



# A Social Learning Approach for Stakeholder Engagement in Large Carnivore Conservation and Management

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The present paper reports on a methodology for stakeholder engagement in large carnivore conservation and management, which was implemented in a LIFE project in Greece (LIFE AMYBEAR: Improving Human-Bear Coexistence Conditions in Municipality of Amyntaio–LIFE15 NAT/GR/001108). The methodology was employed within the frame of human dimension actions in that project and included three different stages planned in a modular sequence (stakeholder analysis, stakeholder consultation and involvement, and participatory scenario development). Each stage was operationalized by means of a template (Strengths, Weaknesses, Opportunities, and Threats analysis template; mixed-motive template; template for participatory scenario development), which was designed to structure stakeholder input and interaction and scaffold social learning. The templates were completed by standard methods and procedures in social science, namely, interviews, focus groups, and workshops. The presentation of the methodology in this paper has a demonstration character. The main aim is to showcase its heuristic value in steering stakeholder collaboration and tracking change as a result of stakeholder joint action. The paper will demonstrate the benefits and added value of innovation and change initiated by actions in the LIFE project, as well as the costs or unintended consequences of that innovation and change, which need to be tackled by future stakeholder collaboration. The beginnings of an institutionalization of stakeholder involvement revealed features of both formal (e.g., new institutions established such as a Bear Emergency Team) and informal institutions (e.g., social norms). These features illustrated a departure from the current condition, where social learning may already be traceable. At the same time, however, stakeholder interaction has also delineated additional aspects that need to be addressed by stakeholders. The added value of the methodology is that it can be enacted by stakeholders themselves, provided that they are empowered to take ownership of the social learning process. Therefore, it can be exploited in after-LIFE plans. The approach can also be used in other multi-stakeholder arrangements, such as platforms concentrated on wildlife conservation and management. Finally, it should be noted that the methodology and templates fill an important gap, often highlighted in the social learning literature, in that they offer a toolkit for monitoring and assessment.

**Keywords:** human dimensions, large carnivores, LIFE-nature, social learning, stakeholder engagement

## INTRODUCTION

Initiatives for stakeholder engagement in large carnivore conservation and management have increased worldwide during the last decades. The need to engage stakeholders is pronounced in human-dominated landscapes due to fear of human–carnivore encounters (e.g., Johansson et al., 2016) and damage caused by these species (see Bautista et al., 2017, 2019; Van Eeden et al., 2017; Widman and Elofsson, 2018). Therefore, the comeback of large carnivores in many European human-dominated localities has exacerbated the challenge of human–carnivore coexistence (Chapron et al., 2014; Gippoliti et al., 2018). It has also refueled the debate about an urban–rural divide in dispositions toward large carnivores (see, for instance, Hovardas and Korfiatis, 2012a; Hovardas, 2018a). Many rural stakeholders conceive large carnivore policy as an imposition on rural areas by urban elites with little, if any, attention paid to rural communities. Environmental non-governmental organizations (eNGOs), on the other hand, celebrate large carnivore expansion, which has eventuated despite the fragmentation of their biotopes (e.g., Rio-Maior et al., 2019) and despite the difficulty in managing transboundary large carnivore populations (Bischof et al., 2016). Whatever one's own positioning, all stakeholders would agree that tolerance toward large carnivores is a prerequisite for human–carnivore coexistence. This tolerance depends on rural socioeconomic trends and sociocultural characteristics (see Pohja-Mykrä and Kurki, 2014; Pohja-Mykrä, 2018).

The need to incorporate a comprehensive human dimension perspective in large carnivore conservation and management has been reflected in numerous LIFE projects funded by the European Commission, which have targeted large carnivores. In many European localities, human dimension actions within LIFE projects have focused on stakeholder attitudes and behavior toward large carnivores, for instance, local farmers' and livestock breeders' willingness to adopt good practice in damage prevention methods, such as electric fences and livestock-guarding dogs (LGDs) (Bautista et al., 2019). The predominance of damage prevention methods as a prototype case of good practice reveals a broad consensus among conservation professionals concerning the importance and effectiveness of proactive solutions (Lute et al., 2018), which has also been supported by empirical data on the field (e.g., Van Eeden et al., 2017). Apart from a marked decrease in damage caused by large carnivores, when properly implemented and maintained, there were many reports that the implementation of damage prevention methods has also improved relationships and trust between local residents (farmers, livestock breeders, beekeepers) and eNGOs (Hovardas and Marsden, 2018). A concern in this regard has been how these actions and constructive relationships will continue after the LIFE projects have been concluded. Despite the weight put by the European Commission on after-LIFE plans, there can be temporal discontinuity in implementing and sustaining good practice, which may jeopardize its sustainability. Another aspect related to after-LIFE plans is the ownership of the processes needed to sustain innovation (see Durham et al., 2014). Innovation is usually driven

by pro-carnivore partners, while local actors rarely take any initiative in this regard. Given these shortcomings, it should not be surprising that human–carnivore conflict may resurface (e.g., Fernández-Gil et al., 2016).

Another aspect that needs attention in the design and implementation of LIFE projects has been an inclination to favor the “knowledge deficit model” or “information deficit model” (Wynne, 1992; Gross, 1994; Kahan, 2010). This model is based on the core assumption that members of a targeted group may lack crucial knowledge or information about a topic, and filling this deficit with valid scientific/technical knowledge will have a substantial effect on their attitudes and behavior. Such incomplete knowledge is diagnosed as the main cause of indifference, inaction, or inadequate action, and the restoration of this gap will elicit an informed attitude or behavioral response. Although there were numerous examples implying that the assumptions of the knowledge deficit model do not hold (for a critical reading of the model, see Castro and Batel, 2008; Brossard and Lewenstein, 2009; Wibeck, 2014; Simis et al., 2016; Hovardas, 2018a; McLaughlin and Cutts, 2018), it still informs communication and awareness actions, which concentrate entirely on transmission of scientific knowledge from knowledgeable actors to unknowledgeable audiences. A first objection is that knowledge does not operate alone as a determinant of attitudes and behavior, since it is one factor within a quite complex web of determinants. Second, there are no “gaps” of “deficits” to be found in stakeholders' interpretations. Indeed, social representations research has highlighted how scientific knowledge may be purposefully adapted and assimilated by social groups to legitimize their positions (e.g., Hovardas and Stamou, 2006; Wagner, 2007). In addition, the same scientific knowledge may be employed differently by different stakeholder groups. But even if it was possible to isolate and elaborate on scientific knowledge only, effective learning cannot be secured by knowledge transmission from a source to a target. Such a unidirectional flow does not guarantee any long-term effect of learning, especially in terms of knowledge ownership and inter-contextual application of knowledge (see Hovardas, 2013). Learning needs to be anchored on the experiences of active learners so that new knowledge is constructed by the learner in a meaningful and motivating context and not just dictated by some authority.

The critique to the knowledge deficit model does not intend to undermine the importance of scientific knowledge in some kind of relativistic turn. Instead, it aims to highlight the instrumental use of any type of knowledge by stakeholder groups, which may prove quite innovative in many occasions. The simplistic, unidirectional flow of knowledge and information in the knowledge deficit model does not align with the rich and often unexpected experiences gained by multiple actors in LIFE project consortia. Recent initiatives in Europe capitalized on the germane outcomes of open stakeholder interaction by initiating multi-stakeholder platforms (see Pellikka and Sandström, 2011; Lundmark and Matti, 2015; Hansson-Forman et al., 2018). These schemes were also embraced by the European Commission, which established in 2014 the EU Platform for Coexistence

between People and Large Carnivores<sup>1</sup>, as well as Regional Platforms of the same kind in 2018<sup>2</sup>. These schemes, LIFE project consortia included, present all core prerequisites for social learning, which stands in sharp contrast to the knowledge deficit model (see O'Donnell et al., 2018). For social learning to occur, there needs to be joint stakeholder action and reflection to foster change (Keen et al., 2005). Consortia and platforms comprise “communities of practice,” where stakeholder groups interact and work together on shared goals to improve the current condition (see Wenger, 1998; Wenger et al., 2002). Such communities of practice have been instrumental for social learning (Armitage et al., 2008; Muro and Jeffrey, 2008; Rodela, 2013; see also Steyaert et al., 2007; Lumosi et al., 2019). However, social learning is taken to be both a process (i.e., joint stakeholder action and reflection) and an outcome (i.e., change, understood as improvement; for an elaboration of social learning as both a process and an outcome, see Plummer and FitzGibbon, 2007; Reed et al., 2010; Cundill and Rodela, 2012; Ison et al., 2015). In this regard, communities of practice cannot always guarantee change as an outcome, since this type of social learning cannot be taken for granted. The praxis-based component of social learning underlines its contingent character, where the end result cannot be known in advance (Steyaert and Jiggins, 2007; Measham, 2013). Despite the strong affinity and resemblance of LIFE project consortia and multi-stakeholder platforms with social learning processes, the literature in large carnivore conservation and management lacks a consideration of stakeholder involvement from a social learning perspective. This would showcase how stakeholder collaboration could be steered toward change in concrete settings, revealing a hiatus with prior undesirable practices, beyond the knowledge deficit model. Such an approach will be attempted in this paper.

The present contribution reports on human dimension actions undertaken within the frame of a LIFE-Nature project implemented in Greece (LIFE AMYBEAR), which focuses on the brown bear (*Ursus arctos*). The increasing trend of the bear population in the project area was accompanied by escalated human–bear conflict and human-caused mortality of bears. To address these challenges, human dimension actions were planned and implemented in a sequential and modular fashion, so that the output of a former action would inform the forthcoming actions. Bridges between actions were facilitated by the use of specific templates, which were completed by means of social science methods and procedures, such as interviews, focus groups, and workshops. In the *Methods* and *Results* sections, it will be exemplified in detail how human dimension actions started with a stakeholder analysis, proceeded to stakeholder consultation and involvement, and continued with participatory scenario development, which was employed to steer and monitor stakeholder interaction. Each action concentrated on a template, which was designed to structure stakeholder input, negotiation, and collaboration. The overall rationale was to move on from the knowledge deficit model to a social learning paradigm. Human

dimension actions and templates were designed to scaffold social learning as stakeholders elaborated on the potential trajectories to be taken. The mid- to long-term objective is to empower stakeholders so that they can carry on with the social learning process initiated in the frame of the LIFE project after the latter expires. The present contribution has wider implications for streamlining human dimension actions in LIFE projects toward a social learning perspective. In addition, it provides valuable insight for the field of social learning, broadly, especially in terms of offering a toolkit of templates and instruments for assessment purposes.

