



Social Networks and Perceptions of Power in the Mekong

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ABSTRACT: Among researchers of the Mekong, there has been a call to incorporate local perceptions into governance regimes, both on social justice grounds as well as to improve policymaking; few studies, however, show how this can be done. This paper suggests a framework which combines quantitative mapping of local narratives onto social networks in order to enable us to understand how networks impact the public narratives which travel along them. We focus on a resettlement community at the Lower Sesan 2 Dam; we use social network analysis (SNA) to investigate relationship flows and Q-methodology to study the impact of the relevant narratives. Intriguingly, SNA shows that villagers perceive themselves to be highly influential in decision-making, whereas local leaders consider villagers to have little or no influence. While SNA classifies networks or groups into those which support dam construction and those which resist it, Q-methodology uncovers eight discourse factors which are far more complex; these include access to economic gains from hydropower development, coping costs from transitions, and non-economic costs such as cultural loss. This complex – and in some ways contradictory – narrative may explain the paradoxical perceptions of power observed between villages and local leaders. Overall, this framework allows policymakers to better understand complex public narratives as well as how and why narratives impact policy implementation.

KEYWORDS: Local perceptions, narratives, social network analysis, water governance, Mekong

INTRODUCTION

Over the past few decades, there has been increasing pressure to exploit the Mekong River and its tributaries as an energy source, with the promise of economic development and improved livelihoods. At the same time, there is clear evidence that hydropower dams have adverse effects; these include abnormal floods, changes in water current, stress erosions (Belay et al., 2010) and loss of ecosystem services in the Mekong Basin (Hecht et al., 2019; Arias et al., 2014; Intrawalan et al., 2018). Given competing demands for food, energy and water along the Mekong, a multilevel approach to water governance is both urgent and critical. Such an approach, however, requires an informed and clearly articulated understanding of local interests and perceptions, and needs to take into consideration how local communities perceive these complex developments; that is to say, the stories they tell themselves about what is happening around them.

While this has led to a rising call among researchers to integrate local perceptions into governance regimes both on social justice grounds (Molle, 2009), as well as with the more pragmatic goal of improving policymaking (Krishnamurthy et al., 2011; Renaud and Kuenzer, 2012; Stern and Öjendal, 2012; Nyantakyi-Frimpong and Bezner-Kerr, 2015; Strauch et al., 2016; van Gevelt et al., 2019), there are few studies which show how local perceptions can be systematically taken into account by governance models. This paper presents a simple methodological premise which marries quantitative investigation of narratives with social network analysis. While we use the Q-methodology in this instance, any systematic narrative analysis will likely work as well when coupled with the SNA framework.

Our research serves three purposes. First, it answers the call of governance scholars for a larger role for local perceptions; it does so by providing a possible framework to understand public narratives and

the way in which networks impact the narratives which travel along them. Second, it provides an empirical test of this framework. Finally, on a practical level, it shows policymakers how public perceptions can be nested within social networks, including within bureaucratic decision-making structures. It ensures that local communities are represented and it allows bureaucrats to better understand how and why some narratives can gain strength while others wither away. Light may be shed, for example, on the continued paradox of why local communities are often frustrated by their lack of ability to achieve their key interests, despite the perceived legitimacy of these interests.

GOVERNANCE AND SOCIAL NETWORKS IN THE MEKONG

The governance of the Mekong River is concentrated at the level of national governments and their agencies. Although Thailand, Laos, Cambodia and Vietnam – the four downstream nations in the Lower Mekong Basin (LMB) – signed the 1995 Mekong Agreement and Procedural Rules which established the Mekong River Commission (MRC) to promote the sustainable development of the Mekong, implementation has been weak (Kirby et al., 2010).

This is unsurprising, since water governance of the Mekong (or Lancang, as it is known in China) has traditionally been fragmented and contentious; this contentiousness is in part due to the prevalence of powerful vested interests, but it also stems from general political sensitivities and non-transparency in dealing with transboundary rivers (He et al., 2006; Molle et al., 2012; Fan et al., 2015). This section provides a broad review of current studies on governance in the Mekong, outlining how the call for the inclusion of local perceptions and discourses has been made from within three broad governance models.

The first group of scholars sees governance as weighing, calibrating and analysing economic and non-economic costs and benefits. Proponents of this 'economically rational' model argue that Mekong water policies are determined by cost-benefit 'logics' (Sokhem et al., 2007); for instance, China's recent willingness to cooperate with downstream countries through generous development aid and information sharing can be understood as a rough quid pro quo for the socio-economic benefits it gains through regional trade and hydroelectricity imports (Lee, 2015). Although the scope of such costs and benefits can include non-economic variables such as diplomatic relations (Sokhem et al., 2007), the literature tends to focus on monetary valuations of livelihoods, industries and flood control (Bhagabati et al., 2014).

One common form taken by such a model is that of Integrated Water Resource Management (IWRM) which 'promotes the coordinated development and management of water, land and related resources, in order to maximise economic and social welfare' (GWP, 2011); more ambitiously, IWRM aims to do this in an equitable manner, "without compromising the sustainability of vital ecosystems and future generations" (Belay et al., 2010: 67; Stern and Öjendal, 2012). In reality, IWRM's goals are difficult to achieve. The social and political costs of some aspects of resource management – such as values, history and rights – may not be given due consideration; the reason for this lack of consideration may not just be issues of disempowerment, but may also be because of the difficulty of measuring such costs (Varis et al., 2008). In reality, the trinity of economic efficiency, social equity and environmental sustainability is unlikely to be equally achievable, or even desirable, considering that the state or other sectoral, private interests might hijack the IWRM to advance their agendas (Molle, 2009; Dore et al., 2012). Trade-offs in the form of other sectoral or private interests dominate the IWRM and make it difficult to achieve all three goals simultaneously. An understanding of local perceptions can therefore provide guidance on the possible trade-offs that are inevitable in such a model.

A second model of governance is the one grounded in *realpolitik*; this power-realist perspective holds that water policy can be disproportionately influenced by well-resourced 'hegemony' (Rai et al., 2014) with strong governments and superior technical and financial capacity (Wyatt and Baird, 2007; Houba et al., 2013). A powerful riparian nation would be able to impose its national interests – in terms of, for example, water withdrawals – in such a way as to supersede basin-oriented 'sustainable' development policies (Sneddon and Fox, 2007; Rai et al., 2014). While this model is useful as a description of the

happenings in the Mekong region and as a predictor of stakeholder actions, it lacks a normative component in terms of what is considered to be good governance. This governance model also provides little room for arguments on social justice, fairness and the legitimate claims of the less powerful (Houba et al., 2013). Inputs from local communities are therefore vital to sustaining such claims, as the realpolitik governance model does not do so (Sneddon and Fox, 2007).

A third, regulatory model, conceives of governance as a process-based, legal and regulatory endeavour (Bearden, 2010). Transboundary conflicts are thought to arise from institutional deficiencies; such as the lack of basin-wide involvement in the 1995 Mekong Agreement, incomplete multisectoral provisions (Kliot et al., 2001), and poor enforcement capability and dispute settlement mechanisms (Ma et al., 2008). Institutions and agreements are therefore crucial in facilitating cooperation between riparian countries (Kliot et al., 2001; Sokhem and Sunada, 2006; Ma et al., 2008; Varis et al., 2008; Bearden, 2010), while inadequate rules result in a lack of incentive for constructive cooperation among states and/or inequitable resource use (Belay et al., 2010).

Empirical studies show, however, that this model has not proven to be effective, in part because of high transaction costs. The 1995 Mekong Agreement, for example, was negotiated as a regional institution in order to facilitate cooperation, but so far it has failed to deliver (Sokhem et al., 2007). While blame has fallen on the poor sharing of information, inadequate decision-making mechanisms, and unequal distribution of benefits, the general lesson could be that good governance is comprised not just of good rules but also of the ability to implement them. In addition, without a normative code of conduct, existing institutions may simply perpetuate power asymmetries between and within countries. This limitation can be overcome, at least in part, by an understanding of what local communities see as 'fair' or 'just', and by incorporating local knowledge as well as what communities have learned from practical experience. In short, all three models of governance can benefit from explicitly incorporating local perceptions. The sections below outline a framework by which this can be done.

