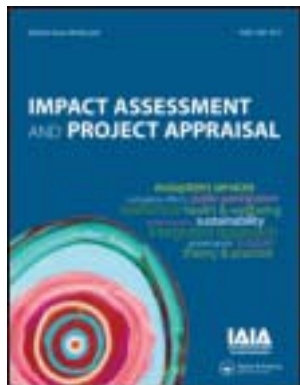


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Exploring the social dimensions and complexity of cumulative impacts: a case study of forest policy changes in Western Australia

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Social impacts resulting from policy changes and other interventions interact and aggregate, and are influenced by additional interventions and exogenous factors, leading to cumulative social impacts. We explored these complex impacts through a case study of forest policy changes introduced in the state of Western Australia between 1999 and 2004. In this process, we both drew on and modified the recently-proposed Cumulative Effects Assessment and Management (CEAM) framework, to improve its utility as an analytical tool for exploring cumulative social impacts that arise from policy changes in natural resource sectors. Our findings highlight the complexity of the pathways that lead to social impacts and the significant influence of individuals' responses. The findings also demonstrate the importance of considering cumulative impacts - negative and positive, and intended and unintended - when designing and implementing mitigation strategies, emphasizing the value of adaptive management approaches. Our results suggest that the CEAM framework, appropriately contextualized and adapted, is relevant to the assessment of social impacts associated with interventions in complex natural resource management cases, and probably more widely.

Keywords: Cumulative effects assessment and management; ex-post facto social impact assessment; forestry; mitigation strategies; policy reform; social impacts

Introduction

Natural resource and environmental policy changes affect, amongst others, business owners and employees working in resource-dependent industries, thus necessitating the use of social impact assessment (SIA) processes to assess, manage and monitor the attendant social impacts. Predicting and managing the social impacts that arise from a single policy, project or programme-related intervention is challenging, partly because of the additional consequences of previous, current and potential future interventions, and other economic, social and political factors (Ehrlich 2010, Franks et al. 2010b, 2011). Short- and long-term experiences of change are also mediated by the responses people make to the positive and negative social impacts they predict or experience (Walker et al. 2000, Ross and McGee 2006, Loxton et al. In press), and by the provision of mitigation strategies implemented with the aim of reducing negative and enhancing positive social impacts (Ehrlich 2010, Loxton et al. 2011, Esteves et al. 2012). Together, these changes alter the nature of the environment in which social impacts are experienced, thus influencing both the implementation and experience of future activities (Brereton et al. 2008, Franks et al. 2011). These interactions mean that social impacts caused by disparate factors are experienced cumulatively (Franks et al. 2009a, João et al. 2011), encouraging increased assessment of cumulative social impacts within SIA (Franks et al. 2010b, Esteves et al. 2012).

Cumulative impacts (or cumulative effects) are defined as the 'successive, incremental and combined impacts of one, or more, activities on society, the economy and the

environment' (Franks et al. 2010b, p. 300). Increased recognition of the cumulative nature of impacts has led to the practice of 'Cumulative Effects Assessment and Management' (CEAM) within the field of impact assessment (Canter and Ross 2010). Previous CEAM studies have focused principally on project-based developments and cumulative environmental impacts, with little focus on social impacts (Canter and Ross 2010, Franks et al. 2011). Empirical evidence is needed to better inform the consideration of social impacts in the practice of CEAM; in particular, improved understanding is needed of the processes involved in the interaction and aggregation of social impacts, and the development of strategies to address cumulative social impacts (Franks et al. 2010b).

Social impacts differ from other types of impacts, such as those on the environment, owing to the role of human interpretation in determining how individuals experience interventions (Lockie et al. 1999, Vanclay 2002, Ehrlich 2010). SIA literature recognizes the complexity of social impacts and distinguishes between social change processes (independently verifiable changes resulting from an intervention) and social impacts (an individual's physical or perceptual experience of those changes) (Slootweg et al. 2001, Vanclay 2002). This distinction emphasizes that changes invoked by an intervention lead to a variety of social impacts that involve both physical (material) and perceptual (symbolic) dimensions (Lockie et al. 1999, Vanclay 2002). SIA also recognizes that people anticipate and respond to social impacts they predict or experience, and thus actively influence the impacts they feel

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(Walker et al. 2000, Loxton et al. In press). The nature of an individual's responses is influenced by the provision of mitigation strategies (Loxton et al. In press).

Despite recent advances in understanding social impacts, little research has focused on understanding how their interaction and aggregation determine the cumulative outcomes people experience. It is therefore helpful to apply current understandings of SIA to the issue of exploring cumulative social impacts, to gain a better understanding of how the recognized complexities of social impacts influence the way people experience social impacts cumulatively, and – in turn – explore the associated implications for the practice of CEAM.

Understanding the pathways that lead to cumulative social impacts encourages the development of processes, methods and tools to better address this complexity (Canter and Ross 2010). The recently developed CEAM framework (Franks et al. 2010a, 2010b) articulates the pathways through which cumulative impacts develop. The framework was first conceptualized in the context of the mining industry, where individual mine sites (referred to in the framework as 'activities'), each involving multiple actions, inputs and outputs, lead to activity-specific impacts that interact and aggregate, thus generating cumulative impacts (Ehrlich 2010, Franks et al. 2010b). Although the CEAM framework assists the conceptualization of cumulative impacts, it has not yet been applied to examine social impacts resulting from policy changes in natural resource management. We therefore felt it useful to use and evaluate these recent developments in CEAM theory in the process of examining the social dimensions of cumulative impacts in the natural resources arena through a case study of forest policy change in south-west Western Australia (SWA).