## METHODS

### Study Area and Context of Study

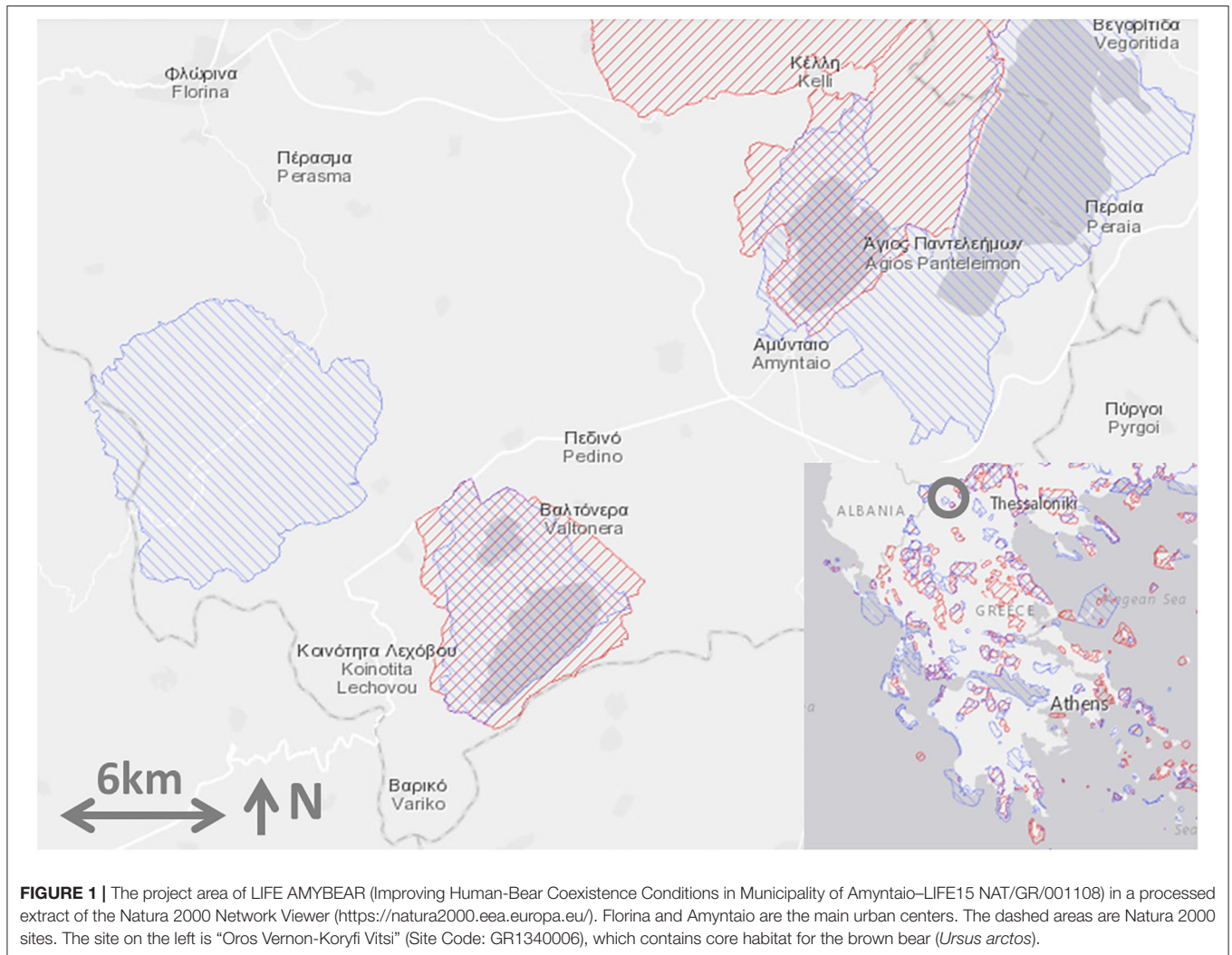
The study focuses on the project area of LIFE AMYBEAR (Improving Human-Bear Coexistence Conditions in Municipality of Amyntaio–LIFE15 NAT/GR/001108), which is situated in Northwestern Greece and includes two Municipalities: The Municipality of Florina, with about 30,000 residents, and the Municipality of Amyntaio, with another 15,000 residents. The Natura 2000 site “Oros Vernon-Koryfi Vitsi” (Site Code: GR1340006) in the project area contains core habitat for the brown bear (*U. arctos*) (Figure 1). The local bear population amounts to around 130 individuals and equals to one-fourth of the overall bear population in Greece (Karamanlidis et al., 2010, 2015). This population is crucial for sustaining the geographic connectivity between bear subpopulation nuclei, since it is directly attached to the Dinara-Pindos population in the North. The increasing bear numbers led to human–bear conflict, since many local residents are occupied in agricultural activities. Traffic accidents and illegal poisoned baits are among the main reasons of human-caused mortality of bears. Illegal poisoned baits do also cause the loss of LGDs in the area, which may count several hundreds annually.

LIFE AMYBEAR started in 2017 with the main objectives to increase local tolerance toward bears and decrease human-caused mortality<sup>3</sup>. The present contribution will report on the human dimension actions of LIFE AMYBEAR, specifically, stakeholder analysis, stakeholder consultation and involvement, and participatory scenario development. These actions concentrated on the risk of bears approaching human settlements and two damage prevention methods, namely, electric fences and LGDs. Concerning bears approaching human settlements, it was addressed by developing bear-proof garbage containers and establishing a Bear Emergency Team (BET), with members from the Forest Service (supervising authority), game wardens of the Hunting Federation, and eNGOs. The BET should intervene when bears come close to or enter human settlements, when they cause recurrent damage to agricultural production, in the case of traffic accidents with bears, and in the event of autopsies executed on killed bears. It operates under the provision of a Common Ministerial Decision: Members of the BET can use deterrents and other techniques (firecrackers, rubber bullets, capture equipment such as dart guns and traps) under a

<sup>1</sup> Available online at: [https://ec.europa.eu/environment/nature/conservation/species/carnivores/coexistence\\_platform.htm](https://ec.europa.eu/environment/nature/conservation/species/carnivores/coexistence_platform.htm).

<sup>2</sup> Available online at: [https://ec.europa.eu/environment/nature/conservation/species/carnivores/regional\\_platforms.htm](https://ec.europa.eu/environment/nature/conservation/species/carnivores/regional_platforms.htm).

<sup>3</sup> Available online at: <http://lifeamybear.eu/en>.



protocol based on the level of food conditioning and outcome of human–bear interaction (Government Gazette 212/07-02-2014). Depending on the circumstances, so-called “problem” bears may need to be aversively conditioned, relocated (moved to another place within the same region), or even translocated (moved to another region)<sup>4</sup>.

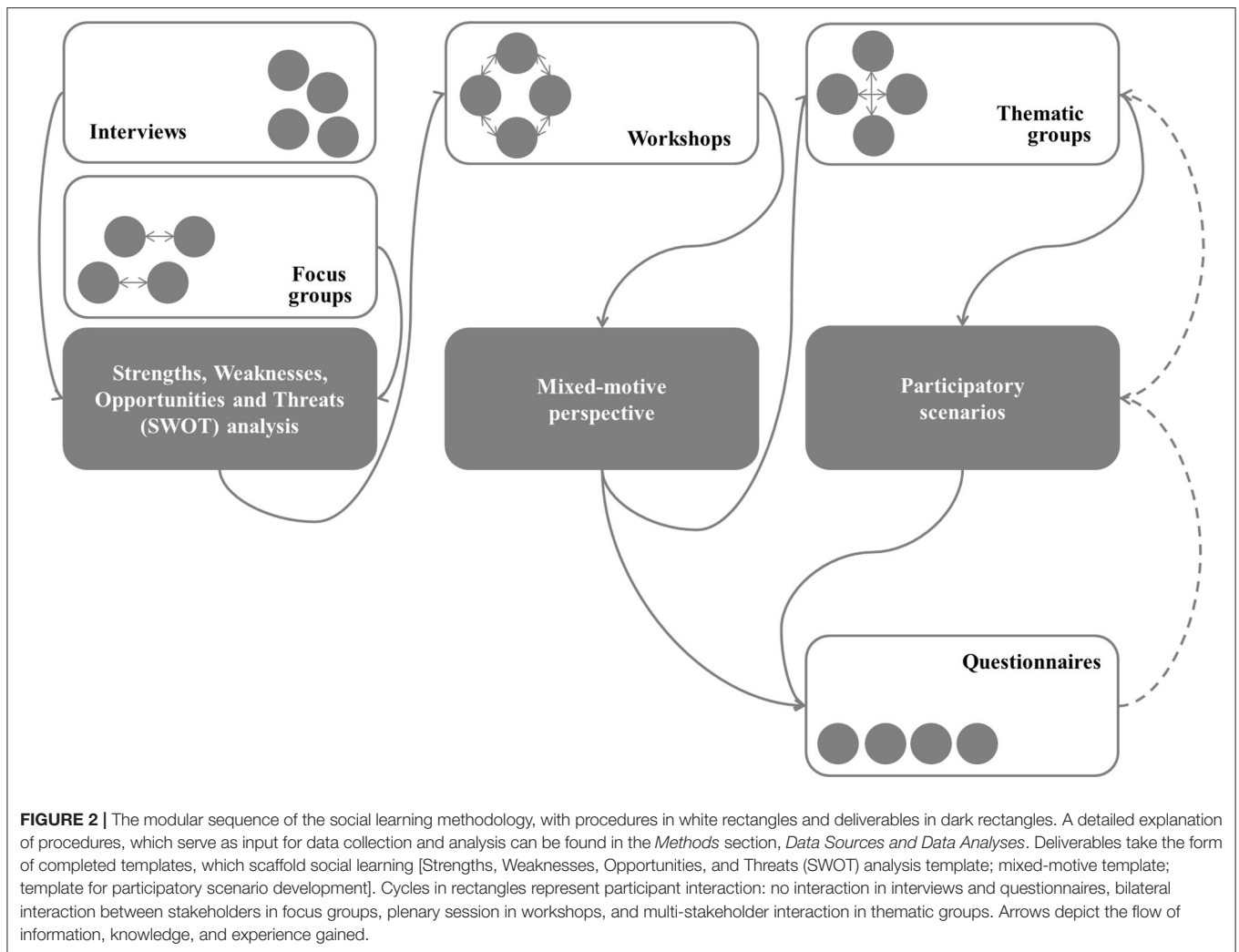
### Social Learning Templates

The approach followed in this contribution was based on the methodology proposed by Hovardas (2018b). It comprises three stages undertaken in a modular sequence: (1) First, stakeholder analysis is conducted to reveal in-group aspects of stakeholders and intergroup relations, which may enable or hinder change and innovation; (2) the second stage orchestrates stakeholder consultation and involvement by considering both benefits and the added value of innovation/change as well as its costs or unanticipated consequences; (3) the third stage includes a participatory scenario development procedure to plan and

