**Article:**
Smith, T orcid.org/0000-0002-7110-3221, Holmes, G orcid.org/0000-0002-5393-5753 and Paavola, J orcid.org/0000-0001-5720-466X (2020) Social Underpinnings of Ecological Knowledge: Business Perceptions of Biodiversity as Social Learning. Organization & Environment, 33 (2). pp. 175-194. ISSN 1086-0266

https://doi.org/10.1177/1086026618803723

## Introduction: biodiversity, business, and ecological knowledge

Biodiversity – the variety and variability of genes, species, and ecosystems – underpins life. Its loss poses serious risks to business operations, threatening resource availability, supply chains, and "ecosystem services" such as water provision (Bishop, 2012; Evison & Knight, 2010; Whiteman, Walker, & Perego, 2013; Winn & Pogutz, 2013). These risks are recognised at a global level (Evison & Knight, 2010; Natural Capital Coalition, 2016; World Business Council for Sustainable Development, 2012) but further research is needed to understand business perceptions and actions regarding biodiversity in local contexts (Reade, Thorp, Goka, Wasbauer, & McKenna, 2015; Whiteman et al., 2013; Winn & Pogutz, 2013). Ecological knowledge can help businesses to transform operations regarding biodiversity, but gaining this knowledge often requires collaborations beyond organisational boundaries (Boiral & Heras-Saizarbitoria, 2017; Pogutz & Winn, 2016). Managing impacts and dependencies on biodiversity can therefore be very complex, and so biodiversity management means integrating diverse and sometimes competing forms of knowledge (e.g. scientific, economic, and indigenous) and values (e.g. spiritual, commercial, social, normative) (Boiral & Heras-Saizarbitoria, 2017). The processes by which learning occurs, and how ecological knowledge converts into action across different contexts remain unclear. We use social learning as the lens through which to explore the processes of ecological knowledge transfer in the Chilean forestry and salmon farming industries.

Social learning has been successfully applied to explore biodiversity management in natural resource based settings (Berkes, 2009; Siebenhüner, Rodela, & Ecker, 2016) but rarely used to understand learning by business (d'Angelo & Brunstein, 2014). Social learning is rooted in exploring processes in socio-ecological systems (SES), where "people depend on resources

provided by ecosystems, and ecosystem dynamics are influenced, to varying degrees, by human activities" (Chapin, Kofinas, Folke, & Chapin, 2009: p. 2). Consequently, it is suited to understanding contexts where businesses must account for multiple social and ecological factors. Forestry and salmon farming are vital to the Chilean economy, but where forestry firms have sought to control their impacts, salmon producers remain largely inactive (Latta & Aguayo, 2012). We investigate the role of the Forestry Stewardship Council (FSC) as a "bridging organisation", enabling forestry firms to learn about biodiversity, different values associated with it, and to reform operations. We contrast the forestry and salmon farming cases to emphasise the importance of bridging organisations in enabling learning and action, and highlight the role of stakeholders and institutions in prompting and enabling learning about biodiversity. We consider why ecological knowledge transfer may lead to reform, but not transformation, of operations regarding biodiversity.

We demonstrate how it is possible to apply social learning to understand processes of ecological knowledge transfer to business, highlighting how the social context (particularly regulations and stakeholder interactions) shapes perceptions and actions regarding biodiversity in relation to operations in forestry and salmon farming in Chile. We respond to calls to advance understanding of the tensions underlying corporate sustainability (Van der Byl & Slawinski, 2015) by exploring some of the unique challenges that tackling biodiversity loss presents, particularly the processes by which firms might deepen their ecological knowledge (Winn & Pogutz, 2013). Our findings have potential applications to understanding learning and action regarding biodiversity in other contexts where natural resource-based firms are operating. We conclude by exploring strengths and limitations of this research, regarding applications to other contexts and sectors, and identify future avenues of research.

## Factors in business learning about biodiversity

A wide variety of literature indicates the importance of ecological knowledge in influencing business perceptions and actions regarding biodiversity. In this section, we identify the gaps in understanding processes of ecological knowledge transfer that we address through our study.

Ecological knowledge influences corporate perceptions regarding biodiversity. Concern about biodiversity loss is higher in sectors that face greater operational risks related to biodiversity (Bonini & Oppenheim, 2010). Firms with biodiversity policies are often from sectors with the largest exposure to and impact on it, such as utilities and mining (Bhattacharya & Managi, 2013). Measuring and reporting impacts on biodiversity aids comprehension (c.f. D'Amato, Li, Rekola, Toppinen, & Lu, 2015; Jones & Solomon, 2013; Rimmel & Jonäll, 2013; Samkin, Annika, & Dannielle, 2014). Ecological knowledge is also important in motivating operational reform: better measurement is seen as critical in motivating operational reforms to account for biodiversity (Natural Capital Coalition, 2016). Pogutz and Winn (2016) found the process of learning about ecological impact stimulated operational innovations at food producer Barilla for instance, leading to deep reforms in farming practices.

The social context is vital in influencing ecological knowledge transfer. Stakeholders are integral to the learning process: suppliers and local authorities may shape corporate reforms regarding biodiversity (Pogutz & Winn, 2016) and NGOs and public bodies can help businesses prioritise biodiversity activities (Overbeek, Harms, & Van den Burg, 2013; van den Burg & Bogaardt, 2014). NGOs and conservation scientists assist businesses in understanding biodiversity's complexity and why conserving it matters (Boiral & Heras-Saizarbitoria, 2017), for example by providing information in terms that they and other decision-makers can more easily understand (Oakleaf, Kennedy, Boucher, & Kiesecker, 2013; Ruckelshaus et al., 2015).

NGOs can also help to reduce operational impacts on biodiversity, by providing expertise and advice via formal collaborations (Robinson, 2012).

Rules and regulations and voluntary governance arrangements can shape the business case to act regarding biodiversity influencing, and sometimes specifying, who is involved in providing ecological knowledge (Lambooy & Levashova, 2011; Mulder & Koellner, 2011; Wolf & Primmer, 2006). Voluntary governance arrangements such as FSC certification require businesses to consult conservation NGOs and local communities regarding conservation measures (Boiral & Heras-Saizarbitoria, 2017). Regulations regarding biodiversity may also influence when and how firms choose to engage with stakeholders concerning operational impacts (Houdet, Trommetter, & Weber, 2012; Räty, Toppinen, Roos, Riala, & Nyrud, 2016). Some regulations may stimulate reactive corporate strategies focussed on limiting stakeholder engagement, rather than proactive approaches that seek to account for biodiversity at the outset, and which include consulting multiple stakeholders (Houdet et al., 2012).

