
This item was submitted to [Loughborough's Research Repository](#) by the author.
Items in Figshare are protected by copyright, with all rights reserved, unless otherwise indicated.

Building with wildlife: project geographies and cosmopolitics in infrastructure construction

PLEASE CITE THE PUBLISHED VERSION

<http://dx.doi.org/10.1080/01446193.2014.911933>

PUBLISHER

© Taylor and Francis

VERSION

AM (Accepted Manuscript)

PUBLISHER STATEMENT

This work is made available according to the conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) licence. Full details of this licence are available at: <https://creativecommons.org/licenses/by-nc-nd/4.0/>

LICENCE

CC BY-NC-ND 4.0

REPOSITORY RECORD

Sage, Daniel J., Andrew R.J. Dainty, Kjell Tryggestad, Lise Justesen, and Jan Mouritsen. 2019. "Building with Wildlife: Project Geographies and Cosmopolitics in Infrastructure Construction". figshare. <https://hdl.handle.net/2134/21014>.

Building *with* Wildlife:

Project Geographies and Cosmopolitics in Infrastructure Construction

ARCOM 2013 Conference Issue (edited by Simon Smith)

Across many construction projects, and especially infrastructure projects, efforts to mitigate potential loss of biodiversity and habitat are significant concerns, and at times politically controversial. And yet, thus far, very little research has addressed the interplay of humans and animals within construction projects. Instead those interested in the politics and ethics of human-animal relations, or Animal Studies, have arguably focussed far more on more stable and contained sites, whether organisations like zoos, farms or laboratories, or other places like homes and parks. These largely ethnographic studies inevitably perhaps downplay the unplanned, unexpected and highly politically and ethically charged, collision of hitherto rather separate human and animal geographies. Yet, as we argue here, it is often within such colliding spaces, where animal geographies are unexpectedly found at the heart of human projects, that we formulate our respect and response to both animals, and indeed other humans. Here we examine such encounters conceptually, with reference to Actor-Network Theory, and empirically, through case study analysis of two infrastructure projects. In doing so, we highlight the relevance of our analysis to both construction project management and other animal studies.

Keywords: Human-Animal Geographies, Actor-Network Theory, Infrastructure, Environment Impact Assessment

Introduction

Construction activity can be extremely disruptive or damaging to animal habitats and wildlife itself. This is particularly the case for infrastructure projects, where anthropogenic effects can often be amplified by the scale and nature of the activity, as well as the long-lived legacies of the assets that they create. Whether this damage relates to the disruption of natural environments, or to the displacement of animals within their natural settings, the consideration of environmental impacts now ranks amongst the most important decision criteria governing infrastructure development, and efforts to mitigate damage to natural habitats are increasingly central to investment decisions in such projects. It is surprising, therefore, that animals and their habitats (or ‘wildlife’) have not been studied more extensively within the construction project management field. Indeed, with a few recent exceptions (Sage et al. 2011; Tryggestad et al. 2013), there is a paucity of work which has examined the interaction between humans and wildlife in construction projects. This is despite the burgeoning interest in other non-humans, namely technological objects and artefacts, in construction projects (for a review see Bresnen and Harty, 2010; Sage, 2013), especially as influenced by Actor-Network Theory (ANT).

The need for such research is further underscored by the tendency within the interdisciplinary animal studies field to largely ignore surprising encounters with animals around the construction process, choosing often instead to examine sites where animals are rather more deliberately ab/used, such as farms (Evans and Miele, 2012), zoos (Davies, 2000), laboratories (Greenhough and Roe, 2011) and homes (Wolch et al., 2000). However, this body of work is valuable to the extent that it sensitizes us to the importance of spatially and temporally specific practices in the formation of our (ethical, economic and physiological) relationship with wildlife; and thus, it challenges absolutist ethical arguments about animal welfare (e.g. Singer, 1975) as well as utilitarian arguments about animals favoured by the contemporary meat and pharmaceutical industry. Evans and Miele (2012), for example, discuss how the connection and disconnection of meat eaters and sites of meat production are mediated through a prism of national cultural practices of sensual taste and language. Hence animals emerge as very different matters of concern across European nations (Evans and Miele, 2012). Similarly, Wolch et al. (2000) argue that our ethical relations with animals are

social constructions bound up with the social status of particular groups in specific places and times.

Extending the scope of this body of work to the field of construction, we adopt an ANT approach to examine how animal spaces and places are often, and unexpectedly, found at the heart of human infrastructure projects. By focussing here on such encounters, our broader purpose here is to question how *human actors* anticipate the agencies of animals, and then ask how wildlife habitats and infrastructure might exist alongside each other before, during and after the development process? In pursuing the overarching aim set out above, this paper is organized into five sections. The first section addresses how the presence of animals is systematically (mis)framed within construction infrastructure projects: the Environment Impact Assessment (EIA) process. The EIA process is the accepted way of rendering animals visible within the management of construction projects (and countless other organizations), yet, as we will examine in the subsequent ANT section, it offers a rather limited view of the complexity of animal agency. Section three outlines our methodological approach employed in the engagement with our case studies. In sections four we discuss our two case studies – the Hallandsås tunnels project and Ashwood to Oakton pipeline project – in order to attempt to shed light on how these complex agencies can and do shape the management of infrastructure projects. In the final section we reflect upon how the analysis developed here poses new questions for construction management practitioners and researchers alike in how they conceptualize the role of wildlife in projects, and in particular the role of Environmental Impact Assessment. We conclude with some questions for future research and practice in this area.

Animal as Receptors in Environmental Impact Assessment

The infrastructure sector has a long history of accounting for the environmental impact of its activities. The legal enforcement and effectiveness of the field of Environmental Impact Assessment (EIA) to encourage a detailed consideration of the impact of all manner of human activity on both natural and human environments, is increasing throughout the world (Tullos 2009). Originally developed in the United States in response to the National Environmental Policy Act 1969, there are now over 100 different legally-supported applications of EIA in

operation globally (Wood 2003: 1). The EIA process was legal mandated across Europe in 1985, through the implementation of Directive 85/337/EEC (amended in 1997, 2003 and 2009 - now all codified in 2011 under Directive 2011/92/EU). Although originally developed as a way of involving the public in the process of decision making (Kværner et al. 2006), the prominence of EIA has arguably been provided with additional impetus in recent years under the Corporate Social Responsibility agenda (CSR), not least given the reputational damage incurred by contractors who failed to account for wildlife habitats in infrastructure projects (see Murray and Dainty, 2009). With the growth in major infrastructure investment, the importance of such assessments is set to grow in the foreseeable future.

The primary purpose of the EIA process is to ensure that potential environmental effects of development have been properly considered before consent for a development is granted (Griffith 1996; Jay et al. 2007). Thus, the EIA process does not necessarily represent a mechanism for preventing environmental impact (although this might be an eventual outcome), but for evaluating the likely impact should a development go ahead (Wood, 2003). It is therefore incumbent on any EIA process that it accounts for the full range of potential impacts that might occur during and after the development phase, and that it considers such impacts from as wide a range of stakeholder perspectives as possible. To this end, the legislative provisions of the UK EIA system, for example, benefit from a participative and transparent process in relation to human stakeholders (Bassi et al., 2012). Sweden is similarly seen as a pioneer of ensuring human stakeholder involvement in the EIA processes (Kågström et al., 2013). However, the literature reveals rather less about the how the needs and agencies of non-human stakeholders, such as animals and other wildlife, are accounted for in the EIA process. Moreover, while the emergence of the EIA can be seen as generally positive to the mitigation of environmental damage, there has been a tendency to see wildlife, and their habitats, as passive 'receptors' of development, rather than an influence on, or a stakeholder to, construction and development. In the UK the term 'receptor' is now in popular use across professional bodies (Royal Institute of Chartered Surveyors, 2013), charities (Friends of the Earth, 2008), industry (BP, 2002) government (Scottish Natural Heritage, 2013) and academia (Morris and Therivel, 2009). Indeed, the term is used in preference to 'stakeholder' when referring to wildlife and their habitats.