monitor stakeholder joint action. Each step of the methodology ends up in the completion of a template by means of social science methods (Figure 2). Stakeholder analysis delivers an adapted Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis template (Tables 1, 4, 7), which is completed by means of interviews and focus groups with key stakeholders. The second stage of the methodology involves the processing of a mixed-motive template with stakeholder input provided in workshops (Tables 2, 5, 8). This stage offers a negotiation and conflict resolution arrangement to explore trade-offs (see *Data Sources and Data Analyses*). The final stage of the methodology builds on a template for participatory scenario development, where stakeholders plan their future initiatives (Tables 3, 6, 9). This procedure is undertaken in multi-stakeholder schemes concentrated on specific objectives (thematic groups).

The presentation of the methodology in this paper has a demonstration character for its potential to structure stakeholder interaction and scaffold social learning. The main aim is to showcase the heuristic value of the methodology in steering stakeholder collaboration and tracking change as a result of that collaboration. The templates of the methodology (SWOT

<sup>4</sup>Lethal control is foreseen as an option of last resort only and after all other methods have been tried and failed.



**FIGURE 2 |** The modular sequence of the social learning methodology, with procedures in white rectangles and deliverables in dark rectangles. A detailed explanation of procedures, which serve as input for data collection and analysis can be found in the *Methods* section, *Data Sources and Data Analyses*. Deliverables take the form of completed templates, which scaffold social learning [Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis template; mixed-motive template; template for participatory scenario development]. Cycles in rectangles represent participant interaction: no interaction in interviews and questionnaires, bilateral interaction between stakeholders in focus groups, plenary session in workshops, and multi-stakeholder interaction in thematic groups. Arrows depict the flow of information, knowledge, and experience gained.

template, mixed-motive template, and template for participatory scenario development) fill an important gap often highlighted in the social learning literature concerning monitoring and evaluation of social learning (Muro and Jeffrey, 2008; Reed et al., 2010; Rodela, 2013). The main scaffolding functionality of the templates refers to the modular sequence of the methodology. Stakeholder negotiation by means of the mixed-motive perspective (second stage) builds on the content of the SWOT analysis template of the first stage, while the template for participatory scenario development in the third stage builds on the mixed-motive template of the second stage. Overall, there is a transition from stakeholder analysis to stakeholder consultation and involvement and then to participatory scenario development<sup>5</sup>. This operationalization secures an iteration of

deliberation/action–reflection cycles, which has been highlighted as indispensable for social learning (Keen et al., 2005; Van Epp and Garside, 2019). The added value of this perspective is that it can be enacted by stakeholders themselves, without the need for an external facilitator, provided that stakeholders are empowered and motivated to do so. Therefore, it can be exploited

<sup>5</sup>There are several parameters to consider when elaborating upon the appropriateness of the methodology for a local context, its cost-effectiveness and its feasibility. The appropriateness of the method is to be judged based on whether stakeholders in a local context need to cooperate to achieve a common goal or set of goals. The methodology itself cannot guarantee any success, which is to be determined by the course of stakeholder interaction, but it can certainly enable social learning by steering stakeholder interaction, at least up to a degree.

This will be ascertained in the two transitions between the three stages of the methodology. First, the transition from the stage of stakeholder analysis to stakeholder consultation and involvement: A thorough stakeholder analysis exemplified in an inclusive and comprehensive SWOT analysis template will feed in stakeholder consultation and involvement and enable stakeholder negotiation around trade-offs. Second, the transition between stakeholder consultation and involvement and participatory scenario development: A sincere and exhaustive negotiation will enable the formulation of realistic scenarios to steer stakeholder joint action. The cost-effectiveness of the methodology can be discussed with reference to several multi-stakeholder schemes that currently operate in Europe and cover various areas of natural resource management. If the methodology is aligned with the operation of these schemes, then it may be perfectly integrated in the agenda of stakeholder meetings to guide their interaction and collaboration in concrete locations. The feasibility of the methodology is to be assessed on the basis of whether stakeholders can use it to plan and implement common action even if disagreement or conflict between them persists or resurfaces.

**TABLE 1 |** SWOT analysis template for bears approaching human settlements.

	Local authorities	Farmers/stockbreeders	eNGOs	Forest service	Hunters
Strengths (in-group aspects promoting innovation/change)	Committed to adapt waste management systems	Option to supply and establish deterrents	Participation in the BET	Participation in the BET	Participation in the BET
Weaknesses (in-group aspects hindering innovation/change)	Concerned that bear-proof containers may increase time for garbage collection substantially	High risk of a human–bear encounter that cannot be easily dealt with, for instance, when farmers water their cornfields in the night	Bureaucratic problems and delay in the supply of equipment for the BET perpetuate the distinct position and competence of eNGOs in dealing with emergencies	Budget cuts due to the economic crisis in Greece adds considerable challenges to the operational capacity of the Forest Service	<ul style="list-style-type: none"> <li>• Risk for human safety in human–bear encounters</li> <li>• Risk of hunting dogs being killed by bears</li> </ul>
Opportunities (intergroup aspects promoting innovation/change)	Can implement awareness campaigns and outreach for the use of adapted waste management systems	Endorsed subsidies for leaving 10% of crops (corn) unharvested for bears	Transfer of good practice as an opportunity for optimization	Wider synergies acknowledged for increasing food sources for bears in forest management plans	Enhanced role of game wardens through synergies with the Forest Service
Threats (intergroup aspects hindering innovation/change)	<ul style="list-style-type: none"> <li>• Bear-proof garbage cans may redirect bear routes</li> <li>• Lack of knowledge how to react when encountering bears decreases tolerance toward bears</li> </ul>	Local communities may oppose deterrents, especially when they cause noise	A latent attitude that eNGOs “own” bears is still existent among stakeholders	Gaps in long-term planning probable, which hinders the effective coordination of stakeholders	The hunters’ suggestion that managing the bear population (culling) cannot be ruled out may create tension with eNGOs

BETs, Bear Emergency Teams; eNGOs, environmental non-governmental organizations; SWOT, Strengths, Weaknesses, Opportunities, and Threats.

**TABLE 2 |** Mixed-motive template for bears approaching human settlements.

	BET	Waste management systems
Benefits, added value of innovation/change	<ul style="list-style-type: none"> <li>• Cooperation of stakeholders in the BET increases stakeholder recognition and trust and improves intergroup relations</li> <li>• The operation of the BET allocates each stakeholder’s liability according to their institutional mandate</li> </ul>	<ul style="list-style-type: none"> <li>• The need to adapt waste management systems was acknowledged by many local residents</li> <li>• The adaptation of waste management systems is a catalyst for their overall optimization</li> </ul>
Costs, unintended consequences of innovation/change	<ul style="list-style-type: none"> <li>• The operation of the BET adds workload to institutions operating already very near to their capacity limit</li> <li>• The latent and still existent attitude that eNGOs “own” bears does not allow for an effective operation of the BET</li> </ul>	<ul style="list-style-type: none"> <li>• The adaptation of waste management systems necessitates a thorough redesign of logistics</li> <li>• Adapted waste management systems should be incorporated in an integrated planning of all measures at the landscape level</li> </ul>

BET, Bear Emergency Team.

in after-LIFE plans. The methodology can also be used in other multi-stakeholder arrangements, such as platforms concentrated on wildlife conservation and natural resource management.

An additional advantage of the methodology is that the structure of each template guides stakeholder interaction but does not dictate any content, which is left to stakeholders themselves<sup>6</sup>. Such an open character of stakeholder interaction

is a crucial assumption for social learning. Many scholars see a marked overlap between social learning and adaptive

not imply, however, that the implementation of the methodology and the final form of the social learning templates in a particular local context are arbitrary. The structure of the SWOT template in each context will be determined by stakeholder synthesis, while its content will be shaped by the main in-group and intergroup aspects. In this regard, specifications for sample selection, data collection, and data analysis should be respected, so that error is minimized to insubstantial levels or even eliminated in terms of: (1) including all affected stakeholders (sample selection through snowball and purposive sampling); (2) covering all major in-groups and intergroup aspects with implications for large carnivore conservation and management (recruiting multiple independent members from each stakeholder group to achieve saturation of information provided by interviewees and focus group participants); and (3) data analysis (inter-rater reliability should showcase the consistency in using codes over the entire data corpus—qualitative data gathered). These aspects are presented in detail in the section *Data Sources and Data Analyses*.

