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RESEARCH ARTICLE

Factors driving collaboration in natural resource conflict management: Evidence from Romania

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Abstract A critical challenge in natural resource management is to bring all stakeholders together to negotiate solutions to critical problems. However, various collaborative approaches to heading off conflicts and resolving natural resource management disputes have been used. What drives these efforts, however, still needs further research. Our study provides a systematic look at the drivers likely to initiate collaborative problem-solving efforts in four cases in Romania. We use Emerson's et al. (2012) framework for collaborative governance and multi-value qualitative comparative analysis (mvQCA) to analyze cases involving endangered species, restrictions on forest harvest, conflicts associated with infrastructure development projects, and disputes over the management of environmentally sensitive areas. Our findings contribute to the already existing collaborative governance literature indicating which of the four factors: uncertainty, interdependence, consequential incentives, and leadership, in which combination, are necessary and sufficient to spur collaborative resource management efforts. Our results showed that in Romania the initiation of collaboration is best explained by positive consequential incentives (i.e., financial opportunities) which has determined leaders to take initiative. This study provides additional information for the complicated process of natural resource management which is often overriding collaboration by investigating what enables and constrains collaborative efforts in a country where natural resources were managed and used according to the principles of central planning.

Keywords Collaboration · Consequential incentives · Interdependence · Leadership · mvQCA · Uncertainty

INTRODUCTION

Climate change, desertification, deforestation, and concerns about biodiversity are key drivers of environmental conflict all over the world (Gerber 2011; Ide 2015). Questions about how best to manage natural resources in such cases often lead to surprisingly intense conflicts. For solutions to emerge, key actors from multiple levels must see sufficient reasons to engage in collaborative problem solving (Brown et al. 2015).

The collaborative approach to natural resource management has flourished in large measure because, in a world of uncertainty and complexity, conventional administrative and court processes have failed to produce satisfactory results (Susskind and Cruikshank 1987; Innes and Booher 2010). Traditional approaches to public participation in resource management disputes lack direct interaction among the affected parties and tend to present win–lose outcomes that tend to support an unjust status quo (Innes and Booher 2004).

The management of socio-ecological systems, which are complex adaptive systems characterized by self-organization, adaptation, non-linearity, and uncertainty (Berkes 2010; Messier et al. 2016), has led to the search for more effective forms of collaborative problem solving as a way of supplementing what government can do to resolve resource management disputes (Wondolleck and Yaffee 2000, 2003). Collaborative management refers, in general, to all efforts that bring multiple stakeholders with diverse influence and experiences to the bargaining table to seek ways of reconciling their conflicting interests and concerns

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about how natural resources should be used (Heikkila and Gerl 2005; Johnston et al. 2011). It is a process of learning by interaction to both solve problems and create opportunities, where stakeholders adapt and change their behavior and perceptions in response to the information gathered during the process (Innes and Booher 1999).

Previous research has shown the effects collaboration has in natural resource management. For example, Hill et al. (2015) found that collaboration can improve resources' conditions such as slowing down biodiversity loss through mobilizing institutions, and Koontz and Newig (2014) and Scott (2015) observed improvements in water quality parameters. Berkes (2010) found that in a wide range of resources (i.e., wildlife, forests, protected areas, wetlands, watershed) collaboration-related processes (i.e., deliberation, trust, and capacity building, learning) led to adaptive co-management. Furthermore, many social benefits may directly or indirectly result, such as additional social, intellectual, and political capital (Innes and Booher 2004; Sabatier et al. 2005), new and strong relationships between stakeholders (Ulibarri 2015), as well as an increased sense of community even among parties who may not traditionally cooperate (Wondolleck and Yaffee 2000).

A handful of collaboration studies investigate what it takes for the emergence of commitments to participate (Ostrom 1990; Sabatier et al. 2005; Emerson et al. 2012). According to the Emerson's et al. (2012) framework for collaborative governance, a collaborative process is more likely to be initiated when one or more of the four drivers: uncertainty, interdependence, consequential incentives, and adequate leadership are in play. Emerson's et al. (2012) framework for collaborative governance (Fig. 1) represents the theoretical basis for this study. It is general, flexible, and encompassing. It is appropriate for our study because it can guide empirical evaluations of cases. In an earlier study, we explored what contributes to the success or failure of the resolution process in cases of land-use conflicts. We found that, in Romania, the absence of collaborative efforts contributes to failure (Tudor et al. 2014). The current study complements our previous research by focusing on the initiation of collaboration and specifically to focus on the assertion that, i.e., "one or more of these four drivers must be present to start a CGR (collaborative governance regime) and that the presence of more drivers increases the likelihood that such a regime will be initiated" (Emerson et al. 2012). This offers us a way to better understand how the four drivers might relate to each other.

Uncertainty

Uncertainty is ubiquitous in natural resource management and results from the very nature of the complexity and unpredictability of socio-ecological systems. Uncertainty arises from different combinations of resistance (barriers) and connectivity (interactions). For example, in cases of high connectivity and low resistance, the likelihood for change to be initiated is highest, as barriers are broken and connections are established. In cases of low connectivity and high resistance, the likelihood for change to occur is lowest, as many barriers exist and poor connections are established (Holling 2001). Uncertainty also results from the fact that stakeholders are competing with each other for the same limited resources in ways that they cannot predict with confidence (Innes and Booher 2004). Furthermore, the higher the degree of uncertainty, the greater the willingness of stakeholders to commit to collaboration. However, in climate change as well as immigration politics, uncertainty can drive parties to compete and not to collaborate (Emerson and Nabatchi 2015) but it can be shifted from competition to collaboration when interdependence is present.