Current literature indicates several gaps in understanding learning processes regarding biodiversity. Ecological knowledge influences corporate perceptions of biodiversity, whilst stakeholders and institutions shape processes of ecological knowledge transfer. The characteristics of successful learning processes, where biodiversity is accounted for and different forms of ecological knowledge are considered, remain unclear. The mechanisms by which different stakeholders influence business perceptions and actions regarding biodiversity are also uncertain. Formal arrangements, such as inter-organisational agreements, may be critical to ensuring transformation regarding biodiversity management in some contexts, but informal relationships, like ad hoc working groups, may be important in others (Westley & Vredenburg, 1997). By focussing on external processes we do not suggest that the internal

dynamics of businesses are insignificant (Bansal & Roth, 2000): gaining internal buy-in is important to ensure that boardroom decisions on biodiversity are implemented (Overbeek et al., 2013; Paoli, Yaap, Wells, & Sileuw, 2010). Multiple external processes influencing learning about biodiversity by businesses remain unexplored, though. We next outline how we will explain these processes.

## Explaining business learning about biodiversity

The empirical literature highlights the importance of social contexts, particularly rules, regulations and stakeholder engagement in shaping learning about biodiversity. We outline below how social learning, supported by the concept of boundary objects and institutional theory, advances understanding of ecological knowledge transfer and operational reform.

Social learning describes the process through which new ecological knowledge translates into action regarding biodiversity (d'Angelo & Brunstein, 2014; Siebenhüner & Arnold, 2007; Siebenhüner et al., 2016). We define social learning as "a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks" (Reed et al., 2010: "Conclusions") and "a process where organizations display behavioural changes" (Siebenhüner & Arnold, 2007: p. 341). Communication with stakeholders is key to learning, enabling relationships to develop, different forms of knowledge to be transferred, and prompting changes in the outlook of the organisations involved (Siebenhüner et al., 2016). As relationships evolve, knowledge and competences "scale-up", facilitating the co-development of new biodiversity management practices (Berkes, 2009; Pahl-Wostl et al., 2007).

Learning processes regarding biodiversity and ecosystem management are often dynamic,

involving interactions between formal and informal institutions (Siebenhüner et al., 2016). "Bridging organisations" are essential in facilitating these interactions, enabling dialogue and collaboration between firms and stakeholders (Berkes, 2009; c.f. Folke, Hahn, Olsson, & Norberg, 2005; Reed, 2008). As a "formal, third party entity distinct from the individuals or organizations it connects" (Sternlieb, Bixler, Huber-Stearns, & Huayhuaca, 2013: p. 121), (Folke et al., 2005), a bridging organisation provides a site for dialogue, knowledge transfer, trust building, conflict resolution, and potentially ad hoc cooperation to tackle specific issues (Berkes, 2009; Sternlieb et al., 2013). Bridging organisations therefore span multiple functions and services, facilitating stakeholder engagement and learning, as well as enabling co-management of biodiversity and ecosystems (Berkes, 2009).

Social learning and bridging organisations do not fully explain why in some instances co-management procedures may only result in "single loop" learning (superficial behavioural change), rather than "double loop" learning (transformation of attitudes and values) (Berkes, 2009; d'Angelo & Brunstein, 2014; Reed et al., 2010; Siebenhüner & Arnold, 2007). Co-management procedures can be considered as a "boundary object", operating within the broader functions of bridging organisations (Folke et al., 2005), enabling agreement between diverse actors on biodiversity management practices, but allowing for divergent views on the ultimate purpose of the procedures themselves (Carlile & Rebentisch, 2003; Nicolini, Mengis, & Swan, 2012; Star & Griesemer, 1989). Consequently, businesses might perceive co-management procedures as an end in their own right, focussing on tactical alliances, and minimal compliance, resulting in partial and provisional learning (Carlile & Rebentisch, 2003; Nicolini et al., 2012). Whilst bridging organisations enable new procedures to develop therefore, businesses might treat these as boundary objects, resulting in more symbolic change.

Social learning also fails to explain what motivates learning processes amongst businesses regarding biodiversity, or why consequent operational reforms may not be uniform amongst all businesses. Social learning can be conceived as a process of de-institutionalisation, where existing practices are no longer socially desirable (Oliver, 1992). Businesses can deploy different strategies in response to pressures to reform regarding biodiversity (Boiral, 2016; Scherer, Palazzo, & Seidl, 2013). Some might concede to all demands or negotiate a compromise, resulting in substantive, possibly transformative reform (Scherer et al., 2013). Others may make symbolic concessions, managing stakeholder perceptions about the extent of reform (Boiral, 2016; Scherer et al., 2013). The sources of pressure may also influence the extent of reform. Beyond-compliance reform is often due to pressure from customers, suppliers, or competitors, whereas more limited, sanction-avoiding behaviour occurs where pressure from regulators, NGOs or civil society (Delmas & Toffel, 2008; Testa, Boiral, & Iraldo, 2015). Firm size may also moderate the speed, depth, and/ or extent of reform, and hence the depth of learning that occurs (Delmas & Toffel, 2004). Smaller firms are less visible and may not be compelled, or have the resources, to reform to the same degree as larger firms. Consequently, in evaluating the extent of operational reform regarding biodiversity, the sources of institutional pressure placed on businesses, and the size and resources of the businesses involved, must be considered.

To summarise, social learning provides a means to analyse ecological knowledge transfer processes. Where learning is occurring, we expect to see a bridging organisation help foster dialogue between diverse stakeholders, and the scaling-up of biodiversity co-management. A specific focus on co-management procedures themselves helps understand the degree of learning. Operational reform may vary depending on what businesses need to do to retain or regain social legitimacy, and the sources of social pressure. There may also be differences

between firms, depending upon strategic choices and firm size.

## Case Studies

Understanding corporate perceptions of biodiversity requires consideration of many variables relating to social and ecological contexts. Case studies enable detailed investigation of multiple variables, helping to understand phenomena in their context (Cresswell, 2008; Yin, 2014). Multiple cases can advance new theories and concepts (Eisenhardt, 1989; Yin, 2014). We adopted a "polar type" approach (Eisenhardt & Graebner, 2007: p. 27), examining two sectors operating in contrasting socio-ecological contexts, with different responses to biodiversity management (see Table 1 and case histories below).

**Table 1: Ecological interdependencies of forestry and salmon farming sectors**[i]

### Forestry

Biodiversity management has changed considerably in Chilean forestry since the early 2000s. The 1974 Forestry Law (Ley 701) subsidised forestry firms planting on deforested and degraded land, but also saw firms substituting native forest with commercial plantations (Echeverria et al., 2006; Zamorano-Elgueta, Rey Benayas, Cayuela, Hantson, & Armenteras, 2015). Substitution officially ended in 2003 after US NGO ForestEthics campaigned against retail chain Home Depot's purchase of timber sourced from native forests. In response, Arauco and CMPC, Chile's two largest forestry firms, signed commitments to stop harvesting native forest (Heilmayr & Lambin, 2016). Forestry firms resisted pressure for further reform, particularly to adopt FSC certification, and with support from state development agency CORFO instead created CERTFOR, their own certification standard organisation, with limited protections for native forest (Heilmayr & Lambin, 2016). Substantive reform occurred when a pulp mill owned by Arauco contaminated the Río Cruces wetlands, resulting in the death of

thousands of black-necked swans. Facing widespread public protest, Arauco and CMPC joined FSC Chile, achieving FSC certification in 2012 (Sepúlveda & Villarroel, 2012).