SOCIAL NETWORKS AND GOVERNANCE

Social network analysis (SNA) has recently emerged as a promising method for tackling the complexity of natural resource management and collective action issues (Bodin and Crona, 2009; Lienert et al., 2013; Hauck et al., 2015; Navarro-Navarro et al., 2017; Ingold et al., 2018; Jean et al., 2018; Noble et al., 2019); it focuses on the structure of ecosystems and patterns of relationships among actors (Borgatti et al., 2009). SNA takes into account both formal and informal relationships (Schiffer and Waale, 2008) and, in explaining individual or collective behaviour, recognises the significance of interdependencies within a network (Fischer, 2011); it is therefore a useful policy tool for mapping and understanding decision-making processes within a community. Social networks are also thought of as bridges that link communities across different organisations, as Rathwell and Peterson (2012) found in their study of water management practices in the Montérégie region of Canada. While past research has established that a wide range of social constructs – such as knowledge, information, perceptions and discourses – are consistent across social networks, few have explored the impact of networks on narratives; that is, does the network change the narrative which travels along it, or does the network passively convey the narrative?

Currently in the Mekong, social networks – or 'bridges' as the term is used above – are often analysed separately from the flow of the objects and narratives that travel along them. The mapping of networks per se has been done by researchers such as Grimble and Wellard (1997) and, more recently, by Lienert et al. (2013) and Meissner and Jacobs (2016). In the meantime, research into the flow of perceptions, information and adaptive behaviours among social networks along the Mekong has been the subject of a parallel strand of research; this includes research on public perceptions towards water pollutants and the role of these pollutants in causing illness, death, and the reduction of food availability arising from damage to agricultural land and fisheries (NGO Forum on Cambodia, 2005). Existing research on risk

perception by local communities has often taken place against a backdrop of curiosity about the observed absence of adaptive behaviour; it has focused on, for example, the reasons for the occurrence and persistence of what seem to be irrational behaviours (Schad et al., 2012).

Because the research has been carried out in two strands, the role of social networks in constraining, amplifying or changing public perceptions with regard to environmental risk has often been overlooked or underestimated. The strength of the SNA, however, lies precisely in its shift from a 'command and control' view of resource management to one of adaptive co-management, where learning and collaboration address complex socio-environmental dilemmas by changing behaviours (Armitage et al., 2009). SNA therefore can be usefully combined with other forms of analysis to show how networks themselves interact, instantiate, and even change social constructs. Rathwell and Peterson (2012), for example, in examining water management practices in the Montérégie region of Canada, combine a study of social networks with socio-ecological analysis; they find that a critical role in water management is played by bridging organisations. Power asymmetries in these interactions makes bridging organisations necessary for the preservation of institutional stability amid external change (Gunderson et al., 1995). It is not merely the bridges that make the difference, but the content and type of these connections that determine the effectiveness of the bridging organisations; researchers found that bridging organisations "preferentially connected with municipalities that used more tourism related ecosystem services rather than those that used more agricultural ecosystem services" (Rathwell and Peterson, 2012).

This parallels Wilder and Howlett's (2014) idea that policy change does not occur paradigmatically, but instead requires an interpretive process in its expression and implementation. These findings further show that consideration of the socio-ecological context of social networks can help explain their structure and can reveal socio-ecological clusters and disconnects in the network. Ruzol et al. (2017) apply cultural theory alongside SNA in order to uncover the behavioural patterns that contribute to the pollution of the Calumpang Watershed in the Philippines, while Larson et al. (2013) explore the role of informal social networks in urban wastewater management using stakeholder analysis and SNA. McNicholl et al. (2017) use SNA and primary interviews to reveal the characteristics of social networks that support improvements in rural water supply. This paper therefore joins these researchers in seeking to understand how and where narratives travel along social networks, and whether these networks have the power to reshape the narratives that they convey.

THE CASE OF THE LOWER SESAN 2 DAM

Our research site is in a cluster of villages in the area of the Lower Sesan 2 (LS2) Dam project. This project impacts nearly 5000 villagers from seven villages that lie within the 335 square kilometre (km²) area that will be flooded as the dam is being built. An additional 7086 hectares (ha) of forest land is being destroyed in the process of the resettlement of villages; this includes the loss of 1290 ha of lowland agricultural land, or about one-quarter of all the wet rice paddy land in the Sesan District. Access to migratory fish is being lost by villagers who live along the Sesan and Srepok Rivers upstream of the LS2 Dam, as well as by the inhabitants of the 87 villages along the tributaries of the two rivers, (Baird, 2009). In all, more than 22,000 villagers are being affected.

For this paper, fieldwork was carried out in the province of Stung Treng; primary data was collected in three villages in Sesan District. Figure 1 shows the geographical locations of the fieldwork that took place in August and September 2015. It was predicted that all three villages in the district (Sre Kor, Phluk, and Kbal Romeas) would be severely affected by the dam development. Sre Kor is located near the main road, hence its inhabitants are relatively well off, with a few households owning woodcutting machinery, tractors and cars. The Commune Chief, a member of the opposition party, lives in this village. A sign at its entrance states, "I would rather die than leave this village".

Figure 1. Location of study site



Source: From Google maps, labelled by author

Plork is adjacent to the river and is served by dirt roads; villagers have set up businesses here, including a simple resort that attracts tourists from nearby villages and from other provinces. The Commune Chief who met the researchers was from the ruling party; he held mixed views about the dam development.

Kbal Romeas is near a large road that is not paved and is at times muddy and difficult to navigate. Areas near the road are mainly used for crop and rice farming. Most households do not have a bathroom or toilet.

All three villages consist mainly of medium-income households that are highly dependent on river water for drinking and daily usage. Flooding occurs more frequently than drought and is a threat to their livelihoods. This causes villagers to diversify their sources of income from farming to other occupations such as fishing.

Households in these villages are situated close together with strong networks of information flow and frequent community meetings; literacy is at a low to medium level and sanitation is generally poor. Rice is the dominant crop, but fishing is another other income-generating occupation (Baird, 2009). Nearly half the population in the affected LS2 Dam hydropower project area is illiterate and average monthly household income is US\$387.

PARTICIPANTS

Given our review of governance models above, three groups of perceptions might prima facie provide useful inputs and may help explain our choice of participants. We consider NGOs to be useful in representing perceptions of value and claims made in specific contexts. The network of commune leaders are capable of providing insights about the prevalence of power structures, while the network of villagers serve as repositories of local knowledge and expertise. The communicative role of NGOs also helps facilitate information flows between leaders and local communities. We are nevertheless careful about the possible vested interests of the NGOs. (We provide some information about these vested interests in the Appendices.)

Participants invited for the network mapping exercise included:

1. Three groups of villagers, one from Sre Kor (40 participants), one from Kbal Romeas (52 participants) and one from Sre Sronok (18 participants). Numbers of male and female participants were balanced; they were predominantly farmers, fishers and homemakers. Typically, about four to eight of the participants from each group were actively involved in the meeting, while the others observed or gave intermittent opinions. Notably, the villagers from Sre Kor and Kbal Romeas were reluctant to relocate while the participants from Sre Sronok had accepted the government's compensation for resettlement.
2. Two groups of commune councillors, five from Sre Kor and four from Kbal Romeas, of which all but one of whom were men. (Commune councillors are elected leaders at the commune level who are responsible for the delivery of basic public services.)
3. One representative from each of four local NGOs; of these, one was a woman who was a junior staff person and three were men who were senior staff with 8 to 13 years of experience working with local NGOs.