**TABLE 3 |** Template for participatory scenario development for bears approaching human settlements.

Themes	Business-as-usual scenario	Small-effort scenario	High-effort scenario	Best-case scenario
Bear Emergency Team (BET)	The BET lacks necessary equipment and may not always be able to act as prescribed	BET is properly equipped and its members are trained to use equipment effectively	Competent institutions incorporate the operation of the BET in their organizational structure	The BET updates its operation based on a record of pre-specified parameters for each event
Practical knowledge on how to react in a human–bear encounter	Stakeholders lack practical knowledge on how to react in a human–bear encounter	Good practice guide developed by experts and made available to local stakeholders	Stakeholder engagement in revisiting and regularly updating good practice	Stakeholder ownership of the processes needed to revisit and regularly update good practice
Waste management systems	Waste management systems not adapted to prevent bears from feeding on garbage	Bear-proof garbage containers developed and established in preselected points	Bear-proof garbage containers effectively integrated in waste management systems	Waste management systems redesigned to address integrated planning at the landscape level
Forest management plans	Forest management plans include measures for increasing the provision of natural food sources for bears in forests	Spatial information integrated in updating forest management plans	Stakeholder engagement in updating forest management plans	Forest management plans updated to address integrated planning at the landscape level

Scenarios have not yet been finalized by stakeholders in the LIFE AMYBEAR project area. BET, Bear Emergency Team.

**TABLE 4 |** SWOT analysis template for electric fences.

	Beekeepers	Stockbreeders	Farmers	Merchants	eNGOs
Strengths (in-group aspects promoting innovation/change)	Highlight the importance of the local context in establishing and maintaining electric fences	Possibility of fencing enclosures up to a certain surface	Possibility of fencing certain types of crops and fields	Sustained demand for electric fences	Experience in establishing and maintaining electric fences in many areas
Weaknesses (in-group aspects hindering innovation/change)	<ul style="list-style-type: none"> <li>It is costly to obtain an electric fence unless subsidized</li> <li>May establish an electric fence after having suffered damage from bears</li> </ul>	It is costly to obtain an electric fence unless subsidized	<ul style="list-style-type: none"> <li>It is costly to obtain an electric fence unless subsidized</li> <li>Cost increases proportionally with the area to be fenced</li> </ul>	Grounding equipment is imported and does not align with the local context	Need for further research to study bear behavior after it has been deterred by an electric fence
Opportunities (intergroup aspects promoting innovation/change)	Subsidies available in forthcoming calls	Subsidies available in forthcoming calls	Subsidies available in forthcoming calls	<ul style="list-style-type: none"> <li>Synergies with local actors in forthcoming calls</li> <li>Can offer after-sale support</li> </ul>	Competence in describing and updating technical details and specifications
Threats (intergroup aspects hindering innovation/change)	<ul style="list-style-type: none"> <li>Eligibility issues in the case of multiple income sources</li> <li>Tension with stockbreeders when the latter pass with their animals through fenced areas</li> </ul>	Eligibility issues in the case of multiple income sources	Eligibility issues in the case of multiple income sources	Cannot easily accommodate differentiated demand	Minimal uptake in former calls due to ineffective outreach

eNGOs, environmental non-governmental organizations; SWOT, Strengths, Weaknesses, Opportunities, and Threats.

management, provided that the latter is conceptualized as an inclusionary procedure with multiple stakeholders and not scientists only (e.g., Armitage et al., 2008; Cundill and Rodela, 2012; Cundill et al., 2012; Schmidt, 2017). For example, social learning and adaptive management share a learning-by-doing, experimental strategy with regular assessments to be taken over by stakeholders. LIFE projects provide the time span needed for a thorough enactment of open procedures of that kind

(Steyaert and Jiggins, 2007; Reed et al., 2010; Johnson et al., 2012; Measham, 2013; Beers et al., 2016). The measure of improvement is not some presupposed solution imported from elsewhere or dictated by some authority. Given the double character of social learning as a process and an outcome (see Plummer and FitzGibbon, 2007; Armitage et al., 2008; Reed et al., 2010; Cundill and Rodela, 2012; Ison et al., 2015), the nature of its tangible outcomes is always contingent on the processes that made them

**TABLE 5 |** Mixed-motive template for electric fences.

	Establishment and maintenance of electric fences	Supply of and demand for electric fences
Benefits, added value of innovation/change	<ul style="list-style-type: none"> <li>• Joint action of stakeholders in the case of electric fences increases trust and improves intergroup relations</li> <li>• Apart from the first reflexive response, the electric fence also secures a long-lasting aversion of the bear</li> </ul>	<ul style="list-style-type: none"> <li>• Supply can be adequately differentiated to cover different needs of different producers in the project area</li> <li>• The effectiveness of electric fences triggered some local supply but local providers are not yet certified</li> </ul>
Costs, unintended consequences of innovation/change	<ul style="list-style-type: none"> <li>• The local context imposes substantial workload for an effective operation and maintenance of electric fences</li> <li>• To decrease total cost, some producers may deviate from good practice in obtaining and setting up the electric fence</li> </ul>	<ul style="list-style-type: none"> <li>• There are beekeepers who need to move their beehives, and these cannot be covered with one electric fence only</li> <li>• Certain specifications of imported equipment do not fit in the local context and need to be reconfigured</li> </ul>

**TABLE 6 |** Template for participatory scenario development for electric fences.

Themes	Business-as-usual scenario	Small-effort scenario	High-effort scenario	Best-case scenario
Supply and demand	Local demand not satisfied	Local demand satisfied by imported equipment	Equipment manufactured locally and certified	Number of electric fences owned, managed, and improved by local institutions
Local context	Local context not adequately addressed	Good local practice guide developed and made available to stakeholders	Stakeholder engagement in revisiting and regularly updating good local practice guide	Good local practice guide incorporated into an integrated planning at the landscape level
Eligibility	Eligibility covering registered producers only in different calls	Eligibility covering registered producers in the frame of the Greek Rural Development Programme	Using additional funding to cover all producers	Damage prevention as a prerequisite for compensation
Outreach	Outreach not planned	Outreach planned and executed by competent authorities	Stakeholder engagement in outreach planning and execution	Outreach planning and execution taken over by stakeholders

*Scenarios have not yet been finalized by stakeholders in the LIFE AMYBEAR project area.*

possible. The outcomes of social learning should be attributed to the unique socio-historical processes that produced them in a certain context and cannot be understood without direct reference to these processes and context<sup>7</sup> (see in this regard Ison et al., 2007, p. 505; Newig and Fritsch, 2009).

## Data Sources and Data Analyses

### Stakeholder Analysis

During the first stage of the methodology (stakeholder analysis), representatives and spokespersons of all key stakeholders were identified in local media and asked to be interviewed by the author. Informants were requested to indicate further potential interviewees. This purposive and snowball sampling started with at least two independent interviewees for each stakeholder group

<sup>7</sup>Sociodemographic and sociocultural factors may influence participants' responses, intention, and behavior during each stage of the methodology. It is expected, however, that stakeholder membership will be the major parameter to mediate participants' positioning. An inclusionary procedure should secure the participation of all stakeholder groups. Based on the templates to be exploited in each stage, the methodology uses stakeholder interaction and the dynamics inherent in the process to steer stakeholder engagement and joint action toward the accomplishment of shared goals. Indeed, it is frequently observed that stakeholders can agree and collaborate on a common agenda, even if disagreement and divergent views on some major or minor issues persist.

and resulted in 32 semi-structured interviews<sup>8</sup>, which lasted between 30 and 60 min and which were recorded with the consent of the interviewees. Interviewees were briefed about the LIFE AMYBEAR project and gave their informed consent for being interviewed. All interviewees were also notified that they were free to withdraw from the research at any time, without detriment, if they wished to do so, and they were granted anonymity and access to the results of the research. The interviews concentrated on bears approaching human settlements, electric fences, and LGDs the interview protocol is given as **Supplementary Material**. Specifically, in-group factors were outlined for each stakeholder group, which either promoted or hindered innovation/change, as well as intergroup factors in stakeholder interaction, which facilitated or impeded innovation/change. The interviewer gave the opportunity to the interviewees to elaborate on any issue they desired, while he formulated new questions to explore emerging issues. Data selection stopped when core information on the focal topics

<sup>8</sup>With regard to the numbers of stakeholder members among interviewees, there were five from local authorities, nine farmers/stockbreeders/beekeepers, four from eNGOs, four from the Forest Service, four hunters, three merchants, and three veterinarians.



**TABLE 7 |** SWOT analysis template for LGDs.

	<b>Stockbreeders</b>	<b>Hunters</b>	<b>Forest service</b>	<b>eNGOs</b>	<b>Veterinarians</b>
Strengths (in-group aspects promoting innovation/change)	<ul style="list-style-type: none"> <li>• There are many good LGDs in the project area</li> <li>• Adequate experience in training LGDs</li> </ul>	Spent a substantial amount of money on their hunting dogs	Responsible by the law for investigating cases of illegal poisoned baits	Supply LGDs through an already existing network, which they have set up covering many different areas	Engaged in LGD care
Weaknesses (in-group aspects hindering innovation/change)	<ul style="list-style-type: none"> <li>• Least-cost investment strategy per dog capita</li> <li>• Empathy for peers who wish to take matters into their own hands</li> <li>• Many hire shepherds and do not themselves accompany their flocks while grazing</li> <li>• In-group tension inhibits exchange of dogs</li> </ul>	May lose hunting dogs when engaged in fight with LGDs	Cannot easily detect perpetrators due to the local omertà	Local demand for LGDs surpasses the supply that eNGOs can currently support	There is no effective outreach for disseminating good practice in veterinarian care for LGDs
Opportunities (intergroup aspects promoting innovation/change)	Supply anti-poison kit	Supply anti-poison kit	Committed to decrease the use of illegal poisoned baits	Increase overall supply of LGDs in the project area and other areas	The local LGD network will improve veterinarian care, nutrition, training, and reproduction
Threats (intergroup aspects hindering innovation/change)	<ul style="list-style-type: none"> <li>• Intergroup tension with hunters catalyzes the use of poisoned baits</li> <li>• Some obtained big dog breeds from other areas of the world</li> </ul>	Intergroup tension with stockbreeders catalyzes the use of poisoned baits	Illegal poisoned baits present a substantial threat for many wildlife species	Illegal poisoned baits are among the primary causes of loss of LGDs in the project area	Cannot succeed unless stockbreeders deal with their dogs as a long-term investment

eNGOs, environmental non-governmental organizations; LGDs, livestock-guarding dogs; SWOT, Strengths, Weaknesses, Opportunities, and Threats.

