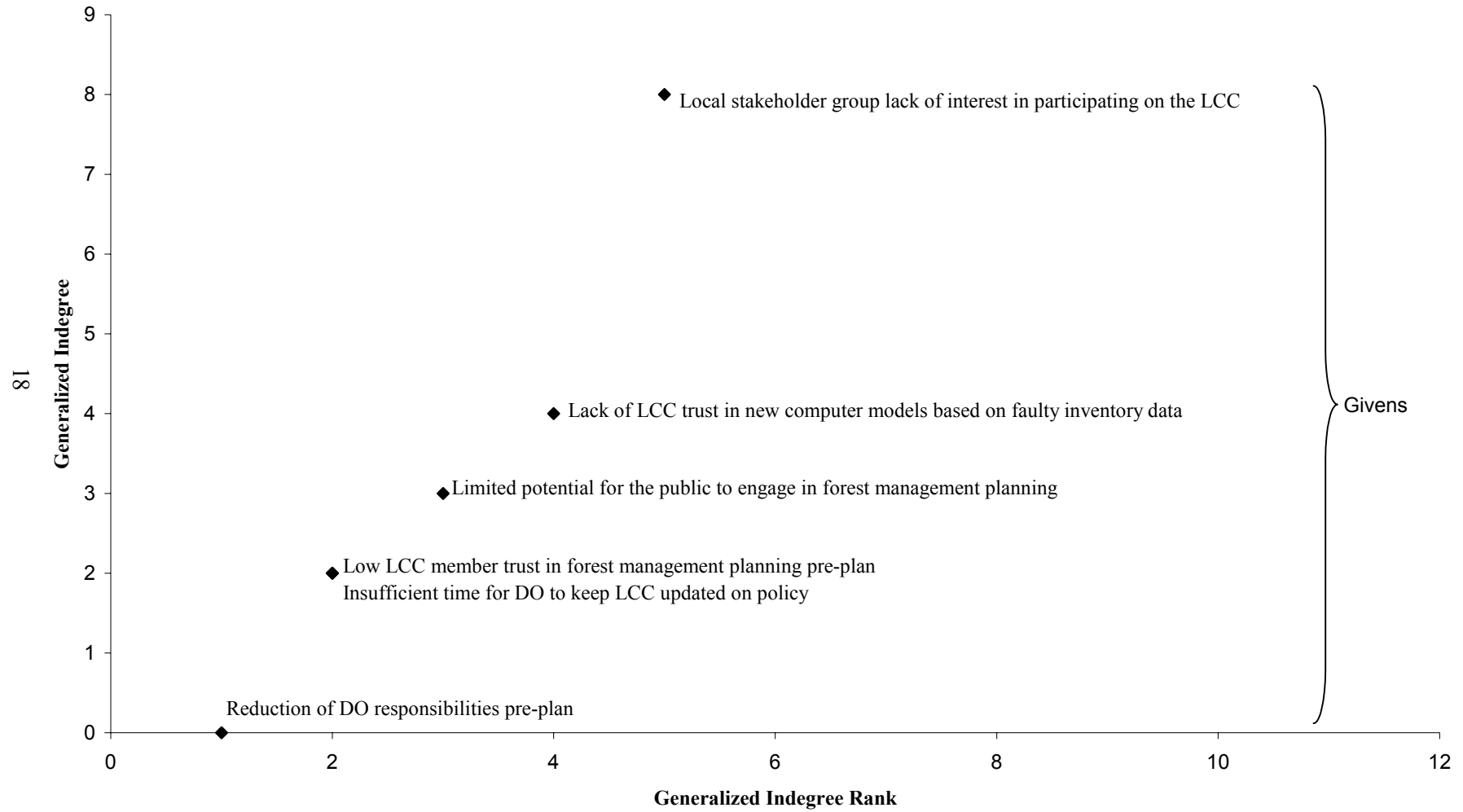
Case #1	Case #2
Limited potential for the public to engage in forest management planning	*High forest company responsiveness to local stakeholder concerns
Low LCC member trust in forest management planning pre-plan	*Publicly-owned management unit interspersed with high proportion of private land
Insufficient time for DO to keep LCC updated on policy	
*Lack of trust in new computer models based on faulty inventory data	
Local stakeholder group lack of interest in participating on the LCC	
201. Reduction of DO responsibilities pre-plan	

* criterion that only emerged in that case

lack of interest in participating on the LCC", ranked fourth; and "reduction of DO responsibilities pre-plan", ranked fifth. The only key criterion not directly or indirectly linked to both cooperation criteria was the lack of LCC trust in new computer models criterion which was not linked into the development of cooperation among LCC members criterion. The two key context criteria that only made the Case #2 rankings were: "high forest company responsiveness to local stakeholder concerns", ranked first, and "publicly-owned management unit interspersed with high proportion of private land", which was ranked second.

