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Discursive barriers and cross-scale forest governance in Central Kalimantan, Indonesia

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ABSTRACT. Students of social-ecological systems have emphasized the need for effective cross-scale governance. We theorized that discursive barriers, particularly between technical and traditional practices, can act as a barrier to cross-scale collaboration. We analyzed the effects of discursive divides on collaboration on Reducing Emissions from Deforestation and Forest Degradation (REDD+) policy development in Central Kalimantan, an Indonesian province on the island of Borneo selected in 2010 to pilot subnational REDD+ policy. We argue that the complexities of bridging local land management practices and technical approaches to greenhouse gas emissions reduction and carbon offsetting create barriers to cross-scale collaboration. We tested these hypotheses using an exponential random graph model of collaboration among 36 organizations active in REDD+ policy in the province. We found that discursive divides were associated with a decreased probability of collaboration between organizations and that organizations headquartered outside the province were less likely to collaborate with organizations headquartered in the province. We conclude that bridging discursive communities presents a chicken-and-egg problem for cross-scale governance of social-ecological systems. In precisely the situations where it is most important, when bridging transnational standards with local knowledge and land management practices, it is the most difficult.

Key Words: *cross-scale governance; discourse; Indonesia; policy network analysis; REDD+*

INTRODUCTION

Interest in the challenges of cross-scale governance, understood as governance that encompasses multiple spatial extents and different levels of administrative authority, is strong and growing in the literature on social-ecological systems (Adger et al. 2005, Cash et al. 2006). Although national and transnational connections may be necessary to secure access to resources and technical expertise, it is argued that local participation in the governance of social-ecological systems provides legitimacy (Biermann and Gupta 2011, Dryzek and Stevenson 2011), accommodates diverse interests and values (Brown 2003, Lebel et al. 2006), and taps local ecological knowledge (Berkes and Folke 2002, Gerhardinger et al. 2009, Raymond et al. 2010). Despite the importance of cross-scale relations, studies note that these relations also can become a bottleneck for governance because incompatible discourses and power relations impede collaboration and information exchange (Adger et al. 2005, Cash et al. 2006, Bodin and Crona 2009, Crona and Hubacek 2010). Ironically, when discursive divides are the strongest, that is, when governance measures must address diverse ecologies, cultures, and land-use practices, effective exchange is likely to have the most value. These potential barriers raise an important question for students of social-ecological systems: to what extent do discursive divides limit cross-scale connections?

In this article, we test the claim that discursive divides impede cross-scale governance of social-ecological systems by analyzing Reducing Emissions from Deforestation and Forest Degradation (REDD+) policy development in Central Kalimantan, an Indonesian province on the island of Borneo. Addressing complex social-ecological systems characterized by cross-scale connections (Holling 2001, Holling et al. 2002), REDD+ is itself inherently a cross-scale enterprise (Korhonen-Kurki et al. 2012). In Central Kalimantan, REDD+ policy is a response to a complex history featuring waves of deforestation drivers operating at multiple scales. Forests in the province suffered under Soeharto's forestry-

concession-based patronage system (Bruenig 1987, Brookfield and Byron 1990, McCarthy 2001, Ross 2001) and an attempted conversion of 1.4 million hectares of forested peatland to rice production in the mid-1990s that resulted in massive wildfires (Sabiham 2004, Suyanto et al. 2009, Jaya et al. 2010). Forest loss from logging, mining, and the expansion of palm oil plantations continued through the 2000s, when Central Kalimantan had the highest deforestation rate in Indonesia (Sumargo et al. 2009, Koh et al. 2011).

In 2010 Central Kalimantan was selected to receive \$100 million in funding to pilot provincial-scale REDD+ policy as part of an agreement between the governments of Indonesia and Norway (Butler 2010). Since that time, developing provincial REDD+ policy has been a slow process. In July 2011, approximately six months after Central Kalimantan was selected as a pilot province, it was announced that a provincial REDD+ strategy would be completed in two months (Aurora 2011). It was not until 15 May 2012, however, that the document was finalized (Satuan Tugas REDD+ 2012), and formal outreach activities were not officially launched until 12 February 2013 (Tim Penyusun Sosialisasi Strada REDD+ Kalimantan Tengah 2013). The fieldwork reported here took place from January to May 2012, in the midst of the policy development process, providing an opportunity to study how discursive barriers impeded the cooperation required for REDD+ to be fully successful.