Interdependence

In system theory interdependence is considered a subset of a network of interactions or systems. Multiple interactions create networked systems of interactions and thus the likelihood for emergence increases. Interactions between actors involve a mix of constructive or destructive tendencies (Green 2006). Constructive interactions tend to support collaboration between actors, while destructive interactions may result in power inequities and obstruction of other party's interests. In Emerson et al. (2012) framework, interdependence refers to stakeholders' willingness to interact. Previous research has found that the parties' recognition of dependence on each other increases cooperation in water resource management (Mostert et al. 2008) and human-wildlife conflicts (Wondolleck and Yaffee 2000) and it is crucial in collaborative forest and nature management (Zachrisson and Lindahl 2013).

Consequential incentives

It also turns out that stakeholders engage in collaborative activities when they perceive sufficient consequential incentives to do so. These incentives may be both positive, such as financial opportunities, that may require participants to work together or negative, such as threatened reforms that are unappealing to many or most of the stakeholders involved, or proposed policies that seem unlikely to work (Emerson et al. 2012). For example, Nita et al. (2016) found that EU funding puts different actors together to devise common conservation strategies. Furthermore, Zurba and Trimble (2014) found that

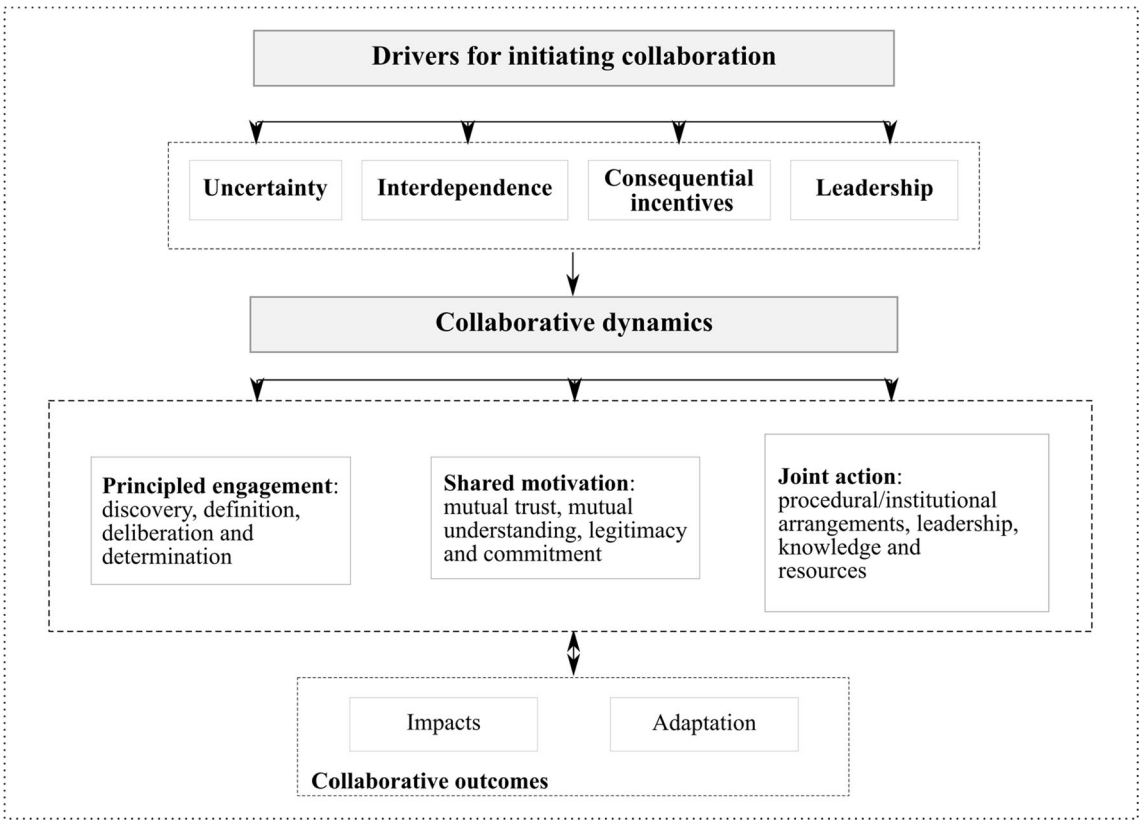

Fig. 1 The framework for collaborative governance, based on Emerson et al. (2012)

consequential incentives strongly related to crises in the fishery and forestry sectors have sparked collaborative initiatives.

Leadership

Finally, in the Emerson's et al. (2012) framework, leaders play a critical role in encouraging people to act together as already Imperial (2005) pointed out. These have to be esteemed individuals, who are perceived as honest and neutral, and who can secure the resources needed to initiate collaborative efforts. For example, having assistance from a neutral leader during a collaboration process may make it easier to meet the interests of less powerful parties and ensure fairness in the process and justice in the outcomes (Colvin et al. 2015).

Emerson et al. (2012) and Emerson and Nabatchi (2015) point out that the system context, specifically the political, social, economic, and environmental influences, may enable or constrain the effect of these four drivers in initiating collaboration. Collaboration may be enabled depending on the socio-economic and cultural characteristics of a community. For example, communities with limited financial resources may seek to connect with well-endowed ones to access certain public services. Also, the environmental problems (i.e., pollution, natural resources scarcity) may enable collaborative environmental problem solving in order to improve or limit them. Furthermore, people collaborate when opportunities for collaborative practices are available (i.e., the Federal Advisory Committee Act which facilitates collaboration between the public and the government). However, collaboration fails to be initiated when a country's political history and its social and economic diversity undermine people's readiness to collaborate (Susskind et al. 2015). Also, staff with insufficient skills in collaborative planning, inadequate resources (i.e., funding, neutral expertise, technical, and logistical support) and an unresponsive bureaucratic culture can create serious roadblocks to collaboration (Carr et al. 1998). Finally, individualistic lifestyles typical of most modern societies where collective interests are neglected (Wondolleck and Yaffee 2000) and the philosophical differences and contending values among stakeholders which make trust quite challenging (Davenport et al. 2007) are important barriers to the emergence of collaborative efforts. In order to get a better understanding of the drivers likely to initiate collaboration, we address contextual influences in the discussion of the results.