GME and CSP Analysis of Key Context Criteria

The average linkage to concept ratio for all context criteria was 1.77 for Case #1 while it was 1.83 for Case #2. The range of both indegree and outdegree for the key context criteria was greater in Case #1 compared to Case #2. Indegree ranged from a high of eight to a low of zero in Case #1 and from a high of three to a low of zero in Case #2 (Figures 2 and 3). Outdegree ranged from a high of seven to a low of one in Case #1 compared to a range of zero in Case #2 with both key context criteria having an outdegree of three (Figures 4 and 5).
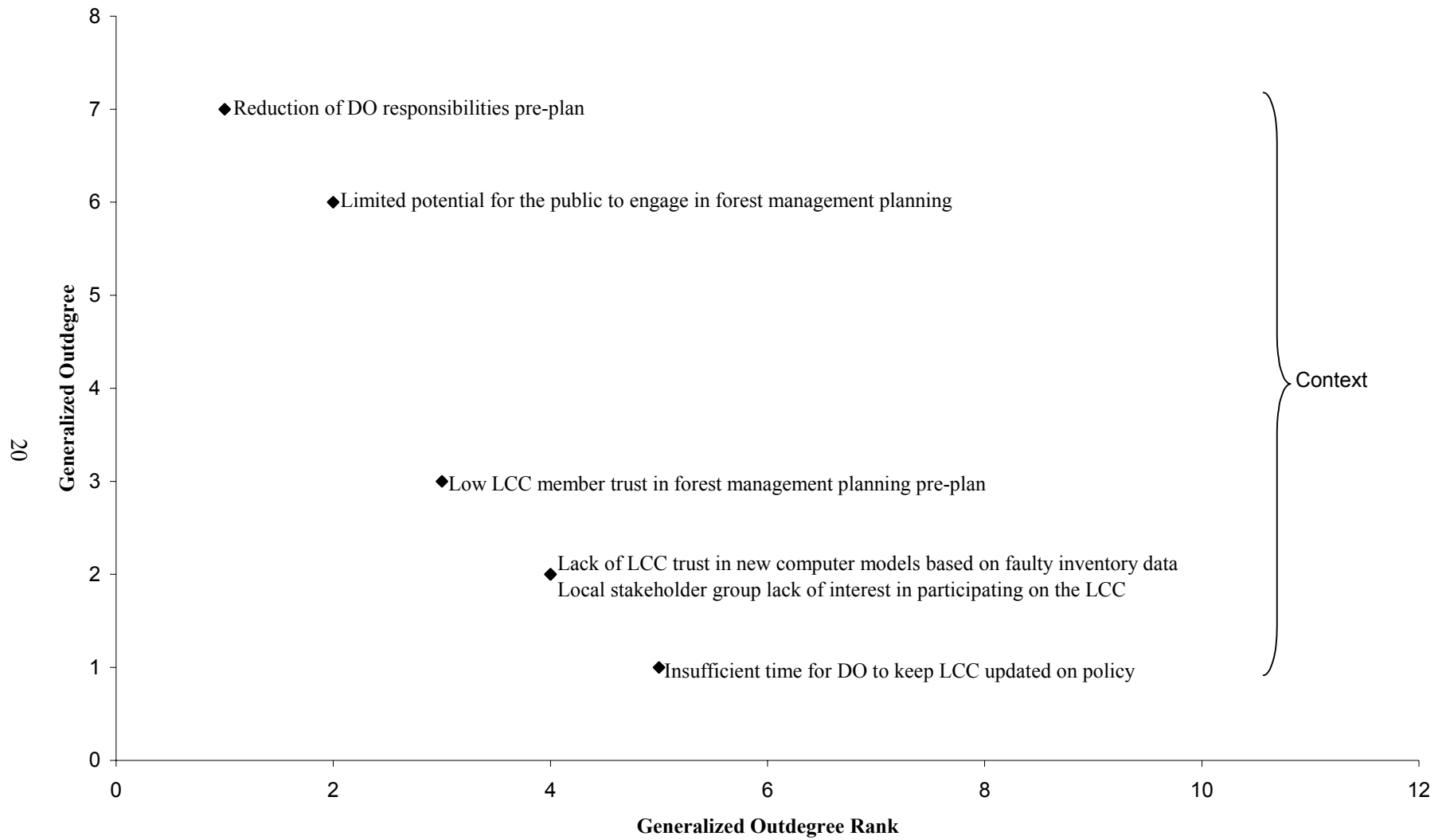