THEORETICAL FRAMEWORK

Discourses construct understandings of appropriate approaches to REDD+ policy, defining which actions should be taken (Brockhaus and Angelsen 2012; Brockhaus et al., *in press*) and who should benefit (Luttrell, et al. 2012). Complementing growing attention to relations between discursive communities engaged in REDD+ policy (McDermott et al. 2011; Brockhaus et al., *in press*), we analyzed what happened when different discourses met.

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Di Gregorio (2012) observes that the coalescing force in information and resource networks is a shared discourse; however, discourses are also bounded and divisive (Foucault 1972, Kuhn 1996). Discursive divides have been noted in the governance of many social-ecological systems (Schmelzkopf 2002, Trainor 2006, Li 2007, Jessup 2010). Studies from a variety of perspectives have noted the challenge of bridging technical and local knowledge systems to produce hybrid knowledge systems (Nygren 1999, Berkes and Folke 2002, Becker and Ghimire 2003, Moller et al. 2004, Thomas and Twyman 2004, Drew 2005, Dove 2006, Li 2007). Bridging this divide can be of crucial importance to the governance of social-ecological systems, because local discourses frame and coevolve with sophisticated local institutions (Ostrom 1990, North 2005).

As a new layer of rules (Bartley 2010, 2011) cutting across existing traditional land management practices, provincial policies, and national policies, REDD+ policy development requires translation between traditional practices, government regulations, and international scientific and management expectations (McDermott et al. 2011). We hypothesized that the difficulty of accommodating all these discourses would limit collaboration between groups based in the province of Central Kalimantan and actors based in Jakarta or abroad.

The need to bridge divergent discourses and institutions to develop REDD+ policy should raise opportunities for brokers, individuals, or groups who mediate relationships between groups that are otherwise relatively unconnected (Burt 2005). Brokers must be able to translate between different discourses and identify complementary interests among divergent groups. In Central Kalimantan, we expected the dominant form of brokerage to be “scale-crossing” (Ernstson et al. 2010), in which a broker acts as a bridging organization (Olsson et al. 2004, Hahn et al. 2006, Olsson et al. 2007) that connects local groups to networks operating at different administrative levels and spatial scales. The nested REDD+ system (Pedroni et al. 2009, Forest Trends and Climate Focus 2011) being piloted in Central Kalimantan, in which project and subnational REDD+ actions ideally will lead to national approaches, requires considerable partnership between national and subnational actors (Cortez et al. 2010, To et al. 2012) and should generate a need for translation between local issues and concerns raised by external actors. Because of the combination of substantial resources and local knowledge required to maintain these connections, we expected this role to be filled by the provincial government.

METHODS

Data collection

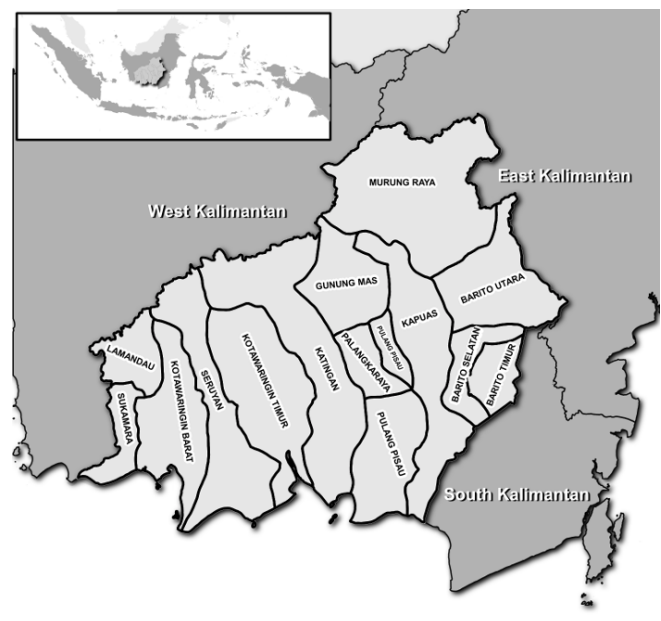
Methods included interviews consisting of semistructured and fixed-form survey items, conducted between January and May of 2012 with representatives of organizations with an interest in REDD+ policy development in Central Kalimantan (N = 36). From an initial list of approximately 100 organizations, compiled from a database of Indonesian nongovernmental organizations (SMERU Research Institute, <http://www.smeru.or.id/ngolist.php>), records of organization attendance at meetings on REDD+ held in Central Kalimantan (Sekretariat Bersama REDD+ 2011a, b), and organization lists from the national-level version of the survey, 40 organizations were selected in consultation with

a panel of four experts involved in governance, policy advising, or advocacy related to REDD+ in Central Kalimantan. These organizations were deemed to constitute the provincial REDD+ policy network. Of these 40 organizations, 36 provided interviews and answered survey questions, a response rate of 90% (see Appendix 1 for organization names). Organizational representatives were designated by the head of the organization as the in-house expert on REDD+ issues. In a few cases, two to four representatives asked to be interviewed together and determined responses to the fixed-form items jointly.