The following section of this paper outlines our research approach. In the Results section we describe the modifications we made to the CEAM framework, and then discuss our results in terms of how they both reflect and helped modify the original CEAM framework. The discussion explores the implications of the complexity of cumulative social impacts for their assessment and management.

Research approach

The SWA native forest timber industry experienced significant changes between 1999 and 2004. These resulted from the implementation of three policy changes that reduced access to native forests for timber production and introduced regulations affecting the harvesting and processing of timber. The policy changes provided an ideal case study to examine the dynamics of cumulative social impacts because the three successive policy changes each involved different negotiation processes and introduced new changes, and thus contributed to cumulative social impacts.

We used an adaptive theory approach to explore the dynamics of cumulative social impacts. Adaptive theory encourages an iterative process of data collection, analysis and theorizing in which prior theory – in this case, existing SIA and CEAM theory – is used to guide the research process, while also being adapted through it (Layder 1998). This research approach enabled us to draw on the

original CEAM framework to inform our interpretation of the data, and to use that interpretation to modify the CEAM framework. While we discuss our methods and the modification of the CEAM framework separately, in practice data collection and analysis began concurrently, and the CEAM framework was modified by and in turn influenced the data analysis process. Further information about the case study, research methods and results are reported in Loxton et al. (In review).

Data collection

Semi-structured interviews were conducted between May and November 2010 with 41 participants, all of whom were stakeholders in the SWA native forest industry. Participants included business owners, managers and employees engaged in timber harvesting and haulage, and in sawmilling and furniture making; government agency staff involved in forest management and regulation; and representatives from peak industry bodies, and from community, environmental and tourism organization (Loxton et al. In review). The three policy changes examined in the case study also contributed to social impacts experienced at the community and regional scales, and by other stakeholder groups (see Coakes Consulting 2002, Brueckner et al. 2006); however, our study focused on members of the native forest industry to conduct an in-depth assessment of a key stakeholder group, rather than what would necessarily have been a less detailed study of a broader range of impacted groups.

Interviews were guided by three high-level questions:

- What is your experience of the SWA forest industry?
- What changes have you seen in the industry over time?
- How have you been affected by, and responded, to those changes?

All but three interviews were audio-recorded and transcribed. Documents including parliamentary records, media articles, and other reports produced as part of the policy change processes were analysed to provide further context to the study.

Data analysis

We began the data analysis process from the first interviews as we recorded our reflections and synthesized these with relevant literature. Once transcribed, we analysed the interview texts further through a process of coding and comparison. Coding refers to 'labelling' segments of text to indicate the themes discussed by participants and facilitate comparison of these themes across the multiple data sources (Layder 1998, Attridge-Stirling 2001). As we analysed the data we drew on, and modified, the CEAM framework.

Results

Results are discussed in five sections. The first describes the modifications we introduced to the CEAM framework.

The following four sections draw on the modified CEAM framework to demonstrate the new understandings of cumulative social impacts that developed through the research. The second section outlines the activities and actions involved in the 1994–2004 SWA forest policy changes and other relevant exogenous factors. The third section describes the ‘receiving environment’ (defined in Table 1). The fourth section discusses the activity-specific and cumulative social impacts experienced by participants, focusing on uncertainty, perceptions of injustice, and financial stress. The fifth section highlights the multiple interactions, aggregations, responses and feedbacks that contributed to these three cumulative social impacts.

Modifications to the CEAM framework

We modified the original CEAM framework (Franks et al. 2010a, 2010b; Figure 1) through the research process to improve its utility as an analytical tool for exploring cumulative social impacts. The modifications are represented in Figure 2 and explained in Table 1. We first modified the framework to apply it to our forest policy case study by defining an activity as the introduction of a forest policy or management change (hereafter, ‘policy change’). Each policy change consisted of multiple individual changes, referred to in the framework as actions, and led to activity-specific impacts.

As we modified the original CEAM framework we redefined some concepts to improve their applicability to the social dimensions of cumulative impacts. First, the concept of the receiving environment as a system defined on the basis of geographic, social or economic dimensions was construed as the multiple interacting and nested social groups in which changes and impacts are experienced (Franks et al. 2011; for a discussion of nested scales of social impacts, see Schirmer 2011).

Second, we redefined the concept of actions, originally described in terms of inputs and outputs associated with source and sink impacts because these terms did not fit well with participants’ conceptualizations of social impacts. Instead, we interpreted actions as referring to the addition or removal of opportunities and restrictions related to native forest resource harvesting or processing, and associated employment.

Third, we expanded the concept of feedbacks by adding the concept of responses made by individuals or communities in reaction to the changes and impacts they anticipated or experienced, as observed in the literature (Walker et al. 2000, Ross and McGee 2006, Loxton et al. In press) and our data. This modification illustrated the significant influence that an individual’s actions have on the negative and positive social impacts they and others experience, and the potential for these responses to influence the achievement of policy goals.

Fourth, we expanded the scope of the impact pathway included in the original CEAM framework, which depicts feedbacks from cumulative social impacts as leading to additional social impacts. We acknowledged that

responses and feedbacks are both influenced by, and in turn influence, individuals’ experiences of social impacts. We also added the influence of social impacts on the implementation and realization of policy changes, recognizing that the achievement of some policy goals requires particular actions by individuals. Finally, we added a further feedback process, extending from the receiving environment to activities. This modification emphasizes that the presence of an activity changes the nature of the receiving environment, thus influencing future activities (Brereton et al. 2008).