No doubt part of the explanation for this erasure of non-human agency is the recognition that any EIA is always deeply rooted in a specific political context, and that political or economic factors will often outweigh environmental concerns (Wood, 2003: 3). Indeed, the act of developing an EIA is never politically neutral, and can yield actions which fully acknowledge negative environmental effects of infrastructure development. Recent examples of this range from the high-profile third-order effects of the Three Gorges Dam project on the Yangtze River, China to the rare Yangtze River dolphin (Tullos, 2009), to the more prosaic anthropogenic effects of reservoir building on parasite fauna (Morley, 2007). What unites these cases is that the broader societal and environmental benefits of these developments were deemed to outweigh concerns for the wildlife which inhabit them; Nature appears passive to and separate from Society (Latour, 1993; 2004a).

Although the politicisation of the EIA process is clear (see Wood, 2003: 3; Cashmore and Richardson, 2013), wildlife, their habitats, and their advocates, often themselves play a political role in transforming the outcomes of such analyses. In the UK, environmental groups, such as Friends of the Earth, have criticized EIA processes as often being overly-reliant on desk-based surveys, designed to achieve planning permission at minimal cost, while lacking involvement with local environments and communities (Friends of the Earth, 2008). The sociologists, Goldman and Schurman (2000), make a similar point as they argue 'environmental impact assessment and cost-benefit analyses rarely reflect localized cultural forms and norms, but rather, newly contrived universal norms and models of sustainability, resource valuation and degradation' (p. 576-577). Hence unsurprisingly, insights gleaned from EIAs can and are often challenged by emergent encounters during the construction process with wildlife and their advocates. The impact on the local Eurasian Otter population by the Skye Bridge project shows how failings in the initial EIA required costly post-hoc analysis and mitigation strategies (Sage et al., 2011). Yet, even long after construction, techniques, such as population sampling, deployed within EIA, can successfully improve habitats. For example, Dodd et al. (2004) show how the sampling of wildlife road deaths influenced the construction of a barrier culvert system designed to enable animals to cross a long-established Florida highway safely. It is important to note that the act of rendering the road safe to cross also afforded an opportunity for the local population to appreciate wildlife and their habitat that would have been difficult to achieve without the initial infrastructure

development. By contrast on Skye, the otter population has refused to use the expensive mitigation systems (Sage et al., 2011), thus the project displaced the otter's former habitat.

Despite the obvious political importance of the EIA process, there are surprisingly few studies which have sought to generate new theoretical understandings of it (Bartlett and Kurian, 1999). Moreover, there is noticeably little emphasis on the role of animals and wildlife in work that has critiqued particular EIA processes. Hence, in this paper we posit that infrastructure projects, and EIA and other managerial techniques, can be transformed by, as well as productively or adversely impact, habitats and wildlife. This point challenges the notion of wildlife as a passive 'receptor' to the construction project, and suggests that the EIA process might be limited as a way of thinking about the role of animals in infrastructure development. Thus, in the light of this discussion of the importance of the EIA process we can refine the research aim set out above into two specific questions: 1. To what extent can and should wildlife be managed in advance as a passive receptor? 2. Is wildlife always a cost or risk or can it benefit infrastructure development, perhaps in unexpected ways, and if so how? Before addressing the case studies in more detail to engage with these questions, we will position and develop these two questions further with reference to ANT-derived studies of non-humans. In so doing we seek to address the potential for construction to politicize wildlife, and in the process challenge the long-standing assumption that Nature is separate to Society (Latour, 2004a).

The Politics of Nature in Actor-Network Theory

While some work in EIA has recognized its political context (e.g. Cashmore and Richardson, 2013), the modus operandi of EIA dictates that 'the environment', or Nature, is little more than a complex mosaic of receptors passive to the social interactions of the construction process (and thus Society):

At the simplest level, a whole aspect of the environment could be considered a sensitive receptor, for example, the flora and fauna of a site. As interactions between different aspects of the environment are complex, it is however usually too simplistic

to take such an approach, and it is recommended that some attempt be made to break down the receiving environment into receptors (Royal Institute of Chartered Surveyors, 2013).

Set against EIA, there has been a steadily growing interest in the *active* involvement of various non-human actors in construction management processes (see Bresnen and Harty, 2010; Harty, 2008; Lingard et al. 2012; Ivory and Alderman, 2011; Sage, 2013). Much of the work around non-humans within construction management has been influenced by ANT (Latour, 2005), its derivatives and relations. ANT approaches the question of agency symmetrically and agnostically which means that no *a priori* claims of whom or what (usually framed as either Society or Nature) is the source of agency can be made. According to Latour, “an actor is *any entity* that modifies another entity in a trial ...” (Latour, 2004a: 237, emphasis added). Hence, this body of work opens up an opportunity to consider how animals and their habitats co-construct aspects of managerial agency within construction projects. ANT's insistence on the agency of non-humans offers a useful starting point for the purpose of this paper as this opens up the possibility of seeing animals as actors within social science analysis.

While there appears to be a tendency within ANT research to focus on objects rather than animals or other forms of wildlife, like plants or bacteria (perhaps influenced by Latour, Law and Callon's initial focus on physical science and technological projects – despite some notable exceptions – Callon, 1986) a number of ANT studies have explored the interaction of humans and organic non-humans. This work includes: Callon's (1986) seminal work on the simultaneous domestication of scallops, fishermen and scientists; Whatmore's (2002) hybrid geographies; Thompson's (2002) analysis of elephants in African national parks. Hinchcliffe et al.'s (2005) analysis of water voles and urban conservation; Power's (2005) examination of the agency of plants in suburban Australian gardening practices; Law and Mol's (2008a; 2008b) exploration of the politics of boiling pigswill and the ontologies of the Cumbrian sheep; Blok's (2011) work on whales and agonistic cosmopolitics and Stuart and Wooroz's (2011) investigation into the pathologies of bacteria in industrial food production. Two studies have also drawn on ANT to explore how animals may become actors in construction projects. Sage et al. (2011) focused on how otters shaped the development and operation of

the Skye Road Bridge project, while Tryggestad et al. (2013) showed how the surprising presence of moor frogs at a construction site influenced the project and its management.

What unites such work is that animals are afforded the possibility of being more than simply passive intermediaries of human intentions and actions. In ANT terminology, they become 'actors' that help "transform, translate, distort, and modify the meaning or the elements they are supposed to carry" (Latour, 2005: 39). The important point here is that animals are not *always* actors, but they may *become* actors in specific empirical contexts and always in relation with various others. According to ANT the question of animal agency can only be settled in empirical analyses that account for the differences made by animal actions. In a construction context, animals are seen as actors when they bring changes to the construction project, adding new elements and transforming relations and push it in new, and often surprising, directions (Tryggestad et al. 2013: 74). Following Latour they can be seen as "troublemakers" in the sense that "they emerge in *surprising* fashion, lengthening the list of beings that must be taken into account" (Latour 2004a, p. 79, emphasis added). And, moreover, as troublemakers they disturb the assumption, exemplified by EIA, that Nature and Society are separate.