The key context criteria in order of indegree ranking for Case #1 were: "local stakeholder group's lack of interest in participating on the LCC", ranked first; "lack of LCC trust in new
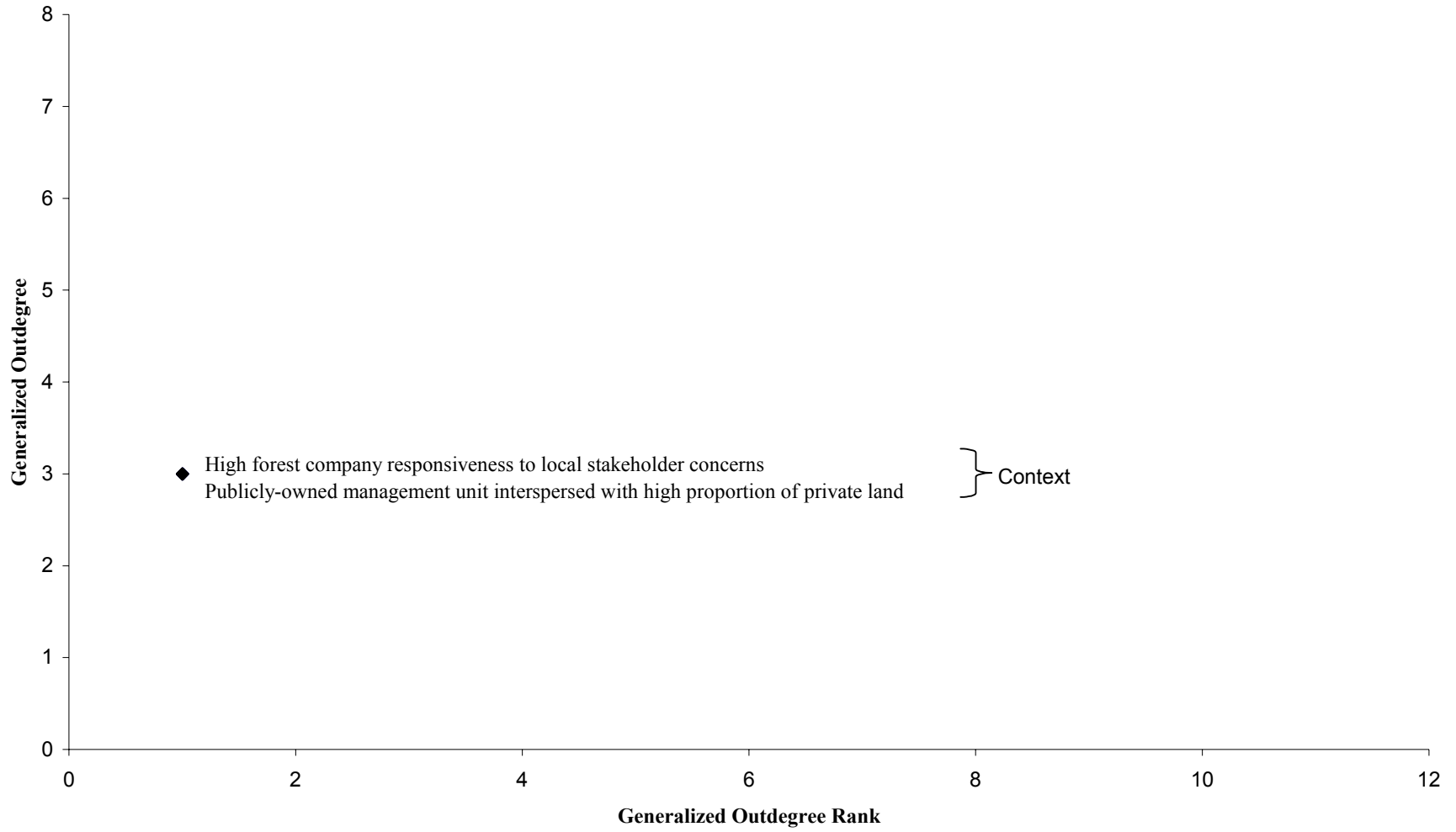
Figure 2: Given, Means, Ends Analysis of Case #1 Context
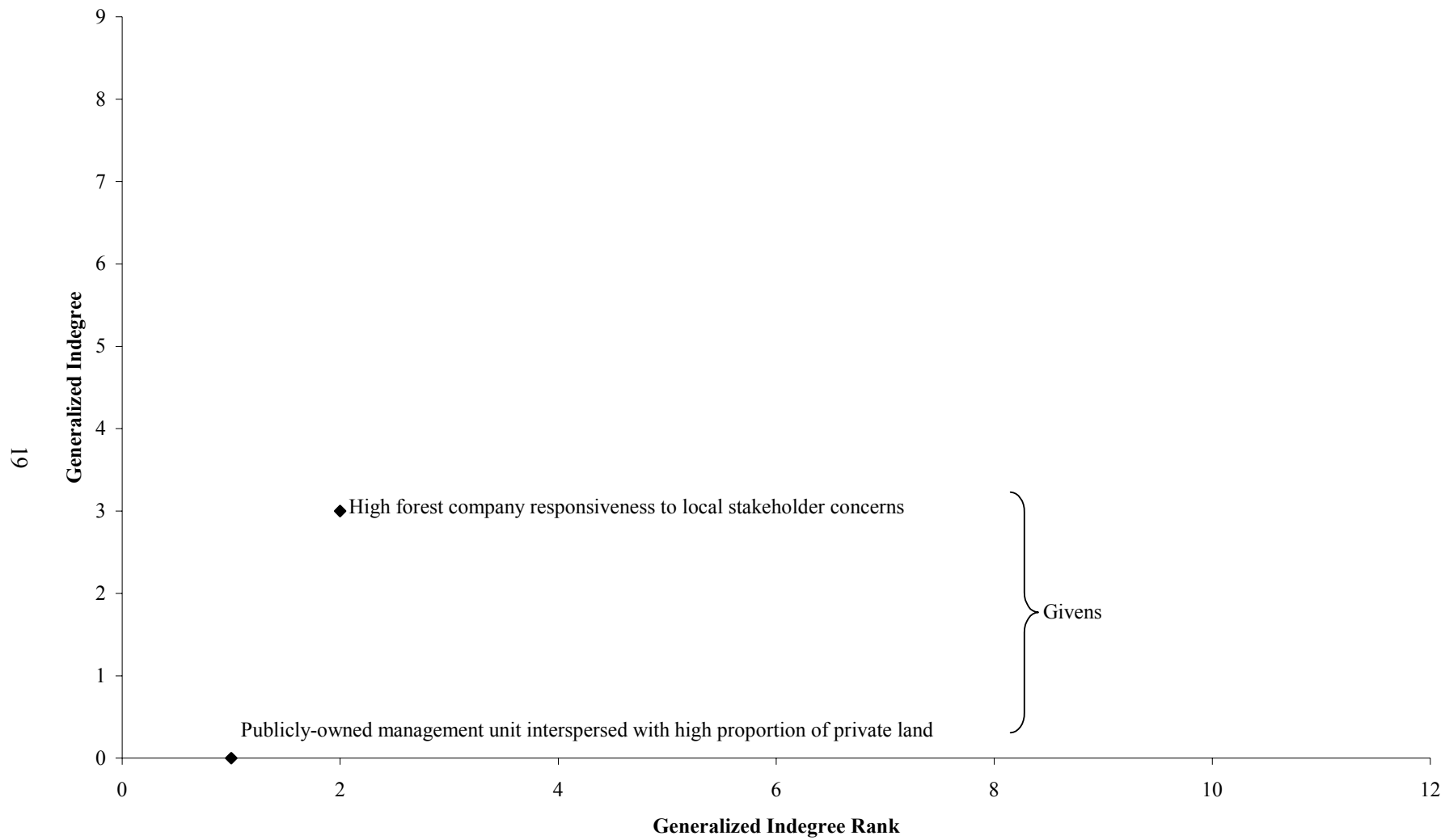
Figure 3: Givens, Means, Ends Analysis of Case #2 Context