Interviews consisted of four main components. The first was a set of open-ended questions regarding the process of REDD+ policy making in Central Kalimantan, designed to elicit perspectives on the policy process, the inclusiveness of discussions, and possible challenges. The second consisted of Likert-scale questions measuring organizational perspectives on REDD+ policy such as stances on market-based approaches (35 items). A third contained questions focused on interorganizational relationships and also asked respondents to designate organizations they believed to be highly influential on REDD+ policy.

The province of Central Kalimantan consists of 13 districts and 1 municipality, the capital city of Palangkaraya (see Fig. 1). Data on organizational activities at the district or municipal level were collected by archival searches of organizations’ websites, newspapers, and local blogs. Organizations were coded as having activities in a district or municipality if they were found to have undertaken projects or extensive research of any kind or had a local office or other administrative body in the area.

Fig. 1. Central Kalimantan, Indonesia (Global Administrative Areas 2012).



Descriptive statistical analysis of organizational collaboration

Recently, students of social-ecological systems have adopted network analysis approaches to study governance (Bodin et al.

2006, Bodin and Crona 2009, Crona and Hubacek 2010, Bodin et al. 2011), and this framework can be particularly helpful in addressing questions of scale and collaboration (Bodin and Crona 2009, Crona and Hubacek 2010). We utilized data on collaboration and information sharing among organizations interested in REDD+ in Central Kalimantan to test our hypotheses that discursive divides impede cooperation and that the provincial government serves as a cross-scale broker for REDD+ policy.

We modeled these data as a network composed of nodes representing organizations, with edges (or links) connecting them. We analyzed three networks to compare the effects of discursive divides for different types of relationships. The first network included all relationships in which an organization reported regularly and routinely sharing information with another. This was a directed, dichotomous network, in which edges connected organizations with the information partners those organizations claimed to have. The second network, also directed and dichotomous, recorded relationships between organizations that reported collaboration on REDD+ policy either nationally or within the province. In this case, edges connected the organization reporting collaboration to the organization with which collaboration was reported. In the final network, used for descriptive analysis, edges connected organizations that reported any form of collaborative relationship with one another. For example, if one organization reported receiving funds from another, although the partner organization reported information sharing, these nodes were connected by an edge. Any combination of regular information exchange, receipt of scientific information, receipt or provision of funding or in-kind support, or collaboration on policy activities was represented by an undirected edge.

We used betweenness centrality (Freeman 1978) to highlight organizations that potentially served brokerage roles. Calculated by counting the number of shortest paths between two nodes that cross a given node, betweenness centrality can indicate the degree to which an organization connects organizations that are not directly connected. The measure is normalized by dividing each score by the maximum score possible for a network with the same number of nodes. Calculation of this metric and visualization of the network was conducted with the Statnet package (Handcock et al. 2003) in R version 3.0.1 (R Core Team 2013).

Inferential statistical analysis of organizational collaboration

Because edges are not independent, statistical tools that assume independence of observations, i.e., logistic regression, are not applicable to network data (Cranmer and Desmarais 2011). Exponential random graph models (ERGMs) avoid this problem by taking the observed network as a single observation from the distribution of all possible networks with the same number of nodes (Robins et al. 2007). ERGMs model the local, social processes that generate the observed network by testing for a nonrandom presence of network structures that result from those processes (Robins et al. 2007). Coefficient estimation is based on network statistics, which measure properties of an observed network, such as the probability of observing an edge between two randomly selected nodes. Model coefficients reflect the change in the conditional log odds of observing a given edge in the network with each unit increase in a given network statistic

resulting from the presence of an edge, holding the rest of the network constant (Hunter et al. 2008a). A positive conditional log-odds coefficient means that our likelihood of observing an edge increases with the amount that an edge's presence increases the corresponding network statistic. Because of the intractability of standard maximum-likelihood estimation for most applications, proponents of ERGMs generally use Markov-Chain Monte Carlo maximum-likelihood estimation (Robins et al. 2007), a technique we adopted for this study. Our models were estimated with the ERGM package (Handcock et al. 2003, Hunter et al., 2008a) in R version 3.0.1 (R Core Team 2013).