All notions that Nature and Society are separate domains, and that Society is active while Nature passive, are problematized within ANT, and in particular Latour's philosophical treatise, *We Have Never Been Modern* (Latour, 1993). Given how the EIA process assumes Nature is passive and separate to a more active Society, as described in the previous section, it is worth elaborating this ANT derived critique of the Nature-Society dualism. Perhaps the most important point to make in this regard is that Latour (1993) argues that the separation of Nature and Society is *the* modus operandi of Western, scientific and political, thought since the Enlightenment – it "makes it possible to do everything without being limited by anything" (p32). This process occurs in three steps. First, we must speak as if Nature acts as some kind of *transcendental*, sublime force, even while we also *immanently* construct Nature in the laboratory (thus we speak for it and develop and use all manner of instruments and devices in the process – Callon, 1986), else it remains "forever remote and hostile" (Latour, 1993: 30). Second, we must speak as if Society is *immanent* to our action, our destinies are ours alone, yet we know Society exists beyond us, it surpasses the intention of individuals, it is durable,

transcendental even; otherwise it would crumble in an instant. Latour then proposes a crucial third step to balance this twin-fold oscillation between transcendence and immanence: Nature and Society must be kept apart forever; thus all entanglements between Nature and Society remain inadmissible in this view of Nature and Society as separate domains. Taken together these three steps allow Nature (non-humans) to be harnessed to buttress and transform all manner of political projects, while simultaneously the destinies of Societies appears no more than the product of human will:

[t]hey are going to be able to make Nature intervene at every point in the fabrication of their societies while they go right on attributing to Nature its radical transcendence; they are going to be able to become the only actors in their own political destiny, while they go right on making their society hold together by mobilizing Nature (Latour, 1993: 32)

Latour's thesis suggests that the separation between passive Nature and active Society as described above within the EIA process, simultaneously denies a much more complex reality: agency is always shared between the two domains: "Everything happens in the middle, everything passes between the two, everything happens by way of mediation, translation and networks" (Latour, 1993: 37). More importantly perhaps, if we ascribe agency asymmetrically in this way to either Nature or Society, we will fail to understand the proliferation of hybridized agencies (that is, part Nature, part Society) and their "dangerous consequences" (Latour, 1993: 41). The problem, as Latour (1993) suggests, is that these dangerous consequences are becoming harder for us ignore, as in the cases of anthropomorphic climate change, genetic engineering, bird flu, and perhaps even construction management, if we separate out (passive) Nature and (active) Society in advance (Latour, 2004a; 2004b).

Following ANT, we problematize this view that Society acts upon Nature (or vice-versa). As a result, we do not wish to focus on the agency of wildlife *per se*, for that would simply reverse the Nature-Society dualism of EIA, instead we are interested in understanding the *shared* agency of human of non-humans, as well as technologies and other artefacts. And thus we will ask how wildlife can help contribute to, though not direct, the action of construction

management. We wish to suggest that the contribution of animals within projects can be just as useful, surprising, troublesome, and indeed political, as humans. But instead of simply documenting the unexpected influence that animals and their habitats may have on the direction of construction projects (as in Sage et al., 2011; Tryggestad et al. 2013), we seek to question here how animals are being understood and managed in projects, in relation to EIA and other construction management practices, and the limitations and opportunities therein of such practices for all involved.

By comparing two rather different infrastructure projects we want to say more about the complex interaction of management systems, cultures, political environments, as well habitats and wildlife. Thus, this paper has a more normative, arguably political, orientation than earlier work in this area. But, following Hinchcliffe et al. (2005), by ‘political’, we do not mean to represent the interests of wildlife more accurately, as if to provide a more faithful, body of knowledge for Society to identify and pin down the behaviours of Nature. Rather, we will view the interests and behaviours of wildlife as open-ended as they are produced through dynamic relations with all manner of actors, not least humans. In what follows, we elaborate a politics of wildlife for construction which recognizes how we share agency with wildlife; this is a political act too as we seek to allow them to become troublemakers that may “object to the stories we tell about them, to intervene in our processes as much as we intervene in theirs” (Hinchcliffe et al., 2005: 56-6). ANT proponents have conceptualized this version of politics as ‘cosmopolitics’, where “*Cosmos* protects against the premature closure of *politics* [around human actors], and politics against the premature closure of *cosmos* [around natural facts]” (Latour, 2004b: 454). This version of politics is set against a representational politics of nature where natural matters of fact either close down political debate or are rendered insignificant to it (Latour, 2004a). Thus instead of just applying this notion of cosmopolitics to our case studies, we ask what unique role (infrastructure) construction might have in both inhibiting and realizing cosmopolitics?

Methodology: ontological politics

In the subsequent section we will turn towards the two case studies – the Hallandsås tunnels project and Ashwood to Oakton pipeline project - to address the question identified above, as

well as those two posed earlier in relation to EIA. But first it is useful to set out how ANT informs our approach to research methodology and methods. Most visibly, within ANT, data is usually presented as a narrative (cf. Callon, 1986; Law and Singleton, 2005) – our paper is no exception. Following ANT, these narratives are not intended to form objective accounts of ‘singular, independent, definite and a priori realities’ (Law, 2006: 23-26). Rather, they are multiple, dependent, indefinite and simultaneous enactments (Law, 2006: 32) of realities (see also Mol, 1999; 2002). This idea stems from a constructivist ontological claim within all ANT studies: descriptions of reality can *help* enact reality. This proposition arises because ANT insists that scientific, not least social scientific, methods do not unveil an objective reality rather scientific practices slowly, and cautiously, translate, and transform, matters into (relatively) obdurate facts, or realities (cf. Callon, 1986; Latour, 1987; Law, 2006).

The question therefore becomes, not *simply* whether reality is described accurately or not by our methods, but *also* do our methods enact particular realities that are ethical, emotionally engaging, inspirational or spiritually uplifting (Law, 2006: 154)? Or, as Mol (2002) explains “Good knowledge, then, does not draw its worth from *living up* to reality. What we should seek, instead, are worthwhile ways of *living with* the real” (p. 158). In short, what worlds might our methods, our concepts, bring into being? Mol (1999, 2002) describes this approach as “ontological politics”: “if the term ‘ontology’ is combined with that of ‘politics’ then this suggests that the conditions of possibility are not given. That reality does not precede the mundane practices in which we interact with it” (Mol, 1999: 75). Law (2006) elaborates how all research methods involve three concurrent processes: “Some classes of possibilities are made thinkable and real [presence]. Some are made less thinkable and less real [manifest absence]. And yet others are rendered completely unthinkable and completely unreal [Otherness].” (p. 34). What is more, if realities can be constructed they can also be multiple (see e.g. Alcadipani and Hassard, 2010; Greenhough, 2011; Law, 2006; Law and Singleton, 2005; Mol, 2002; Sage et al., 2013). But, to reiterate, we certainly cannot craft realities at will (Law, 2006: 33); this is because we must work with extant realities that always already influence what we can do. As Latour’s (1987) shows, it takes meticulous effort to bring new realities into being, whether DNA or diesel engines, to make space for them by drawing upon existing worlds, building networks of translation that admit new ‘objective’ facts into society; this is no less the case then with the realities of social science research, such as class, place, identity, the economy (Latour, 2005: 257). Bluntly stated: “Yes, there are things to discuss.

Yes, there are beings that do not deserve to exist. Yes, some constructions are badly made. Yes, we have to judge and decide” (Latour, 2013: 142-3). Accordingly, Mol (1999, 2002) and Law’s (2006) ‘ontological politics’ can be considered a further specification, within the collective of ANT, of how we might develop what Latour has termed ‘cosmopolitics’ (Latour, 2004b; 2005).

The two narratives presented here are fully intended to add to the lively realities of wildlife developed and encountered within other related animal studies (e.g. Blok, 2011; Evans and Miele, 2012; Greenhough and Roe, 2011; Hinchcliffe et al., 2005), and in various empirical practices like construction management; thus they are strategically set against those (more passive) realities of wildlife enacted by methods like EIA. As such, we purposefully set out to develop our empirical case studies as a form of ontological politics: to enact the reality of wildlife differently while working alongside extant reality producing practices like EIA. The two case studies were chosen on the basis that they can help us develop new realities for animal agency in infrastructure construction, but we believe the experiences within the narratives are not untypical of other infrastructure construction projects. This said, the chosen case studies are not identical. Rather, each enacts different, if related, realities of wildlife, including different aspects of the EIA process.