Figure 4: Context, Structure, Performance Analysis of Case #1 Context

Figure 5: Context, Structure, Performance Analysis of Case #2 Context

computer models based on faulty inventory data", ranked second; "limited potential for the public to have a say in forest management planning", ranked third; "low LCC member trust in forest management planning pre-plan" and "insufficient time for DO to keep LCC updated on policy", tied for fourth; and "reduction of DO responsibilities pre-plan", ranked fifth.

The key context criteria for Case #2 in terms of indegree rankings were "high forest company responsiveness to local stakeholder concerns", ranked first, followed by "publicly-owned management unit interspersed with high proportion of private land", ranked second (Figures 2 and 3).

The key context criteria in order of outdegree ranking for Case #1 were: "reduction of DO responsibilities pre-plan", ranked first; "limited potential for the public to have a say in forest management planning", ranked second; "low LCC member trust in forest management planning pre-plan", ranked third; "lack of LCC trust in new computer models based on faulty inventory data" and "local stakeholder group's lack of interest in participating on the LCC", ranked fourth; and "insufficient time for DO to keep LCC updated on policy", ranked fifth. However, the lack of LCC trust in new computers models criterion was not directly nor indirectly linked to the development of cooperation among LCC members criterion.

The key context criteria for Case #2 in terms of outdegree rankings were "high forest company responsiveness to local stakeholder concerns" and "publicly-owned management unit interspersed with high proportion of private land", tied for the same rank (Figures 4 and 5).

Comparative Discussion of Cognitive Map Characteristics, Key Context Criteria and GME and CSP Analysis of the Key Context Criteria for the Two LCCs

Comparison of Cognitive Map Characteristics

The higher number of support staff interviewed could have increased the level of map detail in Case #1 but this would have been offset by the fewer questions directly addressed to DO1 compared to DO2 support staff, and the longer average length of interviews by DO2 support staff. Interviews could also have been longer due to interviewer inconsistency across cases or a greater level of knowledge on the part of DO2 support staff. Knowledge, in terms of formal education however, was higher for DO1 than DO2 support staff.

The substantially greater number of key context criteria identified in Case #1 is proportionately much higher than would be expected given Case #1's total number of context

criteria and suggests Case #1's context map is more segmented than Case #2's context map. A more segmented map indicates group cognition that is more divided than shared (Norris, Jones, & Norris, 1970). However, this could reflect the fact that most DO1 support staff directly addressed fewer questions than DO2 support staff.

Comparison of Key Context Criteria

The most highly ranked key context criterion in Case #1, "limited potential to engage the public in forest management planning" reflects the formal approach used by support staff to involve the public, such as the use of impersonal letters to invite local stakeholders to attend open houses and use of letters instead of face-to-face discussions to resolve issues. This reinforces the finding that there was an initially low level of acceptance of the LCC by DO1; that little mutual respect existed between DO1 support staff and LCC members during the development of FMP1; and that the DO1's commitment and cooperation with the LCC was lower compared to Case #2. It may reflect a negative attitude towards public involvement in general by DO1 support staff which may have resulted in a limited effort to fully engage with local stakeholders. However, it also may reflect lack of knowledge on the part of DO1 support staff and LCC members about how to elicit local stakeholder involvement.

The relatively formal approach of DO1 support staff contrasts with the DO2 support staff's high and more informal responsiveness to local stakeholder needs as indicated by the D)2 support staff's use of personalized letters with maps that outlined local landowner/stakeholder interests vis a vis proposed forest developments. The low acceptance, low mutual respect and negative attitude of DO1 support staff ultimately may have been due to a previous district manager's disagreement with the concept of an LCC which may have been the source of the high LCC1 turnover that occurred immediately prior to the development of the plan.

"High forest company responsiveness to local stakeholder concerns" may have been the most highly ranked criterion in Case #2 because the SFL holder, being a small and locally-owned cooperative, possibly had deeper roots in the community and a greater sense of responsibility to local citizens compared to a typical, large and non-locally-owned SFL holder, or even a government agency. The group of independently-owned FMC contractors would be more likely to fulfill Singleton and Taylor's (1992) definition of community where contractors would likely share the same beliefs as local stakeholders, expect to continue to interact and have direct and

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multiplex relations with them, and be more stable members of the community. This, combined with the FMC's greater dependence on and thus vulnerability to the local forest economy would increase the FMC's desire to resolve collection action problems endogenously (Singleton & Taylor, 1992). The fact that this appears to have occurred suggests that there is a strong sense of community between the FMC and local stakeholders.

However, since the FMC was newly established as a result of the transition from public to private management of Crown lands, the DFMC had also been extra vigilant due to significant government oversight. It had also been vigilant as a result of LCC2 oversight as well as the FMC's increased understanding of other stakeholders' point of view as a consequence of participating on LCC2. This may be why a FMC-hosted open house had the highest ever turnout the DO1 had ever witnessed and it was able to resolve a lot of the conflicts with private landowners that had haunted past government-developed plans.

