

Where is 'elsewhere' in biodiversity offsetting?

A political-geographical exploration of values and localizations of offset measures in two development projects of Port of Gothenburg, Sweden



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ABSTRACT

Biodiversity offsetting is a relatively recent measure that aims to mitigate loss of ecological values in conjunction with urban and infrastructure development projects. Previous research of biodiversity offsetting has mainly targeted policy development, ecological outcomes, and, lately, now also its social and critical aspects. Except from the latter array, localization of offset measures is rarely traced. Thereby, the location of offset measure is commonly referred to as *elsewhere*. On the contrary, present master's thesis sheds light on how the generic and abstract 'elsewhere' is materialized on the ground. By considering tensions between *systematic* and *integrative* conceptualizations of the material world, this issue of elsewhere is scrutinized in order to question too abstract narratives and their associated effects. Empirically, I explore this problem by focusing on valuation of offset species and negotiations of offset localization in two offset cases; one land-based and one marine-based. The former targets lesser spotted woodpecker (*Dendrocopos minor*) and smooth snake (*Coronella austriaca*), while the latter concentrates on the marine seaweed eelgrass (*Zostera marina*). Both cases are consequences of Port of Gothenburg's (Sweden) spatial expansion. The thesis thus explores how species are socially valued, whether the two cases initially prioritize the action (offset measure) over the context (elsewhere), and potential practical constraints that may occur. Methodologically, a thematic analysis is conducted that is based on empirical materials consisting of interviews with actors and case specific documents. The findings are interpreted through a theoretical framework that elaborates with the material ontology of the Swedish geographer Torsten Hägerstrand (referred to as *all-ecology*) together with analytical insights from *political ecology*. The findings emphasize how valuation and selection of species are rooted in social practices and conventions. Findings further delve into how actors conceptually relate to the everchanging processes of nature. This is assorted into four 'tacit challenges' of which are crucial for how actors plan, reorganize and manage places for offsets. Contextually, the two cases differ in terms of implementations; actors face contrasting challenges wherefore the given practical situation is always critical. As both cases did not include nonexperts in decisions, selections and negotiations, I lastly elaborate on a model that can include affected communities, residents and others. This, in order to more democratically embed the affected humans' opinions and experiences into offsetting arrangement. Thereby, nonhumans have a greater chance to be articulated as integrative members of our contextual togetherness too.

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Sammanfattning

Ekologisk kompensation är en relativt ny åtgärd vilket syftar till att minska förlusten av ekologiska värden i samband med stads- och infrastrukturutvecklingsprojekt. Tidigare forskning om ekologisk kompensation har främst riktat sig till policyutveckling, ekologiska effekter, samt nyligen också dess sociala och kritiska aspekter. Med undantag för den sistnämnda skaran undersöks sällan lokalisering av kompensationsåtgärder. Därmed tillkännages ofta kompensationsplatsen som *någon annanstans*. Likväl belyser den föreliggande masteruppsats hur det generiska och abstrakta 'någon annanstans' sedermera materialiseras på marken. Med avsikt att ifrågasätta alltför abstrakta narrativ samt tillhörande effekter undersöks frågan om någon annanstans genom att överväga spänningar mellan *systematiska* och *integrativa konceptualiseringar* av den materiella världen. Empiriskt undersöker jag detta problem genom att fokusera på värdering av kompensationsarter samt förhandlingar om lokaliseringar av kompensationsåtgärder i två olika fall; ett landbaserat och ett marinbaserat. Det förstnämnda riktar sig till mindre hackspett (*Dendrocopos minor*) och hasselsnok (*Coronella austriaca*), medan det senare koncentrerar sig på det marina sjögräset ålgräs (*Zostera marina*). Båda fallen är konsekvenser av Göteborgs hamns rumsliga expansion. Uppsatsen undersöker således hur arter värderas socialt, huruvida de två fallen initialt prioriterar handlingen (kompensationsåtgärd) över sammanhanget ('någon annanstans') samt potentiella förekommande praktiska begränsningar. Uppsatsens metodik vilar på en tematisk analys av empiriskt material, som består av intervjuer med aktörer samt fallspecifika dokument. Resultaten tolkas genom ett teoretiskt ramverk, bestående av svenska geografen Torsten Hägerstrands materiella ontologi (benämnd *all-ekologi*), tillsammans med analytiska insikter från *politisk ekologi*. Resultaten betonar hur värdering och urval av arter är förankrat i sociala praktiker och konventioner. Vidare fördjupar sig resultaten i hur aktörer konceptuellt förhåller sig till naturens ständiga förändringar. Detta sorteras in i fyra 'tysta utmaningar', vilka är avgörande för hur aktörer planerar, omorganiserar och hanterar kompensationsplatser. Sammanfattningsvis vad gäller implementeringar så skiljer sig de två fallen; aktörer står inför kontrasterande utmaningar varför den givna praktiska situationen alltid är kritisk. Eftersom båda fallen inte inkluderat icke-expert i sina beslut, urval och förhandlingar, utarbetar jag slutligen en modell som kan inkludera berörda samhällen, invånare och andra. Detta för att mer demokratiskt förankra de drabbades åsikter och upplevelser i kompensationsarrangemang. Därmed har även icke-människor en större chans att också bli artikulerade som integrerande medlemmar av vår kontextuella samvaro.