Romania's general political and economic context has experienced interesting shifts in the past years. The

Romanian state is a unitary state, with a young democracy, since 1989 when the communist regime collapsed. Romania's entrance into the European Union (EU) in 2007 and the subsequent influence of the EU organizations and conventions in shaping the national environmental policies have secured participation as an influential force in environmental policy-making. However, the environmental issues still receive little attention from the public which prefers to not get involved, fearing that expressing opinions might impair their own well-being as a result of the communist past when public involvement was not allowed (Stringer et al. 2009). The industrial breakdown in the post-communism period has given rise to multinational corporations and non-governmental organizations which have called for greater transparency in Romania's environmental policies. However, the environmental policy is still characterized by centralized policy-making and implementation (Stringer and Paavola 2013).

MATERIALS AND METHODS

Cases selection

We chose a multiple, small-N case study approach because it permits us to explore in some depth the way in which causal mechanisms work. This approach is preferred because it describes in some detail the real-life context in which the cases unfolded (Yin 2003) and allows a comparison of process and outcomes that would not be possible if we used a quantitative or statistical comparison (Conley and Moore 2003) or large-N analyses (Ryan and Smith 2011). The case studies were selected to study natural resource conflicts in different resource systems (such as: wildlife, forestry, and water) in order to find variation in the initiation of collaboration. Most importantly, we selected only cases where at least some components of collaborative dynamics (Fig. 1) had been initiated. An alternative approach would be to contrast cases with failed and successful initiation as well as with lack of any attempt to initiate collaboration. The potential of this approach for future research is elaborated on in the "Discussion".

We selected four Romanian cases studies on the following issues: (i) a human-bear conflict; (ii) a conflict caused by restrictions on forest harvest; (iii) a conflict which emerge when infrastructure projects were proposed in sensitive areas; and (iv) a conflict which arose over faulty management of environmentally sensitive areas (Table 1).

The published analyses of natural resources conflict resolution cases are scarce. Therefore, to document and ensure a reasonably comprehensive understanding of each story, information was collected from a variety of sources. We studied the projects reports, official meeting notes, and recordings. Furthermore, the personal experiences of some authors of this paper who have been involved in the case studies (as expert advisors) were used to complement the information from the sources we used for documentation (Table 1). The triangulation of these sources allowed us to develop a solid understanding of each case.

Furthermore, we searched for other similar four cases (in terms of similar realm of conflicts) in the United States literature to devise the calibration rules for the four drivers ("Calibration") and to investigate whether the Romanian cases have similar traits to previous cases. We chose the U.S. literature because of the considerable number of reported case studies that illustrate collaborative efforts to resolving conflicts over biodiversity conservation, natural resource management, urban development, as well as social justice (Susskind and Cruikshank 1987; Wondolleck and Yaffee 2000; Sabatier et al. 2005). Four of these were selected for close analysis (Table 2).

Qualitative comparative analysis

We used multi-value qualitative comparative analysis (mvQCA) to explore which drivers from Emerson et al. (2012) framework for collaborative governance (Fig. 1) preceded the initiation of collaboration. According to QCA terminology, we refer to the four drivers as 'conditions.'

Since 1980 when the QCA was developed (Ragin 1987), it has been applied in various research fields, including conflict research (Ide 2015) and social collaboration (Baynes et al. 2015). The purpose of QCA is to identify necessary and sufficient conditions that justify an outcome. Necessary conditions are those without which the outcome could not have been produced, while sufficient conditions are those that could produce the outcome by themselves without other conditions being present (Rihoux and Ragin 2009). These emerged from our analysis of set-theoretic relations across cases. Furthermore, QCA identifies not just necessary and sufficient conditions, but also INUS conditions. The term INUS is defined as an *i*nsufficient but *n*ecessary part of a condition which is itself *u*nnecessary but *s*ufficient for the result. Therefore, an INUS condition is neither necessary nor sufficient by itself, but part of the combinations of conditions which are sufficient for the outcome under investigation.

QCA focuses on complex causality, being able to explore multiple paths leading to the same outcome and requires an in-depth knowledge of the cases.

In our study, we used multi-value qualitative comparative analysis (mvQCA), because it advances beyond crisp-set QCA (which allows only full (1) or no (0) membership of a condition in a set) and fuzzy-set QCA (which uses fine-grained membership scores, specifically every possible

Table 1 Properties of the selected cases

Properties	LIFE Ursus Project	Putna-Vrancea Natural Park	Highway—Surlari protected forest	Green Siret management plan
Sources	LIFE Ursus Project (2010, 2011), authors' own experiences, http://lifeursus.carnivoremari.ro/	Putna-Vrancea Natural Park (2010), authors' own experiences	EPA (2007), online media content analysis	LSM Administration (2015), meetings recordings and notes, authors' own experiences
Natural resource system	Wildlife	Forest	Infrastructure—forest	Water
Conflict type	Conservation conflicts (human-bear conflicts)	Forest-related conflicts	Forest—infrastructure conflict	Conflicts induced by the environmental degradation of water-related ecosystems
Time, duration	2010, 3-year period	2010, 6-year period	2007, 4-year period	2012, 3-year period
Location	Vrancea, Harghita, and Covasna counties, Romania	Vrancea County, Romania	Ilfov County, Romania	Braila, Galati, Vrancea, Bacau counties, Romania
Extent	Regional level	County level	National level	Regional level
Main topic	An EU-funded project, aimed at improving the brown bear conservation and management (by changing the hunters' and farmers' perception about the brown bear) and to reduce the human–bear conflicts	Collaboration efforts triggered by restrictions on timber harvest levels in some private forests because of their zoning as protected areas where no intervention is allowed	Negotiated efforts to find a solution concerning a transportation project planned to cross an important protected forest for bird conservation	Negotiated effort to resolve the disagreements over the actions proposed in the management plan of a river valley and its protected areas in order to achieve a consensual agreement
Main stakeholders	Environmental protection agencies, NGOs, hunters, farmers, conservationists, local citizens	The park administration, forest owners associations, environmental protection agencies	Romanian Company of Highways and National Roads Environmental Protection agencies, NGOs	Governmental organizations, NGOs

values between 0 and 1) by capturing the causal effect of every category of a multi-value condition (Haesebrouck 2016). In mvQCA, each condition may have more than two categories, but generally a low number. Thus, mvQCA is most suitable for our data which were calibrated into 2–3 categories (see "Calibration").