The above criteria underscore the differences between the first of four themes identified in Case #1 and first of two general themes identified in Case #2. Case #1's first theme focuses on the DO1's formal and limited engagement with local citizens while Case #2's first theme is focussed on how well the forest industry licensee fully engaged with local citizens.

Case #1's second theme addresses how the co-management agency partner is repeatedly referenced in a negative way in Case #1 but not mentioned in Case #2. The references relate to LCC1's low trust in forest management planning prior to the plan due to limited knowledge; the insufficient time available for DO1 to keep LCC1 kept abreast of policy changes since discussions had focused on DO1 and forest company issues; LCC1's lack of trust in computer models that are based on faulty computer-generated instead of ground-truthed inventory information; and the lack of local stakeholder interest in participating on LCC1 due to the perception that LCC1 was a rubber stamp, as well as stakeholder burnout, which may have been communicated by the previous LCC. These were important constraining influences on the process and the development of cooperation between LCC1 members and DO1 support staff in Case #1 but not in Case #2. They suggest that linkages between DO1 support staff and LCC1 stakeholders were perceived to be much more focused on forest company and DO1 interests than the broader interests of all local stakeholders. They also indicate a lack of DO1 capacity to monitor forest resources and evaluate computer modelling.

The narrow linkages with local stakeholders in Case #1 contrasts with the high responsiveness of Case #2 support staff to a broad range of local stakeholders in the Case #2 and local stakeholder interest in participating on LCC2. This may be a function of the smaller difference between the level of formal education of DO2 support staff and their LCC2 members compared to DO1 support staff and their LCC1 members. It could also be a function of the smaller size of Case #2's largest community which would increase the potential for DO2 support staff to continue to interact and have direct and multiplex relations with local stakeholders and to share the same beliefs. Conversely, the greater difference in Case #1 and the substantially higher rate of LCC1 member turnover prior to the plan suggests DO1 support staff felt they would be less likely to continue to interact and have direct and multiplex relations with local stakeholders and less likely to share the same beliefs (Singleton & Taylor, 1992).

Case #1's third theme is about the reduction in DO responsibilities that took place prior to the plan. This was a result of the abandonment, downloading or privatization of numerous MNR responsibilities. The most significant of these was the transfer of the operation and management of Crown forest management units from the public to the private sector. Responsibility for FMU2 and the other MU in Case #1 had already transferred to the private sector but was in the midst of taking place for FMU1. This was why approximately 60 per cent of DO1 staff had been involved in the development of FMP1 while only 22 per cent of DO2 staff had been involved in FMP2. Consequently, it was a more important issue for DO1 support staff who were still struggling with their loss of responsibility, loss of traditional paternal role as protector of local resource interests, and loss of some staff members. This may have been the reason for the previous district manager's lack of support for the previous LCC1 and the high LCC1 turnover that subsequently took place and would have resulted in heavier demands on support staff as they worked to re-establish what was essentially a new committee.

Case #1's fourth theme addresses how all context criteria in Case #1 negatively reference the co-management agency partner in some way. This may reflect LCC1's lower level of development compared to LCC2 and its greater dependence on DO1 as a result.

Finally, Case #2's second theme was the only theme that referred to the physical rather than the social relational context. The theme addressed how the publicly-owned management unit was not contiguous but interspersed with a large proportion of private land with multiple

owners that, at times, landlocked the public unit. This meant that numerous negotiations with private landowners were required to undertake forest management operations.

Comparison of the GME Analysis

The higher linkage to context concept ratio of Case #2 compared to Case #1 may be because DO2 support staff had a greater level of knowledge of the context criteria that influenced LCC2. However, it may also be due to the fewer questions that were addressed to DO2 support staff.

The lowest rank of the, "reduction of DO responsibilities pre-plan" criterion on indegree in Case #1 indicates that it was the criterion over which DO1 support staff perceived that they had the least control. This finding is consistent in that support staff would have had little control over the political decision to reduce the scope of MNR activities and staff. Case #2's lowest ranked, "publicly-owned management unit interspersed with high proportion of private land" criterion is similarly implicated. This finding is also consistent in that support staff would have little control over land ownership, the only physical context criterion.

In contrast, the top ranked context criterion on indegree for Case #1, "local stakeholder group's lack of interest in participating on the LCC", indicates that it was perceived to be a criterion over which support staff felt that they had the greatest sense of control. This may also be explained in terms of goal desireability. The need for local stakeholder interest may have been greatest since not all relevant interests were represented on LCC1 and this is MNR's policy (MNR, 1996). Institutional establishment is also a typical focus of government mandated collaborative planning processes (Westley, 1995) and lack of representation would advertise an obvious shortcoming. Similarly, the issue may have resonated with LCC1 members and DO1 support staff because it was a rather salient criterion (Ford & Hegarty, 1984). The need for local stakeholder interest was also subject to the greatest overall influence from the other key criteria, since the direct influences on a concept have been highly correlated with its cumulative influences (direct plus indirect effects) (Ford & Hegarty, 1984).