Nyckelord: Ekologisk kompensation, All-ekologi, Politisk ekologi, Människa-miljö relationer, Göteborgs hamn.

Preface

This master's thesis wraps up an academic journey that has been going on for three plus two years. Beginning in September 2015 as a bachelor student, I had no clue of what the discipline of geography had to offer. What essentially drawn my attention was however something about human-environment relations. That was it. With present thesis, I hope I now can demonstrate that I have obtained knowledge that is more than just 'something' about humans' relations to the environment.

Some people deserve to be acknowledged for their contribution and influence on the work. First of all, I will give a huge thank you to the informants that I interviewed. I appreciate that all of you set aside some time for me and communicated your important experiences!

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Abbreviations

BO	Biodiversity offsetting
CABVG	County Administrative Board of Västra Götaland
MH	Mitigation hierarchy
NNL	No net loss
SEC	Swedish Environmental Code
SEPA	Swedish Environmental Protection Agency
SPO	Species Protection Ordinance
SwAM	Swedish Agency for Marine and Water Management

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1 Introduction

1.1 Background

Moving things (including plants and animals) in space, and consequently rearranging the Earth's surface, may be mankind's greatest pursuit. 'Urban forms and structures' are examples of well-organized aftermaths of past agglomerated movement and management of things. Above all, such man-made structures indicates on materially manifested economic growth of a society (Harvey, 2019, pp. 101-102). As further urban-economic development rests on extended spatial possession, encroachment in 'untapped' terrain, inflicting on habitats for different species, is almost inevitable. At times, these processes creates conflicts between economic growth and ecological endurance (Campbell, 1996).

Recently, attempts are made to overcome these conflicts by incorporating the role of biodiversity in urban development. One such strategy is called *biodiversity offsetting* (BO). A frequently referred definition of BO is provided by the Business and Biodiversity Offsets Programme (BBOP):¹ During project development, estimated loss of biodiversity shall be compensated through preservation measures, after critical commitments of avoidance and mitigation. Since offsets have to correspond the impact on biodiversity, the losses must be measurable (BBOP, 2009). Although BBOP state that localization of offset measures shall consider the affected landscape context, others sometimes refer localization to *elsewhere* in their definitions (e.g. Bull, Suttle, Gordon, Singh, & Milner-Gulland, 2013; Griffiths, Bull, Baker, & Milner-Gulland, 2019; Norton, 2009), or completely omits it (e.g. McKenney & Kiesecker, 2010). Not many studies have addressed the question *where* offset measures are implemented and what it practically implies.

Though BO has been globally institutionalized, its practical adaptation yet differs from country to country; procedures such as habitat banking, compensation pools and certain measures of tree planting are sweeping examples of various national policies (cf. Madsen, Carroll, & Moore Brands, 2010). In Sweden, of which context present thesis emanates from, BO is either distinguished as legal or voluntary. The former refers to offset measures that are induced by the Swedish Environmental Code (SEC) (Enetjärn et al., 2015, pp. 65-67; SOU 2017:34, pp. 163-183). On the contrary, the latter rather suggests on green policies by local municipal governments, which recently have increased in adaptation (e.g. City of Borås, 2018; City of Gothenburg, 2018; Lomma municipality, 2011).