An important step in mvQCA is the construction of the 'truth table' which lists all the logically possible configurations (Thiem and Dusa 2013a). For example, assuming four drivers (or conditions) (k) for the initiation of collaborative activities, and each driver (j) having 3, 2, 2, and 3 categories (pj), there are 36 ($\Pi_{j=1}^{k} pj$) logically possible configurations. The truth table was constructed from the multi-value data, using a cut-off score of 0.8 to show which configurations (from all the 36 possible ones) are expected to contribute to the initiation of collaboration.

When applying the Boolean minimization to the truth table to detect sufficient conditions, three solutions can be produced. The conservative solution is based on the combinations of conditions from the truth table that correspond only to empirically observed cases. The parsimonious solution incorporates logical reminders, specifically those combinations of conditions that are logically possible and would have a positive output, but are not found in the empirical cases. The intermediate solution is based on directional expectations (Thiem and Dusa 2013b) regarding the relationship between a condition and the outcome, and thus retains those logical reminders where theoretical knowledge suggests they contribute to the outcome. We calculated all three, but chose to discuss the intermediate solution as it is best suited to our study because (i) we could set the directional expectations based on Emerson's et al. (2012) proposition that one or more of the four drivers: uncertainty, interdependence, consequential incentives, and leadership are likely to explain why collaborative activities are initiated and (ii) it uses those logical reminders from the parsimonious solution in line with the theoretical knowledge, thus 'artificially' increasing the number of case studies.

The truth table shows set-theoretic sufficiency relations. Twenty-one truth table rows remain as logical reminders in line with the theoretical knowledge (Appendix S1). Eight truth table rows correspond to empirically observed case studies.

Graphical representations (Venn diagrams) that display the relationships of necessity were used. The most important parameters of fit in QCA are consistency (which refers to the degree to which a condition is needed for the

Table 2 The US case studies selected for devising the calibration rules ("Calibration")

Cases	Sources	Brief description
Beartree Challenge Project	Forest Service (1993), Wondolleck and Yaffee (2000), Kemmis (2001)	An innovative partnership, designed to improve the ecological habitat of the grizzly bears without affecting logging in the region, and to solve the conflicts between the angry farmers and the pro-wildlife groups, made diverse actors collaborate on behalf of grizzly bear management
Quincy Library Group	Terhune and Terhune (1998), Wondolleck and Yaffee (2000), Bryan and Wondolleck (2002), Davies and White (2012), http://www.qlg.org/	A partnership started to bring together all the actors concerned about the effects on the local economy of a sharp decline in the timber harvest
Alewife Task Force	Susskind (1981), Susskind and Cruikshank (1987)	A consensus-building approach to advance a proposal about a regional transportation facility planned to be built in the heart of an environmentally sensitive wetland
Casco Bay Estuary Project	CBEP (1996), Grijze (2010)	A consensus-based planning process to develop comprehensive actions for the management of a watershed

outcome to occur), and coverage (which refers to the percentage of cases explained by a causal condition) (Thiem and Dusa 2013b). Coverage is meaningful only for consistent results (having a consistency score higher than 0.90). The necessity in the consistency scores was analyzed to identify which (combination of) conditions might precede the initiation of collaboration. We used 0.90 as a threshold for accepting a condition to be necessary, as Rihoux and Ragin (2009) recommend.

QCA is suitable for small-to-intermediate-N research designs (Ragin 1987). No generally agreed fixed limits to decide on the suitable number of case studies in QCA analysis are available. Studies using small-N analyses showed that such an approach allows gaining intimate case knowledge (Ryan and Smith 2011) which is indispensable in QCA data analysis (Schneider and Wagemann 2010). Furthermore, a within-case analysis is more suitable to get the story behind the macro configurations that emerge from the QCA (Ebbinghaus 2006). By contrast, in large-N comparative studies, the possibility to gain familiarity with cases is difficult and such an approach is time-extensive.

Our research design did not allow for more case studies to be selected. As such cases of natural resource management conflicts are social phenomena, they are most of the time limited in their diversity (Ragin 1987). Given the small-N case studies we used, the problem of limited diversity occurs. This problem comes from the presence of logical reminders (those combinations of drivers that are logically possible but for which no empirically observed cases exist) in the truth table. Not all the 36 possible combinations from the truth table are empirically observable and there is no guarantee that a set of 36 case studies will cover all the 36 possible combinations as same cases may experience the same combinations of drivers. To alleviate the problem of limited diversity, we produced the intermediate solution which uses only those logical reminders that the parsimonious solution comprises and are based on theoretical knowledge (Appendix S1) (Ragin and Sonnett 2005).

The QCA analysis was performed with the QCA package (Thiem and Dusa 2013a) in R (R Development Core Team 2008).

Calibration

Data consist of membership scores which were assigned to the four drivers (uncertainty, interdependence, consequential incentives, and leadership) and the outcome (the initiation of collaboration) based on the evaluation of four U.S. case studies (Appendix S2). Therefore, we used natural numbers such as 0, 1, and 2 to dichotomize and trichotomize the four drivers and the outcome (Table 3).

The calibration of the outcome (the initiation of the calibration), was achieved by assessing each component of the collaborative dynamics (principled engagement, shared motivation, and joint action), for each case study (Appendix S2). According to Emerson et al. (2012), an initiated collaboration reflects the degree to which parties are likely to further interact and collaborate to reach an agreement. Therefore, a membership score of 2 is assigned when principled engagement, shared motivation, and joint action were generated and were of high quality and effectiveness (Table 4). When the quality and effectiveness of these components decrease they received a membership score of 1. A membership score of 0 is attributed when some of these components failed to be initiated.