Legitimacy has been identified to be the single overarching theme by participants in resource management and planning processes and includes fair representation, appropriate government agency support and consensus-based decision making (Mascarenhas & Scarce, 2004). It may be that because of a high LCC member turnover following the previous plan due to

burnout, the existence of an initially low level of acceptance of LCC1 by DO1 and the limited mutual respect that existed between DO1 support staff and LCC1 members, that potential representatives viewed LCC1 as a rubber stamp and did not fully accept its legitimacy.

The top ranked context criterion for Case #2, "high forest company responsiveness to local stakeholder concerns", indicates that it was perceived to be an achievable goal. Explained in terms of goal desireability, the need for high FMC responsiveness was presumably because FMU2 was a private, forest industry SFL so the FMC, as plan author, would be pivotal to the plan's development. The need for high FMC responsiveness would also have been important for resolving the long standing conflicts that had existed between adjacent private landowners and DO2 with respect to the operation and management of FMU2.

Comparison of the CSP Analysis

The identification of the, "insufficient time for DO1 to keep LCC1 updated on policy" criterion as the performance criterion for Case #1, suggests DO1 was overwhelmed by the work involved in supporting LCC1 due either to its focus on DO1 and forest company issues or an insufficient number of staff. Both the key context criteria for Case #2 shared the same outdegree so it is difficult to compare the two cases. But the medium level outdegree for both context criteria suggests that neither were clear performance criteria.

The top outdegree ranking of the "reduction of DO1 responsibilities pre-plan" criterion in Case #1 indicates that this was the most influential of Case #1's key context criteria in terms of direct causality and cumulative influence (Ford & Hegarty, 1984). Consequently, the criterion had the greatest overall negative influence on the other key context and consensus-building criteria, including the development of cooperation among and between LCC1 members and DO1 support staff.

The influence of each successively ranked key context criterion - "limited potential for the public to have a say in forest management planning", "low LCC1 member trust in forest management planning pre-plan", "lack of LCC1 trust in new computer models based on faulty inventory data" and "local stakeholder group lack of interest in participating on LCC1", followed by "insufficient time for DO1 to keep LCC1 updated on policy" - dropped off according to its rank. However, the lack of LCC1 trust in new computer models criterion had no influence on the development of cooperation among LCC1 members criterion. All of the above Case #1 context

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criteria negatively reference the co-management agency partner in some way so all would have been especially significant constraints on consensus-building and the development of cooperation between LCC1 members and DO1 support staff.

In contrast, both Case #2 key context criteria shared the same medium outdegree so both, "high forest company responsiveness to local stakeholder concerns" and "publicly-owned management unit interspersed with high proportion of private land", exerted the same mid-level influence. Influence was exerted on the other key context criterion as well as consensus-building criteria, including the development of LCC2 member and LCC2 – DO2 support staff cooperation. Context criteria appear to reference the physical source and resolution of the long standing conflicts that had existed between adjacent private landowners and DO2 with respect to the operation and management of the FMU2. This suggests the new FMC SFL arrangement would have enhanced consensus-building and the development of cooperation among LCC1 members.

Relationships between GME and CSP Analyses

The low controllability and high negative influence of the reduction of DO1 responsibilities criterion on consensus-building and the development of cooperation between LCC1 members and DO1 support staff suggests that DO1 support staff were extremely frustrated during the development of FMP1. The key context criterion exerted more influence than any other and negatively affected the DO1's status among local citizens, and the DO1 was powerless to change it. This provides further evidence of how cooperative relations, especially between local stakeholders and a co-management agency, can be crowded-out by non-complimentary state policies.

Similarly, the low controllability but relatively lesser negative influence of the public land interspersed with multiple private parcels of land criterion reflects the negotiation challenges involved in developing FMP2. This element of the physical context was somewhat influential and had negatively affected the DO2's development of past plans since multiple negotiations were required to resolve issues and there was no way for the DO2 to avoid it. These transaction costs of negotiation had been a significant barrier to conducting efficient forest management in the past.