Activities, actions and exogenous factors

While the outcomes of a policy change may be easily defined, individuals’ ability to respond to the resulting changes, and the presence of other past, current or foreseeable future changes and exogenous factors, must be taken into account when assessing cumulative social impacts. This requires a thorough understanding of the broader context in which change is introduced. Therefore, our first step in assessing cumulative social impacts is to examine these contexts through a brief history of the policy change processes we examined and participants’ reflections on the activities and actions associated with them.

Activities and actions

Changes to the management and harvesting of native forests in SWA were introduced through the Regional Forest Agreement (RFA) for the South-West Forest Region of Western Australia signed in May 1999 (Commonwealth of Australia and State of Western Australia 1999); additional changes were made by the State government in July 1999 (usually referred to by members of the industry as ‘the backflip’; NAFI 1999), and by the Protecting Our Old Growth Forest Policy (OGP) introduced by a new State government in February 2001 (Australian Labor Party 2001). Together, implementation of the three policy changes led to a *c.* 70% increase in the area of public forest conservation estate, and *c.* 70% reduction in the allowable annual harvest of the two predominant commercial timber species (data derived from Commonwealth of Australia and State of Western Australia 1998, Conservation Commission of Western Australia 2004; also see Houghton 2012). These policy changes were associated with a number of actions, including those related to the policy negotiation processes, outcomes of these negotiations, and provision of mitigation strategies.

The RFA introduced changes to the processes by which forest industry businesses gained access to timber from publicly owned native forests. Sawmills were required to apply for a 20-year Wood Supply Agreement, replacing previous shorter-term licences. The existing system, in which harvest and haulage contractors were contracted directly by sawmills, was replaced by one in which the state Forest Products Commission engaged contractors (Conservation Commission of Western Australia 2004). The forest management changes associated

Table 1. Explanation of the original and modified Cumulative Effects Assessment and Management frameworks (drawing on Franks et al. 2009b, 2010a, 2010b, 2011).

Original concept	Description	Modified concept	Explanation for the modification and use of the concept for this paper
Modified concepts			
Activities: mine and non-mine	The (proposed) mine or non-mine activity (intervention) in addition to other past, current or reasonably foreseeable future activities. Franks et al. (2011) refers to developments	Activities: previous, current and anticipated future forest policy changes	A past, current or reasonably foreseeable (anticipated) future change in native forest policy or management (i.e. 'policy change')
Feedbacks	Cumulative impacts influence the development of additional activity-specific impacts via feedbacks	Feedbacks and responses	We added the concept of responses and modified the direction of the feedback to emphasize people's ability to respond to changes or activity-specific impacts and recognize that cumulative social impacts both encourage and are influenced by these responses. Finally, we added an additional feedback, from the receiving environment to further activities, as activities change the nature of the receiving environment, thus influencing future activities
Actions: inputs and extra-outputs/outputs and additions	The individual actions, including the input/output and extraction/addition of natural, social and financial resources that occur in the process of carrying out activities	Actions: restrictions and opportunities	The individual components involved in the development and implementation of policy changes. The concepts of opportunities (factors that assisted members of the industry to adjust to change and/or provided new projects or employment) and restrictions (factors that hindered members of the industry from conducting their original business or employment activities, or which reduced their or others' income) was adopted to reflect the forest policy context and participant's language
Reframed concepts			
Receiving environment	The system (e.g. the 'social group, economic unit or geographic region') in which activities take place/impacts are felt (Franks et al. 2011, p. 202)	Receiving environment	We emphasize the presence of nested, interacting social groups
Activity-specific impacts	Impacts associated with actions and activities	Activity-specific impacts	We expanded the scope of their influence: activity specific impacts were influenced by responses people made to the specific/cumulative impacts they experienced and influenced the implementation of activities/actions
Source and sink impacts	Source impacts resulting from the extraction of a resource (biophysical or human), and sink impacts resulting from the addition of material	Restrictions and opportunities; their influence on policy implementation	Restrictions and opportunities were associated with activities and thus activity-specific impacts. Activity-specific impacts influenced the implementation of activities and the outcomes of policy changes
Interaction (triggers and associations)	Impacts may be triggered by, or associated with other impacts, leading to cumulative impacts	Interaction (triggers and associations)	We emphasized the process by which feedbacks and responses directly influenced interactions
Cumulative impacts	The 'successive, incremental and combined impacts of one, or more, activities on society, the economy and the environment' (Franks et al. 2010b, p. 300). The sum of the aggregation and interaction of all activity specific impacts and exogenous factors	Cumulative impacts	We focused on cumulative social impacts
Unmodified concepts			
Aggregation (time and space)	The accumulation over time of impacts associated with the implementation or anticipation of multiple activities within a receiving environment	Aggregation (time and space)	No change

Table 1 – continued

Original concept	Description	Modified concept	Explanation for the modification and use of the concept for this paper
Exogenous factors	External factors that influence a receiving environment regardless of the activity/actions, e.g. 'variations in climate, global economic conditions or cultural or social trends' (Franks et al. 2010b, p. 300)	Exogenous factors	No change

with the SWA RFA, 'backflip' and OGP were operationalized in the 2004–2013 Forest Management Plan (Conservation Commission of Western Australia 2004).