A common approach to testing model fit with ERGMs is to use the model to simulate a distribution of random networks and compare observed but unmodeled network statistics with the distribution of these statistics across the simulated networks. A good model will generate a distribution of networks whose network statistics are not significantly different from those of the observed network (Robins et al. 2007). Although a clear threshold has yet to be established in the literature, prominent applications (e.g., Hunter et al. 2008b) implicitly use $P = 0.05$.

Modeling organizational collaboration: specifying variables

The primary variables of interest for our statistical tests were those modeling the effects of discursive divides between local and national/transnational discourses, as well as more general discourses on REDD+, in addition to a variable measuring the number of connections between the provincial government and other actors, which was used to test the hypothesized role of the provincial government as a cross-scale broker. We modeled local and national/transnational discursive divides using two variables. The first was the Euclidean distance between the number of districts in the province in which organizations were active (District Distance). The second recorded the total number of edges between organizations headquartered in the province and those headquartered outside, regardless of whether or not they had offices in the province (Cross-Scale). We identified more general discursive divides by coding our 35 opinion items as relating to governance effectiveness, fairness, the role of markets, biodiversity, the role of science, and the appropriate scale for REDD+ policy. Because of the risk of multicollinearity, we selected the three categories whose members accounted for the highest percentage of overall opinion variance (markets, biodiversity, and science) for inclusion in our model. We computed the Euclidean distance between organizations' responses on items in these three categories (Market, Biodiversity, and Science Distance, see Appendix 2), as well as the Euclidean distance between responses on all 35 opinion items (Opinion Distance), to model discursive divides across these discourses. To test the hypothesis that the provincial government serves as a cross-scale broker, we added a term measuring the number of edges between governmental and other actors (Public-Private). We also included a measure of reputational power (Brass 1984, Krackhardt 1990), measured by the number of respondents who nominated an organization as particularly influential on REDD+ policy in the province (Reputational Power). To ensure the observed effect of difference in the geographic spread of an organizations activities was unbiased, we included a count of the number of districts in the province in which an organization has activities as an additional variable (Districts). Finally, we included a variable counting the total number of edges in the network

Table 1. Explanation of exponential random graph model terms.

Term	Explanation	Process Tested
Edges	Total edges in the network	Residual propensity of nodes to form edges (Goodreau et al. 2008)
Province	Organization is headquartered in Central Kalimantan	Control
Districts	Number of districts where organization has activities	Facility with local discourses
Public-Private	Number of edges between governmental and non-governmental organizations	Provincial government cross-scale brokerage
Cross-Scale	Total edges connecting organizations based within the province and organizations based outside the province	Difference in discursive position
Reputational Power	Number of respondents citing an organization as influential	Reputational power (Brass 1984, Krackhardt 1990)
Opinion Distance	Euclidean distance between opinion item responses of two organizations	Difference in discursive position
Market Distance	Euclidean distance between opinion item responses of two organizations in market category	Difference in discursive position
Biodiversity Distance	Euclidean distance between opinion item responses of two organizations in biodiversity category	Difference in discursive position
Science Distance	Euclidean distance between opinion item responses of two organizations in science category	Difference in discursive position
Location Distance	Euclidean distance between organizations' Districts values	Difference in discursive position
Dyadwise Shared Partner 1	Node pairs with exactly one shared partner	Otherwise unexplained popularity of individual nodes (Morris et al. 2008)

(Edges), as well as a measure of residual unexplained popularity of certain nodes (Dyadwise Shared Partner 1). See Table 1 for a summary of variable definitions.

We should note that Reputational Power is potentially endogenous to the network. An organization's network position could increase its perceived influence, just as formal influence could lead others to seek out the organization as a partner (Krackhardt 1990). The addition of the Dyadwise Shared Partner 1 should help alleviate this problem, but in any case the effect of Reputational Power was not of primary interest in this study, because our theoretical focus was the role of discursive divides in cross-scale governance.