The present thesis's empirical foundation builds in two legal cases wherein BO has been and is used to preserve targeted species. The cases are tied to two corresponding development projects of Port of Gothenburg; one case is a warehouse development and the other case concerns development of new quays. Hence, one land-based and one marine-based activity. Offset species of the land-based case concerns lesser spotted woodpecker (*Dendrocopos minor*) and smooth snake (*Coronella austriaca*), both inhabiting forested environments. This case was induced by a dispensation from the legal regulation of Species Protection Ordinance (SPO)

¹ Established in 2004, BBOP is a partnership organization compounded by stakeholder in public and private sector which aims to develop policies of BO (BBOP, 2016).

[Artskyddsförordningen]. In contrast, the marine-based BO-case is a product of a suspended sentence [villkorlig dom] that amongst other things termed Gothenburg Port Authority [Göteborgs Hamn AB] to test plant the marine seaweed eelgrass (*Zostera marina*) during a period of eight years.² If Gothenburg Port Authority succeeds with their test plantations, it is anticipated to thereafter carry out offset measures for eelgrass beds. While the land-based project has conducted their offset measures for lesser spotted woodpecker and smooth snake, the marine-based project thus far struggles with test plantations.

1.2 Point of departure

Not surprisingly, research on BO tends to target issues of ecological outcomes and associated concerns (e.g. Bull, Milner-Gulland, Suttle, & Singh, 2014; Bull, Suttle, Gordon, et al., 2013; Bull, Suttle, Singh, & Milner-Gulland, 2013; McKenney & Kiesecker, 2010; Norton, 2009; zu Ermgassen et al., 2019). However, although BO targets loss of biodiversity, it is indeed a social and political venture. Nonetheless, critical social perspectives on BO are yet less explored (except for instance Apostolopoulou, 2016; Apostolopoulou & Adams, 2017, 2019; Bormpoudakis, Tzanopoulos, & Apostolopoulou, 2019; Lapeyre, Froger, & Hrabanski, 2015; Sullivan & Hannis, 2015). Although raised attentions of BO's critical aspects, social and political negotiations of *elsewhere* in BO-projects are still in detail uncharted.

In order to complement existing knowledge of BO, I will throughout this thesis argue for a *situational* approach when situating localizations of 'elsewhere'. In doing so, I emanate from insights and arguments provided by the Swedish geographer Torsten Hägerstrand. He is probably most known for his development of *time geography* where he emphasizes that every existing thing, including all living creatures, occupies space in the inevitable temporal voyage. For those interested in landscape perspectives and various conceptualizations of human-environment relations, he sketches on a challenging ontology called *all-ecology*. At the most basic level, all-ecology equates humans and nonhumans as both formative beings alongside natural processes (Hägerstrand, 2001, 1993; Stenseke, 2020) hence questioning the misleading Nature/Society-dualism in an extraordinary manner.

However, although Hägerstrand arrange all-ecology with overarching and eloquent descriptions of the world, these notions lack analytical tools. Therefore, I employ all-ecology with critical social theory. In particular, notions from *political ecology* is adopted, where the main argument is that the unfolding of ecology is infused by sociocultural politics (Robbins, 2011, pp. 11-18). Akin to the ontology of all-ecology, recent insights in political ecology suggest scholars to ground urban natures through textured articulations (Ernstson & Sörlin, 2019a, 2019b). Such rethinking recognizes "a historical-geographical epistemological location, a place that has been shaped by wider social, cultural, and economic processes that have shaped certain way to make sense of the world" (Ernstson & Sörlin, 2019b, p. 22). This argument derives from criticism posed by urban studies of global South, contending that Northern theories constructed from Northern contexts lack the ability to explain urban outcomes in the South (cf. Robinson, 2002; Roy, 2009). The notion of *situation* (Hägerstrand, 1982a, 1984), as way of

² It is of importance to distinguish Gothenburg Port Authority from Port of Gothenburg. The former refers to the corporation that is mandated to enable port functions for the local and national business sector while the latter is the activities of the port (Gothenburg Port Authority, n.d.-b).

highlighting the given context of ordered things in time and space, is indeed on the carpet in the 21st century.

To capture a situational ‘elsewhere’ of BO, the present thesis sketches out a theoretical point of departure from a paper titled “The two vistas”. Here, Hägerstrand (2004) argues that we as humans socialize the world and every material thing based on two different, but not necessarily contradictory, perspectives. The first, which I refer to as *systematic conceptualization*, obtains knowledge from partition; by disassembling the diverse and complex world into smaller, analogous pieces, followed by systematic analyses, and thereafter, through reason assembling the pieces back into the world again, we can understand how related qualities influence the outcome of one (or more) variable.