NET-MAPS

We replicate Schiffer and Waale's (2008) Net-Mapping Model in the sections below. Each group of participants was asked to produce a net-map; these were made on a large sheet of white paper using materials such as coloured pens and Post-it® notes (Figure 2). Instructions to the participants differed slightly from the original model, being based on later work by Schiffer and Hauck (2010). (See Appendix A for a detailed representation of this research activity.)

Figure 2. Map drawing by participants: [A] villagers of Sre Kor receiving instructions from our researcher prior to the network mapping exercise; [B] commune councillors from Kbal Romeas assembling and arranging the actors (written on Post-it® notes); [C] a villager from Sre Sronok linking the actors with multicoloured lines; [D] villagers of Kbal Romeas placing toy bricks on the net-map to indicate the influence (power) of a listed actor.



Source: Author's own

RESULTS

Six moderately fragmented net-maps (43-59%; Table 1) were produced by the participants and a total of 82 actors were named (Appendix A). Among these actors, 24 were named in at least four net-maps (Table 2); out of these 24, seven were national-level actors, six were provincial-level actors and four were district-level and lower. In at least four of the six net-maps, four local NGOs were also named. The three builders of the dam completed this list of the 24 key actors, namely HydroLancang International Energy, the Royal Group of Cambodia, and Vietnam Electricity.

Table 1. Summary of the network properties of the net-maps.

Network Properties	V _{SK} ¹	V _{KR} ²	V _{SS} ³	C _{SK} ⁴	C _{KR} ⁵	NGO ⁶
Nodes	31	18	31	33	36	60
Added nodes*	1	2	0	0	0	0
Links	213	118	159	250	196	731
Added links**	22	12	15	0	27	5
Avg. geodesic distance	3.05	2.18	2.82	2.79	2.97	2.07
Density	46%	77%	34%	47%	31%	41%
Fragmentation	56%	43%	56%	53%	59%	44%
Degree of centralisation	58%	26%	70%	56%	73%	61%

Note: V_{SK} = villagers of Sre Kor; V_{KR} = villagers of Kbal Romeas; V_{SS} = villagers of Sre Sronok; C_{SK} = commune council of Sre Kor; C_{KR} = commune council of Kbal Romeas; NGO = non-governmental organisation.

* = additional actors the participants wish to include in the governance of the river; ** = additional links between actors and existing links that participants would like to see included and strengthened.

¹ For Sre Kor, 31 actors were named and connected to one another by 213 links (Figure 3A). In addition to the 31 named, the participants believed that Cambodia's King Norodom Sihamoni should also play a role in the governance of the river. The villagers who made this net-map also felt that governance would be improved by stronger top-down and bottom-up ties that linked local-level citizens and households to the Prime Minister and strengthened connections between the Prime Minister/national ministries, Provincial Governors/departments, District Governors, and villagers. In terms of protecting the natural resources and people of the river basin, local actors – particularly the Commune Chief, households and local NGOs – had the highest influence (with a score of 5 out of 5); in contrast, all actors at the national and provincial level received low influence scores of 2 or less.

The network produced by Sre Kor participants had an average 'degree of centralisation' score of 58%. Key central actors (normalised degree centrality: 60-70%; see Appendix C) included the Provincial Governor as well as all the local stakeholders, including the District Governor, the villagers and all the NGOs named in the net-map. All the other actors had markedly low (below 20%) 'degree of centrality' scores. The 'closeness centrality' of the actors was generally low – between 19% and 49%, with an average of 34%. The Provincial Governor, District Governor and Commune Chief received the highest 'betweenness centrality' scores of 74%, 54% and 50% respectively, while the other actors scored below 15% (Appendix C).

² Like the villagers of Sre Kor, Kbal Romeas participants named the King of Cambodia as an actor they would like to involve in the governance of the river basin; they also added the United Nations as a desired actor. Also like the villagers of Sre Kor, the villagers of Kbal Romeas expressed the need for closer cooperation between actors across the country's administrative hierarchy. Of the six net-maps produced, the Kbal Romeas net-map had the lowest 'degree of centralisation' score (26%) reflecting relatively higher homogeneity of actor centrality. Almost half of the actors (Provincial Governor, households and all NGOs) had a 'degree centrality' of at least 80% (Appendix D). The actors in the network had a moderate 'closeness centrality' range of between 30% and 61%, with an average of 48%. In this net-map, the households, Provincial Governor and Prime Minister had the top three highest scores of 'betweenness centrality' – 42%, 32% and 16%, respectively (Appendix D). The centrality scores of all the other actors were below 10%.

³ The Sre Sronok net-map had a relatively high 'degree of centralisation' score (70%) with activities mainly centred on the Prime Minister, Provincial Governor and Commune Chief ('degree of centrality' scores were 73%, 77% and 53% respectively; Appendix E). The Prime Minister and Provincial Governor also had the highest 'betweenness centrality' scores of 56% and 72%, respectively, while those of the other actors were mostly 0% (Appendix E). Actors named in the net-map had a moderate range of 'closeness centrality' of 29% to 57%, with an average of 36%.

⁴ The Sre Kor network had an average 'degree of centralisation' score of 56%; all actors at the provincial level had the highest degree of centrality, with the highest of these being the Provincial Governor (88%) followed by the provincial departments

collectively (Appendix F). The Provincial Governor also had a distinctly high 'betweenness centrality' score of 69%, followed by the Prime Minister (37%); most actors scored 0% (Appendix F).

⁵ The Kbal Romeas network had the highest 'degree of centralisation' score (73%), with the majority of activities centred on the Prime Minister, Provincial Governor and households (degree of centrality: 60%, 66% and 74%, respectively; Appendix G). These actors, along with the council of ministers (48%), had the highest 'betweenness centrality': the Prime Minister (50%), the Provincial Governor (48%), and households (43%). The 'betweenness centrality' of other actors was under 5% (Appendix G).

⁶ Compared to the actors of the other net-maps, the actors on the NGO net-map had a relatively higher 'closeness centrality', averaging 50% (Appendix H). The 'betweenness centrality' scores of actors in this network were generally low, with a maximum of 20% (Appendix H). The 'degree of centralisation' of the network was moderate, at 61%, with key actors – those with a degree centrality greater than 70% – including, at the national level, the Ministry of Agriculture, Forestry and Fisheries as well as the Ministries of the Environment, Industry, Mines and Energy, and Rural Development; at the provincial level, the key actors were the Provincial Compensation and Resettlement Sub-Committee; developers and builders; the Royal Group of Cambodia, HydroLancang International Energy, Vietnam Electricity, and Sophorn Company (the dam-building subcontractor).

Table 2. List of key actors named on at least four net-maps.

Actors	Abbrev.	V _{SK}	V _{KR}	V _{SS}	C _{SK}	C _{KR}	NGO
Prime Minister	PM	2	4	5	1	5	5
National Assembly	NA	1		5	1	5	1
Ministry of Industry, Mines and Energy	MIME	1	4	2	2	3	3
Ministry of Land Management, Urban Planning and Construction	MLUC	1		1	1	3	
Ministry of Agriculture, Forestry and Fisheries	MAFF	1		3		4	5
Ministry of Rural Development	MRD			4	2	3	4
Ministry of Environment	MEnv	1	4	3	2	2	4
Provincial Governor	PGov	2	3	4	5	4	3
Provincial Department of Mines and Energy	PDME	1		1	3		2
Provincial Department of Agriculture, Forestry and Fisheries	PDAFF	1		2	2	3	3
Provincial Department of Environment	PDE	1			3	1	2
Provincial Department of Water Resources and Meteorology	PDWRM	1		2	3	3	4
Provincial Forestry Administration	PFoA	1		1	3	3	
District Governor	DGov	2	3	3	4	3	3
Commune Chief	CoCh	4	3	3	3	3	3
Village Head	VHead	2	2	3	2	3	3
Households	HH	5	5	5	1	3	3
3S Rivers Protection Network (NGO)	3SPN	4	3	3		2	3
My Village Organisation (NGO)	MVi	4	3	4	2	2	3
Culture and Environment Preservation Association (NGO)	CEPA	4		3	2	2	3
NGO Forum (NGO)	NGOF	4	3			2	3
Electricity Vietnam	EVN	1		1		2	1
HydroLancang International Energy	HL	1	1	1	1	1	1
Royal Group of Cambodia	RG		1		1	2	1

Note: V_{SK} = villagers of Sre Kor; V_{KR} = villagers of Kbal Romeas; V_{SS} = villagers of Sre Sronok; C_{SK} = commune council of Sre Kor; C_{KR} = commune council of Kbal Romeas; NGO = non-governmental organisation; Colours in cells represent the actor orientation (Figure 3); Numbers in cells denote the influence of actors on a five-point rating scale (1 = no influence; 5 = very high influence).