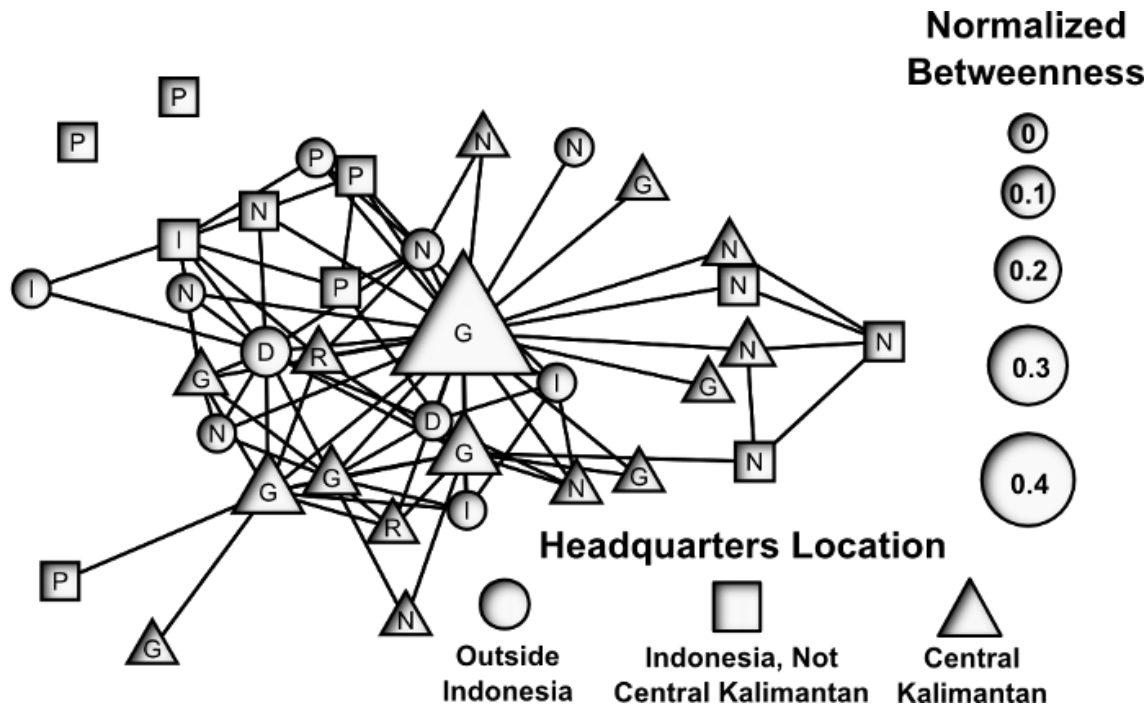
RESULTS

Discursive divides on REDD+

There were two primary discursive divides on REDD+ in Central Kalimantan. The most important for our purposes was a divide between traditional and technical approaches, which tracks with a cross-scale divide. As REDD+ adds questions about rights to carbon to already contentious rights to forest use more generally, the layering of rules becomes increasingly complex (Galudra et al. 2011). The qualitative sketch is presented here primarily to provide context for the model estimations and provide justification for the discursive frames selected as variables.

At the time of the fieldwork, the development of policy intended to reduce forest loss and, more importantly, peatland degradation and wildfires in Central Kalimantan was led by the ad hoc Provincial Committee on REDD+ (KOMDA), composed primarily of provincial agency heads and chaired by the governor. The committee's first objective was to produce the Provincial REDD+ Strategy, which took nearly a year and a half to complete (Aurora 2011, Gubernur Kalimantan Tengah 2012a). Confusion about the respective roles of the provincial and national governments following decentralization (McCarthy 2001, 2004) could account for some of the delay, as could the challenges involved in adapting REDD+ policy models to local land-use practices, politics, and governmental capacity. As REDD+ expanded to encompass more traditional development concerns, including land tenure and measurement methodologies, the information and advice available was generally abstract, often giving very general guidelines for very complex processes, which were frequently reduced to bullet points in presentations. In Central Kalimantan, the complexity of REDD+ is further heightened by the need to address peatland hydrology and traditional land tenure that is not fully recognized by the state. As one official put it, "[REDD+] causes headaches. There's a lot that's confusing." Respondents particularly noted uncertainties about benefit distribution, the technical problems of measurement, and what if any transnational regime for REDD+ might be forthcoming.

Fig. 2. The REDD+ policy network in Central Kalimantan, Indonesia. Letters denote organization type (G = Provincial Government; N = Nongovernmental Organization; R = Research/Academic Organization; D = Donor Government Agency; I = International Organization). Nodes are scaled by normalized betweenness centrality (Freeman 1978), defined by a count of the number of shortest paths between all pairs of nodes in the network incident on a given node. Calculated in statnet (Handcock et al. 2003) and visualized with ggplot2 (Wickham 2009) in R 3.0.1 (R Development Core Team 2013).