The Swedish case study concerns a highly controversial infrastructure construction project which has become somewhat of a national calamity, akin maybe to the construction of the Sydney Opera House or the Scottish Parliament. Here successive EIA processes intended to mitigate the impact of the project on wildlife, that is, to place nature outside politics, seemed to serve only to further politicize wildlife. Owing to the large archive of public documentation on this project, our narrative is constructed from secondary data, including public inquiries. A key document in this case is the final concluding report from the Tunnel commission, a public inquiry initiated by the Swedish government fall 1997 in the aftermath of the scandal (SOU 1998:137). This report in turn is based on visits to the construction site and the people living in the affected area. The commission conducted hearings and interviews with key actors and organizations implicated in the tunnel project, document studies of meeting-and decision protocols during the project, further examinations of the affected natural environment, the work environment and medical examinations of affected tunnel

workers and citizens in the aftermath of the scandal. The commission included university researchers across a range of relevant disciplines as well as experts and consultants, all of whom have contributed with publications in separate reports prior to the final report such as SOU 1998:60. In addition the case narrative draws on a doctoral thesis with a focus on the Hallandsås tunnels project (Frisk 2008) as well a research publication (Päiviö, J. and WallenHans-Geog, W. 2001) with a particular focus on the EIA process related to the Hallandsås tunnels project (Päiviö, J. and WallenHans-Geog, W. 2001). A research contribution by Weideborg et al. (2001) on the behaviour of the chemical agents in Rhocha Gil under different underground conditions concludes the case material. To maintain a level of confidentiality, the name of the contractor is fictionized within our dataset.

The UK case study concerns a smaller scale and far less controversial project. The project is entirely anonymized to protect the parties involved and in part this reflects its unremarkable status; unlike the Swedish case study it has not achieved national infamy and little public documentation exists. Hence here we rely more on primary data. To develop the UK case we interviewed eight individuals: two environmental managers within the client's environment division, environmental officers working for the client and general contractor; the client project manager, a sub-contracted environmental consultant, two wildlife officers working for the local authorities, and a manager of a local wildlife charity who was consulted on the project. These individuals were asked in semi-structured interviews to, *inter alia*, describe; how wildlife was managed on the project, how wildlife shaped the project's development, and whether the project was typical of their experience of infrastructure projects. This data was gathered alongside reviews of documentation including: the Environmental Statement, environmental 'best practice' case studies prepared by the client and contractor, minutes of planning minutes within the local authority and environmental mitigation protocols. This case study demonstrates how wildlife is politicized in a more quotidian manner across infrastructure construction and how a single EIA procedure both conceals and shapes this process. Further similarities and differences between the cases are discussed later in this paper.

These two datasets were developed into two case study narratives. This process involved two analytical stages. Firstly, we extracted background information on the aim of each project,

key stakeholders, project timetables, environmental practices and important events. Secondly, our analysis paid attention to specific instances where animals made a difference to the direction of the two construction projects. That is, where animals might be considered active within the shared agency of the project (Latour, 2005). However, as we were also interested in the extent to which this agency is being effaced by a representational politics, we also noted instances when although animals were represented, their agency was elided, in particular, documentation and practices related to the EIA process. In developing our analysis we are conscious that our dataset had limitations. Specifically, we had no access to specific project costs (which may have helped explain the selection and use of particular wildlife strategies, not least EIA) and, as our case studies were historical, we could not develop ethnographic access to ‘follow the actors’ (as proposed by e.g. Law, 1994; although see Dulepos and Miller, 2012). Thus inevitably the case study narratives rendered certain things present (animal agencies), some things manifestly absent (wildlife as a passive receptor), and, no doubt ‘Othered’ many other things, including much which appeared less inspirational (Law, 2006: 144), or accessible, to us, for example the cost-efficiency of particular environmental strategies. Following the imperative of ontological politics, our narratives are self-consciously political and partial. ANT suggests that to claim otherwise is erroneous. Notwithstanding the confines of a single research paper, our modest hope is that they enable new ways to enact the agency of animals, and other wildlife, in infrastructure construction projects, than current practices like EIA.

Case Studies

The Hallandsås Tunnels Project

In October 1997 a large public infrastructure project, the construction of two parallel 8.6 kilometre long railway-tunnels through the Hallandsås ridge in the south of Sweden, was brought to a halt. Farmers living in the neighbourhood of the construction site found paralyzed cattle on the fields and dead fish in the ponds. Three paralyzed cattle were slaughtered on the 1st October. The farmers went public with their concerns and claimed that the project had caused the sickness and death of the animals. They contacted the media, organized public meetings and demonstrations and demanded that the project should be

stopped. Investigations confirmed the farmers' claims. The constructor and key contractor Scandia held a meeting with the Båstad municipality on the 3rd October which revealed that toxic water was leaking from the tunnel. This prompted the municipality to use the media to warn the public about the danger. The municipality filed criminal charges against the client, the National Railway Authority, (NRA) and the contractor, Scandia, for environmental damage. The project was halted on the 7th October. Construction workers had previously expressed concerns to their managers about their own health and safety when working with the composite Rhoca Gil to water seal the tunnels. A governmental investigation began on 20th October 1997. It concluded that 27 wells near the construction site were contaminated; 333.000 kg milk needed to be destroyed; 370 cattle had to be slaughtered; the value of farm land and property had declined together with the sales of local crops; and the crew had not been appropriately equipped and educated to work with Rhoca Gil. Workers expressed feelings of numbness in limbs and itching on the skin. Medical examinations revealed that about 20 construction workers had documented neural effects related to their work with the toxic composite material (Tunnelkommissionen, 1998:137).

Prior to these events, the Hallandsås project had been in process for years. As mentioned above, it was carried out by the NRA and the aim was that the tunnels would reduce the time for rail journeys and increase capacity for cargo and passengers. As required, NRA had considered environmental impacts in their project planning. Due to local geology, construction would cause a temporary lowering of groundwater, requiring NRA to obtain approval from the Water-Rights Court (WRC). For this application to be approved an Environmental Impact Assessment (EIA) had to be conducted. The EIA revealed that some sections of the ridge had high water transport capacity (due to small rocks and clay) and that this in turn could result in high losses of groundwater with environmental impacts on vegetation, animals, farmers and other inhabitants living on the ridge. The WRC permitted the NRA to release groundwater, but did express concerns regarding the degree of impact, suggesting that additional investigation should be conducted. The WRC also required more detailed considerations of the concrete lining method and a chemical control programme to ensure the water-quality (Päiviö and Wallentinus, 2001, 66). The local municipality, the Swedish Environmental Protection agency and the Ministry of Environment called for further investigation of the environmental impacts (as per 85/337/EEC on railway projects over 2.1km). However, during the early 1990s Sweden was not a member of the European Union

and there was no formal and legal requirement for an EIA for a particular type of construction work. Only the Swedish Water act required an EIA in case a building and construction project would affect the ground water level. With the EIA and subsequent WRC approval in place, the Government decided to start the project in February 1992.

The first contractor to work on the task was Kraftbyggarna who was awarded the 690 million Swedish crown (SEK) key-contract in spring 1992 with an estimated completion time in 1996. The contractor used a tunnel boring machine (TBM) that turned out to be unable to handle the variable geological conditions. Small rocks and clay jammed the boring head. Only a few meters were accomplished during the first years. The TBM, with a design that had been proven successful when working on massive rock, proved to be unfit when working under these more variable and complex ground conditions. The contractor ended up in a dispute with its client and left the project in 1995. This unexpected and trouble-some setback was only one in a series of surprising events which implicated variable and complex physical-technical conditions during the construction process.