After joining FSC Chile, cooperation between forestry companies, local communities and conservation NGOs has increased. A forestry dialogue (Diálogo Forestal), launched in 2009, brought together community and conservation NGOs with the major forestry firms to discuss issues related to plantation and native forest management. Chile's three largest forestry firms (Arauco, CMPC and Masisa) are involved in the World Wildlife Fund (WWF) New Generation Plantations (NGP) initiative, exploring ways to coordinate biodiversity management efforts such as the establishment of wildlife corridors to aid species migration across plantation sites (New Generation Plantations). Forestry firms also joined representatives from CONAF, the forestry agency, and other state agencies, community and conservation NGOs, and indigenous communities on the Chilean government's Forest Policy Council (CPF). The CPF has produced a strategy for Chilean forestry until 2050, including achieving sustainability (CONAF, 2016). Tensions remain: forestry firms have yet to commit to the CPF's proposed strategy, conflicts with the indigenous Mapuche over land ownership are growing and disputes with local communities persist (Salas et al., 2016). However, the status of biodiversity has evolved with FSC membership, with greater dialogue regarding conservation.

**Salmon Farming**

Biodiversity management remains a peripheral concern in salmon farming in Chile. With state assistance, salmon farming rapidly expanded from the mid-1980s, but its geographic concentration in the Los Lagos region resulted in increased ecological stress, prompting a series of regulatory reforms in the early 2000s, including Environmental Impact Assessments (EIAs) and rules on sanitation (Barton & Fløysand, 2010). The outbreak of Infectious Salmon Anaemia (ISA) virus in 2007 exposed poor practice amongst producers and the inadequacy of these

regulations (Buschmann et al., 2009). Recommendations from a "salmon roundtable", comprising state agencies, salmon producers and their suppliers (Bustos-Gallardo, 2013) led to tighter biosecurity regulations, a new Superintendent of the Environment (SMA), and increased oversight and enforcement powers for state agency Sernapesca (Barton & Fløysand, 2010). Whilst producers have adopted voluntary standards, including IS014000, Global GAP and Best Aquaculture Practices (BAP), certification has not had the same impact in salmon farming as in forestry (Cid Aguayo & Barriga, 2016). The eight largest producers in Chile joined the Global Salmon Initiative (GSI), committing to achieving Aquaculture Stewardship Council (ASC) standards, but its reforming potential remains uncertain (Cid Aguayo & Barriga, 2016).

Ecological crises have complicated stakeholder relationships: protests about redundancies following the ISA crisis led to industry association SalmonChile's offices being burned down in 2009 (Latta & Aguayo, 2012). An algal bloom in early 2016 forced some producers to close farm sites, writing-off a large proportion of their stock and dumping it in the sea (AQUA, 2016). The simultaneous declaration of a Red Tide by the Chilean government prompted rioting by fishermen and local communities who blamed salmon producers for the crisis and loss of their livelihoods (Paz Infante Heymann, 2016). Local communities and conservation NGOs remain peripheral stakeholders: neither group was invited to help the salmon roundtable response to the ISA crisis (Bustos-Gallardo, 2013). Whilst GSI members participated in the WWF-led Aquaculture Dialogues, all producers have resisted the efforts of conservation NGO Oceana to disclose levels of antibiotic use (Esposito, 2016).

The forestry and salmon farming cases demonstrate the evolution of contrasting approaches to conservation. Despite continued conflicts with stakeholders biodiversity appears to have a gained higher profile amongst forestry firms. The FSC appears to have helped enhance

ecological knowledge in forestry, but it is unclear how it has aided learning, or the depth of learning that has occurred. Little appears to have changed in salmon farming, but the reasons underlying continued inaction regarding ecological crises merits closer examination. In the next section, we detail our use of mixed methods to explore corporate perceptions and actions regarding biodiversity in Chilean forestry and salmon farming.

## Data collection and analysis

Data collection was based on a method developed by Rydin and Falleth (2006) to research institutional and stakeholder dynamics in natural resource management. In stage one, we reviewed company websites and sustainability and annual reports, identifying key themes, projects, stakeholders, stated business priorities and activities regarding biodiversity. Documentary material often only provides partial insights: corporate reporting on biodiversity is generally characterised by selective disclosure on actions and motivations (Boiral, 2016; Lähtinen, Guan, Li, & Toppinen, 2016; c.f. Rydin & Falleth, 2006). Consequently, in stage two, we used interviews to explore key themes in greater depth.

Our principal interview targets were managers engaged with operations. We also approached business development and corporate relations managers in the largest firms if their role included some engagement with biodiversity. Managerial risk perceptions are vital in determining biodiversity management by businesses (Lambooy & Levashova, 2011; Sharma & Nguan, 1999) and we expected managers to offer strategic insights into the challenges and opportunities presented by the integration of biodiversity into operations. We interviewed stakeholders to 1) understand stakeholder priorities regarding biodiversity, and 2) triangulate views about interactions, minimising the possibility of "retrospective sense-making" and impression management by business participants (Eisenhardt & Graebner, 2007: p. 28).

Stakeholder relevance regarding biodiversity varies depending on local context (Boiral & Heras-Saizarbitoria, 2017; Reade et al., 2015). Accordingly, we considered the case histories of both sectors to generate our sample and revised our list following discussions with researchers, former managers, and industry observers based in Chile. Supplementing Boiral & Heras-Saizarbitoria's (2017) approach using corporate reports and websites, we reviewed industry association, certification and Chilean government websites to identify stakeholders. In forestry, we checked FSC Chile board membership; and participants involved in the Diálogo Forestal (forestry dialogue) and NGP processes in Chile. In salmon farming, we searched for environmental consultants working on EIAs and explored websites of organisations involved in environmental and social campaigns. Conservation scientists, NGOs, local communities, and the state are recognised as key stakeholders regarding biodiversity management (Boiral & Heras-Saizarbitoria, 2017; Pogutz & Winn, 2016). We added representatives of industry associations, and community-based NGOs to our sample for both sectors; environmental consultants in forestry, and senior managers and directors of oceanography firms, laboratories and feed suppliers in salmon farming (see Figure 1).

Some stakeholders were not included in this study (see Figure 1). Trades unions had limited involvement in biodiversity policy; certification bodies were also more peripheral stakeholders in Chilean salmon farming regarding biodiversity. The main retailers in both cases are based outside of Chile, but managers, NGOs working with retailers, and state representatives provided sufficient information to be able to understand retailer priorities regarding biodiversity management. We were unable to identify specific shareholders or corporate investors to approach, drawing instead on current and former managers to account for investor priorities. In mitigation, no participant mentioned active investor involvement regarding

biodiversity, although with more time and resource we would target investor interviews.