Respondents from both civil society and government emphasized the importance of traditional land management practices in forest protection, suggesting that people living in the province had been doing REDD+ in all but name for some time (e.g., Kalteng 2013a). The problem, they suggested, was articulating these activities with REDD+ ideas. As one respondent put it, REDD+ “is very clean and clear when discussed in the province level [and] in the national level, in a seminar,” but seminars do not capture the complexity of implementation. REDD+, in the respondent’s view, had to move to the more complex village level to be effective. Although both governmental and nongovernmental respondents generally expressed this sentiment, several informants reported knowledge about REDD+ was limited to a small number of people, mostly in the provincial capital, Palangkaraya. As one official noted, “There are 100 meetings at a hotel [for every] 10 meetings in the village.”

The recently discontinued Kalimantan Forest Carbon Partnership (KFCP) is a telling example of these divisions (Butler 2013). Intended to lower greenhouse gas emissions by restoring peatlands and preventing further clearing of peatland forests, KFCP was a frequent target of criticism from groups like Friends of the Earth (Friends of the Earth Australia et al. 2009, Pearce and Dehm 2011) and the Indigenous People’s Alliance of the Archipelago (Simamora 2011), who questioned the project’s orientation toward carbon markets and highlighted local nongovernmental organization concerns about a lack of

consultation; free, prior, and informed consent; and issues of land tenure. Local nongovernmental organizations such as Yayasan Petak Danum and its sister organization, Aliansi Rakyat Pengelola Gambut, actively raised these issues at the international level. They pointed, in particular, to a lack of engagement of local people and a sense of confusion on the part of locals as to what carbon was and what the REDD+ mechanism was all about. There were further conflicts between the KFCP and local groups on issues of land tenure. Issues ranged from failure to acknowledge local rituals that were required prior to taking action on the peatland (Forest Peoples Programme et al. 2011) to confusion regarding traditional authority structures and their relation to formal governance systems (Forest Peoples Programme and Pusaka 2012).

As the KFCP example suggests, discourses about REDD+ in Central Kalimantan are not independent of broader discourses on REDD+. One divide appears to be a dispute between market and nonmarket approaches to forest governance. Representatives of groups that are more skeptical of market approaches raised relatively common concerns that REDD+ offsets allowed developed countries to go on polluting (Kalteng 2013b) and would raise incentives for land grabbing (Kompasiana 2011). References to these broader debates, however, are often made in the context of the technical/traditional debate, which seems to be the primary discursive divide on REDD+ in the province.

Table 2. Markov Chain Monte Carlo Maximum Likelihood Estimation of Exponential Random Graph Model parameters for the REDD+ policy network in Central Kalimantan. * = Significant at 0.05; ** = Significant at 0.01; *** = Significant at 0.001. Estimated with the ERGM package (Hunter et al. 2008a) in R 3.0.1 (R Core Team 2013).

	Undirected Collaboration 1	Undirected Collaboration 2	Undirected Collaboration 3	Undirected Collaboration 4	Directed Information	Directed Collaboration
Edges	-4.79*** (1.00)	-4.81*** (0.985)	-4.84*** (0.985)	-4.82*** (0.980)	-4.15*** (0.532)	-6.46*** (0.720)
Province	-0.337 (0.297)	-0.314 (0.285)	-0.295 (0.097)			
Districts	0.165 (0.108)	0.163 (0.108)	0.147 (0.097)	0.053** (0.019)	0.039** (0.11)	0.111*** (0.220)
Public-Private	0.145 (0.455)	0.151 (0.455)				
Cross-Scale	-0.723* (0.350)	-0.717* (0.349)	-0.660* (0.304)	-0.775** (0.287)	-0.466** (0.160)	-0.640** (0.220)
Reputational Power	0.144*** (0.019)	0.146*** (0.018)	0.146*** (0.018)	0.141*** (0.018)	0.104*** (0.009)	0.093*** (0.012)
Opinion Distance	-0.298 (0.151)	-0.344** (0.111)	-0.342** (0.111)	-0.343** (0.112)	-0.139* (0.058)	0.029 (0.077)
Market Distance	-0.017 (0.146)					
Biodiversity Distance	-0.023 (0.161)					
Science Distance	-0.098 (0.165)					
Location Distance	-0.116 (0.133)	-0.115 (0.132)	-0.092 (0.115)			
Dyadwise Shared Partner 1	0.145*** (0.027)	0.148*** (0.026)	0.149*** (0.026)	0.146*** (0.026)	0.001 (0.040)	0.064* (0.027)
AIC	364.57	359	357.1	355.2	1034	661.7
BIC	417.92	399	392.7	381.9	1065	692.5