The high controllability and somewhat low and negative influence of the lack of stakeholder interest in participating criterion in Case #1 may have been one rank before the perfomance criterion because it was still a goal that had not yet been achieved. Its closeness to the performance criterion however suggests the development from a weak to a stronger sense of community between the DO1 and local stakeholders was in the process of taking place. This supports the previous contention that due to high LCC member burnout and turnover following the previous plan, the existence of an initially low level of acceptance of the LCC1 by the DO1 and the limited mutual respect that existed between DO1 support staff and LCC1 members, potential representatives may have viewed LCC1 as a rubber stamp so did not fully accept its legitimacy.

Finally, the high controllability and somewhat high and positive influence of the high forest company responsiveness criterion in Case #2 reflects the FMC's ability and desire to respond as a result of understanding other stakeholders' points of view and having a strong sense of community with local stakeholders, as well as the vigilance of DO2 and LCC2 oversight. This was how the new FMC manager was able to overcome the long standing conflicts that had plagued DO2 - private landowner relations in the past.

Conclusion

The study illustrates how the analysis of content and the analysis of structure provide both redundant information that enables triangulation and complementary information in terms of scale and validity/reliability. Micro-level information high on validity was provided by the content analysis and macro-level information that appeared to be high on reliability was provided by the structural analysis.

It also builds on the development of cooperation, consensus-building and co-management theories. On the basis of outcomes of this paper, five inferences about the content of the context and how context influences consensus-building and the development of cooperation can be drawn.

First, while no key context criterion emerged that was shared across cases, one common general theme that did emerge was the importance of community. The narrow sense of community that was shared between the DO1 and just a subset of its local stakeholders in Case #1 case was reflected by the high LCC1 member turnover that had occurred prior to the plan;

lack of local stakeholder interest in participating on the LCC1; the DO1's limited effort to fully engage with local stakeholders; and the insufficient time that the DO1 was available to keep LCC1 abreast of policy changes due to its focus on its own or forest company issues. These context criteria reflected the initially low level of acceptance of LCC1 by the DO1 and the little mutual respect that existed between DO1 support staff and LCC1 members during the consensus-building process.

In contrast, the DO2's broad sense of community was reflected by its extensive effort to fully engage with all local stakeholders as well as local stakeholder interest in participating on LCC2. These presumably provided the foundation for the more familiar and respectful relationship that existed between DO2 support staff and its LCC2 members; and DO2's higher commitment, the most influential phenomena criterion overall for both cases. This suggests that cooperation outside of consensus-building processes is a critical precondition for commitment and tangible support during consensus-building and for consensus-building success.

This support's the conclusion that government agency commitment and tangible support are essential components of sustainable advisory group co-management systems. The context components described here are considered to be analogs to Baland and Platteau (1996) and Wade's (1988) critical enabling conditions for the sustainability of user group co-management systems – shared local agency-local stakeholder norms, past successful experiences, interdependence among and between the local agency and local stakeholders - in that they capture the supportive government-local stakeholder context relations required for the sustainability of co-management institutions.

Second, the analysis illustrates LCC1's lower level of development in that it reveals its greater dependence on DO1 as a result of the extensive turnover in members that had taken place prior to the plan.

Third, none of the key context criteria identified in each case were key context criteria for the other case. This supports the notion that evaluation of the unique situational aspects of agency-local stakeholder interactions are pivotal to consensus-building, co-management and the development of local stakeholder-stakeholder and local stakeholder-agency cooperation.

Fourth, the study acknowledges that it is difficult to neatly separate context from consensus-building criteria, but rejects Innes' (1999) contention that it cannot be done. Indeed,

where apriori definitions were not sufficient to delineate context from phenomena criteria, the GME analysis was used to confirm a criterion's categorization.

Fifth and last, of the six key context criteria identified in Case #1 and two key context criteria identified in Case #2, only the public land interspersed with multiple private parcels of land criterion referred to the physical rather than the social relational context. This suggests that while physical context can structure social relational demands, most influences on consensus-building and the development of cooperation originate from the social relational context.

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[i] This expands Innes and Booher's (1999) definition to include face to face interactions with a coordinating authority and interactions with represented and outside groups.

[ii] While four of Case #1's five DO support staff addressed 15 context questions, all 21 context questions were addressed by one support staff member in Case #1 and all support staff in Case #2. This was because some context questions had initially only been addressed to community informants who had been thought to be in the best position to provide a balanced response. The initial Case #1 interviews however, revealed that a community informant's knowledge focussed on their own and not the overall relationship between local communities and DO1 support staff so community informant questions were addressed to the remaining DO1 and DO2 support staff who had not been interviewed.