The participants generally agreed that all the national-level key actors are pro-development in varying degrees (yellow and red nodes on net-maps); an exception is the Ministry of Environment which was largely perceived to be pro-conservation (blue and green; Table 2). The participants all agreed that the builders listed had a strong development orientation (red); in contrast, all key NGOs were generally perceived to be supporters of environmental conservation.

The Prime Minister and Provincial Governor were perceived to have the highest influence on protecting the sustainability of the natural resources and welfare of the people in the river basin; their average influence scores were 3.67 and 3.50, respectively (Table 2). The great influence vested in the Provincial Governor aligns with the decentralisation reforms that have been adopted in recent times to ensure policy coordination and accountability in local governments (Sedara and Öjendal, 2009). Interestingly, all the local stakeholders were perceived to have considerable influence (i.e. the District Governor, Commune Chief, Village Head and households), as were all the key local NGOs. In Sre Kor, local actors – particularly the Commune Chief, households and local NGOs – had the highest influence (with a score of 5 out of 5) in terms of protecting natural resources and people of the river basin; in contrast, all actors at the national and provincial level received low influence scores of 2 or less. While this is empirically borne out by the net-maps, the actual mechanism of this influence remains an intriguing subject for future research.

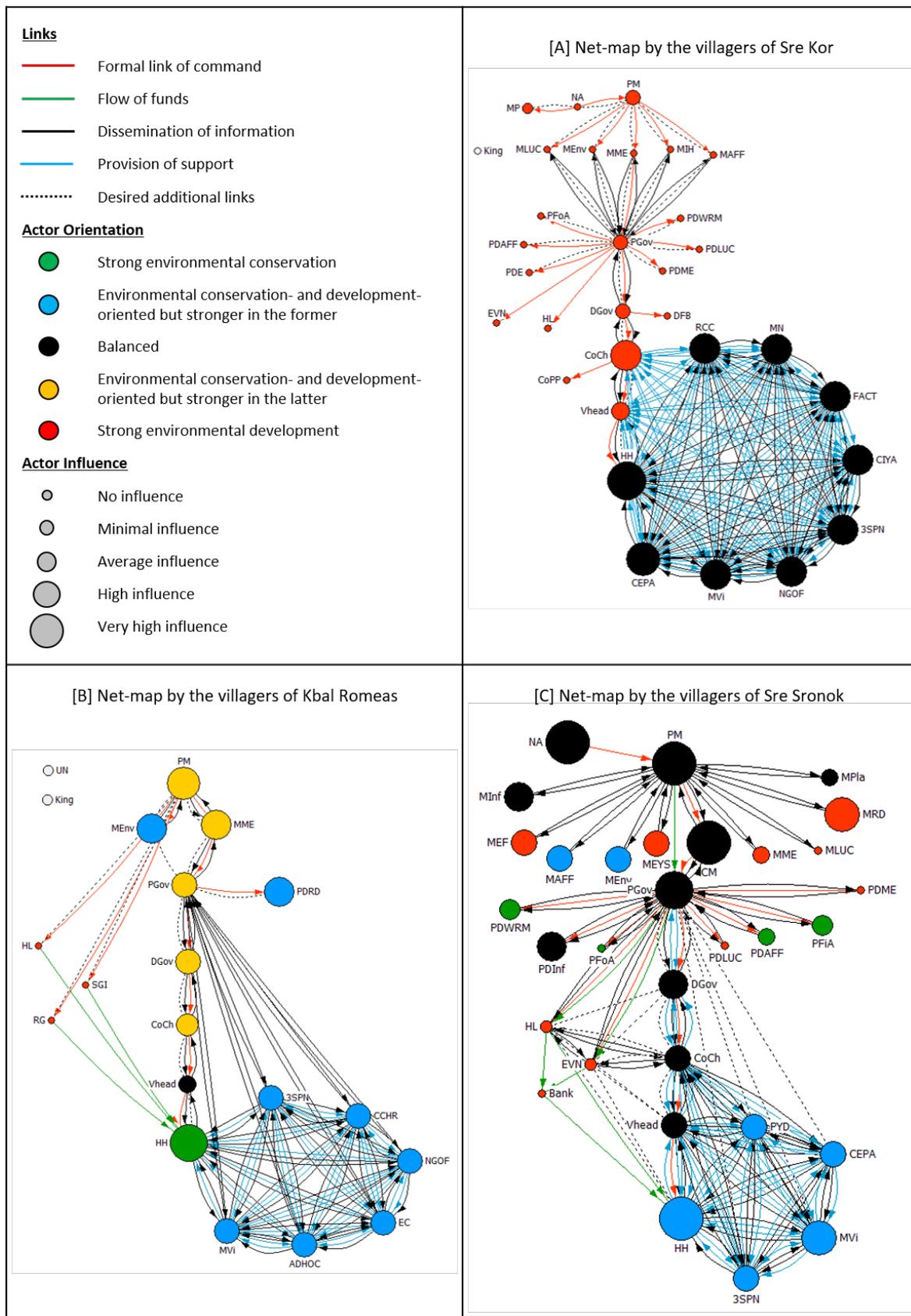
With regard to the links between actors, one clear finding is the power of NGOs; all the maps produced show an apparent strong relationship between villagers and the local NGOs; All the participants agreed that there was a good exchange of information between villagers and local NGOs as well as among NGOs themselves (black arrows in net-maps; Figure 3). All the participants also agreed that villagers were supported by all the local NGOs (blue arrows; Figure 3).