After a new tender process Scandia took over the project with a contract worth 900 million SEK. The company used the well proven method of drilling, blasting and excavation. However, progress was soon lagging behind the time schedule as the amount of groundwater that seeped through the cracks was much larger than anticipated and created more difficult working conditions for the construction crew. In an attempt to get the construction project back on schedule NRA and Scandia decided to expand the construction approach by also accessing the ridge from the top. By constructing a vertical access tunnel from the top down to the middle of the planned rail track it would be possible to do construction work from four access points instead of only two (Tunnelkommissionen, 1998:137). However, the building of a the new access point would also require a new EIA and permission from the WRC since it could affect surface water on top of the ridge, ground water in the ridge, as well as the surroundings. The EIA included considerations of the impact of noise on birds as well as on the landscape, arguing that the former would get used to it, while the latter could be mitigated by restoring the surroundings. (Päiviö and Wallentinus, 2001: 72). The Båstad municipality, local farmers and people living in the area became concerned and protested against the new

plan and approach. A quite lengthy process of negotiation was required during 1995 before the municipality finally issued a building permission for the new construction site.

However, the client and contractor soon developed new concerns about an eventual violation of the permission issued by the WRC. Yet another EIA was conducted as part of a new application to WRC to lower the ground water. The EIA in this instance considers new emerging issues and measures, such as a re-active measure to irrigate already dry ponds and wetlands (due to ongoing construction activities) as well as more pro-active safety measures in case of future release of unwanted chemicals into the ground water. (Päiviö and Wallentinus, 2001: 66). Growing concerns among local farmers and people living on the ridge about the water supply were reported by the press. At this point neither the WRC nor the Government was willing to grant the NRA permission to proceed with the plans of lowering the groundwater level. The NRA was thus forced to come up with new solutions to the groundwater problem. Together with Scandia, the NRA investigated new ways to seal and contain the water flows. Tests with ordinary lining methods that used concrete showed them to be insufficient. Lining had to be complemented with other methods. The client and contractor decided to do a test on a limited area of the tunnel with the chemical composite material Rhoca Gil, which was a quite well established sealing method for underground construction work internationally (Weideborg et al. 2001). The test results obtained in spring 1997 were encouraging and project management then decided to scale up for production. Large quantities of Rhoca Gil were used during the summer and fall. The environmental scandal emerged shortly after.

The investigations conducted in the aftermath of the scandal revealed some of the subtleties of Rhoca Gil in use. When used under conditions of moderate water pressure, the toxic agent in Rhoca Gil would harden quite swiftly and be contained with relatively little discharges into the waterways. However, when used under high water pressure, the toxic agent would reveal a different behaviour and take much longer time to harden while discharging the toxic chemical acrylamide into the water flow (Weideborg et al., 2001; Frisk, 2008) – in ANT terms the sealing agent, due to its complex and unexpected behaviour, had become a troublemaker with life threatening implications for biological species, humans and wildlife

alike. The project resumed in 2003 and is estimated to be completed in 2015 at a cost of 10.5 billion SEK, over 17 times over budget, and 19 years late.

Ashwood to Oakton Pipeline Project

The Ashwood to Oakton pipeline (AOP) project (fictitious name, but based on a real project) involved the construction of a £45m value, 1200mm high pressure gas pipeline over 18.5km from protected Green Belt land into outlying suburbs of a large conurbation in the United Kingdom. Construction took place between 2007 and 2009. The project sponsor was an international, privately-owned, utility provider (hereafter named 'Gasgen'). The project did deviate from original time and cost estimates (of a spring 2007 start and 2008 end) partly due to its environmental impact. However, it was also regarded as highly successful for its environmental practice, winning a national award for waste management. This award was a success for the project as from conception its environmental challenges were amplified given its location close to densely populated urban areas with scarce environmental resources. Hence even a relatively small environmental incident would be quickly detected and very damaging to the company's reputation and ability to work in similar areas in the future.

Under the Public Gas Transporter Pipe-line Works (1999), adopted in response to European Directive 97/11/EC, the pipeline required a full EIA as it was over 800mm in diameter. While this act exempts pipelines from the requirement to gain planning consent from local authorities, all pipelines requiring an EIA also require approval from the relevant Secretary of State. The EIA was captured in the Environmental Statement by a team of independent consultants (named here 'Ecoplan') on behalf of Gasgen, in conjunction with statutory and non-statutory bodies, from regulatory bodies to local authorities and environmental charities (the 'consultees'), in addition to landowners.

The Environmental Statement introduces the purpose of the EIA thus:

The environment comprises human beings, animals, plants, soil, water, air, climate, material assets, landscape and cultural heritage, all referred to as receptors. Positive

(beneficial) and negative (adverse) impacts are identified [in the Environmental Impact Assessment] and measures are introduced to avoid, reduce, remedy or compensate significant adverse impacts.

In producing the Environmental Statement for the AOP project, Ecoplan utilized both desk-based surveys where they identified environmentally sensitive areas (with statutory designations - for example National Nature Reserves) in conjunction with statutory environmental advice and enforcement bodies, such as English Nature, and ecological surveys, undertaken on foot of the preferred route. These surveys mapped out what habitats and animals were present within the landscape, up to 500m from the centre of the pipeline, or 50m in the case of watercourses intersected by the pipeline. The Environmental Statement stated that during operation the pipeline would “have no impacts on ecology” so the focus of the assessment was on the impact during the construction and post-construction reinstatement phase. It is beyond the scope of this paper to reproduce the results of these surveys, instead we will discuss how three species: the European Badger (*meles meles*), the English Oak (*Quercus robur*) and Himalayan balsam (*Impatiens glandulifera*) were depicted within the ES, as receptors, and the usefulness, and limitations, of this politics of representation.

The protection of European Badgers in the UK is established in the Protection Badgers Act (1992) (hereafter ‘the Badger Act’) which affords badgers, and their setts, a high-level of protection from any disturbance, punishable by prison sentences. The Act also stipulates that anyone whose actions make lead to these effects can be punished, hence it is commonplace within the ecology community (including those undertaking EIAs) to maintain the secrecy of badger setts. Thus while two badger setts were found in the EIA surveys on the AOP project, the setts’ locations were not disclosed in the Environmental Statement. The Environmental Statement describes how the impact on badgers will be ‘minor adverse because of the scale of the working area affected compared to the foraging area available’ and crucially as the ‘pipeline has been routed to avoid impact on known badger setts’. However the Environmental Statement notes that during construction badger pathways will be intersected by construction activities and so badgers may damage the site; become trapped in ditches and may lose access to habitat. As a result, the ES suggested a number of mitigation strategies including: a 30m buffer between construction work and all active setts; consultation with English Nature on any works within this buffer zone; the use of fencing to maximize

available foraging habitat; robust fencing to provide crossing points where badger pathways are intersected by construction work; planks and pipe end caps placed in construction trenches to allow badgers to escape if they fall into them; new inspections close to areas of known badger activity to be re-inspected for new sett construction immediately prior to construction.

During the start of construction a previously unknown badger sett was encountered by the contractors as they were clearing access for construction equipment; this is perhaps not surprising given that the survey for the ES was undertaken over two years before the start of construction. In consultation with English Nature, the contractors and Gasgen were advised to spend several thousand pounds to construct an artificial sett away from the pipeline route and place food to encourage the badgers to leave their former sett and use the artificial one; this effort failed – the five badgers did not use the new sett – in ANT terms they had become troublemakers. At this moment it appeared that English Nature was not able to speak for the badgers. As a result, English Nature (the legal spokesperson for the badgers) stated to Gasgen that the pipeline has to be tunnelled underneath the sett instead of routed using open-cut tunnelling to avoid disturbance and avoid prosecution. This change in the construction technique used for this section of the pipeline route added around £500,000 to the construction cost of the project overall.