Quantitative analysis: modeling organizational collaboration

The REDD+ policy network in Central Kalimantan (see Fig. 2) clearly indicates that the Governor’s Office has emerged as a scale-crossing broker. Node size is scaled by normalized betweenness centrality, and the Governor’s Office, with a betweenness of approximately 0.4, is by far the largest. Although there are certainly some connections between organizations operating at different scales, only the Provincial REDD+ Committee clearly emerges as a scale-crossing broker that brings together multiple locally, nationally, and internationally based organizations.

ERGM estimations are presented in Table 2. Our primary focus is on the full collaboration models, which are models of the undirected network. Additionally, we estimated models of the directed information and collaboration network as robustness checks. The directions of the effects were consistent across models. We estimated four models of our primary network of interest and two additional models of the information and collaboration networks alone as robustness checks. Model selection was based on the minimum Akaike and Bayesian information criteria (AIC and BIC).

Model fit was good: networks simulated from the models were not significantly different from the observed network at the 0.05 level for measures of degree, edgewise shared partners, or geodesic

distance, the three unmodeled network statistics chosen to assess model fit, indicating a good description of the structure of the observed network. Using AIC and BIC for model selection, the simplest model of the undirected collaboration network was preferred. The coefficient estimates of the preferred model, with the exception of the coefficient for the Districts variable, were consistent across models. With only one exception, the variables in the preferred model retained the same sign when used to predict the undirected information-sharing and collaboration relationships. These findings increased our confidence that the relationships identified would be robust to changes in model specification.

Of the six variables intended to test the effects of discursive divides on collaboration, only two, Opinion Distance and Cross-Scale, were statistically significant in undirected collaboration model 1. When all discursive divide variables except these two were removed, there was an improvement in both AIC and BIC. In the preferred model (undirected collaboration model 4), both differences in the location of an organization’s headquarters (Cross-Scale) and Opinion Distance were statistically significant, with effects in the direction we would expect if discursive divides were a barrier to collaboration. In substantive terms, the effect of Opinion Distance was considerably greater than that of the Cross-Scale divide. Whereas Cross-Scale was a binary variable, Opinion

Distance ranged from 0 to 13. It was not possible, however, to identify specific discourses within the opinion items that provided unique barriers to collaboration.

The second hypothesis, that the provincial government serves as a cross-scale broker, also met with mixed results. The Public-Private variable, intended to capture brokerage on the part of the government, was not statistically significant. Given the network structure shown in Figure 2 and the statistically significant effect of Dyadwise Shared Partner 1, it seems likely that the correct interpretation is that the Governor's Office, along with KOMDA, has emerged as a cross-scale broker rather than the provincial government in general.

As expected, the effect of Reputational Power was statistically significant, although it was difficult to interpret given the potential endogeneity problems. The control variable Districts was statistically significant in the preferred model, but the effect was substantively small, and the variable only ranged to a maximum of 13.

DISCUSSION

We found evidence that discursive divides impede collaboration, though we could not identify specific substantive discourses driving these effects. We also found that Central Kalimantan's Governor's Office, an early leader on forest protection (Creagh 2009), has taken on a key brokerage role, connecting provincial activities with work in Jakarta and abroad. This role seems to have been taken on primarily by the Governor's Office rather than the provincial government as a whole.

Based on our qualitative evidence, it seems plausible that divides over the role of markets, biodiversity, and technical knowledge stem from the more fundamental traditional/technical divisions. An additional barrier to bridging these discourses is that institutional arrangements within Central Kalimantan remain ad hoc, a problem cited in particular by representatives of organizations in the provincial government. Even if the REDD+ institutions were based in the Governor's Office to be more formally institutionalized, the diversity of organizations with institutional authority over aspects of REDD+, not to mention conflicts between agencies at different levels of government over who has authority over particular actions, could continue to raise barriers against collaboration and deliberation across discursive divides.

Both governmental and civil society actors recognize these challenges, and efforts to develop more robust cross-scale connections within the province and between provincial and transnational actors have been ongoing since the time of the fieldwork. For example, a coalition of nongovernmental organizations has launched a social media website that enables users to microblog about provincial forest issues via text message, taking advantage of an emerging form of communication to build cross-scale connections within the province. A further example is the recently established Climate Communication Center, sponsored by the provincial government and the United Nations Development Programme, intended to provide education about climate change issues for people living in the Pulang Pisau district (Harian Umum Tabengan 2013).