**TABLE 8 |** Mixed-motive template for LGDs.

	<b>Network of stockbreeders for exchanging LGDs</b>	<b>Illegal poisoned baits</b>
Benefits, added value of innovation/change	<ul style="list-style-type: none"> <li>• Participation in the network was accompanied by a substantial improvement of in-group and intergroup relations</li> <li>• The local network, as part of a broader network in the country, would support stockbreeders in overcoming inbreeding</li> </ul>	<ul style="list-style-type: none"> <li>• An anti-poison dog unit was operating close to the project area and could be called to detect poisoned baits and examine poisoning events</li> <li>• Key stakeholders would be willing to sign a Memorandum of Understanding for sanctioning poisoned baits</li> </ul>
Costs, unintended consequences of innovation/change	<ul style="list-style-type: none"> <li>• Many stockbreeders were reluctant to join the LGD network due to the increased investment needed</li> <li>• There were stockbreeders who deviated from good practice to decrease the cost of maintaining LGDs</li> </ul>	<ul style="list-style-type: none"> <li>• Many stockbreeders were reluctant to join the LGD network given the risk of losing one's dogs to poisoned baits</li> <li>• Anti-poison kits may provide a counter-motive for an effective sanctioning of poisoned baits</li> </ul>

LGDs, livestock-guarding dogs.

was saturated<sup>9</sup>. Interviews were transcribed verbatim, and open coding by the author was used to identify the main codes

<sup>9</sup>With regard to saturation of positions, it was operationalized by means of decision trees developed by coding. Specifically, different positions of interviewees for each topic (bears approaching human settlements, electric fences, and livestock-guarding dogs) were arranged in different branches of a decision tree, and the positions that were iterated by interviewees showcased overlap. When no new branches were added to the decision trees, interviews stopped, since core information on the focal topics was considered to be saturated. The same procedure was followed for focus groups.

employed by interviewees (Strauss and Corbin, 1990)<sup>10</sup>. After a discussion of preliminary coding results between the author and an expert in qualitative analysis, the latter coded 20% of the corpus and inter-rater reliability reached over 85%. Unresolved cases were arranged during a discussion between the two coders. Apart from interviews, five focus groups were also conducted with interviewees who stated their willingness to provide further input. Focus groups provided additional stakeholder input for validating the main findings derived from interviews. Each

<sup>10</sup>These codes are included in the SWOT analysis templates presented in **Tables 1, 4, 7**.

**TABLE 9 |** Template for participatory scenario development for LGDs.

Themes	Business-as-usual scenario	Small-effort scenario	High-effort scenario	Best-case scenario
Network for exchanging LGDs	Local LGD breed gradually degenerates	Stockbreeders enter the network after an eNGO initiative	Stakeholder engagement in managing the network for exchanging LGDs	Stakeholder ownership of the network for exchanging LGDs
Veterinarian care, nutrition, and training	Veterinarian care, nutrition, and training incomplete and/or incorrect	Low-cost guidelines developed and made available to stakeholders for good practice in veterinarian care, nutrition, and training	Institutional support provided to stockbreeders for monitoring good practice in veterinarian care, nutrition, and training	Good practice in veterinarian care, nutrition, and training established as a social norm among stockbreeders
Illegal poisoned baits	Illegal poisoned baits threaten LGDs and wildlife	Competent institutions sign an agreement for banning illegal poisoned baits	Illegal poisoned baits drop in frequency and range	Illegal poisoned baits effectively sanctioned by social norms
Dog breeds	Some stockbreeders obtained big dog breeds from other areas of the world	Other breeds are not mixed with LGDs in reproduction	Breeds of LGDs developed and maintained locally acknowledged as more effective in preventing damage from bears than other breeds	Breeds of LGDs developed and maintained locally established as necessary and sufficient for preventing damage from bears

Scenarios have not yet been finalized by stakeholders in the LIFE AMYBEAR project area. eNGO, environmental non-governmental organization; LGDs, livestock-guarding dogs.

focus group contained members of at least two stakeholder groups (average number of participants = 4), while the author acted as the facilitator<sup>11</sup>. Focus groups lasted around 60 min, and the concentration was again on bears approaching human settlements, electric fences, and LGDs (inter-rater reliability = 86%). Interview and focus group codes were used for the completion of the SWOT analysis template for each topic (bears approaching human settlements; electric fences; LGDs; **Tables 1, 4, 7**).

**Stakeholder Consultation and Involvement**

The next stage involved workshops with a wide participation of key stakeholder groups, which were designed according to principles identified by previous research (Schusler et al., 2003; Muro and Jeffrey, 2008; Johnson et al., 2012). The facilitation was taken over by the author. Stakeholders were encouraged to report and reflect on their positions and practices with regard to the topics of human dimension actions of LIFE AMYBEAR and explain their reasoning in a comprehensive manner (see Steyaert and Jiggins, 2007). Each participant was given enough time for an unconstrained contribution, while all concerns were elaborated upon in turn. The facilitation was fine-tuned to secure a motivated and constructive dialogue, while reframing was

employed to overcome deadlocks (e.g., Pahl-Wostl, 2006; Lumosi et al., 2019). Facilitation also allowed for exploiting disagreement between stakeholders in a constructive manner (see Dyball et al., 2007; Steyaert et al., 2007; Cundill and Rodela, 2012; Cundill et al., 2012; Ison et al., 2015; Beers et al., 2016; Benson et al., 2016). In this direction, participants were prompted to comment on socio-ecological trade-offs, especially, how a certain course of action may be accompanied by a disproportional or unexpected burden on stakeholders (see, for instance, Galafassi et al., 2017).

Overall, 150 participants took part in 10 different workshops held in the project area. Participant selection, informed consent, and participation followed the same pattern as in the case of interviews of the first stage. Spokespersons and representatives of key stakeholders were asked to participate, and they were also asked to invite other in-group members who would be interested. Date, time, and venue for the workshops were announced in local media. This outreach secured a diverse representation of all key stakeholders. Workshops lasted from 1.5 to 2.5 h. Stakeholder positions and dialogue during workshops were transcribed verbatim after all participants granted their informed consent. A coding procedure was followed analogous to the one used for interviews and focus groups in the first stage (stakeholder analysis). In this case, coding aimed to identify current or anticipated benefits and costs of innovation/change, which stakeholders related to different actions (inter-rater reliability = 84%). The end result of this analysis was the completion of the mixed-motive template for each topic (**Tables 2, 5, 8**).

**Participatory Scenario Development**

The mixed-motive templates delivered in the previous stage were used to develop a road map concerning potential paths for joint action by stakeholders. A procedure of participatory scenario development was undertaken by thematic groups with stakeholder representatives under the facilitation of the author. Points of convergence between stakeholders were singled out,

<sup>11</sup>The combinations for stakeholder groups in focus group discussions were determined based on core intergroup interactions concentrated on the focal topics. In the invitations submitted to potential participants by the author, the synthesis of the focus group was presented and the advice of potential participants was sought in terms of the need to include any other member of any other stakeholder group. Although not all possible combinations for all stakeholder groups were trialed, each stakeholder group was represented in all relevant focus group discussions. Further, focus group analysis did not show that there was any omission of any key stakeholder group in any focus group discussion. Overall, there were three participants from local authorities, five participants from farmers/stockbreeders/beekeepers, four participants from eNGOs, three participants from the Forest Service, two participants from hunters, two merchants, and two veterinarians.

while the final course of action was decided to be revisited according to the development of each different initiative. Draft scenarios were differentiated in terms of stakeholder input and resources needed. A business-as-usual scenario described the current condition, while a small-effort scenario demarcated a departure from the current condition toward a commonly agreed objective, after a small-scale investment had been allocated by the stakeholders. In an analogous manner, the high-effort scenario corresponded to a substantive move toward change, while the best-case scenario described an ideal future. These scenarios will be used to scaffold stakeholder interaction, and they will be regularly updated to account for any relevant development in the project area. By the time this manuscript was submitted, the third stage of the methodology was ongoing, so the scenarios to be presented in the *Results* section were under development and had not yet taken their final form (Tables 3, 6, 9). Scenarios will be further supported by the quantitative input of questionnaire data. A first round of questionnaire administration and analysis has been concluded (150 questionnaires gathered and analyzed), while a second round of questionnaires will follow to monitor the main trends in stakeholder attitudes and behavior. Although questionnaire data were not considered for this publication, they are expected to provide valuable insight for consolidating scenarios.

## RESULTS

### Bears Approaching Human Settlements

The SWOT analysis template in Table 1 summarizes stakeholder input from interviews and focus groups in the topic of bears approaching human settlements. Stakeholder groups are shown in columns. The template distinguishes between in-group aspects, which may promote or hinder innovation/change toward effectively addressing the risk of bears approaching human settlements (see “Strengths” and “Weaknesses” in the two first rows, respectively). The template also includes intergroup aspects, which may foster (“Opportunities”) or inhibit (“Threats”) innovation/change toward the same goal. Reading a column from the top downward, we can follow strengths, weaknesses, opportunities, and threats for each different stakeholder group in the template. Reading a row from the left to the right, we can observe in-group or intergroup aspects across stakeholder groups that accelerate or prevent innovation/change. The input of stakeholders in this first topic concentrated on two issues: (1) the adaptation of waste management systems to prevent bears from feeding on garbage (developing and installing bear-proof garbage containers) and (2) the establishment and operation of the BET.