As part of the RFA process, the Commonwealth and Western Australian governments funded a Forest Industry Structural Adjustment Package (FISAP) to support opportunities for industry restructuring and to assist those who left the industry (Rush Social Research Agency 1998, Auditor General for Western Australia 2005). FISAP was expanded with subsequent policy changes. The four main programmes were:

- Business Exit Assistance to assist business owners to exit or partially exit the public native forest timber industry;
- Industry Development Assistance to encourage innovation and business development by contributing to the costs of purchasing new equipment required to produce higher-value (i.e. 'value-added') products;
- a Worker Assistance Program to provide redundancy payments, training, relocation assistance and other support to workers who lost their job;
- Community Development Assistance to assist towns to develop new opportunities (Auditor General for Western Australia 2005).

Support was also offered by government agency staff, and community and industry groups, who provided information and personal support, and assisted people to access FISAP programmes.

Participants' reflections on activities and actions

While interview participants easily identified the three principal policy changes, the RFA, 'backflip' and OGP, the individual actions attributable to each policy change were generally less understood. There are probably two reasons for this. First, the changes were made in quick succession, so participants experienced them at the same time because, for example:

If you stop logging you stop logging ... whether it was Old Growth [OGP] or whether it was RFA, there was no difference to the average timber worker and the community, because the end result was the same. (Industry representative 1)

Second, some actions such as the FISAP provisions were associated with more than one policy change. This indicates that, in some circumstances, the nature of the individual activities and actions is less important than the overall experience of these activities and actions, because it is the overall experience to which the individual experiences and responds.

A subset of participants were more aware of the processes responsible for the multiple policy changes and distinguished between their various actions. These participants referred to the progressive implementation of the policy changes and the relative influence they had on their livelihood, usually identifying that the influence accumulated. For example, a business owner explained

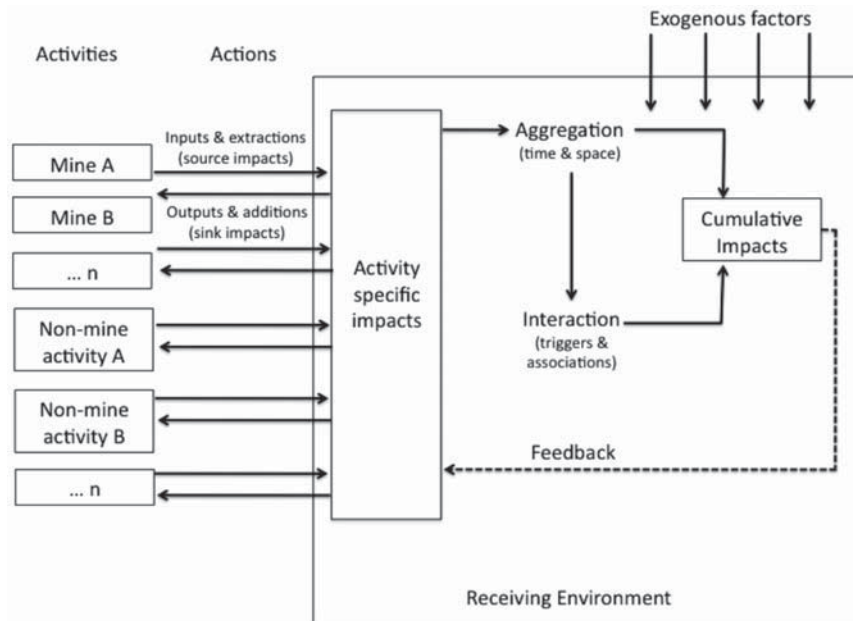


Figure 1. Original Cumulative Effects Assessment and Management framework (reproduced based on Franks et al. 2010a, p. 13, 2010b, p. 300). Used with the kind permission of Daniel Franks.

The one that we've really got clobbered with was following the RFA, was Court's 'back flip'. That created enormous disruption. And then the next one which was the killer of them all was, and which we still haven't recovered from, was the Gallop government one [the OGP]. (Processor/owner 1)

the competitiveness and profitability of the forest industry, viewed as creating additional restrictions. The breadth of these factors indicated the mixture of symbolic, 'intangible' factors (for example, cultural norms) and material, tangible factors (for example, market competition) that together influenced participants' cumulative experiences of the three policy changes.

Exogenous factors

Exogenous factors also influenced the changes and impacts that participants associated with the policy changes. Exogenous factors included reduced public acceptance of harvesting native forests, viewed by many in the industry as 'unfairly' driving policy changes, and factors influencing

Anticipated future activities

At the time we conducted the research, participants were anticipating further change as one of the region's largest forest industry businesses had announced significant