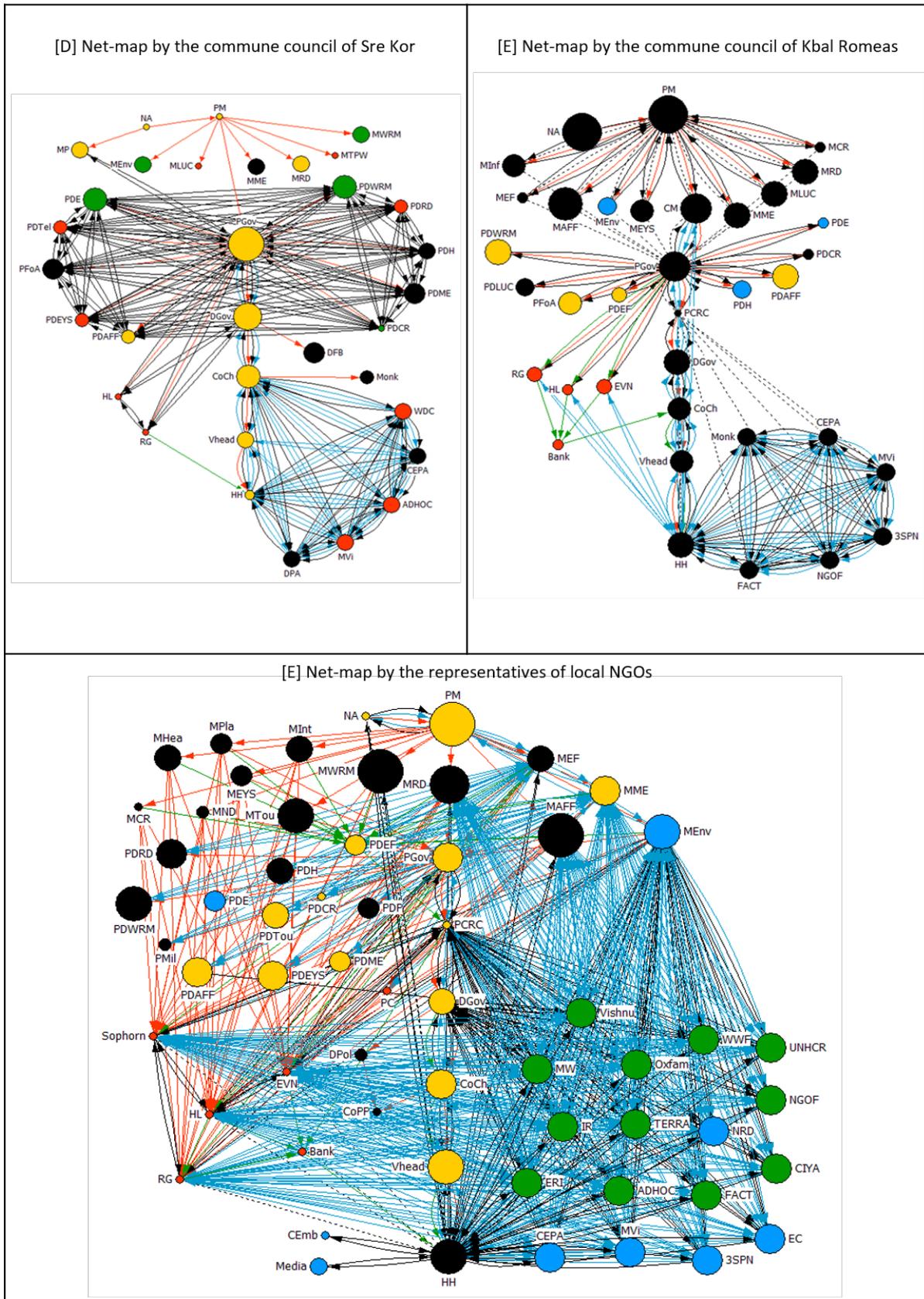
Villagers' net-maps

Sre Kor. The villagers named 31 actors who were connected to one another by 213 links (Figure 3A). In addition to the 31 named, the participants believed that Cambodia's King Norodom Sihamoni should also play a role in the governance of the river. The villagers also felt that governance would be improved by stronger top-down and bottom-up ties that linked local-level citizens and households to the Prime Minister and strengthened connections between the Prime Minister/national ministries, Provincial Governors/departments, District Governors, and villagers. This village is different from the other two as its residents have already accepted compensation and are ready to move out. Its net-map also differs in that it is more clearly binary than the others, that is, it is more clearly divided into balanced versus more pro-development groups. Participants classified "actors' orientations" into only two categories, either balanced (black) or development-oriented (red). Only the households and NGOs were considered to be balanced, while all the other actors named were perceived to be in the latter category.

The network produced by Sre Kor participants had an average 'degree of centralisation' score of 58%. Key central actors (normalised degree centrality: 60-70%; see Appendix C) included the Provincial Governor as well as all the local stakeholders, including the District Governor, the villagers and all the NGOs named in the net-map. All the other actors had markedly low (below 20%) 'degree of centrality' scores. The 'closeness centrality' of the actors was generally low – between 19% and 49%, with an average of 34%. The Provincial Governor, District Governor and Commune Chief received the highest 'betweenness centrality' scores of 74%, 54% and 50% respectively, while the other actors scored below 15% (Appendix C).

Figure 3. Digitised versions of net-maps made by the participants in this study.





Note: PM = Prime Minister; NA = National Assembly; MIME = Ministry of Industry, Mines and Energy; MLUC = Ministry of Land Management, Urban Planning and Construction; MAFF = Ministry of Agriculture, Forestry and Fisheries; MRD = Ministry of Rural Development; MEnv = Ministry of Environment; PGov = Provincial Governor; PDME = Provincial Department of Mines and Energy; PDAFF = Provincial Department of Agriculture, Forestry and Fisheries; PDE = Provincial Department of Environment; PDWRM = Provincial Department of Water Resources and Meteorology; PfoA = Provincial Forestry Administration; DGov = District Governor; CoCh = Commune Chief; VHead = Village Head; HH = Households; 3SPN = 3S Rivers Protection Network; MVi = My Village; CEPA = Culture and Environment Preservation Association; NGOF = NGO Forum; EVN = Vietnam Electricity; HL = HydroLancang International Energy; RG = Royal Group of Cambodia.

Kbal Romeas. This net-map has the fewest named actors (18) (Table 1; Figure 3B). The actors were connected by only 118 links but have the highest density (77%), which indicates a high level of connectivity between actors compared to the other net-maps. With the exception of the three actors from the private sector – Royal Group of Cambodia, HydroLancang International Energy, and Siv Guek Investment – all actors were perceived to have considerable influence on the protection of the river. Both the villagers of Sre Kor and Kbal Romeas named the King of Cambodia as an actor they would like to involve in the governance of the river basin; they also added the United Nations as a desired actor and expressed the need for closer cooperation between actors across the country's administrative hierarchy.

Interestingly, however, only households were given the maximum score of 5 out of 5. Of the six net-maps produced, the Kbal Romeas net-map had the lowest 'degree of centralisation' score (26%) reflecting relatively higher homogeneity of actor centrality. Almost half of the actors (Provincial Governor, households and all NGOs) had a 'degree centrality' of at least 80% (Appendix D). The actors in the network had a moderate 'closeness centrality' range of between 30% and 61%, with an average of 48%. In this net-map, the households, Provincial Governor and Prime Minister had the top three highest scores of 'betweenness centrality' – 42%, 32% and 16%, respectively (Appendix D). The centrality scores of all the other actors were below 10%.

Sre Sronok. The villagers assembled 31 actors on this net-map; they were connected by 159 links (Table 1; Figure 3C). This is a low-density map with only 34% of potential links between actors enabled (Table 1). While the net-maps by the villagers of Sre Kor and Kbal Romeas suggested that stronger ties should exist between actors across the administrative hierarchy, the villagers of Sre Sronok called only for stronger connections within the provincial level. Like the participants from the other two villages, the villagers of Sre Sronok also considered themselves to have maximum influence to affect the protection of the resources and people in the Sesan River Basin. Most of the actors named in the net-map – particularly those at the provincial level – were perceived to have either a balanced environmental conservation – development orientation (black) or a pro-conservation orientation (blue, green). The Sre Sronok net-map had a relatively high 'degree of centralisation' score (70%) with activities mainly centred on the Prime Minister, Provincial Governor and Commune Chief ('degree of centrality' scores were 73%, 77% and 53% respectively; Appendix E). The Prime Minister and Provincial Governor also had the highest 'betweenness centrality' scores of 56% and 72%, respectively, while those of the other actors were mostly 0% (Appendix E). Actors named in the net-map had a moderate range of 'closeness centrality' of 29% to 57%, with an average of 36%.

Commune councillors' net-maps

Sre Kor. A five-member representative group from the commune council connected 33 actors with 250 links on their net-map; this gave a density of 47% (Table 1; Figure 3D). The Sre Kor network had an average 'degree of centralisation' score of 56%; all actors at the provincial level had the highest degree of centrality, with the highest of these being the Provincial Governor (88%) followed by the provincial departments collectively (Appendix F). The Provincial Governor also had a distinctly high 'betweenness centrality' score of 69%, followed by the Prime Minister (37%); most actors scored 0% (Appendix F). This is the only net-map where participants agreed that no additional links were required and no existing links needed to be strengthened.

The commune council disagreed with the participants from the three villages on the amount of influence that households have over the protection of the river; while all villager participants rated themselves to have 'very high influence', the commune council regarded them as having 'no influence'. On the commune council net-map, the Provincial Governor was perceived to have the highest influence (Table 2). This is the only net-map where the households (yellow) and some NGOs (red) were perceived to be pro-development.