When we set the directional expectations to produce the intermediate solution, we considered that in case studies where (i) uncertainty has a membership score of 1 and 2, (ii) interdependence and consequential incentives of 0 and 1, and (iii) leadership of 2, collaboration is more likely to be initiated.

Table 3 Rules for deriving calibration scores for the initiation of collaboration

Drivers	Scores		
	2	1	0
Uncertainty	When no information about the conflict and how to solve it has been available, we considered the case to have a high uncertainty and calibrated it as 2	A membership score of 1 is assigned when information existed about the conflict but no information about on how to solve it has been available	A case where parties had information about the conflict and how to solve it was calibrated as 0
	1	0	
Interdependence	A membership score of 1 is assigned when interdependences were present. This means that the parties could not solve the problem on their own and looked for collaborators at both state and local levels	A case where interdependences were present, but parties looked for collaborators either at state or at local level is calibrated as 0	
	1	0	
Consequential incentives	When both positive and negative incentives existed, the case receives a membership of 1	A case is calibrated as 0 when the negative consequential incentives were dominant	
	2	1	0
Leadership	When a case has leaders that help secure support for collaboration, are committed to collaborative solving problem and impartial to the preferences of the other parties, it receives a membership of 2	A membership score of 1 is assigned when the leaders are present, they secure resources for collaboration, but they are not committed to collaborative solving problem, or impartial to the preferences of the other parties	The absence of leaders results in a membership score of 0

RESULTS

The assessment of each driver of the initiation of collaboration in each case study (Appendix S2) revealed particular situations in which collaboration is likely to be initiated (Table 5).

LIFE Ursus Project and Green Siret Management Plan case studies are good examples of how collaboration was initiated: parties were aware that they would have to collaborate in a self-organized team to begin the project implementation. Furthermore, parties realized they had to work together or lose the benefits of the resources that were important to them. In both cases, field trips and presentations were organized so that the participants could get a better understanding of the environmental as well as socio-economic conditions necessary to conserve the brown bear (LIFE Ursus Project) or to create the management plan (Green Siret Management Plan).

In the Putna-Vrancea Natural Park and highway—Surlari protected forest case studies, collaboration was initiated only because the administrative process required them to do so. No joint activities were organized, no trust was built, and no platform for civil deliberation was set up. Moreover, the lack of governmental agencies committed to implement a collaborative approach raises questions about the legitimacy of collaboration.

Necessary and sufficient conditions for the initiation of the CGR

Our analysis of necessity shows six combinations of drivers (without which collaboration would probably not be produced) which meet the threshold of 0.90 (Table 6).

In the case studies characterized by these six configurations, collaboration was likely to be initiated.

The evaluation based on Venn diagrams (Fig. 2) revealed that while the six combinations of drivers are necessary to initiate collaboration, their presence is not sufficient. Each ellipse contains the number of the case studies that are members of the configuration each ellipse represents. As there are cases outside the outcome (i.e., the initiation of collaboration) but within each configuration of drivers, it shows that each configuration is only necessary but not sufficient for collaboration to be initiated.

Our analysis of sufficient drivers for the initiation of collaboration revealed three solutions: conservative, parsimonious, and intermediate. We chose to interpret the intermediate solution (Table 7).

The intermediate solution formula can be read as follows: the presence of both positive and negative consequential incentives AND of leaders who help secure support for collaboration, but not committed to collaborative solving problem, or impartial to the preferences of the other parties (CI{1}*L{1}) OR the existence of

Table 4 Rules for deriving calibration scores for the components of collaborative dynamics

Collaborative dynamics		
Components	Elements	High quality and effectiveness
Principled engagement creates the space for shared interactions. These, in turn, can help identify needed information, build shared understanding of the issue, and create space for deliberations leading to decisions	Discovery	When activities aimed at revealing the individual and shared interests, concerns and values of participants and engaging in joint-fact-finding and analytic investigation are organized
	Definition	When parties define concepts and common goals, clarify tasks and expectations, and develop evaluation criteria
	Deliberation	When parties have a fair and civil dialogue, are open during communication, thoughtfully listen and examine perspectives, and manage disagreements
	Determinations	When agreements are reached and parties consider them as fair, equitable, durable, and efficient
Shared motivation contains trust-building activities as well as legitimacy and commitment to the process which can increase the potential for future positive interactions and lower conflict around natural resources	Mutual trust and mutual understanding	When there is strong evidence of trust-building between participants
	Legitimacy	When the participants deem the collaboration process and its parties to be useful, worthy, and credible
	Commitment	When the participants are committed to collaboration and its collective purpose, are motivated to achieve outcomes together, and feel responsible and accountable for the outcomes
Joint action reflects parties' common efforts over time. Together, they establish rules, institutional arrangements, engage in knowledge building activities, and make efforts to provide resources. However, when parties have contending views, somebody has to help, which in some cases is a professional neutral who is central to collaborative decision-making	Procedural and institutional arrangements	When procedural and institutional arrangements exist and are of good quality
	Leadership	When leadership roles are filled (i.e., expert, sponsor, facilitator/mediator) and well defined during moments of deliberation or conflict and the leaders champion the collaborative implementation
	Knowledge	When the information was presented in different interactive ways, was of good quality, and was understood by the participants
	Resources	When resources were well accommodated and from diverse sources

information about the conflict but not about on how to solve it (uncertainty) AND of leaders who help secure support for collaboration, are committed to collaborative solving problem and impartial to the preferences of the other parties (U{1}*L{2}) OR the absence of any information about the conflict and how to solve it (uncertainty) AND parties' interdependences at both state and local levels AND the presence of leaders who help secure support for collaboration, are committed to collaborative solving problem and impartial to the preferences of the other parties (U{2}*I{1}*L{1}) are necessary and sufficient drivers to initiate collaboration.