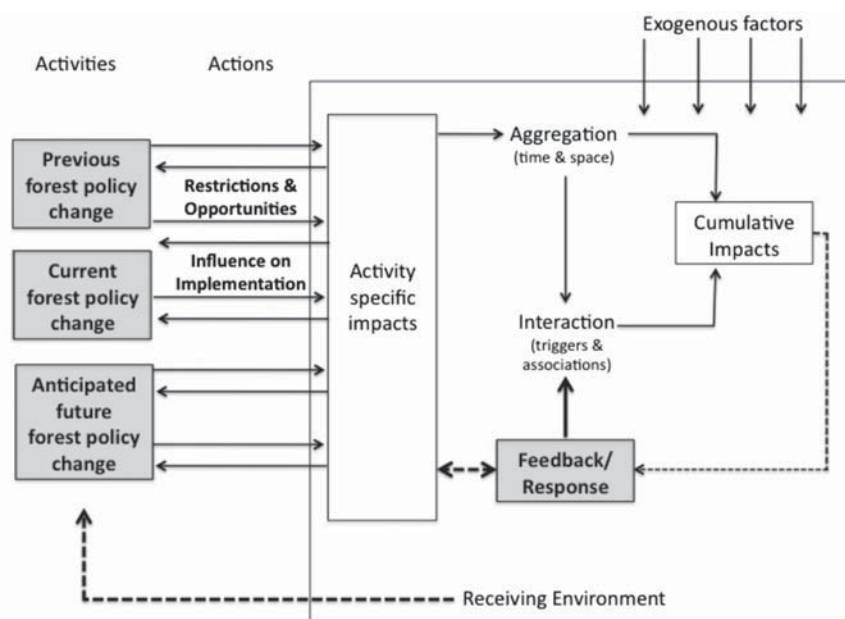


Figure 2. Modified Cumulative Effects Assessment and Management framework (based on Franks et al. 2010a, p. 13, 2010b, p. 300). Modifications are highlighted in a shaded box and/or have been bolded. Used with the kind permission of Daniel Franks.

restructuring. Future policy changes were also anticipated with the implementation of the next (2014–2023) Forest Management Plan. Participants made various predictions about the future structure and management of the industry, although most felt uninformed about the anticipated changes. The continuing impact of anticipated changes suggests the need for studies of cumulative social impacts to assess the influence of perceived future changes on the responses that individuals make at a given point in time and the concerns they express during an SIA.

The receiving environment

In the context of this research, the receiving environment referred to the socially defined system, consisting of multiple nested interacting sub-groups, in which activities, actions and exogenous factors were experienced. We defined these sub-groups predominantly on the basis of participants' role in the industry, or involvement in a business. Other factors such as age and education also played a role in distinguishing these groups, and some participants belonged to multiple groups. These groups formed social networks which played an important role in providing members with critical support through the sharing of information and advice that helped to generate new opportunities.

People living and working in local communities in which the native forest timber industry operated were also included in the receiving environment, although they were rarely interviewed as the research approach did not allow for an in-depth analysis of community or regional impacts. These communities included small and medium-sized towns and regional centres dependent on the timber industry to various degrees. While participants were asked to describe their personal and family's experiences, many also discussed their views regarding how others, and their community as a whole, had been affected by forest policy changes. Owners of processing mills also placed their business within the regional- and global-market contexts, demonstrating that factors at these larger scales influence individuals' experiences.

Social impacts

The material and symbolic dimensions of social impacts, and the responses people made to social impacts and policy changes, were interlinked through feedback cycles. Analysis identified three negative social impacts that were specifically cumulative, rather than being attributable to an individual policy change: uncertainty, perceptions of injustice and financial stress. Each is outlined briefly below with specific reference to the CEAM framework to demonstrate the processes through which cumulative social impacts manifested. We present further detail on these social impacts in Loxton et al. (In review).

Uncertainty

Uncertainty manifested itself in the short and long term. It was initially associated with the extended RFA negotiation

and assessment processes. During this period, workers felt concern regarding their job security and future options, although some businesses were considered more secure than others. Business owners discussed their concerns regarding their future access to, and the quality and price of, native timber resources. Participants associated these issues with social impacts at the family and community levels, including anxiety and reduced community morale.

While anticipatory impacts have been documented previously in SIAs and thus were expected to occur here in the short term, the results revealed that participants continued to experience uncertainty. This long term impact was often attributed to the introduction of further policy changes through the 'backflip' and OGP. Most participants felt that these policy decisions had been influenced by pressure from the broader Western Australian electorate, rather than scientific evidence, and felt little control over these policy decisions. These perceptions contributed to participants' uncertainty regarding future forest-management decisions, such as those that would be made in the next Forest Management Plan, due for implementation in 2014.

Feelings of uncertainty and distrust thus increased as additional policy changes were introduced, and interacted with other impacts, including financial stress. For example, increased uncertainty discouraged business owners from investing in their business, as discussed by a contractor:

they're reluctant to possibly spend a lot of money on something that they just haven't got a lot of confidence in. (Contractor 1)

Uncertainty thus had a number of consequences. It generally made it difficult for industry members to make financial decisions or proactive responses to future or current restrictions and opportunities, although exceptions were noted as uncertainty encouraged some members of the industry to leave their job or close their business prior to the conclusion of the RFA. Uncertainty also contributed to the financial stress and sense of injustice members of the industry continue to feel, as described further below. These results highlight how the cumulative nature of social impacts can feed back to produce new restrictions and opportunities, thus contributing to additional social impacts. The ongoing nature of this uncertainty is of particular concern given the SWA RFA's stated aim of providing the native forest industry with security to encourage industry innovation, development and investment (Commonwealth of Australia and State of Western Australia 1999).

Perceptions of injustice

Impacts related to perceptions of injustice centred on participants' perceptions that the policy changes, and therefore their associated social impacts were, to varying degrees, unfair and unnecessary. For some participants it was not the RFA but rather the two subsequent policy changes that frustrated them most, highlighting the influence of both the policy changes and the actions

involved in their design and implementation on cumulative social impacts. Participants often felt that some change to the management of the forest industry had been warranted, but not to the extent that occurred. The accumulation of the perception of injustice with each new policy change, heightened by subsequent activities such as continued anti-logging protests that have hindered their work and the stability of the industry, illustrates the cumulative nature of perceptions of injustice.