Kbal Romeas. Representative councillors from this commune produced the lowest density net-map (31%), with 36 actors and 196 links (Table 1; Figure 3E). The Kbal Romeas network had the highest 'degree of centralisation' score (73%), with the majority of activities centred on the Prime Minister, Provincial Governor and households (degree of centrality: 60%, 66% and 74%, respectively; Appendix G). These actors, along with the council of ministers (48%), had the highest 'betweenness centrality': the Prime Minister (50%), the Provincial Governor (48%), and households (43%). The 'betweenness centrality' of other actors was under 5% (Appendix G).

These participants felt that the relationships across the net-map could be improved either by adding new links or strengthening existing ones. Like the commune council of Sre Kor, the participants also did not agree that the villagers hold a 'very high influence' over the protection of the natural resources and people of the Sesan River; the villagers were perceived to have 'average influence' while national-level key actors, namely the Prime Minister and the National Assembly, were perceived to have the highest influence (Table 2; Figure 3E). Over 60% of the actors listed on the net-map were perceived to have a balanced environmental conservation – development orientation (black).

NGOs' net-map

This is the most complex net-map produced in the study. The network has a density of 41%, with 731 links and 60 actors (Table 2; Figure 3F). The participants suggested that the existing link between the households and the National Assembly of Cambodia should be strengthened; they also believed that households should have a direct link to the developers of the hydropower dam (i.e. Royal Group of Cambodia, HydroLancang International Energy, and Vietnam Electricity).

Compared to the actors of the other net-maps, the actors on the NGO net-map had a relatively higher 'closeness centrality', averaging 50% (Appendix H). The 'betweenness centrality' scores of actors in this network were generally low, with a maximum of 20% (Appendix H). The 'degree of centralisation' of the network was moderate, at 61%, with key actors – those with a degree centrality greater than 70% – including, at the national level, the Ministry of Agriculture, Forestry and Fisheries as well as the Ministries of the Environment, Industry, Mines and Energy, and Rural Development; at the provincial level, the key actors were the Provincial Resettlement Sub-Committee; developers and builders; the Royal Group of Cambodia, HydroLancang International Energy, Vietnam Electricity, and Sophorn Company (the dam-building subcontractor).

National-level actors – the Prime Minister, the Ministry of Water Resources and Meteorology, the Ministry of Rural Development and the Ministry of Agriculture, Forestry and Fisheries – were perceived to hold the highest influence over the protection of the sustainability of the natural resources and welfare of the people of the Sesan River Basin (Figure 3F); however, all the local actors, including the NGOs, also were perceived to have considerable influence. With the exception of the NGOs listed, the orientations of nearly all of the actors in the network were perceived to be either balanced or pro-development.

Overall, the SNA gives us three key insights. First, narratives in some networks are more clearly delineated than in others; for example, villagers who have already committed to a course of action have more deterministic views than others and their views will thus be harder to change. Second, narratives are far richer than expected, such that a simplistic pro-development or pro-environment division does not adequately capture the reality of the villagers' self-perception as well as the local leaders perceptions of the villagers. Third, there is some dissonance between how the villagers regard themselves and how

they are regarded by the local leaders; villagers may be overestimating their power to influence, or the councillors may be underestimating it. This tension is interesting and is worth exploring in future research.

One possible reason for the gap between the perceptions of villagers and those of councillors is the political agency of local state actors. In Cambodia, because of how the government operates to secure its power, local authorities often work to fulfil their own self-interests and material aspirations (Un and So, 2009; Heder, 1995); this, coupled with their loyalty to the ruling party and fear of underperforming or losing status, may instil different types and intensities of fear towards the Cambodian management, which is considered corrupt by many. (Un and So, 2009). Considering Cambodia's political configuration, it is possible that councillors think very highly of their capacity to influence the management of resources and, in turn, underestimate villagers' power to influence the protection of natural resources and the people of the Sesan River.

The SNA was useful in showing us the rough outline of pro-dam versus anti-dam discourse; even so, we see that many maps – aside from that of Sre Kor – do not align neatly into binary narrative coalitions. Such binary configurations have been called 'thin' narratives, whereas the maps display evidence of a deeper discourse called a 'thick narrative' (Leong and Lejano, 2012). In the following section, thick narratives will be uncovered by the Q-methodology.

THE Q AND THICK NARRATIVES

Q-methodology is a quantitative research method designed to "analyze subjectivity, in all its forms, in a structured and statistically interpretable form" (Barry and Proops, 1999: 338-339). This method was chosen over questionnaires and surveys – sometimes known as 'R-type methods' (Albizua and Zografos, 2014) – because while these latter forms are useful for gathering specific concrete pieces of self-reported data, the aim of this paper is to gather many and unique local discourses. Q-methodology is uniquely qualified to do this because of its ability to take into account diverse perspectives (Pike and Page, 2014; Bracken et al., 2016). Unlike traditional research methods such as surveys or questionnaires, Q does not aim to capture a 'representative sample' in the sense of the opinions of a large proportion of the population; instead, the Q's ability to capture diverse perspectives is especially important where policy narratives are highly contested, as in the case of the Mekong. Vugteveen et al. (2010), Woolley and McGinnis (2000), Bumbudsanpharoke et al. (2009), and Albizua and Zografos (2014) show the variations in the way that different stakeholders may define a policy problem or value a policy solution.

The typical approach to Q involves: i) identifying a series of statements ('Q-sample') on the topic in question, ii) getting participants to rank the Q-sample according to a given configuration, which is usually a normal distribution with positions based on Likert scales, and iii) using principal components analysis or centroid factor analysis to identify statements that agree, or dialogue, with each other.

In our study, we obtained more than 300 statements from a variety of sources, including English and Khmer newspapers, government documents which have been made public, and other public documents such as reports from NGOs. The keywords we used were 'Mekong', 'hydropower', 'development', and 'relocation/resettlement'. The original 300 statements were parsed to 50 non-repeated statements; these were then administered to the 25 villagers for sorting.

Participants were mainly from the villages of Phluk and Sre Kor. Of the 25 interviewees, 16 were male and 9 female; their ages ranged from 18 to 62, with only 4 above 50. All had received a primary school education and 13 out of 25 had graduated from high school. Most were engaged in agriculture or fishing, with a few employed as general workers.

The 25 responses to the 50 statements were correlated in a 25 by 50 matrix. This matrix was then factor analysed using PQMETHOD software, which automatically determined the initial factor loadings and extracted eight principal component factors using varimax rotation. Of the 39 respondents, 8

clustered on Factor 1, 8 on Factor 2, 2 on Factor 3, 7 on Factor 4, 2 on Factor 5, 2 on Factor 6 1 on Factor 7, and 1 on Factor 8. Factor loadings with eigenvalues greater than 1.00 are considered significant (McKeown and Thomas, 1988).

Analysis of three randomly generated Q-datasets showed that a total of eight factors had eigenvalues greater than 1.00 (17.1648, 3.9464, 2.5544, 2.4090, 1.7181, 1.4745, 1.3145 and 1.1932).

These eight discourse factors were clustered around three themes: economics of the Mekong; ecological costs of development; and local knowledge about the alternative types of sustainable development (Appendix I). The eight themes are examined in detail below, along with the three limitations that we outlined in the discussion of the three main models of governance: non-economic considerations, moral values and practical effectiveness.

Economic factors

Factor 1: The economics of fisheries is eroded by dams.

Factor 6: Aside from hydropower, There are alternative means to generate livelihoods apart from hydropowers.

These two factors concern the value of fisheries and traditional livelihoods. The narratives put forward a subtle, multi-layered case. First, while the economic value of hydropower may be more than that of fisheries (Electricity Authority of Cambodia, 2012, 2017; WWF, 2016), the determination and realisation of such gains are uncertain and the loss is real and immediate.