**Figure 1: Stakeholders involved in biodiversity in Forestry and Salmon Farming in Chile**

Fieldwork took place in Chile from November 2015 to May 2016, comprising 70 interviews in the Metropolitan, Bio Bio, Araucania, and Los Lagos Regions. We also visited forestry operations and attended a forestry industry conference. Most interviews were face to face (three were via Skype), conducted in Spanish (four were in English). We continued until saturation, i.e. until similar themes reappeared and new interviews yielded few insights (Bauer & Arts, 2000). We had multiple records for each participant type to achieve a spread of interviews across firms and stakeholder types and to account for individuals and organisations unable to participate. We contacted named individuals directly; otherwise we contacted the relevant organisations requesting interview with someone in the target position. We cross-referenced our list of organisations with each participant to check for possible additions.

**Table 2: Participants by sector and type**

We conducted interviews as guided conversations, structured around themes, retaining flexibility to explore important topics that had not been foreseen prior to interviews (see Figure 2). We checked terminology and suitability of interview content through conversations with key informants, along with the first five interviews for each case.

**Figure 2: Interview content by participant type**

Interviews were independently transcribed by a native Spanish speaker and checked against original recordings; the four interviews in English were transcribed by the authors. We used NVIVO 10 to conduct multiple stages of coding, focussing on manager interviews (Bazeley & Jackson, 2013). All coding was conducted by the lead author, with regular progress updates to refine codes. Through "within-case" data analysis (Eisenhardt, 1989: pp. 539-540) we

developed individual codes in Spanish, finalising them in English, and after several iterations created group and theme level codes (see Figure 3). We identified similarities and differences across cases using "cross-case" data analysis (Eisenhardt, 1989: pp. 540-541).

**Figure 3: Section of coding trees for forestry and salmon farming cases**

## Findings

The analysis identified three key themes from the material: 1) contrasting perceptions of biodiversity and responsibilities regarding its conservation between forestry and salmon farming firms; 2) the divergent impact of the FSC in forestry and state regulations in salmon farming in framing perceptions, learning and actions, and; 3) how engagement with stakeholders affected learning about biodiversity. In the discussion section, we consider how social learning helps explain the findings.

### Priorities relating to biodiversity and perception of conservation role

Managers of forestry firms spoke with confidence about their approach to biodiversity and their change of mind-set about biodiversity: "[b]efore productivity was the objective: pine and eucalyptus. Today it is productivity as well as conservation" (I54, Forestry Firm). Managers accepted their responsibility to conserve: "[we] bear a great deal of responsibility: we can't hide. We're very visible and we're aware of the demands [on us]" (I6, Forestry Firm). Water management at plantations has become a public issue as droughts have increased. Managers accepted the need to co-decide conservation priorities with stakeholders: "problems need to be identified and discussion needs different viewpoints to find solutions" (I6, Forestry Firm). The three largest forestry firms engage more with conservation NGOs, local communities, and native forest-based projects and biodiversity related initiatives, such as NGP, than other forestry firms. But managers at all forestry firms emphasised that conservation had moved up

the agenda, and anticipated increased responsibilities for native forest conservation to retain FSC certification: “standards will continue to rise each year; you started here but you must continue raising what is required” (I7, Forestry Firm).

Salmon producers framed biodiversity in terms of pursuing sustainability and how challenges such as diseases and environmental crises complicate achieving it. One manager summarised, “the development of a sustainable industry has had many ups and downs, it has been through various crises and this has made it quite unstable” (I40, Salmon Producer). Caligus (sea lice) and diseases such as Salmon Rickettsial Syndrome (SRS) were considered major threats, and greater in Chile than elsewhere: “Norway barely uses antibiotics, but they don’t have SRS; since we have these bacteria we fight them with antibiotics, we use a large amount” (I63, Salmon Producer). Antibiotics were also identified as a challenge for achieving ASC certification. Salmon producers’ interest in biodiversity is focussed on protecting salmon, for example through investments in treatments and genetic improvements, rather than through marine conservation and reduction of ecological impacts. Producers are aware of these impacts, but focus on insulating themselves from, rather than engaging with, biodiversity: “this is a firm producing salmon, not a firm of the natural environment” (I63, Salmon Producer).

**Standards and regulations: framing the business and biodiversity relationship**

Biodiversity management in forestry firms is framed by FSC standards, particularly: commitments to identify, restore and conserve native forest; sustainable management plans and species surveys; and consultation of communities neighbouring native forest and plantations regarding water quality and supply. “I believe that this [FSC certification] explains a great deal regarding [forestry firms and] biodiversity” (I7, Forestry Firm). Adapting to FSC standards was challenging, but now integrates with, and helps structure, operational practice: “initially we began with very complex management systems, with a lot, a lot, of bureaucracy, checking

documents, but ultimately that has become more flexible because it is part of the business's culture" (I25, Forestry Firm). Legislation was rarely mentioned, except restrictions on cutting down native species. Managers and stakeholders alike felt that FSC standards took forestry firms beyond state regulation: "the legal requirements [in Chile] aren't […] as high as in other parts of the world" (I66, Forestry Firm).

In salmon production, regulations are more important for biodiversity management than certification. Managers felt that the severity and quantity of rules and regulations on sanitation, biosecurity, and site monitoring constrained their competitiveness, capacity to act, and complicated efforts to become sustainable: "there are many more regulations here in Chile, I believe there's much more bureaucracy than in Norway" (I51, Salmon Producer). Producers felt that the industry was under considerable economic pressure: "the amount of regulation, outbreaks of illnesses, natural events, like [algae] blooms, have meant that the industry is not in a good way financially" (I46, Salmon Producer). Whilst economic pressure was a bigger issue for firms with fewer sites, even managers of the largest firms highlighted the resources committed to deal with environmental and sanitary regulations and considered that high costs complicated efforts to achieve higher standards: "it's difficult because the ASC [certification] is complex, ASC is onerous; it's really expensive" (I57, Salmon Producer).

**Stakeholder interactions**

The institutional context has influenced interactions with stakeholders regarding biodiversity in both sectors, albeit in very different ways (see Table 3). Forestry companies have increasingly interacted with university-based conservation biologists, conservation NGOs, and local communities; all previously peripheral to firms' decision-making. Managers of the largest forestry firms highlighted how stakeholder engagement had helped build their understanding of operational impacts on biodiversity: "forestry firms are going to tackle and have to develop

science and technology and procedures to realise activities they don't understand in detail, and so they are going to need a lot of support from universities, NGOs and communities to be able to progress" (I25, Forestry Firm). Researchers helped forestry firms to learn about the native forests they owned and to understand local conditions: "there are research agreements with different providers and universities, and various studies are conducted to advance understanding of native forest" (I66, Forestry Firm). Several managers noted how in response to local community concerns about plantations and water use, firms were investing more in understanding links between forest biodiversity and water as an ecosystem service. Conservation NGOs helped firms to understand what works in conservation terms and how activities are perceived by civil society: "it's been a worthwhile task, being able to improve practices related to biodiversity and with social matters" (I25, Forestry Firm).