The process by which the policy changes were negotiated often contributed to participants' sense of injustice. Most felt that the forest industry had not received sufficient acknowledgement, for example, a contractor suggested that 'they paid no attention to what we told them' (Contractor 1). The controversial context and speed with which decisions were made increased perceptions of distrust of the process.

The implementation of mitigation strategies through FISAP also influenced participants' sense of injustice. Some felt that the support provided was inequitable or contributed to further negative social impacts, even if it also provided new, positive opportunities. Participants discussed the adequacy of the FISAP assistance they had received and reflected on the fairness of the eligibility criteria. Some felt that they had not been supported, linking it to increased financial stress, for example:

the timber mills got a payout, as you're probably aware of. But the end users, such as myself who solely uses jarrah, got ... no compensation or anything under the RFA's closing down of timber mills. And which in my opinion is pretty unfair. (Processor/owner 3)

In some cases a participant's lack of access to FISAP was linked to insufficient knowledge about their eligibility and the application process. Those who felt they had been provided sufficient assistance through FISAP were more positive about their overall experiences of the policy changes and more accepting of the responses they made to them than those who felt that had received inadequate support.

Participants' experiences of FISAP were also influenced by the extent to which they felt others had been assisted by FISAP measures and the fairness of this assistance. Some felt that some successful applicants had not deserved FISAP. A community representative felt disappointment that some members of the community had adopted 'a welfare type of attitude', saying 'they got money, why can't we have some?' (Industry representative 2). These results illustrate that, while mitigation strategies aim to enhance positive, and reduce negative social impacts, their design and distribution can contribute to additional negative social impacts.

Financial stress

Financial stress was the third common cumulative negative social impact discussed by participants. It was interlinked with the context of the forest industry, which participants described as a traditionally low-profit industry. Financial stress was discussed most commonly

by business owners, who highlighted two issues related to financial stress: increased debt and reduced profit. These issues were particularly associated with changes in the price, quality and quantity of the timber resource, and businesses' use of Industry Development Assistance. The latter was associated with both new opportunities and negative consequences, as explained by a mill owner:

we didn't have any money because every two bob we got we'd already put into the business. So you know, the three or four dollars I had to borrow for the dollar they gave us, I had to borrow from the bank. So you know, it was more debt. (Processor/owner 4)

Comments such as this highlighted the importance of ensuring that the design of mitigation strategies works to reduce, rather than to enhance, existing pressures, and to maximize the accessibility of these strategies.

Since the policy changes, financial stress had also resulted from reduced profits associated with competition from both Australian and imported timber products. Mill owners also suggested that the increased costs involved in processing meant that, while the RFA aimed to increase 'value adding', it had led to 'cost adding' (Processor/owner 5) that reduced financial benefits. Financial stress also increased perceptions of injustice since participants felt they had responded as the government expected them to, but had not benefitted as they deserved, as reflected in the following quote:

life has got a lot tougher in this industry and I wouldn't mind so much if there was a reasonable profit at the end of it, to say, 'I'm putting in all this work'. There is no profit at the end of it. (Processor/owner 5)

Participants who had lost their job also spoke of financial stress owing to a loss of income. The long-term impacts of job losses depended on whether individuals had been able to find new, stable employment, which most had.

Interactions and aggregations

Results demonstrated the interaction and aggregation of social impacts in two ways: the experience of one impact often intensified the experience of other impacts, and more than one change or impact often combined to intensify the cumulative impacts experienced by an individual (Franks et al. 2010a). A common example of intensification occurred when a participant's perception that the policy changes had been unjust increased the negative impact of financial stress because it was also perceived as being unjust. The interaction and aggregation of social impacts was often related to responses and feedbacks – for example, responses made in association with the use of FISAP compounded financial stress for some people by increasing debt – making it difficult to separate or determine the relative influence of each of these processes.

The nature of the interactions and aggregations depended on the timeframe in which they occurred. The quick succession of the three policy changes substantially intensified their cumulative impact, which was evident from interview participants' use of language suggestive of an ever-increasing impact associated with the succession

of changes. This occurred for two reasons. First, the activity-specific impacts that resulted from the ‘backflip’ and OGP added to activity-specific impacts already present owing to the earlier RFA process. Second, the two additional policy changes were perceived as counter to the spirit of the RFA, particularly the goal of providing long-term security to the industry.

Responses and feedbacks

Responses and feedbacks, while difficult to separate from interactions and aggregations, were critical to understanding the cumulative social impacts associated with the policy changes. ‘Responses’ refers to the actions people took to influence or adjust to the policy changes and associated social impacts they predicted or experienced. Participants often responded to the policy changes before they were introduced. These early responses were aimed at influencing the nature of the policy changes and included participating in formal and informal public consultation processes. In hindsight, participants often felt these activities had only a limited influence on policy decisions; however, they provided opportunities for industry members to receive peer-support and were sometimes considered enjoyable social activities. The established social networks were drawn on subsequently when adapting to change.

A second early response involved discussing concerns and future options with colleagues, family and friends, other business owners, or with FISAP support staff. However, often the uncertainty and lack of information made it difficult for people or businesses to respond proactively, as explained by a business manager:

we went through a period of hardship at the time, working out what we would do but at the end of the day, it was almost a question of ‘so what happens, happens. So we’ll face it when it does’, (Processor/manager 6)

Larger-scale responses began once the initial RFA-based policy changes were understood. Common responses described were:

- exiting the public native forest timber industry, either with or without the assistance of Business Exit Assistance, and retiring, finding new employment, or continuing other business activities;
- investing in their business to increase their level of value-adding or adjust to new harvesting regulations, often drawing on Industry Development Assistance;
- participating in training programmes or applying for funds to assist relocation through the Worker Assistance Package, or applying for new employment independently, often with other forest-sector businesses. No workers interviewed had experienced long-term unemployment, although participants discussed others who had.