This solution is both necessary and sufficient for collaboration to be initiated. It covers 2 Romanian cases studies (Table 8), while other two: the Forestry—Putna-Vrancea Natural Park and Highway—Surlari protected forest cases remain unexplained.

Factors driving collaboration in Romania

The first part of the intermediate solution (CI{1}*L{1}, Table 8) explains why collaboration is initiated in two case studies from Romania: the conflict salience and ripeness, the EU funds as well as the leadership role assumed by the project team have created opportunities for collaboration to be initiated.

In the LIFE Ursus Project case study, the negative consequential incentives were related to the urgent need to resolve the disagreements between stakeholders over the conservation of the brown bear. The conservationists consider the brown bear to be a protected species, which is part of the natural ecosystem. On the other hand, the hunters consider the bear to be a resource that needs to be exploited. Lastly, the livestock farmers and ranchers consider the bear to be a destructive nuisance. Thus, the

Table 5 Main results for each driver likely to initiate collaboration

Drivers	Uncertainty	Interdependence	Consequential incentives	Leadership
Definition (based on Emerson et al. 2012)	Uncertainty refers to the lack of information about how to manage a problem that drives parties to collaborate in an effort to reduce, diffuse, and share risk	Interdependence occurs when the parties express the need to work together to make progress	Consequential incentives refer to internal and external pressures as well as opportunities that lead to the development of collaboration	Leadership is expressed by persons who design and create the collaborative environment
Main results based on previous U.S. case studies	High uncertainty about how to solve the conflicting situation encouraged the parties to consider collaboration as their last best way to solve the dispute	Parties' recognition that they are dependent on each other for any action to occur to solve the conflict increases collaboration in natural resource management	More negative than positive consequential incentives have created opportunities for collaboration to emerge	Self-organizing leadership is more likely to bring the stakeholders to the table creating a chance to transform conflict into collaboration
Main results based on the Romanian case studies	High uncertainty regarding how to solve the conflicts was not sufficient to cause the parties to initiate collaborative efforts	The interest in interdependence applied to collaboration between parties was supported by the need to have the project completed	Positive consequential incentives (i.e., long-term funding) have determined key individuals to take a leadership role and accommodate the resources to stimulate collaboration	Leadership was provided by the team proposing the projects funded through EU grants. The leaders secured resources so that discussions could take place in a collaborative way

Table 6 Necessary drivers for the initiation of collaboration

Combinations of drivers	Explanation	Romanian case studies (no.)	Cons.	Cov.
U{1} + L{1} ← the initiation of collaboration	Regarding uncertainty, information exists about the conflict but no information about on how to solve it has been available OR leaders are present, they help secure support for collaboration, but they are not committed to collaborative solving problem, or impartial to the preferences of the other parties	3	1	0.857
I{1} + CI{1} ← the initiation of collaboration	Parties could not solve the problem on their own and looked for collaborators at both state and local levels OR both positive and negative consequential incentives exist	3	1	0.857
U{1} + I{0} + CI{0} ← the initiation of collaboration	Regarding uncertainty, information exists about the conflict but no information about on how to solve it has been available OR parties looked for collaborators either at state or at local level OR the negative consequential incentives were dominant	4	1	0.750
U{2} + I{0} + L{2} ← the initiation of collaboration	Regarding uncertainty, no information about the conflict and how to solve it has been available OR parties looked for collaborators either at state or at local level OR leaders help secure support for collaboration, are committed to collaborative solving problem and impartial to the preferences of the other parties	4	1	0.750
U{2} + CI{1} + L{2} ← the initiation of collaboration	Regarding uncertainty, no information about the conflict and how to solve has been available OR both positive and negative incentives exist OR leaders help secure support for collaboration, are committed to collaborative solving problem and impartial to the preferences of the other parties.	4	1	0.750
I{0} + CI{0} + L{2} ← the initiation of collaboration	Parties looked for collaborators either at state or at local level OR the negative consequential incentives were dominant OR leaders help secure support for collaboration, are committed to collaborative solving problem and impartial to the preferences of the other parties	4	1	0.750

X{Y} where X is a driver from the dataset and Y is a set of scores of X; + OR, ← the combination of drivers is necessary

cons. consistency, *cov.* coverage

hunters want to kill the brown bear for sport; the farmers want to use the land without suffering losses or by investing in protection against the bears; and the conservationists want that farmers to use non-invasive techniques to protect against the bears. Furthermore, the financial opportunity to continue what other past EU