The second, henceforth identified as *integrative conceptualization*, rather embrace a delimited situation. In doing so, we can thence comprehend the interrelation of neighbouring things and their inherent and indivisible togetherness. Preferably, light shall be shed on *neighbouring* qualities, regardless whether they are obviously related or not. In short, the integrative perspective rather embraces every material relation and understands the examined place on its contextual basis (Hägerstrand, 2004).³

The systematic and the integrative standpoints diverge in many ways, but a central distinction is that the former disregards *the location* of a scrutinized event, while the latter cannot ignore the situation since it is from where the conceptualization emanates (Hägerstrand, 2004). In brief, the tension between the two perspectives is strongly associated to the classical epistemological dilemma of the general (systemized) versus the unique (integrative). Those who identify themselves as geographers are probably well acquainted with the integrative approach. However, by unconditionally rely on systematization of complexities, we tend to forget the original situation. In this context, Hägerstrand asserts the following:

What we need is a way of thinking about the world in such terms that we cultivate the art of keeping in mind what we leave out. We must learn to see that the cuts we make conceptually as scientists or practically as actors are cuts in *one* world. (Hägerstrand, 1984, p. 378, italic in original).

Therefore, Hägerstrand encourage us to highlight those things that often become absent in conjunction with development. At the first glance of BO, you may think that such “art of keeping in mind” is covered. But by making some features, e.g. habitat qualities or ecological functions, absent in one place and thence present in another place might disregards the previous unique situation of the place designated for compensated species. Indeed, BO is thus dependent of two types of places; to distinguish them I henceforth refer the development site to *place of impact* and the site for offset localization to *place for offsets*.⁴

In tensions between the general and the unique, there may emerge paradoxical situations tied to linguistic practices; when creating plans, such as plans for offset measures, actors may

³ Hägerstrand’s concern of “the two vistas” – and that the systematic one has received more attention than the integrative one – is recurring in his writings, although they take different shapes (cf. Hägerstrand, 1982b, 2001, 1984, 1993).

⁴ Usually these places are referred to as *impact site/development site* and *offset site*. But in order to address geographical aspects of BO, I intentionally use *place of impact* and *place for offsets*.

conceptually obscure material constraints at the location of interest (e.g. a place for offsets) due to too general narratives. Interests, intentions, visions or meanings of a project could thus be ‘disconnected’ from the unique context where the implementation is planned to be materialized (Hägerstrand, 1993, p. 43). We can locate this paradox as an inherent logic of categorization (Jones, 2009); categories are after all simplified narratives that can neglect contextual aspects. Simultaneously, categories are building blocks for the narratives that linguistically structures and make sense of the world (Bornemark, 2018; Cloke & Johnston, 2005; Jones, 2009). Empirically, when concepts and categories, that are constructed remotely by experts (as scientists, experts or bureaucrats), interact with actors in practical realities, complications are likely to emerge (e.g. Dahlberg, 2015; Sandberg, 2017; Setten, 2004). This plausibly due to the above mentioned ‘disconnection’ from reality.

1.3 Problem statement

In the light of the generic elsewhere of offset localization, no empirical study to my knowledge has in-depth examined the contingency between more systematic legal regulations, plans and intentions and the integrative reality of practical offset implementations. In brief, what happens when ambitions of compensation hit the ground? Although plans are constructed more or less remotely, ‘practical implementers’ (which is how I distinguish actors that carries out offset measures in the field from other actors) must eventually encounter a selected unique situation where other, may them be analogues, processes side by side unfold.

The problem statement thereby orbiting the following thesis statement: Offset measures informed by legal regulations rely on systematic conceptualization, which may overlook contextual and practical challenges. These challenges are however inevitable for the practical implementers when carrying out offset measures. As Hägerstrand (2000) puts it, materialization of ideas are *filtered by the landscape*.

A critical note regarding simplifications is that offsets should be translatable in a measurable manner, thus quantification of biodiversity is required (BBOP, 2009). Hence, systematization of species and habitats. From a critical stance, Apostolopoulou and Adams (2017) assert that this aspect of BO tends to reduce complex biodiversity into exchangeable values and ignoring place-specific living worlds. Further, socially constructed values are yet abstracted and politicized representations of a complex context, infused with discourses of certain species, habitats or ecosystems (Ernstson, 2013). Also, reducing complex biodiversity by metric valuation is by many critically understood as a capitalistic approach to legitimize urban expansion; if an unexploited place is represented by an abstract number, it could be considered enough profitable to encroach. Uniqueness thus becomes obscured by interests of economic growth (cf. Apostolopoulou & Adams, 2017; Fisher, 2016; Sullivan & Hannis, 2015). In order to enable/disable various activities (e.g. urban development), ‘nature’ must therefore be recognized as contingent since discourses of competing interests (categorially) labelling its elements.