During the time since the fieldwork, the need to effectively bridge traditional and technical discursive divides has, if anything,

become greater. Central Kalimantan's Greenhouse Gas Emissions Reduction Plan, approved on 14 December 2012 (Gubernur Kalimantan Tengah 2012b) as part of Indonesia's National Action Plan to Reduce Greenhouse Gas Emissions, envisions measurable emissions reductions in specific sectors. The plan prioritizes the reduction of greenhouse gas emissions from the land-use sector, particularly peatland rehabilitation, sustainable forest management, and optimizing the location of mining and plantation operations.

CONCLUSION

The evidence presented here suggests that discursive divides can be an important barrier to cross-scale collaboration precisely when that collaboration is most necessary. Bringing traditional and technical discourses into dialogue is challenging, and those concerned with the governance of social-ecological systems are faced with a chicken-and-egg problem: collaborative relationships and open dialogue may be necessary to bridge traditional and technical discourses, but discursive divides are themselves a barrier to collaboration. In Central Kalimantan the Governor's Office has emerged as a crucial link between different groups, and organizations like the United Nations Office for REDD+ Coordination in Indonesia, the Center for International Cooperation in Sustainable Management of Tropical Peatland, and the Faculty of Agriculture at the University of Palangkaraya have been performing similar translating and bridging roles in developing REDD+ policy. However, there is still clearly some way to go. Developing effective ways to spur dialogue between traditional and technical discourses will likely be essential for the effectiveness of many projects in the cross-scale governance of social-ecological systems.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/issues/responses.php/6418>

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Appendix 1

Respondent organizations

Respondents

Lembaga Dayak Panarung [Dayak Panarung Association]
Yayasan Orang Utan Indonesia [Indonesian Orangutan Foundation]
Yayasan Petak Danum [Homeland Foundation]
Yayasan Tambuhak Sinta [Tambuhak Sinta Foundation]
Borneo Orangutan Survival
Perkumpulan untuk Pembaharuan Hukum Berbasis Masyarakat dan Ekologis [Community and Ecological Based Society for Law Reform]
Indigenous People's Alliance of the Archipelago, Central Kalimantan
Save Our Borneo
Care Central Kalimantan
Kemitraan [Partnership] Central Kalimantan
Clinton Foundation
WALHI [Friends of the Earth Indonesia] Central Kalimantan
World Wide Fund for Nature, Central Kalimantan
Government of Kapuas District
Government of Katingan District
Central Kalimantan Forest Service
Central Kalimantan Plantation Service
Central Kalimantan General Work Service
Office of the Governor of Central Kalimantan/Provincial Committee on REDD+
Central Kalimantan Planning Agency
Central Kalimantan Environmental Agency
Central Kalimantan Parliament
Kalimantan Forest Carbon Partnership
Center for International Forestry Research
United Nations Development Program
World Agroforestry Center
United Nations Office for REDD+ Coordination in Indonesia
United States Agency for International Development
Agriculture Faculty of the University of Palangkaraya
Center for International Cooperation in Sustainable Management of Tropical Peatland, University of Palangkaraya
PT. Rimba Makmur Utama
PT. Rimba Raya Conservation
PT. Starling Resources
Association of Forest Industry Businesses, Central Kalimantan Committee
Indonesian Rubber Association, Central and South Kalimantan
Indonesian Palm Oil Association, Central Kalimantan

Appendix 2

Discourse items

Item	Biodiversity	Market	Science
REDD is a financially affordable way to mitigate climate change		X	
REDD will assure fairness in the international distribution of environmental costs and benefits	X		
REDD schemes should only be financed through funds		X	
In the long-run REDD should be included in schemes to offset credits in compliance carbon markets		X	
In the post-Kyoto regime the definition of forest should exclude monocultures	X		
All REDD schemes aimed at reducing CO2 emissions should also all require the realization of other key benefits as poverty reduction and maintenance of biodiversity	X		
REDD schemes developed with the sole objectives to reduce CO2 emissions are likely to be in contrast with biodiversity conservation aims	X		
One of the main challenges for an effective REDD national strategy is the lack of technical expertise for monitoring carbon emissions and sequestration			X
Scientific experts are the best and final authority on REDD			X
Scientific experts dominate the national REDD policy discussion, at the expense of other relevant interests (e.g. business and civil society organizations)			X