Nobody is against development. But if the value of fish catch and river-based livelihoods that will be lost as a result of building dams is much more than that of the income which may be generated by hydropower dams, then what is the use of dams. (16)

Second, the narrative also includes the values of ecology and tradition as part of the costs, values which had hitherto been uncaptured by a purely economic frame. A third thread points to the irreducible value of traditional livelihoods, as seen from this quote:

The damage on livelihoods can never be recovered as their relocation site is miles away from the river with no water, no fertile land, no access to markets/medicines/ schools. They will be thrown in abject poverty and total squalor. (28)

Hence, while the local community agrees that there is an economic case for dams, they are uncertain about whether these economic gains will be fairly distributed. Second, the narrative is more complex than the usual anti-development rhetoric ascribed to villagers; for example, although this statement appeared in five out of the eight factors: "the dams are a disaster of epic proportion", it was coupled with other statements that spoke about the need to develop in a sustainable manner. In three of these cases (Factors 1, 2 and 8), the people who strongly agreed with Statement (1) also strongly *disagreed* with this statement: "In short, people do not want the dam to exist. We do not know what to do to prevent it from happening. There is little hope" (45).

Such apparently contradictory perceptions and sentiments can be understood within a larger narrative where values of history and traditional livelihoods vie with aspirational goals of development and modernity. That is, it is not a choice between development and sustainability, but a choice of *how* development is to take place.

In terms of governance models, this economic narrative appears to bear closest resemblance to the incentive- and interests-based IWRM model; at the same time, it shows that such a model is limited in its ability to take into account the two following elements.

Moral claims

Factor 2: There is a need for greater public participation.

Factor 3: Dams damage the environment and should not be built.

Factor 7: Local interests should be taken into account in decision-making.

These discourse factors point to the need for inclusion and recognition of stakeholders. Stakeholder involvement should not be based on the resources they hold or their positional power, but rather on their moral status and/or social justice claims. This sentiment is demonstrated by statements (under Factor 2) such as:

We expect transparency in MRC meetings, and we want NGOs and communities to be involved (49)

Government has to invite public participation in planning process to ensure Cambodia's electricity system is affordable, sustainable and accessible to all (25)

Factor 2 is an unsurprising call for the inclusion of local stakeholders. Factor 3 argues that such local interests and the interests of 'disempowered' groups entail giving a larger place at the policy table to ecological issues, which are traditionally sidelined under Model 2.

Factor 7, meanwhile, offers a political reply as to why such inclusions are important. First, inclusion is demanded by social justice claims such as calls for the distribution of economic gains; this is demonstrated by the statement, "One way in which locals can be included in the economic benefits that hydropower dams bring is through profit sharing programs to those displaced/affected" (9) Second, local inputs often contribute practical experience with regard to the feasibility of proposed policy measures: "The suggestion to introduce boat tours at dam reservoirs will be an effective mitigation measure to generate revenue from tourism" (7)

Factor 7 is a particularly rich discourse factor as the statements that were disagreed with are as illuminating as those that were strongly agreed with. Most of the disagreed-with statements have to do with the way that benefits from hydropower development are being distributed, with a strong scepticism about how fair and well thought out the current system is. Overall, Factor 7 is a discourse that appears to be supportive of development, but in a way that takes local interests into account.

This second theme provides a good way to relate two models of governance, the interplay of interests and the limits of a pure power-based understanding of governance.

Practical experience and effective implementation

Factor 4: There is a way to develop sustainably.

Factor 5: There is an alternative to dams.

Factor 8: The current way of development has high ecological costs and low economic benefits.

This collection of discourse factors speaks to the contributions of local knowledge to the success of implementation. It also explains some behaviour that is the result of personal experience or the collective experience of the community.

Both Factors 4 and 5, for example, speak to alternative paths of development, including alternative ways of providing electricity and the need to ensure food security. The narrative on food security is illuminating because it focuses not just on supply but on the feeling of security of having a food source within their control and in close proximity. Security arising from proximity allows for greater ease of developmental sustainability (Mollard and Torre, 2004). These contributions of practical experience to the development of policy alternatives should not be gainsaid.

In the three factors, there is strong disagreement with statements that propose alternative livelihoods. Statements illustrating this include:

The suggestion to introduce boat tours at dam reservoirs will be an effective mitigation measure to generate revenue from tourism (7) (Factor 5).

To mitigate the negative effects on rural communities, rural population should be asked to change their eating habits from fish to abundant supply of rabbits available in the northeast region (3) (Factor 8) (Holly, 2017).

This last narrative theme is especially useful in understanding why the third model of governance often fails. While rules provide certainty and are useful in capturing the interests and power considerations of the first two models, they may also be less flexible than what is required on the ground; in addition, the application of rules also needs to take into account local perceptions and interpretations.

Even if these local perceptions can be overturned by expert opinion or by other data, knowing that such perceptions exist, and why they do, is a useful tool for any policymakers who are interested in removing obstacles to smooth implementation. Similarly, another narrative theme speaks to the distrust of the facts that the government and developers have put forward to support their case; an example of this is the assertion of the attractiveness of hydropower as a greener alternative to coal-fired power stations (32), and another example is the claim that the dams will create more jobs for the local community (14). Even if these can be shown to be misperceptions, knowing that they exist provides an opportunity for regulatory change.

As Hensengerth (2017) suggests, "value fragmentation" in local communities arises from development efforts made without due consideration of their impact on local communities spaces. Attitudes towards a place can change according to one's conception of space and identity and this can affect the power relationships between the community and the people who propose an alteration of the waterscape.

These discourse factors may also explain the paradox of power perceptions observed earlier, that is to say the perceptions by local leaders that villagers are less powerful because they hold on to a binary frame and are powerless to stop dam development. However, if we recognise the existence of other discourses, including those on how gains are to be distributed and how transitions and resettlement can be organised, then the villagers' self-perceptions of power can also be justified.

The juxtaposition of discourse factors with the net-map is also useful in helping us see the micro, actor-centred perspectives of larger policy narratives. In the village which has accepted compensation, the salience of the economic versus moral narratives is far higher, which explains the binary nature of their net-maps. In addition, understanding the practical demands of implementation against the backdrop of closed-minded commune councillors allows us to see how and why implementation may fail; it may be due to hubris at local leadership levels, or the villagers' overestimation of their power.

CONCLUSION

In our analysis of social networks earlier in this paper, we suggested that these networks act as bridges, and that narratives are shaped and influenced by the bridges along which they travel. The ideational impact of this phenomenon has already been reported on within the literature on policy reform; Wilder and Howlett (2014) refer to such journeying discourses as "policy bricolage", where actors compete to influence solution sets that constitute a transition from old to new policies. Policy actors are therefore regarded as "institutional bricoleurs" who are engaged in a process of "ideational and knowledge construction". Judging from the narrative factors described above, such local discourses go beyond the binary development narrative. This fact, coupled with our social network analysis, shows that social networks are a vital part of ideational construction, including the reframing of policy decisions within hydropower development to encompass broader moral and social dimensions.

The findings of this perception study are threefold. First, this paper has argued for the important role of local perceptions in the three dominant models of transboundary river governance. Understanding

local perceptions will allow us to use all three models with greater respect for empirical realities and will also give researchers greater analytical freedom to employ different models.

Second, this paper provided an empirical test of a two-pronged approach to incorporating local perspectives into governance models. While the strength of an SNA lies in its capacity to show the links and flows of information, this paper has shown that even as bridges allow information to flow, they also have the capacity to shape and change public narratives.

Last, in terms of practical policymaking, we have found a possible overestimation by the villagers of their power and influence; villagers perceive themselves to be highly influential whereas local leaders perceive villagers to have little or no influence. This difference is especially important when taken together with the 'thick narrative' – or deeper, more multi-layered discourse – that local communities are not 'anti-development' per se, but rather that they hold a narrative about what development *means*, or ought to mean. Local communities, rather than being regarded as opponents of hydropower development or as political advocacy groups to be mobilised, should be regarded as a resource with legitimate inputs, especially on issues of sacredness of place and symbols of holiness, such as animals. This is not, or at least not just, a moral argument of inclusion; it is also an appreciation of the practical value of local experience and empirically informed inputs.