Lastly, two clarification. First, present thesis comprehends offset species, places of impact and places for offsets on a *relational* basis. Selection and valuation of places, animals and plants are social practices and thereby resting on socially constructed relations of environments (Ernstson, 2013; Stenseke, 2018). Preserving ecological features is thus conceptualized as material things with socially constructed qualities that becomes consolidated by social

conventions (for instance legal regulations). Second, since the present thesis partly examine BO through the lens of critical social theory, one may assume that only detrimental aspects are portrayed (as in Apostolopoulou, 2016; Apostolopoulou & Adams, 2017, 2019; Bormpoudakis et al., 2019). Instead, I beside follow suggestions by Gibson-Graham (2008) saying that critical research should look for spaces of opportunities that possess the potential to alter adverse phenomena into more just and equal practices.

In any case, the purpose of BO is to infuse ecological sustainability in the scheme of urban and economic development. But how these ambitions are materialized on the ground, i.e. *where* offsets are localized and thus which contexts are encountered, remain unexplored and left to those who practically implement offset measures. Further, a geographical examination is crucial for portraying a more comprehensive picture of BO. Especially, since this perspective takes the place for offsets and its complex ‘togetherness’ of things seriously (cf. Hågerstrand, 1976). It is time to explore *spatial* and *temporal dimensions* of BO.

1.4 Thesis aim and research questions

The present thesis address offset measures in two cases. Lesser spotted woodpecker and smooth snake are the targets in a land-based compensation, and eelgrass is the subject for a marine-based compensation. Both are tied to the very same expanding economic activity – Port of Gothenburg. Hence, the overarching aim of this explorative thesis is to comparatively explore how biodiversity offset measures understand offset species/habitats, and how these species later on are compensated elsewhere. By using two cases, focus is also on their similarities and differences. A secondary aim is to the discuss the findings in a way that provide novel insights of which can develop BO into a more socioecological inclusive tool. In order to achieve these aims, I conduct a thematic analysis based on empirical materials consisting of interviewed actors and guiding case specific documents. Three research questions are thereby posed:

- How are targeted offset species selected and valuated through relational articulations and statements by actors and case specific documents?
- In the light of the systematic-integrative tension, how do the cases make sense of the localizing of ‘elsewhere’ when conducting offset measures?
- How can we understand constraints when offset measures are practically implemented within the context of places for offsets?

1.5 Delimitations

The thesis consists a few delimitations. First of all, the most imminent and practical delimitation is the time budget of approximately four months. It is not to say that such time frame is neither too little nor too much, but this delimitation has indeed been a crucial influence. As always, if more time was available, more empirical materials could have been explored. Thus, an immediate outcome of the time budget is the amount of cases, informants and documents that have been manageable to examine, which I return to and discuss in subsection 4.7.2 below. However, restricting oneself to two cases does not necessarily entail that the findings are irrelevant, but rather that more cases would most likely provide a more diverse picture of BO. Also, as mentioned in section 1.1, both examined cases are outcomes of legal regulations;

observed elements in present thesis may therefore not necessarily be akin to occurrences of voluntary BO.

In this context, there is also an epistemological delimitation. The thesis is of qualitative character and concerns experiences, opinions and meanings of a phenomenon. Therefore, the results do not provide quantitative accounts in terms of frequency, probability and statistical variations within different arrays. That said, the results can likely inform further quantitative studies.

Lastly, the thesis is spatially delimited. Both examined cases are phenomena situated in Gothenburg. Regarding this, and in relation to the qualitative character of the thesis, the findings may not be representative for other situations of BO – perhaps not even within City of Gothenburg's border.

1.6 Disposition

The present thesis is structured in eight chapters. The first chapter (as you by this time most likely have read) briefly introduce BO and the theoretical point of departure that consists of Hägerstrand's all-ecology and insights from political ecology. It also outlines the problem statement, followed by thesis aim and research questions.

Second chapter provide a more in-depth exploration of BO. Here, notions on its history and definitions are outlined. I thereafter portray five topics of research interest on BO. Subsequently, the scope is narrowed down to policy and research in Sweden. The chapter ends with a short discussion on BO's geographical dimensions.