Responses were not limited to a passive acceptance of assistance through FISAP. Many people implemented responses that were independent of FISAP; others implemented responses that drew on their own resources and combined these with FISAP assistance. For example,

some mill owners responded by developing their business to remain competitive in the industry, with this response partly motivated by the opportunity to employ mill workers who had lost jobs in other contracting and processing businesses. In some cases, individual responses received no support from FISAP because the participant either did not realize they were eligible for FISAP or were not eligible for assistance. In other cases, people decided to leave their original employment for personal reasons.

Participants’ responses were influenced by their goals, motivations and capacity and influenced the social impacts they and others experienced through a variety of feedback processes. Feedbacks occurred in two interacting ways. In the first, responses led to new positive or negative social impacts. In the second, they were responsible for changing (avoiding, diminishing or expanding) the negative or positive impacts that they or others would otherwise have experienced. These responses influenced cumulative impacts and led to new opportunities and restrictions. For example, some business owners viewed Industry Development Assistance as leading to positive financial impacts by providing opportunities to explore new markets and increase the capacity of their business, while others felt it led to new restrictions because the financial support did not cover the full cost of their investment, leading to increased debt. A third perspective was evident, in which initial opportunities contributed to subsequent restrictions. The most prominent example of this was market competition: several participants believed that FISAP itself contributed to intensifying market competition because it encouraged multiple processors to expand their processing capacity in a similar direction. This example illustrates that the use of mitigation strategies and other responses can result in longer-term maladaptations (for a discussion on maladaptation in the context of climate change, see Barnett and O’Neill 2010).

Feedbacks were also important from a policy perspective as participants’ experiences of cumulative negative and positive social impacts influenced whether they responded consistently with policy goals. In particular, the initial success of FISAP in encouraging businesses to invest was followed by a period of uncertainty that reduced business owners’ confidence to invest in industry development and new equipment. This reduced the prospect of industry-related policy goals being realized in the longer term, although there were indications that some businesses have made more recent investments.

Finally, findings also suggest a feedback between the receiving environment and future activities. The nature of the native forest timber industry changed substantially as a result of the RFA, ‘backflip’ and OGP – both in terms of its structure and in the confidence of its members; these changes will, in turn, influence the design and acceptance of future activities such as the upcoming Forest Management Plan.

Discussion

Social impacts are experienced cumulatively rather than in isolation (Franks et al. 2009a, João et al. 2011).

Understanding the complex pathways that lead to cumulative social impacts is challenging, but essential to designing effective mitigation strategies that reduce the negative, and enhance the positive, social impacts that arise from an intervention while assisting the proponent to meet their goals. As our study progressed we modified the original CEAM framework to improve its utility as an analytical tool for assessing and managing cumulative social impacts.

The results of this study highlighted three dimensions critical to understanding cumulative social impacts:

- the role of human interpretation and its influence on individuals' physical and perceptual experiences of social impacts;
- individuals' abilities, willingness and confidence to respond to changes and social impacts they predict or experience;
- interactions between the multiple actions, including mitigation strategies, involved in a single policy change.

The role of human interpretation, and the interacting physical (material) and perceptual (symbolic) dimensions of social impacts (Lockie et al. 1999, Vanclay 2002), have important implications for understanding cumulative social impacts, for two reasons. The first, as reflected in the modified CEAM framework, is that individuals' perceptions of the restrictions and opportunities that result from policy changes influence both the social impacts they experience and their responses to these changes and social impacts. Understanding that individuals may perceive opportunities and restrictions differently encourages mitigation strategies that provide a sufficient diversity of support measures to reduce negative social impacts associated with restrictions while encouraging those affected to identify and take advantage of opportunities.

The second reason why the role of human interpretation is important is that the physical and perceptual dimensions of social impacts not only interact, but also influence the way in which social impacts accumulate. For example, the experience of one social impact can change the experience of other social impacts, and the simultaneous experience of multiple changes can increase the intensity or significance of the overall social impacts experienced by an individual or group (Ehrlich 2010, Franks et al. 2010b). It is therefore necessary to take a holistic approach to assessing and managing social impacts, which may be assisted by tools such as the CEAM framework that help to conceptualize the multiple elements that contribute to cumulative social impacts.

The second dimension that influenced individual's experiences of social impacts was their differing capacities to respond to anticipated and experienced social impacts. These findings reflected SIA literature that demonstrates the influence of anticipatory impacts and individuals' early responses on social impacts (Walker 2000, Ross and McGee 2006, Franks et al. 2010a, 2010b, Loxton et al. In press). These findings were important in the context of CEAM because individuals' responses led to additional positive and negative social impacts, felt either by the individual or

by others, while influencing the outcomes of the policy changes and the nature of the receiving environment.