The data used are listed in the references, figures, supplements and the data repository at <https://mk20mekong.wordpress.com/2017/06/20/interviews-assam/>

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APPENDICES

Appendix A: Activities and actors named by the participants of the network mapping exercises

In summary, participants were asked to:

1. *Assemble the actors*: Participants were asked to name the actors involved in the governance of the Sesan River. These are represented as nodes (circles) on the net-maps.
2. *Link the actors*: Participants were then asked to use different coloured arrows to link the actors based on the following categories:
 - Red: Formal line of command between actors
 - Green: Flow of funds involved in the LS2 Dam hydropower development
 - Black: Dissemination of information
 - Blue: Provision of support
3. *Assign actors' orientation*: For each actor, participants were asked to assign one of the following environmental conservation or development orientations:
 - Strong environmental conservation orientation (green on the net-maps)
 - Strong development orientation (red)
 - Balanced environmental conservation and development orientation (black)
 - Environmental conservation- and development-oriented but stronger in the former (blue)
 - Environmental conservation- and development-oriented but stronger in the latter (yellow)
4. *Define actors' influence*: The participants were then asked to rate the ability of each actor to influence the protection of the Sesan River and its inhabitants (1: no influence; 2: minimal influence; 3: average influence; 4: high influence; 5: very high influence).
5. *List additional actors and links*: Finally, the participants were asked if there were additional actors they would like to involve in the governance of the river or additional links they wished to establish between the actors named. For the existing links, participants were asked to indicate which link, if any, needed to be strengthened in order to improve governance.

The participants' maps were digitised and analysed using VisuaLyzar™, a graphic-editing software that also provides some basic network analysis functions (MDLogix, 2014). The network and node attributes from the maps which were computed using VisuaLyzar™ were *density*, *fragmentation* and *degree of centralisation* for networks, and *geodesic*, *degree centrality*, *closeness* and *betweenness* for nodes (Appendix B).

Actors	Abbrev.	V _{SK}	C _{SK}	V _{KR}	C _{KR}	V _{SS}	NGO
<i>National-level actors</i>							
Prime Minister	PM	x	x	x	x	x	x
National Assembly	NA	x		x	x	x	x
Member of Parliament	MP	x			x		
Council of Ministers	CM			x		x	
Ministry of Agriculture, Forestry and Fisheries	MAFF	x		x		x	x
Ministry of Cults and Religion	MCR					x	x
Ministry of Economy and Finance	MEF			x		x	x
Ministry of Environment	MEnv	x	x	x	x	x	x
Ministry of Education, Youth and Sport	MEYS			x		x	x
Ministry of Health	MHea						x
Ministry of Industry and Handicraft	MIH	x					
Ministry of Information	MInf			x		x	
Ministry of Interior	MInt						x
Ministry of Land Management, Urban Planning and Construction	MLUC	x		x	x	x	
Ministry of Mines and Energy	MME	x	x	x	x	x	x
Ministry of National Defence	MND						x
Ministry of Planning	MPla			x			x
Ministry of Rural Development	MRD			x	x	x	x
Ministry of Tourism	MTou						x
Ministry of Transport and Public Works	MTPW				x		
Ministry of Water Resources and Meteorology	MWRM				x		x
<i>Provincial-level actors</i>							
Provincial Governor	PGov	x	x	x	x	x	x
Provincial Commissioner	PC						x
Provincial Military	PMil						x
Provincial Compensation and Resettlement Committee	PCRC					x	x
Provincial Department of Agriculture, Forestry and Fisheries	PDAFF	x		x	x	x	x
Provincial Department of Cults and Religion	PDCR				x	x	x
Provincial Department of Environment	PDE	x			x	x	x
Provincial Department of Economy and Finance	PDEF					x	x
Provincial Department of Education, Youth and Sport	PDEYS				x		x
Provincial Department of Health	PDH				x	x	x
Provincial Department of Information	PDInf			x			
Provincial Department of Land Management, Urban Planning and Construction	PDLUC	x		x		x	
Provincial Department of Mines and Energy	PDME	x		x	x		x
Provincial Department of Planning	PDP						x
Provincial Department of Rural Development	PDRD		x		x		x
Provincial Department of Telecommunications	PDTel				x		
Provincial Department of Tourism	PDTou						x
Provincial Department of Water Resources and Meteorology	PDWRM	x		x	x	x	x
Provincial Fishery Administration	PFiA			x			
Provincial Forestry Administration	PFoA	x		x	x	x	

Local-level actors

District Governor	DGov	x	x	x	x	x	x
District Police	DPol						x
District Forestry Branch	DFB	x			x		
Commune Chief	CoCh	x	x	x	x	x	x
Commune Police Post	CoPP	x					x
Village Head	VHead	x	x	x	x	x	x
Households	HH	x	x	x	x	x	x

NGOs and religious groups

3S Rivers Protection Network	3SPN	x	x	x		x	x
Cambodian Human Rights and Development Association	ADHOC		x		x		x
Cambodia Centre for Human Rights	CCHR		x				
Culture and Environment Preservation Association	CEPA	x		x	x	x	x
Cambodia Indigenous Youth Association	CIYA	x					x
Development Partnership and Action	DPA				x		
Equity Cambodia	EC		x				x
EarthRights International	ERI						x
Fisheries Action Coalition Team	FACT	x				x	x
International Rivers	IR						x
Mother Nature	MN	x					
My Village	MVi	x	x	x	x	x	x
Mekong Watch	MW						x
NGO Forum	NGOF	x	x			x	x
Northeastern Rural Development	NRD						x
Oxfam	Oxfam						x
Paz Y Desarrollo	PYD			x			
River Coalition Cambodia	RCC	x					
Towards Ecological Recovery and Regional Alliance	TERRA						x
United Nations High Commissioner for Refugees	UNHCR						x
Vishnu Law Firm	Vishnu						x
Women's Development Centre	WDC				x		
World Wildlife Fund	WWF						x
Buddhist monks	Monk				x	x	

Private sectors and others

Royal Group of Cambodia	RG		x		x	x	x
HydroLancang International Energy	HL	x	x	x	x	x	x
Vietnam Electricity	EVN	x		x		x	x
Sophorn Company	Sophorn						x
Siv Guek Investment	SGI		x				
ACLEDA Bank	Bank			x		x	x
Media (ABC, VOA, FreeAsia)	Media						x
Chinese Embassy	CEmb						x
Prince Norodom Sihamoni*	King	x	x				
United Nations*	UN		x				

APPENDIX B: DESCRIPTIONS OF NETWORK AND NODE PROPERTIES CONSIDERED IN NET-MAPS

Property	Description
<i>Network Properties</i>	
Density	The proportion of links that are actually present in the network map, i.e. the ratio of the total number of links to the maximum possible links.
Fragmentation	The weighted degree of reachability between nodes, i.e. when all nodes are directly connected to all other nodes the fragmentation is 0. The fragmentation of a net-map where all nodes are isolates (unlinked) is 1.
Degree of centralisation	The extent to which a network has a single actor or a few actors with high centrality, i.e. the larger the centralisation score, the more likely it is that a single actor is significantly more central within the network, with the remaining actors in the periphery. Essentially, it expresses how unequal, variable or heterogeneous the actor centralities are in the network.
<i>Node Properties</i>	
Geodesic (distance)	A pair of nodes can be connected by several links which may differ in length; geodesic is the shortest path between two nodes.
Degree centrality	A measure of the number of an actor's direct connections (links); a node with the highest score is the most popular and active actor in the network.
Closeness centrality	A measure of how close an actor is to all other actors in the network; this is derived from the mean distance (geodesic) of a node to all other nodes. An actor with a high score can interact most quickly with all other actors.
Betweenness centrality	An indication of the extent to which an actor falls on the geodesic paths between other non-adjacent pairs of actors in the network, i.e. the power that an actor wields over the interactions between other actors.

Note: The detailed description of the computation of the values of the network and node properties are provided in the VisuaLyzzer™ user manual (MDLogix, 2014)

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