Stakeholder engagement has also been about legitimisation and obtaining and retaining a social licence to operate: "credibility and integration with other groups is much easier when working with a university, for example, than just the company directly with the community" (I27, Forestry Firm). Managers considered the state mostly absent and researchers and conservation NGOs also viewed that conservation is a low priority for the state. The managers did not want greater state involvement: "the government moves slowly, doesn't have the knowledge, doesn't understand, [conservation] isn't amongst its priorities" (I6, Forestry Firm).

However, forestry firms have not fully integrated stakeholder perspectives: managers defended plantation practices such as clear-cutting and monoculture, for instance. They felt that there were limits to their responsibility for biodiversity conservation and that trade-offs remain: "if there were infinite resources, fine, we could devote all of our resources to [conservation], but if you don't prioritise, you aren't going to be effective, you're going to aim randomly and you

aren't going to achieve anything" (I66, Forestry Firm). Other tensions and disagreements also remain, including with local communities and the Mapuche over land rights. Some conservation NGOs were frustrated by what they saw as forestry firms using dialogue to hinder reform, rather than achieve a consensus on priorities: "the aim of the companies is to delay, delay and delay and make little progress" (I24, Conservation NGO). Tensions with the state over ever-shifting governmental priorities complicate efforts at reaching agreements with stakeholders: "this is the third time I have invited CONAF to meet to discuss a joint management plan […] they still haven't responded" (I54, Forestry Firm). Managers were wary of greater state involvement: "it slows progress, including progress in projects that could be very good, very well managed from the point of view of biodiversity" (I25, Forestry Firm). The three largest forestry firms interact more with conservation NGOs and local communities than other firms, but local community engagement and efforts to investigate operational impacts have increased across the sector: "nowadays there's joint work with universities and study of the subject of clear cutting" (I65, Forestry Firm). To summarise, relationships with stakeholders have evolved with implications for conservation practices (see Table 3).

In salmon farming, producers engage primarily with state agencies and along the supply chain with feed suppliers, genetics firms, environmental consultants and private laboratories. Producers and state agencies mostly interact over the monitoring and enforcement of sanitation and environmental regulations. One manager summarised: "in terms of the natural environment nowadays, we're quite constrained in terms of the impacts that we can have and, what is more, we're overseen by Sernapesca, by the SMA, by the Ministry of Defence. As such we receive a lot of visits to our centres" (I63, Salmon Producer). State regulations frame producer priorities and interactions regarding biodiversity: "aquaculture depends on Subpesca [a state agency], which is not even a ministry, and this sub-ministry is a division of the Ministry of Economy.

As a result, in terms of priority, every investment must go through this same route" (I40, Salmon Producer). Producers gave examples of cooperation with the state to enhance understanding of the natural environment, such as providing information on the spread of algae, but were focussed on fulfilling regulatory obligations, not discussing reform. Producers worked with academic researchers in specific areas such as illnesses, but these collaborations were sporadic and short term. Consultants were preferred for many tasks such as monitoring and EIAs. Managers criticised academic scientists for failing to understand producer priorities: "I'll probably look for a consultant, someone who will give me quicker answers; perhaps they won't be the best, but they will suit me for the time being" (I57, Salmon Producer).

Stakeholder engagement regarding biodiversity was less about knowledge, mitigating impacts and conservation, and more about maintaining existing practices. GSI members have signed-up to the WWF's Blue Whale monitoring campaign; some have also formed links with other marine conservation organisations. Yet even GSI members expressed caution about these interactions: "having a tie with an NGO is a responsibility that needs to be maintained; it is not easy" (I49, Salmon Producer). NGO-producer relationships were considered hostile: "NGOs are a world that we can have dialogue with, but dialogue requires two people willing to talk" (I62, Salmon Producer). NGOs that have opened dialogue with salmon producers have found it difficult to convince producers of the need to change a mind-set that focusses purely on meeting legal obligations, and is "very minimalist, very short term" (I61, Conservation NGO).

Managers felt the problem regarding biodiversity was about poor communication and misunderstandings about or mischaracterisations of their activities, rather than operational reform. Educational programmes in local communities, emphasise one-way communication, not two-way dialogue, for instance: "how to educate and transfer [knowledge] to the

community is an issue, to your neighbours, so that they know how things work" (I51, Salmon Producer). To summarise, there is considerable disagreement over industry practices, particularly antibiotic use, producer impacts on biodiversity, and industry opposition: "we must come out and defend how we're doing things within the industry" (I63, Salmon Producer).

**Table 3: Stakeholder engagement regarding biodiversity in Chile**

## Discussion

We applied social learning to understand processes of ecological knowledge transfer and operational reform regarding biodiversity in forestry and salmon farming in Chile. In this section, we reflect on the degree to which social learning helps explain these processes, particularly the role of bridging organisations. We also discuss the importance of social pressures in both motivating and stimulating different degrees of learning. We highlight the limitations of social learning as an approach, along with areas for future research.

The forestry case suggests social learning can be a useful tool helping to explain the process of ecological knowledge transfer, by demonstrating how knowledge can change perceptions and transform operations (Pogutz & Winn, 2016; Winn & Pogutz, 2013). Manager and stakeholder testimony indicates a change in attitudes and behaviour by forestry firms regarding biodiversity. Formerly resistant, they now accept their conservation responsibilities regarding native forest, and that these are likely to increase under the FSC. Competencies have scaled-up, with firms adapting and refining management systems to incorporate new standards. Trust has also increased, demonstrated by the growth in dialogue, especially with previously peripheral stakeholders such as conservation NGOs and local communities (see Table 3). Cultural change in forestry firms took time, but they now understand more about native forest flora and fauna, as well as different stakeholder priorities regarding native forest and

plantations, for instance how local communities perceive links between plantation management and ecosystem services such as water provision. The biggest firms are also beginning to understand other potential conservation measures, through dialogue via the NGP.

The findings also indicate the importance of bridging organisations in enabling learning, providing a means to engage with, and act on multiple stakeholder views regarding forest biodiversity (Boiral & Heras-Saizarbitoria, 2017). FSC Chile is a distinct third party entity that, although resisted by firms at first, connected conservation NGOs, conservation scientists and local communities in a way that CERTFOR never could (Sternlieb et al., 2013). FSC Chile fulfilled multiple functions: besides providing certification standards that structured forestry firm reforms, it also provided the basis to facilitate further linkages between forestry firms and stakeholders, including the Forestry Dialogue, NGP, and latterly the CFP (see Table 3) (Berkes, 2009; Sternlieb et al., 2013). It was both a site on which to construct action, and for building trust, fostering networks, and addressing conflict regarding native forest. The absence of any such entity in salmon farming reinforces the importance of these multiple functions. There is limited consensus regarding what salmon producer conservation priorities should be (e.g. alternatives to antibiotic use) or their capabilities to act. Producers emphasise challenges and stakeholders highlight their limited engagement, for example. Interactions remain selective and sporadic, and knowledge transfer is partial (see Table 3). As one stakeholder put it: “one is left with the feeling that there is no learning in the [salmon farming] industry” (I36, State Agency).