The significant influence of participants' responses led us to incorporate the concept of responses into the modified CEAM framework. This modification reduces the emphasis placed on policy changes (or other interventions), introduced by a proponent (or proponents), and increases the emphasis placed on individuals' responses. Furthermore, the influence of personal factors on individuals' responses encourages better identification of these individuals' relevant characteristics – in this case, their motivations and goals, confidence, skills, financial resources and access to alternative opportunities. While some participants had a greater capacity, in terms of their financial resources and skills, to respond actively to policy changes, their perception of the success of their responses was strongly dependent on their goals and priorities. Therefore, some responses, such as closing a business, were considered positive even though they were often viewed from 'the outside' as being negative. Recognizing these factors when designing and implementing mitigation strategies encourages proponents to build on existing opportunities to maximize individual's capacity to adjust to change in ways that reflect both the individual's and proponent's goals (Esteves 2008).

The third dimension that influenced the cumulative nature of social impacts was the multiple actions involved in a single policy change and the additional influences of exogenous factors and predicted future activities. Key actions involved in each policy change included the (varied) consultation and decision-making processes, reductions in the availability of native forest resources, changes in the processes to access these resources, and the provision of mitigation strategies. Each of these actions interacted and aggregated with each other and with exogenous factors to contribute to cumulative social impacts. In particular, interviewees suggested that both the policy design and implementation processes influenced their subsequent experiences of social impacts, consistent with existing theory regarding justice and equity (Gross 2008), and suggesting that a well-designed and conducted policy process may reduce cumulative social impacts. Therefore, SIA needs to focus not only on the actions that typically form the main focus of SIA – in this case, reduced access to native forest resources – but also on the other actions associated with the design and implementation of a proposed activity.

The success of individuals' responses, including their use of mitigation strategies, was partly dependent on the nature of exogenous factors and predicted future activities. These results demonstrate the importance of assessing the wider economic, social and political context during pre-decision SIA, and encourage the design and monitoring of mitigation strategies that take into account likely future activities and exogenous factors (McCold and Saulsbury 1996, Ehrlich 2010). Results also suggest that the introduction of policy changes can lead to changes in the receiving environment that modify the context in which future policy changes will be introduced, and the types of policy changes that may be required. This issue has been

described previously in the context of the mining industry in terms of the current and future availability of nature resources and resource extraction (Brereton et al. 2008, Franks et al. 2011), but requires further exploration in the context of policy changes and the social dimensions of CEAM.

The potential for SIA, and mitigation strategies in particular, to enhance positive impacts has recently received greater acknowledgement (Esteves 2008, João et al. 2011). Our results suggest that the provision of mitigation strategies also has the potential to exacerbate negative social impacts through feedbacks, suggesting opportunities to further explore the concept of maladaptation (Barnett and O'Neill 2010). This complexity demonstrates that planning for mitigation strategies should be incorporated into the pre-decision SIA process to help ensure that unintended negative consequences will be addressed if they arise (Morrison-Saunders et al. 2004).

The importance of ongoing monitoring – commonly recommended in SIA but implemented less frequently (Burdge 2003) – is particularly apparent in the context of cumulative social impacts. Exogenous factors and additional activities may not exist or be predicted at the time of the initial SIA process, and social impacts can interact and aggregate in unintended ways. Monitoring cumulative social impacts and the outcomes of mitigation strategies, and altering or introducing additional mitigation measures where required, is therefore critical to their success. Furthermore, consistent monitoring allows for improved understandings of cumulative social impacts, thus assisting the improvement of CEAM practice within SIA (Brereton et al. 2008).

Monitoring is most effective when used in the context of adaptive management, that is, where there is provision to refine current and future mitigation strategies depending on monitoring results (Canter and Atkinson 2010, Franks 2012). The adoption of adaptive management principles provides greater flexibility and reduces the emphasis on predictive SIA (Morrison-Saunders et al. 2004). It is more frequently associated with environmental impact assessment, although this has begun to change with the development of social impact management plans, particularly in the mining industry (Esteves et al. 2012, Franks et al. 2009b). Further work is required to explore ways to assist proponents of an intervention to monitor and manage social impacts using an adaptive management approach. The importance of assessing and managing social impacts within their broader context suggests the need for the proponents of the multiple activities conducted within a receiving environment to form partnerships to collectively manage cumulative impacts (Franks et al. 2009b, Ehrlich 2010). The modified CEAM framework provides an analytical tool to assist the adaptive management process by facilitating recognition of the multiple factors that lead to cumulative social impacts.

Conclusion

Exploring the complexity of cumulative social impacts through a case study of forest policy changes highlights the

multiple influences that contribute to physical and perceptual experiences of activity-specific and cumulative social impacts. In the case study, much of this complexity arose through: (i) the interaction and aggregation of the multiple restrictions and opportunities associated with the three policy changes; (ii) participants' perceptions of the fairness of the processes through which these policy changes were designed and implemented; and (iii) the dual influences of the provision of mitigation strategies and individuals' capacities to respond to the policy changes and associated social impacts. Understanding this complexity assists SIA practice to assess cumulative social impacts and encourages an adaptive management approach.

The case study findings demonstrate the utility of the CEAM framework for the practice of CEAM in the natural resource management sector. It proved relatively straightforward to adapt the original CEAM framework (Franks et al. 2010a, 2010b) from a multi-development mining context to the complex policy situation evident in the case study. The main modifications we made to the original CEAM framework were to refer specifically to forest policy changes, expand the influence of feedbacks and include the concept of responses, and reframe the concept of actions as relating to restrictions and opportunities. The value of the modified CEAM framework in the interpretation of the case study results suggests that the framework, modified as appropriate, should have general value as a tool to conceptualize the complex social dimensions of cumulative impacts in a range of contexts.

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