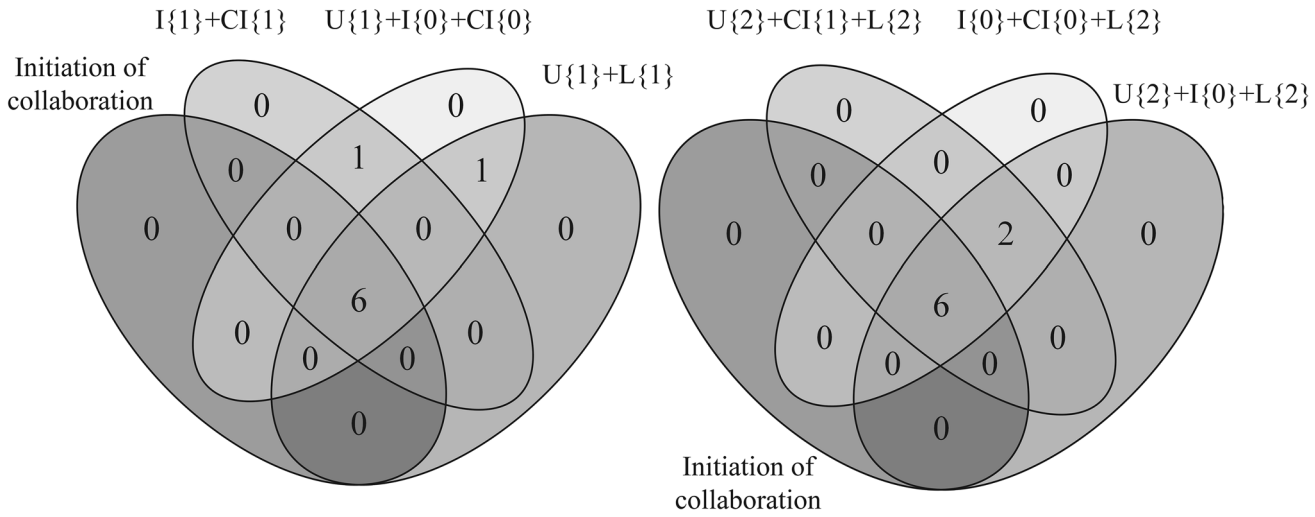

Fig. 2 Combinations of drivers necessary for the initiation of collaboration

Table 7 Intermediate solution for the initiation of collaboration

	Intermediate solution
Solution	CI{1}*L{1} + U{1}*L{2} + U{2}*I{1}*L{1} ⇔ the initiation of collaboration
Consistency	1
Raw coverage	1
Cases covered	6
	qlgUS, luRO, btcUS, tfUS, cbepUS, gsmpRO

X{Y} where X is a driver from the dataset and Y is a set of scores of X; * AND, + OR, ⇔ solution is both necessary and sufficient

qlgUS Quincy Library Group, US; *luRO* LIFE Ursus, RO; *btcUS* Beartree Challenge, US; *tfUS* Alewife Task Force, US; *cbepUS* Casco Bay Estuary Project, US; *gsmpRO* Green Siret Management Plan, RO

Table 8 Partially necessary and sufficient drivers for the initiation of collaboration

Partial solution (as part of the intermediate solution)	Consistency	Raw coverage	Cases covered
CI{1}*L{1}	1	0.333	luRO, gsmpRO
U{1}*L{2}	1	0.5	cbepUS, qlgUS, btcUS
U{2}*I{1}*L{1}	1	0.167	tfUS

X{Y} where X is a driver from the dataset and Y is a set of scores of X; * AND

qlgUS Quincy Library Group, US; *luRO* LIFE Ursus, RO; *btcUS* Beartree Challenge, US; *tfUS* Alewife Task Force, US; *cbepUS* Casco Bay Estuary Project, US; *gsmpRO* Green Siret Management Plan, RO

projects (specifically LIFE) began in terms of threats and conflicts involving brown bears was important to initiate the collaborative efforts. Therefore, a team of experts from regional Environmental Protection Agencies and NGOs took advantages of the EU funds and started an innovative project (LIFE Ursus) focused on enhancing the brown bear conservation status. The team members (the conservationists) pioneered the project. They helped mobilize resources by securing EU funds and donating their energy and time. However, they were advocating for specific methods to conserve the brown bears which made them not impartial to the preferences of the other parties (i.e., the hunters, who had specific methods to evaluate the brown bear population, in a way that the team members, the conservationists, do not accept).

In the Green Siret Management Plan case study, the Lower Siret Floodplain faces several threats related to inadequate grazing, forestry, and hunting practices, aggregate extracting or chemical use in agriculture (LSM Administration 2015). As a result of including the Floodplain within the Natura 2000 network (the ecological network of European protected areas), a management plan of the area was required. Furthermore, a funding opportunity has become available (it is about the 'Sectoral Operational Programme Environment, Axis 4: Implementation of Adequate Management Systems for Nature Protection,' funded by EU funds in partnership with the Romanian government). This has resulted in the emergence of a project, proposed by the Association for Biodiversity Conservation, a NGO, which aims to develop a management plan for the Lower Siret Floodplain and shift from resource exploitation to biodiversity conservation. The association took the leadership role and secured resources, including staff and funding, so that all of the affected

organizations could discuss, in a collaborative setting, their views on the proposed measures to better manage the protected areas. The association prepared meetings and public debates and organized awareness campaigns. However, the Association for Biodiversity Conservation is a young organization and it is not recognized as a leader by the older organizations that have lead for a long period the management of the natural resources in accordance with their interests.

Two case studies from Romania (Surlari protected forest and Putna-Vrancea Natural Park) remained unexplained by the intermediate solution. These are examples of how the initiation of collaboration failed to push parties to further interact and collaborate. For example, in the case of the conflicts triggered by the transportation project planned to cross the Surlari protected forest, although the parties were aware they needed to work together, and negotiated and signed an environmental agreement, they failed to subsequently engage in cooperative activities as a result of the state-road-building-company which ignored the negotiated agreement. Furthermore, the impacts of the transportation project on the migratory and endangered birds in Surlari Forest were not known. This forced the regional Environmental Protection Agency to ask for an Environmental Impact Assessment (EIA). Although an EIA requires collaboration, one of the most important parties, the state-road-building-company, had no interest in collaborating because it was confident it would achieve its desired outcomes under any circumstance.

In the case of the conflicts triggered by the restrictions on harvest levels from Putna-Vrancea Natural Park, the high uncertainty regarding how to achieve a compromise on restricting forest exploitation in a strict protection area encouraged the parties to meet and work together to solve the dispute. However, the parties' intransigence and their low commitment hindered the initiation of collaboration.

Although QCA is a quite a robust method as a result of researcher's in-depth knowledge of the cases (de Meur et al. 2009), we tested the validity of the intermediate solution for the initiation of collaboration by changing the consistency threshold. In the original analysis, we used 0.8 as a consistency threshold for the inclusion of the truth table in the Boolean minimization. We ran the analysis with a higher threshold (0.9) as the next lowest consistency score is beyond the acceptable minimum value (0.75) (Ragin 2009; Thiem and Dusa 2013b). No difference emerged to the original intermediate solution.

DISCUSSION

Romania's political, socio-economic, and environmental context helps to understand what enabled and constrained the effect of the combination of drivers (consequential incentives and leadership) that emerged as necessary and sufficient to explain the initiation of collaboration.