Our findings question the implicit assumption that learning leads to positive, lasting change (d'Angelo & Brunstein, 2014; Siebenhüner & Arnold, 2007; Siebenhüner et al., 2016). Exploring learning processes helps understand why ecological knowledge transfer might lead to single-loop, rather than double-loop, learning. Certification standards acted as a boundary

object within the umbrella of FSC Chile: a uniform set of procedures, but perceived differently by each participant in terms of their purpose. Conservation scientists and conservation NGOs saw certification as a means for further reform, whereas for forestry firms certification was an end in itself, providing a means to retain access to key markets, support a social licence to operate in Chile, and protect plantation practices. Forestry firms know more, but have also used their knowledge to both retain legitimacy and slow the pace of further reform. Engaging with conservation scientists provides vital expertise, but also boosts credibility of results; similarly, conservation NGOs provide advice but also bolster credibility (see Table 3). Adhering to certification standards enabled forestry firms to engage with different stakeholder groups whilst also avoiding more fundamental reform regarding plantations and Mapuche land claims that go to the core of operations (Scherer et al., 2013).

The forestry and salmon farming cases suggest that social learning may be limited – or may not even occur – in certain socio-ecological contexts. The ecological crises in salmon farming, combined with a preeminent role for multiple Chilean state agencies, have limited ecological knowledge transfer. Prescriptive regulations following the ISA Crisis, alongside the fragmented, occasionally contradictory role of the state have discouraged and sometimes prevented innovation. Producers have focussed on investing in site-level, often shorter-term solutions. Sporadic engagement with other stakeholders (see Table 3) is characterised by limited trust and understanding of alternative views about marine biodiversity. The conditions to stimulate learning simply do not exist. The limited appeal of the ASC to producers, especially regarding difficulties implementing environmental standards mean it is not a ready-made solution as FSC Chile was. FSC Chile enjoyed widespread legitimacy, integrating diverse stakeholders and meeting multiple priorities. FSC certification structured forestry firms' ability to go beyond compliance. The ASC does not provide sufficient cause to believe that it will

provide social licence to operate, and with the state the preeminent stakeholder, compliance is a sufficient legitimation strategy (Oliver, 1992; Scherer et al., 2013).

Our study has several limitations, indicating various future research needs. Firstly, our approach must be applied to other socio-ecological contexts. The FSC is a relative success story in Chile, but exploring ecological knowledge transfer in tropical countries such as Brazil or Indonesia, and countries such as the USA; with more comprehensive environmental regulation regarding forestry, would help understand the relative importance of bridging organisations. Exploring other countries would also further understanding of the contextual factors motivating action and inaction regarding biodiversity (Bansal & Roth, 2000). Salmon producers in Chile face distinct ecological challenges compared to Scotland or Norway, and sell to different markets. Producers in these countries may have different outlooks regarding biodiversity and express greater capabilities to manage issues like algae blooms than managers in Chile. The role of the state may also be different in other contexts, helping to facilitate learning via more flexible regulations or evidence provision, rather than acting as a barrier to ecological knowledge transfer.

Secondly, the role of bridging organisations needs examining in other sectors and certification structures, for instance the Roundtable on Sustainable Palm Oil (RSPO). Learning needs and challenges are likely to vary across sectors: retailers have greater reputational exposure but more indirect ecological dependencies; in financial services investment decisions generally rest on long term risk factors regarding returns, rather than short term profits. Thirdly, investigating how organisations internalise ecological knowledge could help strengthen understanding to what extent characteristics such as firm size, resources, leadership and internal team relationships influence the extent of internal reform. Our study noted some differences between

bigger and smaller firms, but examining buyer, shareholder and investor expectations, and team dynamics would help understanding how firms of different sizes balance demands for conservation with maximising productivity. Finally, longitudinal studies would help to understand how learning about biodiversity evolves alongside stakeholder relationships.

## Conclusion

This paper used social learning to address gaps in understanding processes of ecological knowledge transfer, and how knowledge translates into operational reforms regarding biodiversity (Pogutz & Winn, 2016). We applied our approach to explore contrasts in perceptions and actions regarding biodiversity by forestry firms and salmon producers in Chile. Social learning highlights the integral role of bridging organisations as a site for enabling learning about biodiversity and co-management of impacts on it. The FSC fostered dialogue with formerly peripheral stakeholders, enabling forestry firms to understand and incorporate multiple forms of ecological knowledge; certification helped them to structure reforms. The forestry case also demonstrates the limits of ecological knowledge in changing perceptions and prompting substantive reform. Forestry firms better understand their impacts on biodiversity, and different stakeholder priorities regarding its management, but reforms have been compliance-focussed. Firms' attitudes are largely unchanged, focussed on protecting plantation practices rather than integrating alternative values. Under FSC Chile, certification has served as a boundary object, with forestry firms seeing standards as the end goal, but by stakeholders seeing them as a basis for further reform.

The findings support the case for focussing on business activities within the local, socio-ecological context in which they are occurring (Boiral & Heras-Saizarbitoria, 2017; Reade et al., 2015). Whilst the forestry case suggests that ecological crises and social pressures can

prompt albeit limited reform, the salmon farming case demonstrates how they can also reinforce existing practices. State-led responses have restricted innovation and reinforced its role as the pre-eminent stakeholder. Salmon producer engagement with other stakeholders, and a willingness to countenance substantive reforms to address potential impacts on marine biodiversity remains limited. Our study suggests that sometimes stakeholders can have a negative rather than a positive influence on ecological knowledge transfer to businesses (Boiral & Heras-Saizarbitoria, 2017). Social learning must be applied to other socio-ecological contexts to understand whether the same stakeholders play similar roles in other institutional systems. Our approach is also untested beyond natural resource-based sectors: social learning may be less useful as a tool for understanding ecological knowledge transfer where operations are not directly interdependent with biodiversity.

For scholars and practitioners alike, we emphasise that whilst ecological knowledge is important if businesses are to account for biodiversity, the institutional mechanisms by which knowledge is attainted, and competing stakeholder conceptions of what is important about biodiversity, must be considered. Use of measurement and reporting tools should be integrated with broader stakeholder management, and employee recruitment, strategies: who to bring in, when, and how must be carefully considered. Regulators need to consider if rules and activities facilitate or complicate such processes. Biodiversity is dynamic, complex and sometimes intangible: different contexts require different responses, and as knowledge develops, so too must practices. In learning about biodiversity and how best to manage it, businesses need to embrace internal and external tensions (Van der Byl & Slawinski, 2015) across social and ecological systems. Only by integrating different forms of knowledge and values regarding biodiversity can they hope to become fully adaptive (Folke et al., 2005).