Gasgen's Environmental Officer on the project questioned whether the public would have supported this cost if they had known about it, especially as they would have to fund it from their energy bills at a time of increasing energy costs. Yet of course such disclosure was not permissible under the public secrecy clause of the Act. Nevertheless in interview for this research, the Officer reflected whether it would have been far cheaper, and perhaps more popular to have simply forced the badger to use the new sett (as in any case the old sett was abandoned after the project's completion). It is impossible to say how the badgers would have reacted to being moved, but in any event the law forbids such active involvement in their lives (except in certain licensed exceptions as in the recent badger culls). Instead, the gas pipeline was bored under the badger sett and Society (English Nature) could purify and speak for the badgers again (Nature) without further trouble.

Very close to the location of this badger sett, the pipeline route transgressed woodland which contained several mature trees, especially English Oak. These trees provided a significant area of habitat for various species, including badgers and wild birds. This woodland was part of a non-statutory Site of Importance for Nature Conservation, but also contained some mature trees covered by a Tree Preservation Order. The pipeline had to enter this woodland in order to be bored underneath a nearby major road. The Environmental Statement noted that for the pipeline to be routed in this way, a number of less mature trees would have to be felled for the tunnel shafts to be dug. To offset this action Gasgen had agreed to plant several young saplings in the woodland. However when construction began a mature English Oak tree covered by a Tree Preservation Order was found to be blocking the path of one of the shafts for the tunnel. If the tree was not removed the changes to the construction plan would add several thousand pounds in costs to move and extend the bored tunnel. As a result, the contractor contacted the local authority responsible for the TPO and explained that if they could remove the tree they would plant dozens of semi-mature trees in the woodland using some of the money saved in not re-routing the pipeline. These semi-mature trees, including English Oak, would stand a far better chance of becoming established than the young saplings which had been the intended mitigation option. The local authority accepted the revised proposal and the tree was removed.

This example provides an interesting comparison to the badger example above, in that here the local authority was able to negotiate an outcome which although beneficial did change the local environment. In ANT parlance, here the divide between Nature and Society is rather more nebulous; instead project agency – the ability of the pipeline builders to act – appears shared with the trees from the start. After all, active intervention was always permissible at this site: some trees were going to be felled. The question here was what intervention was most beneficial to all parties (the wildlife, the trees, the company, the local authority etc.). This long chain of actors could only be taken into account because the local authority, via planning law, was able to render the visible the shared agency between each actor and problematize them, rather than act as if some interests were given *sui generis* (as in the badger example where a spokesperson – English Nature – already exists to talk for the badgers). If the tree had had stronger statutory protection, like the badgers, these experimental negotiations would have not occurred and a politics of representation would have emerged.

Our third example from the AOP project concerns Himalayan balsam. This species of plant, as the name suggests, originated in Central Asia, not Europe and is thus deemed an ‘invasive species’. The plant is not protected under any legislation and does not form a *necessary* part of any British ecosystem. The Wildlife and Countryside Act 1981 mandates that invasive species should not be spread hence on the AOP project extracted soil was stored and returned *in situ* rather than moved around the site. Evidence was found on the AOP project that the plant had actively destroyed habitats to support other prospective plants, and in turn animals, such as water voles, newts and freshwater fish. The Environmental Statement noted several sites where this had occurred and mentioned that discussions had been taken place the local authority to enhance habitats through weed control. This work was undertaken to help enrol the local authority in support of the project by demonstrating that the environmental impact of the project could be beneficial. To this end, one small river crossing above the pipeline was identified as being engulfed with Himalayan balsam with very low biodiversity. The project team selected this site as an opportunity to enhance local biodiversity. A river restoration company was employed to; clear the river, introduce new riffles to oxygenate the water, plant a range of native aquatic and riverbank species, construct a backwater wetland feature to connect with the original flood plain and grade the banks with biodegradable matting to improve the habitat. While this work helped interest the local authority in the project, it failed to enrol sufficient flora and fauna: the local authority did not have the resources to prevent this promising habitat being re-engulfed with Himalayan balsam, and the river has returned to more or less its former low-biodiversity state.

Discussion

We now revisit our three research questions:

1. To what extent can and should wildlife be managed in advance as a passive receptor?
2. Is wildlife always a cost or risk or can it benefit infrastructure development, perhaps in unexpected ways, and if so how?

3. What unique role might construction have in both inhibiting and realizing cosmopolitics?

In answer to the first question, our two case studies reveal that the EIA process which assumes that the impact upon wildlife and animals can be understood in advance through a politics of representation (and Nature/Society split), is rather more limited than may be suspected in terms of its practical application within construction projects. In both case studies, systematic, and sometimes on-going, attempts were made to map out the behaviour and interests of animals, and their habitats, in advance of various phases of construction. In the Hallandsås case a series of EIA processes were engaged within the project to understand how the construction of the tunnel would influence Nature. In the AOP project a single EIA was used to map out in advance the likely impact of the project on Nature. However, in both cases these processes were discovered to be insufficient as they failed to account for the role of wildlife on agency of project practitioners, technologies and materials. Of course, any good EIA should recognize the methodological, temporal and spatial limitations of its dataset, and recommend follow-up inspections, but we still think there is a deeper problem at work here: by conceptualizing wildlife and habitats as passive receptors separate from the project and its politics, the EIA process aggrandizes the ability of the management to control the project and grasp the interests and passions that move it forward. Moreover, this aggrandization is not limited to the project management team – local authorities in both the AOP and Hallandsås projects also assumed the agency of the project team was separate to a more passive Nature. And in both case studies this aggrandization of human agency both within and around the project team resulted in some costly problems, from the seepage of acrylamide in Hallandsås and the deaths of wildlife and livestock, to the failed enhancement of river biodiversity within the AOP project. Even the adoption of more frequent EIA processes, as in Hallandsås, appears insufficient to prevent these problems. And, of course, in the case of Hallandsås the final EIA process actually induced the decision not to allow groundwater to be lowered, which resulted in the use of Rhoca Gil and in turn caused a national environmental scandal.

In response to the second question, which again assumes the point of view of construction management, the influence of wildlife on the agency of construction management can be

positive *and* negative, useful *and* destructive (e.g. to projects costs, times), and a lot more besides; this point dovetails with similar recent arguments made within construction management research about the varied influence of technological objects on the building process (Bresnen and Harty, 2010; Harty, 2008; Lingard et al., 2012). In short, wildlife is far from simply a hostile and foreign domain for construction practitioners. In the case of the AOP project, encounters with certain habitats and species prompted and permitted the project management team to engage other human actors and reduce costs and cut delays. The negotiations between the local authority and Gasgen around the removal of the mature Oak tree and the subsequent planting of semi-mature trees exemplify this effort. By contrast, in the case of the Hallandsås project, the influence of animals appeared mostly detrimental to the project: dead cows and fish, destroyed livelihoods and polluted communities all became influential in creating large delays and cost over-runs on the project. We might also suggest the animals shared, highly visible, suffering with us (Haraway, 2008) and helped highlight the perils of this project more forcibly. Animals, and other wildlife, were shown in these case studies to be far more influential to the agency of the construction practitioners involved in the projects than the EIA process, and its Nature-Society split, its politics of representation, could admit. Thus we support Latour's (2004a) critique of notions, popular within political ecology, that pristine Nature can be faithfully represented in advance and protected from politics; these notions obscure how non-humans are always already suggesting, forbidding, questioning, disturbing, inspiring, and multiplying all manner of (political) decisions and outcomes, including those on infrastructure projects. Yet remarkably, the political agency of wildlife, even within major infrastructure projects, is something that is often overlooked within animal studies. Hence, in Peggs (2012: 72-83) recent sociological précis of animal studies of the urban environment, wild animals appear only as pests, contagion and pollution.