All strengths in Table 1 related to the potential of the LIFE AMYBEAR project to engage stakeholders. Local authorities could adapt waste management systems to bear presence by developing and incorporating bear-proof garbage containers. Farmers and stockbreeders could establish deterrents to decrease the risk of human–bear encounters. Other stakeholder groups, such as eNGOs, the Forest Service, and hunters participated in the BET. There were other in-group aspects, which could hold innovation and change back, for instance, the implication noted

by local authorities that bear-proof containers may increase time for garbage collection substantially (Table 1; Local authorities; Weaknesses). Farmers stressed that some types of risk of human–bear encounter could not be easily dealt with, for instance, anytime they needed to water cornfields, which should be done late in the night. There were several events when farmers found bears in the mid of their fields, where bears gathered corn and fed on it. These occasions increased the threat for human safety dramatically. Hunters also reported human–bear encounters, some of which were highly risky. The two extracts below highlighted these instances:

*You should wish not to see it in front of you. You know, which is the worst situation . . . . When corn grows in the field, it may reach a height of three meters, and there are corridors opened for the traveling sprinkler. . . . When you enter such a field, and when you see it in front of you then your life is in God's hands. I know an event when a farmer from my village had such an encounter in the night, he was about to check his Pomona pump and he saw it right in front of him. . . . The pump is exactly where the mountain starts after the flatland ends. . . . (Interview with farmer).*

*I had last year a terrifying encounter. I was fishing and saw the bear scratching the ground. . . . It had not realized I was there. With the fishing stock in my hand I entered behind a tree and when I turned around I saw the bear closer to me, with a bear cub staring at me. I said this is my end. . . . The cub noticed me, . . . , and the bear understood that something was happening. . . . To my good luck, the wind was blowing to my direction, the bear did not see me at all. . . . It passed with the cub 5 meters from my car. . . . (Interview with hunter)*

An additional risk hunters noted is that bears could kill their dogs, and this could even happen along the periphery of human settlements in the project area. All these aspects were characterized as weaknesses, since they were related to a widely established in-group attitude, which led these groups to attribute the risk of human–bear encounter as “intrusion” of bears in the human-dominated landscape. To counter this intrusion and habituation, the first reaction of stakeholders was to think how to redraw the symbolic boundary separating humans from wildlife, which was supposedly overridden by bears:

*I believe the situation has got out of our hands in the last year. If things go on like this, we will live with bears in our villages in the next few years. Bears enter cemeteries, they enter villages, the flatland is full of bears, this is not to be disputed. . . . You see their footprints wherever you go. I am not sure what should be done but if we leave the situation to continue as it is unfolding right now then we will end up with a serious problem. . . . I believe we would not be able to step out of our houses, we will not be able to walk around our villages. . . . I meet people who say that they stopped going for a walk because they are afraid of bears. (Focus group, stockbreeder)*

Weaknesses for members of eNGOs were bureaucratic problems, which delayed the full supply of the BET with the equipment needed to respond to emergencies and which perpetuated the distinct position and competence of eNGOs in dealing with these emergencies. This was also closely linked to intergroup relations among stakeholders, where other actors sustained a

latent attitude that eNGOs somehow “owned” bears and where responsible for them (Table 1; eNGOs; Threats). This intergroup aspect was classified as a threat, since it sustained a transfer of responsibility to eNGOs, and therefore, it inhibited stakeholders from endorsing innovation and change. At the same time, transfer of good practice in the project area was allocated as an opportunity for eNGOs, since it impelled them to engage all other stakeholders in adapting good practice to the local context and, thereby, in optimizing solutions that proved successful elsewhere. The rest of Table 1 can be read in the same manner for all stakeholder groups recorded.

Table 2 presents the mixed-motive template for the same topic (bears approaching human settlements). This template was completed with stakeholder input in the workshops held in the project area. The focus of participants was again on the BET and on the adaptation of waste management systems. Participants highlighted the added value of the BET in improving intergroup relations between stakeholder groups, increasing stakeholder recognition, and consolidating trust between stakeholders (Table 2; BET; Benefits, added value of innovation/change). An additional benefit was that the BET allocated responsibilities to engaged stakeholders according to each one’s institutional liability and mandate. A widespread concern, however, was that the BET pushed participating stakeholders to the limits of their institutional capacity, since it demanded readiness to act 24 h a day, 7 days a week (Table 2; BET; Costs, unintended consequences of innovation/change). A further concern voiced by members of eNGOs was that the mobilization of stakeholders was mediated by the widespread attitude of eNGOs as “owners” of bears, which led other stakeholders to expect from eNGOs much more than they should, based on the new distribution of duties and responsibilities in the BET:

*Anytime there is an issue with a bear, let us call Arcturos, let us call Callisto. That is not the way it should work. Arcturos and Callisto are environmental nongovernmental organizations... The may be nonprofit, but they are not entitled to make decisions alone and enforce them. (Workshop, member of eNGO)*

The main outcome of the workshops in this topic was that stakeholder collaboration in the BET had improved working relations between stakeholders, but these still suffered from a persistent attitude that transferred the major responsibility for handling bear issues to eNGOs.

With regard to waste management systems, the need to adapt them, primarily by developing and installing bear-proof garbage containers, was acknowledged by many local residents (Table 2; Waste management systems; Benefits, added value of innovation/change). Stakeholders wished to exploit on this opportunity to reconsider and optimize the design of waste management systems overall. An important reservation expressed mainly by local authorities was that the addition of bear-proof garbage containers should be accompanied by a comprehensive redesign of logistics, which may prove to be quite demanding and involve several tasks (Table 2; Waste management systems; Costs, unintended consequences of innovation/change). Further, skepticism was expressed for

planning and implementing different measures separately or on an individual user basis, which all aimed to decrease the risk of human–bear encounters or deter bears from approaching human settlements and agricultural facilities (e.g., incorporating bear-proof containers in waste management systems, updating forest management plans to increase natural food sources for bears in forests, installing electric fences, and installing deterrents in the road network such as wildlife warning reflectors). A major issue here was that all these different measures should not be left to each individual user alone but should be effectively prioritized and coordinated by reference to spatial information, especially, hotspots of human–bear conflict, which was also incorporated among the deliverables of the LIFE AMYBEAR project. In addition, this planning should take into account the foraging behavior of bears, especially, the alternative routes to be taken by the animal after being locally deterred. Therefore, an integrated planning at the landscape level was needed to reach an optimal use of resources and stakeholder input:

*The new law issued in February establishes a managing authority for all protected areas in Western Macedonia. This will create a new institution, which could plan such interventions... What is more, the selection of successful tenderers is concluded these days, who will take over an environmental study for the whole region of Western Macedonia... This is another issue for us to take into account and integrate all environmental management measures in a strategic planning... (Workshop, member of eNGO)*

Table 3 presents a first draft of scenarios for stakeholder joint action. It should be highlighted that all scenarios to be presented in this paper have not yet been finalized by stakeholders in the project area. Table 3 showcases how stakeholder collaboration can be steered, under increasing input and resources, to move toward the accomplishment of shared goals across a set of themes with regard to bears approaching human settlements. A first necessary step to depart from business-as-usual in how the BET works is that the team is properly equipped and team members are properly trained to use equipment effectively (Table 3; BET; Small-effort scenario). This is expected within the frame of LIFE AMYBEAR. A more demanding adjustment is necessary so that stakeholders incorporate the operation of the BET in their organizational structure, which will allow for a timely and effective mobilization of the team (Table 3; BET; High-effort scenario). The best-case scenario for the BET will also encompass keeping a record of the events it has handled, namely, collecting data across an array of pre-specified parameters for each emergency situation. Such a detailed documentation will enable the examination of these events and the regular update of the decision trees currently determining how the BET works. Practical knowledge on how to react in a human–bear encounter was also underlined by stakeholders as a priority theme for joint action. Here, a good practice guide needs to be developed by experts and made available to stakeholders (small-effort scenario). Ideally, the refinement and update of this practical knowledge should not only build on expert input alone but engage local stakeholders, who may ultimately take ownership of the process. In the themes of waste management systems and

forest management plans, scenarios foresee a gradual progression toward integrated planning at the landscape level.

## Electric Fences

All stakeholders converged on the fact that electric fences were most effective in preventing damage from bears. Given this unanimous endorsement, stockbreeders and farmers were willing to discuss the possibility of obtaining electric fences for enclosures up to a certain surface (Table 4; Stockbreeders; Strengths) and certain types of crops and fields, respectively (Table 4; Farmers; Strengths). This sustained demand would provide a strong motivation to merchants who imported the relevant equipment (Table 4; Merchants; Strengths). In addition, the establishment and maintenance of electric fences have been continuously supported by eNGOs, that have much relevant experience from other areas (Table 4; eNGOs; Strengths). A quite interesting theme in interviews and focus groups for this topic was how beekeepers elaborated on the local context to showcase its peculiarities, especially in terms of micro-climate and weather conditions in the project area, which may have important implications for electric fences. Beekeepers explained how the wind may pile up the snow locally and cause a short circuit to occur, thus necessitating everyday attendance of the electric fence during certain periods in the year. All this information would be most valuable to adapt establishment and maintenance of electric fences to the local context (Table 4; Beekeepers; Strengths). The local context also revealed a major weakness in that the equipment local merchants trade is imported and does not always align with the characteristics of the local context (Table 4; Merchants; Weaknesses). For instance, the electric circuit is completed anytime a bear touches the fence, when the current flows through the bear and the earth back to the fence. The grounding for electric fences is imported from Germany, and it has been specified for soils with significantly higher moisture content. Since soil moisture is related to the conductivity of the soil, it is crucial for a proper functioning of the fence to maintain the impulse energy needed to deter the bear (e.g., dry soil presents high resistance and inhibits the proper functioning of the electric fence):

*The main problem we face is grounding... Most electric fences are manufactured and imported from Germany, where soil moisture is relatively high and therefore, the grounding which is included in the fence equipment is configured for high levels of soil moisture... If the grounding does not operate properly, then the electric circuit will not be completed correctly when the bear touches the fence with its snout, and there will not be enough impulse energy. The device may support it but the circuit will not be correctly completed... The main problem is grounding, where we need to add a second one.* (Focus group, merchant trading electric fences)

A related weakness common for all producers is that they usually did not purchase an electric fence unless it was subsidized, meaning that they were all dependent on the relevant calls and that the equipment they received was commercially supplied. This did not leave much room for innovation and change in terms of addressing the features of the local context. At the same time, however, the LIFE AMYBEAR project as well

as subsidies available in forthcoming calls presented a perfect opportunity for intergroup collaboration and synergies, so that past experience was exploited, solutions were differentiated according to the needs of different users, and technical details and specifications were optimized (Table 4; Opportunities for all stakeholder groups). Two major threats underlined here were eligibility and outreach. With regard to eligibility, there was a noteworthy number of producers who had multiple sources of income and who were not eligible or who lacked necessary licenses, which were a precondition for being eligible (Table 4; Threats, for beekeepers, stockbreeders, and farmers):

*For stockbreeders, if I am not wrong, one should have a license for one's enclosure to be able to be eligible for getting an electric fence. Around 80% or 90% did not have a license and they were excluded.* (Focus group, stockbreeder)

These producers were left disproportionately vulnerable to bear damage, especially if a significant percentage of other farmers were implementing damage prevention methods. With regard to outreach, which was taken up mainly by eNGOs as a theme (Table 4; eNGOs; Threats), previous experience showed that poorly planned outreach campaigns before and during the calls resulted in minimal uptake.