## Bibliography

AQUA. (2016, March 5). Pérdidas de salmón por algas nocivas se traducen en casi 90.000 toneladas. AQUA. Retrieved 26/10/2017 Retrieved from http://www.aqua.cl/

Bansal, P., & Roth, K. (2000). Why companies go green: A model of ecological responsiveness. Academy of Management Journal, 43(4), 717-736.

Barton, J. R., & Fløysand, A. (2010). The political ecology of Chilean salmon aquaculture, 1982-2010: A trajectory from economic development to global sustainability. Global Environmental Change, 20(4), 739-752.

Bauer, M. W., & Arts, B. (2000). Corpus Construction: a Principle for Qualitative Data Collection. In M. W. Bauer & G. Gaskell (Eds.), Qualitative Researching with Text, Image and Sound (pp. 38-56). London: Sage.

Bazeley, P., & Jackson, K. (2013). Qualitative data analysis with NVivo (2nd ed.). London: SAGE.

Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. Journal of Environmental Management, 90(5), 1692-1702.

Bhattacharya, T. R., & Managi, S. (2013). Contributions of the private sector to global biodiversity protection: case study of the Fortune 500 companies. International Journal of Biodiversity Science Ecosystem Services & Management, 9(1), 65-86.

Bishop, J. (Ed.). (2012). The Economics of Ecosystems and Biodiversity in Business and Enterprise: Earthscan, London and New York.

Boiral, O. (2016). Accounting for the Unaccountable: Biodiversity Reporting and Impression Management. Journal of Business Ethics, 135(4), 751-768.

Boiral, O., & Heras-Saizarbitoria, I. (2017). Managing Biodiversity Through Stakeholder Involvement: Why, Who, and for What Initiatives? Journal of Business Ethics, 140(3),

403-421.

Bonini, S., & Oppenheim, J. M. (2010). The next environmental issue for business: McKinsey Global Survey results: McKinsey.

Buschmann, A. H., Cabello, F., Young, K., Carvajal, J., Varela, D. A., & Henríquez, L. (2009). Salmon aquaculture and coastal ecosystem health in Chile: Analysis of regulations, environmental impacts and bioremediation systems. Ocean and Coastal Management, 52(5), 243-249.

Bustos-Gallardo, B. (2013). The ISA crisis in Los Lagos Chile: A failure of neoliberal environmental governance? Geoforum, 48, 196-206.

Carlile, P. R., & Rebentisch, E. S. (2003). Into the Black Box: The Knowledge Transformation Cycle. Management Science, 49(9), 1180-1195.

Chapin, F. S., III, Kofinas, G., Folke, C., & Chapin, M. C. (2009). Principles of ecosystem stewardship: resilience-based natural resource management in a changing world. New York: Springer.

Cid Aguayo, B. E., & Barriga, J. (2016). Behind certification and regulatory processes: Contributions to a political history of the Chilean salmon farming. Global Environmental Change, 39, 81-90.

CONAF. (2016). Política Forestal 2015-2035 Retrieved 26/10/2017 Retrieved from http://www.conaf.cl

Cresswell, J. W. (2008). Research design: qualitative, quantitative, and mixed methods approaches (3rd ed.). London: SAGE.

D'Amato, D., Li, N., Rekola, M., Toppinen, A., & Lu, F. F. (2015). Linking forest ecosystem services to corporate sustainability disclosure: A conceptual analysis. Ecosystem Services, 14, 170-178.

d'Angelo, M. J., & Brunstein, J. (2014). Social learning for sustainability: supporting

sustainable business in Brazil regarding multiple social actors, relationships and interests. International Journal of Sustainable Development and World Ecology, 21(3), 273-289.

Delmas, M. A., & Toffel, M. W. (2004). Stakeholders and environmental management practices: An institutional framework. Business Strategy and the Environment, 13(4), 209-222.

Delmas, M. A., & Toffel, M. W. (2008). Organizational responses to environmental demands: opening the black box. Strategic Management Journal, 29(10), 1027-1055.

Diálogo Forestal. ((n.d.)). Retrieved 26/10/2017, from http://www.dialogoforestal.cl/

Diana, J. S. (2009). Aquaculture production and biodiversity conservation. BioScience, 59(1), 27-38.

Echeverria, C., Coomes, D., Salas, J., Rey-Benayas, J. M., Lara, A., & Newton, A. (2006). Rapid deforestation and fragmentation of Chilean Temperate Forests. Biological Conservation, 130(4), 481-494.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. The Academy of Management Review, 14(4), 532-550.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. Academy of Management Journal, 50(1), 25-32.

Esposito, A. (2016, Jun 1). Chile court orders salmon farms antibiotic use be disclosed. Reuters. Retrieved 26/10/2017 Retrieved from http://www.reuters.com

Evison, W., & Knight, C. (2010). Biodiversity and business risk - A Global Risks Network briefing: World Economic Forum.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. Annual Review of Environment and Resources, 30, 441-473.

Heilmayr, R., & Lambin, E. F. (2016). Impacts of nonstate, market-driven governance on

Chilean forests. Proceedings of the National Academy of Sciences, 113(11), 2910-2915.

Houdet, J., Trommetter, M., & Weber, J. (2012). Understanding changes in business strategies regarding biodiversity and ecosystem services. Ecological Economics, 73, 37-46.

Jones, M., & Solomon, J. F. (2013). Problematising accounting for biodiversity. Accounting, Auditing & Accountability Journal, 26(5), 668-687.

Lähtinen, K., Guan, Y., Li, N., & Toppinen, A. (2016). Biodiversity and ecosystem services in supply chain management in the global forest industry. Ecosystem Services, 21, 130-140.

Lambooy, T., & Levashova, Y. (2011). Opportunities and challenges for private sector entrepreneurship and investment in biodiversity, ecosystem services and nature conservation. International Journal of Biodiversity Science Ecosystem Services & Management, 7(4), 301-318.

Latta, A., & Aguayo, B. E. C. (2012). Testing the Limits: Neoliberal Ecologies from Pinochet to Bachelet. Latin American Perspectives, 39(4), 163-180.

Mulder, I., & Koellner, T. (2011). Hardwiring green: how banks account for biodiversity risks and opportunities. Journal of Sustainable Finance & Investment, 1(2), 103-120.

Natural Capital Coalition. (2016). Natural Capital Protocol Retrieved 26/10/2017 Retrieved from www.naturalcapitalcoalition.org/protocol

New Generation Plantations. ((n.d.)). Retrieved 23/05/2017, from http://newgenerationplantations.org/

Nicolini, D., Mengis, J., & Swan, J. (2012). Understanding the Role of Objects in Cross-Disciplinary Collaboration. ORGANIZATION SCIENCE, 23(3), 612-629.