In contrast to our answers to the first two questions, answering the third question is somewhat trickier. Firstly, construction practice demonstrates the obduracy of the kind of separation between Nature and Society, based around a politics of representation that Latour (2004a, 2004b) is at pains to overcome through his concept of cosmopolitics. The institutionalization of EIA within the construction process has done much to encourage a view that animals are simply to be understood and protected, or not, in the act of building, like the badgers now safe in their sett above the gas pipeline or the fish now once again safe in their ponds above the Hallandsås rail tunnels. It is thus also important to note that within infrastructure

construction the split between Nature and Society, and the politics of representation which it harbours, is far from simply an esoteric philosophical argument. Rather, construction (temporally) enacts spatial divisions between a purified Nature and Society through fences, barriers, nature reserves, protection areas, exclusion zones, bored pipelines and (at least in theory) Rhoca Gil. It is beyond the scope of this paper to fully reflect upon these spatialized practices (see Peggs, 2012; Philo and Wilbert, 2000), but we can surely say that it is an oversimplification to suggest, as ANT tends to (e.g. Latour, 1993; 2004a), that the Great Divide between Nature and Society is simply a conceptual edifice; rather it is also manifest in ongoing, and costly, geographies of naturalization, where, at least on occasion, some non-humans are more or less purified and excluded through the act of building. And then, of course, the issue becomes, whether these containers, these purified spaces, where we learn to live *without* animals rather than live *with* them are more or less ethical? (Urbanik, 2012: 165-175; see also Srinivasan, 2012)? As Peggs (2012) puts it: “it is not only the nature/culture distinction that is an issue, but also the spaces related to conceptualizations of that division” (p.71).

A second issue of relevance here concerns the ways in which construction practice circumvents the Nature/Society dualism and its politics of representation: both case studies demonstrate how non-humans continue to influence the agency of even major infrastructure projects, and indeed many construction practitioners implicitly work through a version of cosmopolitics. This occurs when badgers, oak trees, and dead cows become troubling matters of (political) concern that induce new political imaginaries, controversies and decisions, rather than act as purified matters of fact that close down political debates (Latour, 1993). When you have to pass through the lifecycle of oak trees or badgers, as well as the local authority, to keep a project on track, politics and ethics appears to be very much more about experimentation with possibilities for getting on from within a collective of humans and non-humans (cf. Latour, 2004a; 2005; see also Davies, 2012; Greenhough and Roe, 2011): Put more vividly:

we are in a knot of species coshaping one another in layers of reciprocating complexity all the way down. Response and respect are possible only in those knots,

with actual animals and people looking back at each other, sticky with all their muddled histories (Haraway, 2008 p. 42)

Thus the notion that politics can be delineated to capricious human interests and passions, contrasted against cold, hard, purified natural facts, appears specious. But perhaps what infrastructure construction can teach us most about cosmopolitics is that we should view the Nature/Society dualism not simply as part of a human conversation about ourselves, that conceals (and thus proliferates) a messy array of hybrids (as Latour, 1993; 2004a suggests); rather this dualism is reified or not in *spatial practices of organization* configured to reproduce geographies of exclusion and purification as well as inclusion and hybridization, spaces of “connection’ and ‘disconnection” (Evans and Miele, 2012) – diverse practices which analyses of infrastructure projects can help us reveal, enact and change.

Conclusions

By examining the complex interaction of systems of governance, wildlife habitats and politics in infrastructure projects, we have sought to open up a new ways of thinking about, and understanding, the ways in which animal and human geographies enmesh and collide, sometimes to spectacular effect. In doing so, we have revealed the limitations of the EIA process in seeing animals and wildlife as mere *receptors of* development rather than *stakeholders to* development, or at the very least, as potential ‘troublemakers’ during development. This, in turn, raises questions as to the ways in which wildlife might now be viewed within construction management: should we rethink guidance to construction professionals around the complex engagement they have with wildlife and their habitats? It would seem that there is at least a need to rethink the language, practices and advice used to evade the agency of wildlife during construction. But perhaps of greater theoretical significance is the explication of the role that construction practices can play in both circumventing and reproducing the Nature/Society dualism, and in revealing the ways in which animals readily become matters of political concern within infrastructure projects. This suggests a need to rethink infrastructure development as a process that includes building *with* wildlife rather than always around it, and hence, seeing animals as stakeholders in projects

(Tryggestad et al., 2013). However, as these cases reveal, in many respects perhaps we already are.

References

Alcadipani, R. and Hassard, J. (2010) Actor-Network Theory, Organisations and Critique: Towards a Politics of Organising, *Organization* **17**(4), 419-435

Bartlett, R. and Kurian, P. (1999) The theory of environmental impact assessment: implicit models of policy making. *Policy and Politics*, **27**(4), 415-433.

Bassi, A., Howard, R., Geneletti, D. and Ferrari, S. (2012) UK and Italian EIA systems: A comparative study on management practice and performance in the construction industry. *Environmental Impact Assessment Review*, 34(April), 1-11.

Blok, A. (2011) War of the Whales: Post-Sovereign Science and Agonistic Cosmopolitics in Japanese-Global Whaling Assemblages. *Science, Technology and Human Values*, 36(1),55-81.

BP, 2002. BTC Pipeline - Construction Impacts and Mitigation, BP. Available at:

<http://goo.gl/n6yUs1>

Accessed 12/3/14

Bresnen, M. and Harty, C. (Eds.) (2010) Special Issue: objects, knowledge sharing and knowledge transformation in projects. *Construction Management and Economics*, **28**(6), 549-555.

Callon, M. (1986) Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay, in: J. Law (Ed.) *Power, Action and Belief: a*

new Sociology of Knowledge? Sociological Review Monograph, Routledge: London, pp.196-233.

Cashmore, M. and Richardson, T. (2013) Power and Environmental Assessment: Introduction to the Special Issue, *Environmental Impact Assessment Review*, **39**, 1–4

Davies, G. (2000) Virtual animals in electronic zoos: the changing geographies of animal capture and display, in Philo, C. and Wilbert, C. (Eds.) *animal space, beastly places: new geographies of human-animal relations*, Routledge: London. pp. 243-267

Davies, G. (2012) Caring for the multiple and the multitude: assembling animal welfare and enabling ethical critique. *Environment and Planning D: Society and Space*, **30**(4), 623-638

Dodd, C., Barichivich, W., and Smith, L. (2004) Effectiveness of a barrier wall and culverts in reducing wildlife mortality on a heavily traveled highway in Florida. *Biological Conservation*, **118**(5), 619–631.

Evans, A. and Miele, M. (2012) Between food and flesh: how animals are made to matter (and not matter) within food consumption practices. *Environment and Planning D: Society and Space*, **30**(2), 298-314.

Frisk, M. (2008) Sju miljarder för sju minuter? - Planering, politik och hybrida geografier i tunnelbygger genon Hallandsås, Doktorsavhandling, Fakulteten för samhälls - och livsvetenskaper, Kulturgeografi, Karlstad University Studies

Friends of the Earth (2008) Environmental Impact Assessment, FOE.

Available at: <http://goo.gl/4krkEI>

Accessed 13/3/14

Goldman, M. and Schurman, R. A. (2000) Closing the 'great divide': New social theory on society and nature, *Annual Review of Sociology*, **26**: 563-584.

Greenhough, B. and Roe, E. (2011) Ethics, space and somatic sensibilities: comparing relationships between scientific researchers and their human and animal experimental subjects. *Environment and Planning D: Society and Space*, **29**(1), 47-66.

Griffith, A. (1996) Review of environmental assessment in UK building construction: current awareness, concerns and issues. *Engineering, Construction and Architectural Management*, **3**(3), 205-217.