The most important positive consequential incentive refers to long-term funding, specifically EU funding. The impact of the EU grants on natural resources management has become significant in Romania since its entrance into the EU. Both government and non-government organizations translate such financial opportunities into meaningful projects often on biodiversity conservation (Rozylowicz et al. 2017) and sustainable issues (Batusaru et al. 2015). In Romania, collaboration tends to be initiated when financial incentives exist (Szabo et al. 2008), as seen in the cases of Life Ursus project and Green Siret Management Plan where EU long-term financial incentives have encouraged dedicated leaders to bring together all the stakeholders to start the projects. Other studies have also found that positive events can be catalysts of collaboration in natural resource management as long as someone is coordinating the process and the participants. For example, Cinque (2015) discovered that human–wolf conflicts have triggered government directives aimed at fostering collaborative management with the support of public managers. Therefore, we posit that long-term funding is an important driver of the initiation of collaboration when leaders use it to impel collaboration. This finding complements Emerson's et al. (2012) framework, where long-term funding is not a direct driver although it is connected to consequential incentives and leadership. Long-term funding is also underscored in several studies as important driver for initiating collaboration (Sabatier et al. 2005; Ansell and Gash 2007), although it has been found that financial incentives from EU and national resources spent on collaborative actions are likely to stimulate bottom-up collaboration (Eckerberg et al. 2015). Furthermore, without external funding, the capacity of Romania's environmental institutions to carry out collaboration is limited due to understaffing and inexperienced staff in this matter (Szabo et al. 2008) as well as distrust on the idea of working together for a common purpose (Tudor et al. 2015). When external funding is available, it forces collaboration at least as a formal step than a win–win partnership, which undermines the stability of the negotiated agreements. However, opportunities to access EU funding are limited in Romania because these are poorly communicated to the potential beneficiaries (Mikulcak et al. 2013) and because of the difficulty in finding suitable partners (Rozylowicz et al. 2017).

The presence of leaders that help secure support for collaboration seems to be a INUS condition that precedes the initiation of the collaborative efforts that were made both in the previous cases and Romania. This confirms Emerson's et al. (2012) statement that out of the four

drivers, leadership is the most essential in drawing parties into collaborative activities. The evaluation of the Romanian case studies showed that leaders were not always committed or impartial to the collaborative process. As we found in the previous cases, the role of a committed and impartial leader is crucial to drawing parties into collaborative activities, discovering shared goals, building trust, and generating commitments to collaborative problem solving (Susskind 1981; Grijze 2010). Romania has not yet developed a tradition of impartiality. For the most part, in Romania the idea of relying on an impartial leader to manage negotiations would not be well received. Many parties would view acceptance of such an individual as a sign of "weakness" (Floca 2011).

Two out of four Romanian case studies experienced a poor initiation of collaboration. In Romania, few models of collaboration exist. The challenges might stem from a lack of bridging social capital between different types of actors (both state and non-state actors) in conservation matters (Nita et al. 2016), a lack of communication typical for the national planning culture (Puscasu 2009) as well as the fact that collaborative sessions are often organized only to meet formal requirements (Hossu et al. 2017). However, some good practices have been tried, especially in the field of biodiversity conservation and protected areas management (Szabo et al. 2008; Hersperger et al. 2015; Nita et al. 2016). Furthermore, in Romania, collaboration is unfamiliar for many reasons, including the country's transition from a central economy to a capitalist one where decisions are still taken centrally and collaborative approaches are minimized, bureaucratic hurdles (Tudor et al. 2014), and the lack of public institutions that advocate for it (Stringer and Paavola 2013). In Romania opportunities for collaborations are not always made available. Tudor et al. (2014) found that the negotiation processes were dominated by the political power imbalances which have resulted in impeding local involvement in the process. Furthermore, in some cases locals decided not to participate because they are not interested in any change and they do not have any previous experience with participation. This may be the result of Romania's communist past which still plays a role in present day through a dominant central role of state, low degree of decentralization, and lack of awareness for multi-stakeholder engagement (Stringer and Paavola 2013).

In previous cases, collaboration seems to be initiated by the lack of information to fully understand how to solve the conflicts (uncertainty) which encouraged dedicated parties to look for collaborators and secure resources to initiate collaboration. In the Romanian cases, the high uncertainty does not encourage leaders to help parties deal with their contending views. For example, in Green Siret Management Plan case study no previous environmental investigations were done in the area. This led to high uncertainty about the best ways of managing common resources for either conservation or development. However, not the high uncertainty but interdependence determined parties to look for collaborators because they realized that the project implementation could not begin without the support of all the team members and the interested/affected institutions. Although previous research has found that the parties' interdependence may overcome even the most intractable conflicts (Colvin et al. 2015), it seems it works better under uncertainty and leadership in order to facilitate the initiation of collaboration.

Using multi-value qualitative comparative analysis (mvQCA) in conjunction with the framework for collaborative governance adapted from Emerson et al. (2012) has proven useful because it reveals important causal effect of the categories assigned to each of the four drivers that may explain how collaboration is likely to be initiated. Emerson et al. (2012) found that one or more of four drivers: uncertainty, interdependence, consequential incentives, and leadership are most likely to explain why collaborative activities are initiated. Additionally, our study revealed under which combination the four drivers are necessary and sufficient to initiate collaborative problem-solving efforts in natural resource management in a country. This information is useful to other post-communist countries when they want to explore the drivers that might lead to the initiation of collaboration.

In future research, it would be of interest to examine which elements in each of the three components of collaboration dynamics (principled engagement, shared motivation, and joint action, Fig. 1) are essential for the success of collaborative activities. This will reveal important information on what accounts for the success or failure of collaborative efforts. Furthermore, relevant insights into the initiation of collaboration could be gained by systematically comparing and contrasting cases with successful initiation, cases with failed initiation, and cases with lack of any attempt to initiate collaboration. This will reveal opportunities and constraints under which collaboration efforts unfold which is useful information for managers to improve collaborative processes in natural resources management in the future.

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