Oakleaf, J. R., Kennedy, C. M., Boucher, T., & Kiesecker, J. (2013). Tailoring Global Data to Guide Corporate Investments in Biodiversity, Environmental Assessments and Sustainability. Sustainability, 5(10), 4444-4460.

Oliver, C. (1992). The Antecedents of Deinstitutionalization. Organization Studies, 13(4), 563-588.

Overbeek, G., Harms, B., & Van den Burg, S. (2013). Biodiversity and the Corporate Social Responsibility Agenda. Journal of Sustainable Development, 6(9), 1-11.

Pahl-Wostl, C., Craps, M., Dewulf, A., Mostert, E., Tabara, D., & Taillieu, T. (2007). Social learning and water resources management. Ecology and Society, 12(2), [online]. Retrieved 26/10/2017 Retrieved from http://www.ecologyandsociety.org/vol12/iss2/art5/

Paoli, G. D., Yaap, B., Wells, P. L., & Sileuw, A. (2010). CSR, oil palm and the RSPO: Translating boardroom philosophy into conservation action on the ground. Tropical Conservation Science, 3(4), 438-446.

Pawson, S. M., Brin, A., Brockerhoff, E. G., Lamb, D., Payn, T. W., Paquette, A., et al. (2013). Plantation forests, climate change and biodiversity. Biodiversity and Conservation, 22(5), 1203-1227.

Paz Infante Heymann, M. (2016, May 7). Conflicto en Chiloé: Pérdidas de industria del salmón superan los US$40 millones. El Mercurio. Retrieved 26/10/2017 Retrieved from http://impresa.elmercurio.com

Pogutz, S., & Winn, M. I. (2016). Cultivating Ecological Knowledge for Corporate Sustainability: Barilla's Innovative Approach to Sustainable Farming. Business Strategy and the Environment, 25(6), 435-448.

Räty, T., Toppinen, A., Roos, A., Riala, M., & Nyrud, A. Q. (2016). Environmental Policy in the Nordic Wood Product Industry: Insights Into Firms' Strategies and Communication. Business Strategy and the Environment, 25(1), 10-27.

Reade, C., Thorp, R., Goka, K., Wasbauer, M., & McKenna, M. (2015). Invisible Compromises: Global Business, Local Ecosystems, and the Commercial Bumble Bee

Trade. Organization and Environment, 28(4), 436-457.

Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. Biological Conservation, 141(10), 2417-2431.

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., et al. (2010, 4). What is social learning? Ecology and Society, 15. Retrieved 26/10/2017 Retrieved from http://www.ecologyandsociety.org/vol15/iss4/resp1/

Rimmel, G., & Jonäll, K. (2013). Biodiversity reporting in Sweden: corporate disclosure and preparers' views. Accounting, Auditing & Accountability Journal, 26(5), 746-778.

Robinson, J. G. (2012). Common and Conflicting Interests in the Engagements between Conservation Organizations and Corporations. Conservation Biology, 26(6), 967-977.

Ruckelshaus, M., McKenzie, E., Tallis, H., Guerry, A., Daily, G., Kareiva, P., et al. (2015). Notes from the field: Lessons learned from using ecosystem service approaches to inform real-world decisions. Ecological Economics, 115(0), 11-21.

Rydin, Y., & Falleth, E. (Eds.). (2006). Networks and institutions in natural resource management. Northampton, MA, USA; Cheltenham, UK: E. Elgar.

Salas, C., Donoso, P. J., Vargas, R., Arriagada, C. A., Pedraza, R., & Soto, D. P. (2016). The forest sector in chile: An overview and current challenges. Journal of Forestry, 114(5), 562-571.

Samkin, G., Annika, S., & Dannielle, T. (2014). Developing a reporting and evaluation framework for biodiversity. Accounting, Auditing & Accountability Journal, 27(3), 527-562.

Scherer, A. G., Palazzo, G., & Seidl, D. (2013). Managing Legitimacy in Complex and Heterogeneous Environments: Sustainable Development in a Globalized World. Journal of Management Studies, 50(2), 259-284.

Sepúlveda, C., & Villarroel, P. (2012). Swans, Conflicts, and Resonance: Local Movements

and the Reform of Chilean Environmental Institutions. Latin American Perspectives, 39(4), 181-200.

Sharma, S., & Nguan, O. (1999). The biotechnology industry and strategies of biodiversity conservation: The influence of managerial interpretations and risk propensity. Business Strategy and the Environment, 8(1), 46-61.

Siebenhüner, B., & Arnold, M. (2007). Organizational learning to manage sustainable development. Business Strategy and the Environment, 16(5), 339-353.

Siebenhüner, B., Rodela, R., & Ecker, F. (2016). Social learning research in ecological economics: A survey. Environmental Science and Policy, 55, 116-126.

Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, `Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. Social Studies of Science, 19(3), 387-420.

Sternlieb, F., Bixler, R. P., Huber-Stearns, H., & Huayhuaca, C. (2013). A question of fit: Reflections on boundaries, organizations and social-ecological systems. Journal of Environmental Management, 130, 117-125.

Testa, F., Boiral, O., & Iraldo, F. (2015). Internalization of Environmental Practices and Institutional Complexity: Can Stakeholders Pressures Encourage Greenwashing? Journal of Business Ethics, 1-21.

van den Burg, S. W. K., & Bogaardt, M. J. (2014). Business and biodiversity: A frame analysis. Ecosystem Services, 8, 178-184.

Van der Byl, C. A., & Slawinski, N. (2015). Embracing Tensions in Corporate Sustainability: A Review of Research From Win-Wins and Trade-Offs to Paradoxes and Beyond. Organization and Environment, 28(1), 54-79.

Westley, F., & Vredenburg, H. (1997). Interorganizational Collaboration and the Preservation of Global Biodiversity. Organization Science, 8(4), 381-403.

Whiteman, G., Walker, B., & Perego, P. (2013). Planetary Boundaries: Ecological Foundations for Corporate Sustainability. Journal of Management Studies, 50(2), 307-336.

Winn, M. I., & Pogutz, S. (2013). Business, Ecosystems, and Biodiversity: New Horizons for Management Research. Organization and Environment, 26(2), 203-229.

Wolf, S. A., & Primmer, E. (2006). Between incentives and action: A pilot study of biodiversity conservation competencies for multifunctional forest management in Finland. Society & Natural Resources, 19(9), 845-861.

World Business Council for Sustainable Development. (2012). Biodiversity and ecosystem services scaling up business solutions Retrieved 26/10/2017 Retrieved from www.wbcsd.org

Yin, R. K. (2014). Case study research: design and methods. Los Angeles: SAGE.

Zamorano-Elgueta, C., Rey Benayas, J. M., Cayuela, L., Hantson, S., & Armenteras, D. (2015). Native forest replacement by exotic plantations in southern Chile (1985-2011) and partial compensation by natural regeneration. Forest Ecology and Management, 345, 10-20.

[i] Drawn from Pawson et al. (2013) and (Diana, 2009)