Haapio, A., and Viitaniemi, P. (2008) A critical review of building environmental assessment tools. *Environmental Impact Assessment Review*, **28**(7), 469-482.

Harty, C. (2008) Implementing innovation in construction: contexts, relative boundedness and actor-network theory. *Construction Management and Economics*, **26**(10), 1029-1041.

Haraway, D. (2008) *When Species Meet*, University of Minnesota Press: Minneapolis.

Hinchcliffe, S. Kearns, M. Degen, M. and Whatmore, S. (2005) Urban Wild Things: A Cosmopolitical Experience, *Environment and Planning D: Society and Space*, **23**(5), 643-658.

Ivory, C. and Alderman, N. (2011) Translation and Convergence in Projects: An Organizational Perspective on Project Success. *Project Management Journal*, **42**(5), 17-30.

Jay, S., Jones, C., Slinn, P., and Wood, C. (2007) Environmental impact assessment: Retrospect and prospect. *Environmental Impact Assessment Review*, **27**(4), 287-300.

Kværner, J., Swensen, G., and Erikstad, L. (2006) Assessing environmental vulnerability in EIA—The content and context of the vulnerability concept in an alternative approach to standard EIA procedure. *Environmental Impact Assessment Review*, **26**(5), 511-527.

Kågström, M., Hilding-Rydevik, T., and Sjöberg, I. (2013) Human health frames in EIA—the case of Swedish road planning. *Impact Assessment and Project Appraisal*, (ahead-of-print), 1-10.

Latour, B. (1988) *The Pasteurization of France*, Harvard University Press: Cambridge, Mass

Latour, B. (1993) *We Have Never Been Modern*, Harvard University Press: Cambridge, Mass.

Latour, B. (2004a) *Politics of Nature: How to Bring the Sciences into Democracy*, Harvard University Press: Cambridge, Mass.

Latour, B. (2004b) 'Whose Cosmos, Which Cosmopolitics?: Comments on the Peace Terms of Ulrich Beck', *Common Knowledge*, **10**(3), 450–62.

Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network Theory*, Oxford University Press: Oxford.

Law, J. (1994) *Organizing Modernity: Social Ordering and Social Theory*, Wiley-Blackwell: Oxford.

Law, J. (2006) *After Method: Mess in Social Science Research*, Routledge: London.

Latour B. (2013) *An Enquiry into Modes of Existence*, Harvard University Press, Cambridge, Mass.

Law, J. and Singleton, V. (2005) Object Lessons, **12**(3), 331-355

Law, J. and Mol, A. (2008a) The Actor-Enacted: Cumbrian Sheep in 2001, in C. Knappett and L. Malafouris (Eds.), *Material Agency*, Springer Science and Business Media: New York, pp. 57-77.

Law, J. and Mol, A. (2008b) Globalisation in Practice: On the Politics of Boiling Pigswell, *Geoforum*, **39**(1), 133-143.

Lingard, H., Cooke, T. and Blismas, N. (2012) Designing for construction workers' occupational health and safety: a case study of socio-material complexity, *Construction Management and Economics* **30**(5), 367-382.

Mol, A. (1999) Ontological Politics: a Word and Some Questions, in J. Law and J. Hassard (Eds.), *Actor Network Theory and After*, Blackwell and the Sociological Review: Oxford. pp. 74-89

Mol, A. (2002) *The Body Multiple: Ontology in Medical Practice*, Duke University: Durham. North Ca.

Morley, N. J. (2007) Anthropogenic Effects of Reservoir Construction on the Parasite Fauna of Aquatic Wildlife. *Ecohealth*, **4**(4), 374–383.

Morris, P. and Therivel, R. (2009) *Methods of Environmental Impact Assessment* (3rd

Edition), Routledge: London.

Murray, D and Dainty, A (2009) *Corporate Social Responsibility in the Construction Industry*. Taylor and Francis, Oxford.

Päiviö, J. and WallenHans-Geog, W. (2001) The Hallandsås railway tunnel project, Swedish University of Agricultural Science, Uppsala.

Peggs, K. (2012) *Animals and Sociology*, Palgrave Macmillan: Basingstoke.

Philo, C. and Wilbert, C. (2000) (Eds.) *animal space, beastly places: new geographies of human-animal relations*, Routledge: London

Power, E. (2005) Human–Nature Relations in Suburban Gardens, *Australian Geographer*, **36**(1), 39-53

Royal Institute of Chartered Surveyors (2013) Royal Institute of Chartered Surveyors draft guidance note - Environmental impact assessment, RICS. Availableat:

<http://goo.gl/iz9tuV>

Accessed 13/3/14

Sage, D. (2013) Danger Building Site – Keep Out!?” A Critical Agenda for Geographical Engagement with Contemporary Construction Industries, *Social and Cultural Geography*, **14**(2), 168-191.

Sage, D., Dainty, A. and Brookes, N. (2011) How Actor-Network Theories Can Help in Understanding Project Complexities. *Journal of Managing Projects in Business*, **4**(2) 274-

293.

Sage, D. Dainty, A. and Brookes, N. (2013) Thinking the ontological politics of managerial and critical performativities: An examination of project failure, *Scandinavian Journal of Management*, **29**(3), 282-291.

Singer, P. (1975) *Animal Liberation: A New Ethics for our Treatment of Animals*, New York Review/Random House: New York.

Scottish Natural Heritage (2013) Environmental Assessment Handbook - Appendix 1: Landscape and Visual Impact Assessment, SNH. Available at:

<http://goo.gl/3wRCvd>

Accessed 13/3/14

Srnivasan, K. (2012) The biopolitics of animal being and welfare: dog control and care in the UK and India, *Transactions of the Institute of British Geographers*, **38**(1), 106-109

Stuart, D. and Wooroz, M. (2011) The Myth of Efficiency: Technology and Ethics in Industrial Food Production, *Journal of Agricultural Environmental Ethics*, **6**, 231–256

Thompson, C. (2002) When Elephants Stand for Competing Philosophies of Nature: Ambroseli National Park, Kenya, in Law, J. and Mol, A. (Eds.), *Complexities*, Duke University Press Durham and London, pp.166-90.

Tryggstad, K., Justesen, L. and Mouritsen, J. (2013) Project temporalities: how frogs can become stakeholders, *International Journal of Managing Projects in Business*, **6**(1), 69-87.

Tullos, D. (2009) Assessing the influence of environmental impact assessments on science and policy: An analysis of the Three Gorges Project, *Journal of Environmental Management*, **90**(3), 208-223.

Tunnelkommissionen (1998) Miljö I grund och botten - erfarenheter från Hallandsåsen – Slutrapport av Tunnelkommissionen, SOU 1998: 137, Stockholm, 1-356.

Tunnelkommissionen (1998) Kring Hallandsåsen – Delrapport av Tunnelkommissionen, SOU 1998: 60, Stockholm, 1-287.

Urbanik, J. (2012) *Placing Animals: An Introduction to The Geography of Human-Animal Relations*, Rowman & Littlefield, Plymouth.

Weideborg, M., Källqvist, T., Ødegård, K.E., Sverdrup, L.E. and Vik, E.A. (2001) Environmental Risk Assessment of Acrylamide and Methylolacrylamide From a Grouting Agent Used in the Tunnel Construction of Romeriksporten, Norway. *Water Research*, **35** (11), 2645 – 2652.

Whatmore, S. (2002) *Hybrid Geographies: Natures, Cultures Spaces*, Sage: London.

Wolch, J. Brownlow, A. and Lassiter, U. (2000) Constructing the animal worlds of inner-city Los Angeles, in C. Philo and C. Wilbert (Eds.) *animal space, beastly places: new geographies of human-animal relations*, Routledge: London. pp.71-97

Wood, C. (2003) *Environmental Impact Assessment: A Comparative Review* (2nd Ed.), Pearson, Harlow.