The mixed-motive template unraveled the added value of stakeholder joint action, when establishing and maintaining electric fences, in increasing trust and improving intergroup relations (Table 5; Establishment and maintenance of electric fences; Benefits, added value of innovation/change). A further point was that electric fences did not just prevent damage locally but secured a long-lasting aversion of the animal to fenced areas:

*If it is established properly, then bear behavior is conditioned negatively... The strike from the current in the first touch of the bear makes the animal extremely cautious in the next attempts to approach a fence. Either in the same fence or other fences in other locations. That means that the fence will hardly be touched from the same bear in the future... You can hear the current running through the wires, the bear can also hear that.* (Workshop, member of eNGO)

Two items that should be urgently tackled by future stakeholder collaboration were additional workload needed for an effective establishment and maintenance of the electric fences and cost, which led local producers to deviate from good practice (Table 5; Establishment and maintenance of electric fences; Costs, unintended consequences of innovation/change):

*There is one guy... who manufactures a type of device, I did not see it being sold in shops... Let us say now I have the offer of such device for protecting my beehives from a technician who set it up... Can I trust that? Everybody tries to decrease cost... Getting this device, however, can you feel safe?* (Workshop, beekeeper)

Workshop participants also noted that supply could be adequately configured in forthcoming calls to satisfy different needs of users (Table 5; Supply of and demand for electric fences; Benefits, added value of innovation/change):

*It does not only refer to beekeepers. Electric fences can also be used for certain crops and fields as well as enclosures of stockbreeders. Their power can be adjusted to cover many acres, according to the device for power supply and even for panels. We spoke with a farmer between Fanos [settlement in the project area] and Xino Nero [settlement in the project area], he has around 200 acres with cherries... He can set up an electric fence and prevent damage...* (Workshop, member of eNGO)

In addition, there were some attempts to satisfy demand locally, but no local manufacturer was yet certified. Another concern expressed was that some producers, for instance, beekeepers who moved their beehives, could not be covered by one electric fence only (Table 5; Supply of and demand for electric fences; Costs, unintended consequences of innovation/change). Moreover, certain specifications of imported equipment did not fit in the local context and needed to be reconfigured.

Table 6 summarizes scenarios drafted for the topic of electric fences across four different themes: (1) supply and demand, (2) local context, (3) eligibility, and (4) outreach. A challenge for supply and demand is if equipment necessary for setting up a fence could be locally manufactured and certified. A next challenge is if local institutions could own and manage electric fences, so that they could experiment with different devices and installations to improve this damage prevention method. With regard to the local context, stakeholders would benefit from a good local practice guide, which would ideally be incorporated into an integrated planning at the landscape level. In terms of eligibility, stakeholders should examine the odds of adding electric fences as a measure in the Greek Rural Development Programme as well as explore additional funding sources to ensure that all different types of producers are covered. A more demanding planning would take damage prevention as a prerequisite for compensation. Finally, the planning and execution of outreach would preferably engage stakeholders or even be managed by stakeholders themselves.

## Livestock-Guarding Dogs

The topic of LGDs was dominated by two different themes, the network of stockbreeders for exchanging LGDs, which were among the actions of the LIFE AMYBEAR project, and illegal poisoned baits, which caused the loss of hundreds of LGDs annually in the project area. Table 7 presents the SWOT template for this topic. Strengths for stockbreeders and eNGOs indicated that there were many prospects in the area for developing a network of stockbreeders for exchanging LGDs based on the good pool of dogs, the experience of local stockbreeders in training their dogs, and the experience of eNGOs in developing the same type of network in other areas. Indeed, the local network was planned to become part of a broader network operating in several other Greek areas. Tens of puppies were distributed to stockbreeders in the project area, who undertook the responsibility of delivering future dog's offspring back to eNGOs after the first birth with donated parent dogs. These puppies would be available for stockbreeders in the network:

*We could offer by now in the project area 37 puppies and 4 adult dogs, 41 animals, altogether. In August we will further deliver an adult dog in Petres [settlement in the project area]... Our aim is that they get to know with each other... so that they can go on with this networking on their own.* (Focus group, member of eNGO)

A main obstacle in establishing this network was the widespread use of illegal poisoned baits, which could not be easily dealt with by the competent authority, the Forest Service. This was due to the local omertà, since many local people may have information on perpetrators but no one was willing to give this information to the Forest Service (Table 7; Forest Service; Weaknesses):

*Each group blames the other. We listen to hunters talking about illegal poisoned baits put by stockbreeders to drive away hunting dogs. We listen to stockbreeders talking about illegal poisoned baits put by hunters, generally, always to repel livestock-guarding dogs which kill hunting dogs. We listen various thinks coming from various sources.* (Interview with forester)

At the same time, the frequent use of illegal poisoned baits dictated a least-cost investment strategy per dog capita for stockbreeders (Table 7; Stockbreeders; Weaknesses). The local LGD network would substantially improve veterinarian care, nutrition, training, and reproduction of LGDs, and all these aspects were underlined by veterinarians (Table 7; Veterinarians; Opportunities). It should be also noted that stockbreeders never referred themselves to illegal poisoned baits in interviews or focus groups, since this theme was always initiated by the interviewer or the facilitator in focus groups or other participants in focus groups. Indeed, informants from this stakeholder group stated their empathy for peers who wished to take matters into their own hands:

*I have not suffered any damage yet, but if I do, then I may also want to chase it. I know that it is forbidden... but I will be forced to do so. Will anybody compensate me for my loss? Nobody will. For instance, I have spoken to you about those horses of mine. If the bear damages my horses, how could I ever want to have it here again? Nobody will compensate me. And I am not joking, I have spent a lot of money...* (Interview with stockbreeder)

This empathy was recorded as an additional weakness for stockbreeders, since it reflected an implicit tolerance of the use of illegal poisoned baits that would inhibit an effective sanctioning of that practice. Hunters were also engaged in this topic, mainly through an intergroup tension with stockbreeders, which catalyzed the use of illegal poisoned baits targeting each other's dogs (Table 7; Hunters; Threats). Both stockbreeders and hunters were included among beneficiaries for receiving an anti-poison kit, which was a first-aid kit for dogs to be used in poisoning events (Table 7; Opportunities):

*A man had four livestock-guarding dogs we were able to donate to him... and we also gave him the anti-poison kit... He managed to save a female dog...* (Workshop, member of eNGO)

The mixed-motive template for LGDs revealed the added value of the local network in improving both in-group relations among stockbreeders and intergroup relations mainly among stockbreeders and eNGOs. A further added value for stockbreeders was that the local network, as part of a broader network in the country, would support stockbreeders in overcoming inbreeding within the local pool of dogs. However, many stockbreeders were rather reluctant to join the network given the responsibility and investment that this decision would entail (**Table 8**; Network of stockbreeders for exchanging LGDs; Costs, unintended consequences of innovation/change). This was reflected by the extensive examination of puppies to be adopted by stockbreeders, who checked many different features of dogs and used a complex heuristic of triangulating these features:

*They are quite demanding when they check the dogs they are offered... They want to know the dogs' parental lineage, what their parents were like, if the dog will have a big body size, they want to check the face, what will be the shape of the nose, their chest, their feet, their paws, they examine all these phenotypic aspects very carefully. (Workshop, veterinarian)*

This extensive examination highlighted that stockbreeders prioritized certain phenotypical characteristics as indicators and selection criteria for a good guarding dog and aimed to exclude a considerable loss of time and resources, when these criteria were not satisfied. A related concern was that some stockbreeders deviated from good practice to decrease the cost of maintaining LGDs (**Table 8**; Network of stockbreeders for exchanging LGDs; Costs, unintended consequences of innovation/change).

Regarding illegal poisoned baits, all key stakeholders would be willing to sign a Memorandum of Understanding for sanctioning their use (**Table 8**; Illegal poisoned baits; Benefits, added value of innovation/change). The threat from the current use of illegal poisoned baits could be confronted, at least up to a point, by means of an anti-poison dog unit, which was operating close to the project area by an eNGO and which could be called to detect poisoned baits and examine poisoning events. Quite importantly, illegal poisoned baits were closely related to the local LGD network. There were events where stockbreeders lost almost all their dogs within a day due to poisoning. The high risk of losing one's dogs to poisoned baits was a major counter-motive for joining the network (**Table 8**; Illegal poisoned baits; Costs, unintended consequences of innovation/change). Concerns were also expressed that anti-poison kits may provide a counter-motive for an effective sanctioning of poisoned baits.

The scenarios drafted for the topic of LGDs related to (1) the local LGD network; (2) veterinarian care, nutrition, and training; (3) illegal poisoned baits; and (4) dog breeds (**Table 9**). With regard to the local LGD network, a small-effort scenario was organized around the relevant action in LIFE AMYBEAR, with stockbreeders entering the network after an eNGO initiative. Given that more input and resources could be recruited, the local network could gradually be co-managed or even taken over by local stakeholders themselves:

*This can be done even if it is not included among the actions of LIFE AMYBEAR,..., in the stock breeding center,..., which operates under the auspices of the Decentralized Administration of Epirus and Western Macedonia who is a partner in LIFE AMYBEAR. The relevant license needs to be issued. Puppies from reproduction of livestock-guarding dogs can be available to stockbreeders... The Agricultural Agency of the Administration can take over the bureaucratic procedures and cooperate with the local Association of Stockbreeders... I like thinking of the next day, after the project has expired... We can offer livestock-guarding dogs to the local Association of Stockbreeders, the relevant licenses can be issued... It can even be undertaken in collaboration with the Municipality of Amyntaio... The need for livestock-guarding dogs will not end with the project... (Workshop, Officer of the Municipality of Amyntaio)*

A closely related theme was veterinarian care, nutrition, and training, for which low-cost guidelines could be readily developed and made available. A more extended institutional support could be provided to stockbreeders for monitoring good practice in veterinarian care, nutrition, and training (e.g., local authorities, veterinarians employed by competent authorities at the regional level). The best-case scenario here would be based on good practice being established as a social norm among stockbreeders. A similar end result was envisaged for banning illegal poisoned baits. This scenario could start from an agreement, which all competent institutions were ready to sign, and progress through a drop in the use of this practice, to an effective sanctioning of illegal poisoned baits by social norms:

*The illegal poisoned bait is dealt with in the cafeteria. Zero tolerance. If people in the cafeteria target the one who uses illegal poisoned baits and criticize that guy..., this will be the end of this practice... (Workshop, member of eNGO)*

A last theme was related to a trend observed lately when some stockbreeders got big dogs from breeds developed in foreign countries. This was preferred as a supposedly safer, lump-sum investment on getting these big dogs over a more risky longer-term commitment to the LGD network. A relatively small-effort priority in this case was to avoid mixing other breeds with the local breed of LGDs in reproduction, so that the gene pool of local LGDs is not degenerated. High-effort and best-case scenarios once again involved social norms in acknowledging breeds of LGDs developed and maintained locally as more effective in preventing damage from bears than other breeds as well as establishing local LGD breeds as necessary and sufficient for preventing damage.

## DISCUSSION

The social learning perspective that was exemplified in the present contribution can be implemented in multi-stakeholder schemes, including LIFE project consortia, and platforms (e.g., regional platforms for large carnivores). The templates can steer stakeholder interaction, scaffold social learning, and assess the initiatives undertaken. This is expected to empower stakeholders to take ownership of their joint action (see Diduck et al.,

2015). In the case of LIFE projects, the template of the participatory scenario development can be employed to update after-LIFE plans and support stakeholders in outlining further input needed to sustain outcomes in the long-term. Such a social learning perspective should take into consideration the concern identified by Hansson-Forman et al. (2018) with regard to multi-stakeholder platforms for large carnivore conservation and management. These authors noted that the current level of stakeholder interaction in the schemes they examined was inadequate to overcome mere representation and move on to governance with a truly constructive character. A related concern was voiced by Borowski (2010, p. 1010), who emphasized that stakeholder interaction in multi-stakeholder platform may not always remain as open as needed to foster social learning. Aided by the scaffolding templates, stakeholders can set shared goals, pursue joint action, and evaluate the outcomes of their collaboration. Since this approach is process-oriented and does not dictate any content, it is perfectly compatible with the open character of social learning. The modular sequence of the approach presented in this paper showcases how the fragmentary nature of analogous interventions can be overcome (see Schusler et al., 2003, p. 323; Johnson et al., 2012) and how reflection and iterative learning can be orchestrated in cycles of planning, action, and reflection/evaluation (Van Epp and Garside, 2019; see also Keen et al., 2005).

The implementation of the actions of the LIFE AMYBEAR project has been accompanied by the beginnings of an institutionalization of stakeholder involvement, which revealed features of both formal (e.g., new institutions established such as the BET) and informal institutions (e.g., change in social norms). These features illustrated a departure from the current condition, where social learning may be already traceable. This transition also delineated additional actions that are needed to consolidate the effectiveness of stakeholder interaction. For instance, the establishment of the BET in the area has been underlined by eNGO members as a moment of global commitment of stakeholders in bear conservation and management. According to members of eNGOs, the joint representation and responsibility of the Forest Service, the Hunting Federation, and eNGOs in the BET signal that eNGOs cannot be taken as the exclusive “owners” of bears anymore and that all stakeholders admitted their responsibility in the bear issue. At the same time, however, there were several weaknesses stressed in the current pilot operation of the BET, which could be recognizable exactly because the scheme was set in motion. Among the major problems to be urgently tackled were all the bureaucratic barriers that contradicted the very nature of BET in acting timely to deal with emergencies. Moreover, record keeping would add another layer to the social learning approach for the BET. In the mid-term, the prescribed course of action to be taken by the BET, as it was incorporated in the decision trees for proposed action, should be optimized based on these records. Since record keeping is a prerequisite for the improvement of decision trees, this will be an instance of change catalyzed by the outcomes of joint stakeholder action. The pilot operation of the BET reflected how improvement necessary for social learning can be derived by self-regulated and reflective action in iterative cycles of stakeholder collaboration (see Keen

et al., 2005; Steyaert et al., 2007; Armitage et al., 2008; Lumosi et al., 2019; Van Epp and Garside, 2019).

An example of how informal institutions, such as social norms, may mark stakeholder interaction and promote or hinder change was revealed in the case of LGDs. The widespread use of illegal poisoned baits in the area was characterized as unprecedented by members of eNGOs. At the same time, stockbreeders never introduced poisoning themselves as an issue. This silence indicates that the use of illegal poisoned baits was not effectively sanctioned by social norms. Here we can discern a case of a positive feedback loop, where the outcome of an action (illegal use of poisoned baits) may cause more of this same action to occur (increased use of illegal poisoned baits due to in-group or intergroup retaliatory behavior), unless corrective action is taken (social norms changed to effectively sanction the use of illegal poisoned baits). The lack of any spontaneous account on the use of illegal poisoned baits by stockbreeders also reflects some kind of adaptation to that risk, which is strongly related to how stockbreeders managed their dogs. Given the uncontrolled use of illegal poisoned baits, the current risk of losing one's dogs was high, and stockbreeders were compelled to keep all dog offspring but invest less time and resources per dog capita. They preferred to keep a relatively high number of dogs for their livestock, higher than needed, so that they could account for the event of losing their dogs to poisoned baits. Keeping many dogs, however, decreased the investment cost per dog capita, meaning that proper nutrition, veterinarian care, training, and reproduction were not always accomplished. Indeed, losing a dog on which minimal investment had been spent was preferable to losing a dog after having invested on it heavily. In a few words, dogs were managed as consumables. What is more, the increased number of dogs maintained by stockbreeders increased conflict with hunters and presented another positive feedback loop.

Taking all these aspects together, the establishment of a network for exchanging LGDs in the project area can be conceptualized as a type of collective action problem (see Östrom, 1998; Autto, 2014) and, indeed, a quite complex one. These problems arise when more than one agent is needed to take costly action in order to increase the odds of accomplishing an objective desirable by all agents potentially involved (Medina, 2007). Each agent's decision is based on both injunctive norms (i.e., what one ought to do) and descriptive norms (i.e., what peers are perceived most likely to do; see Hovardas and Korfiatis, 2012b). While cooperation may be considered the injunctive norm (since the objective is desirable by all), anticipated peer defection (descriptive norm) may lock agents to a suboptimal choice and lead to mutual defection instead of mutual cooperation. Although the network for exchanging LGDs has been initiated in the project area, sustaining and enlarging this network will necessitate substantial contribution from many stockbreeders. For instance, it will involve a transition from a currently lost-cost investment strategy per dog capita to a strategy with higher investment. This concern was implied by the exhaustive investigation of phenotypic characteristics performed by stockbreeders to dog puppies they were offered, before they decided to enter the network, in an effort to narrow down the



possibility of an ineffective investment. To sustain the network, the desirable shift in investment needs to be accompanied by proper veterinarian care, nutrition, and training, as well as an effective sanctioning of illegal poisoned baits.

As it has been exemplified by the cases of the BET and the network for exchanging LGDs, institutional change, formal and informal, is at the core of social learning. There are signs of change already identifiable in the project area, and there is, of course, additional change needed. However, change as proof of social learning always implies that stakeholder interaction was able to overcome the uncertainty and complexity of the local context (e.g., Reed et al., 2010; Beers et al., 2016). This challenge may be downplayed anytime good practice in large carnivore conservation and management is thought to be readily transferred from one context to another (see Hovardas and Marsden, 2018) and by simplistic accounts of win-win situations, which have been criticized as being unrealistic (e.g., McShane et al., 2011; Muradian et al., 2013; Redpath et al., 2013; Galafassi et al., 2017; Pooley et al., 2017). Social learning processes need to confront a series of interrelated collective action challenges, where change needs to diffuse among in-group members, apart from representatives and spokespersons in inclusionary multi-stakeholder schemes (Reed et al., 2010). These collective action challenges relate to established attitudes and behaviors, which lock stakeholders in positions similar to Nash equilibria, namely, positions where no individual agent would benefit from altering one's own choices unilaterally, without a collective response (see Autto, 2014, p. 49, 64). Small-effort scenarios exemplify a transition away from Nash equilibria, which demarcate the current circumstances and the conformism of stakeholders in harnessing business-as-usual payoffs. Even a small departure from this reality will trigger a move toward questioning own assumptions and approaching more sustainable futures. Perhaps the most urgent change in the project area and elsewhere, which will require an extensive repertoire of such departures, is integrated planning and management at the landscape level. A series of different measures may be planned and implemented separately or on an individual user basis (e.g., adopting waste management systems, revisiting forest management plans to increase the provision of natural food sources for bears in forests, and establishing electric fences), but this fragmentary action cannot lead to synergies. Linking compensation to prevention, which featured in one of the scenarios presented for electric fences, echoes an analogous call by Bautista et al. (2017, 2019). This call needs to be conceptualized within the frame of an

integrated planning and management at the landscape level. Monitoring and assessing social learning in large carnivore conservation and management should address a whole toolkit of measures and not each initiative separately and, indeed, within the frame of complex sociocultural realities, which characterize the human-dominated landscapes of Europe.

## DATA AVAILABILITY STATEMENT

The datasets generated for this study will not be made publicly available. Data availability was not included among the terms according to which the informed consent of participants was granted.

## ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

## AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fevo.2020.525278/full#supplementary-material>

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**Conflict of Interest:** The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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