Third chapter broadly consists of two overarching sections. The first demonstrate the all-ecology in terms of (i) situational material constraints; (ii) human-induced material morphology; and (iii) notes on Hägerstrand's political elements regarding environmental management. The third part works as a bridge to the second section: viz., political ecology. In detail, the second section explores (i) the logics behind categorization and how humans seek to control ecology, space and time by categories; (ii) how social valuation (tied to categorization) of features in the landscape is conducted; and (iii) how categorization and valuation conceptually could lose sight of unique and contextual features since categories and values are abstract representations. In order to emphasize on the theoretical structure, the chapter is lastly summarized.

Fourth chapter outline the methodology of the present thesis. The foundation for the methodology is thematic analysis. Thus, general notions on this method is firstly introduced. Thereafter, I briefly portray the study design (comparative case study), followed by a more detail provision of the two cases and Port of Gothenburg. As thematic analysis relies on qualitative data, the empirical materials consists of recorded interviews with actors and case specific documents. Thus, I demonstrate the procedure to attain the demanded data. Further descriptions on how the thematic analysis was conducted is thereafter provided. The chapter is wrapped up with a thorough critical review on the methodology.

Fifth chapter is the empirical nexus of the present thesis. Here, I present findings from interviews and documents, structured in two main themes; one that regards selections of offset species and another concentrating on localization of offset measures.

Sixth chapter analytically interweave the findings with theoretical notions and insights from previous studies on BO. Claims are also discussed in a more compressive manner. The chapter

concentrates on (i) how values are articulated; (ii) challenges of offset localizations; (iii) difference between constraints on land and under sea level; (iv) suggestions on how we can develop BO into a more just and inclusive measure, and lastly, (v) proposals for further research directions.

Seventh chapter settles the thesis. I return to the thesis statement and conclude some important insights in order to answer the research questions.

2 Literature review on biodiversity offsetting

2.1 Introduction

Based on a literature review, present chapter address BO. The focus is not only on studies of ecological outcomes or technical improvements of BO. Rather, as Apostolopoulou and Adams (2017) amongst others notes, BO concerns social processes and politics, thus these perspectives are also included.

Firstly, I locate BO in a general (Western) context in terms of definition and historical roots. As we will see, it is truly as much a question for social scientists as it is for ecologists and biologist. I secondly briefly illustrate five crucial elements within the frame of BO-research. These five aspects correspond to each question of ‘how much to offset?’, ‘what to offset?’, ‘where are offsets localized?’, ‘when and for how long to offset?’, and ‘offset for whom?’. Thereafter, a review on the Swedish context of BO in terms of policy and research is outlined. Lastly, I end the chapter with a summarized discussion in order to stress some important geographical aspects of BO.

2.2 The rationale behind biodiversity offsetting

As touched upon in the previous chapter, in conjunction with urban development, BO is a measure of which major concern is to compensate selected biodiversity units elsewhere (BBOP, 2009). In his thoroughly overview of offset measures, Persson (2011, pp. 16-17) explains four general concerns of BO:

1. Offsetting must be connected to a specific ecological loss;
2. In terms of species, habitats or other notions which ascribe what is degraded, the offset measure does not have to be precisely equivalent to the ecological loss at the place of impact. There is therefore capacity for flexibility;
3. Offsetting is only an instrument for anthropogenic impact on the environment;
4. Offsetting should not be utilized as a preventive measure.

Regarding the second point, others (for instance Bull, Suttle, Gordon, et al., 2013) agree but stress that equivalence should be desirable. In connection to the four aspects, Persson (2011, p. 18, own translation) defines BO as “a redress for lost environmental values arising from human activity.” This definition, Persson underlines, does neither specify what shall be compensated, whom is responsible nor which actors that should carry out the measure. Hence, this definition is quite general and Persson argue that “there must be a conscious understanding of what has been destroyed and what should compensate for this damage” (ibid., p. 18, own translation). In terms of practical implementations, we can already here distinguish some ambiguities. Wide guidelines give actors unspecific leeway. However, for European Union, BO is installed under the so-called *Polluters Pay Principle*, i.e. the developer that is responsible for the loss of biodiversity should also be responsible for the offset measures (Tucker et al., 2013).

Emergence of BO can be located in the American context during the 1970s; a time of raised environmental consciousness intertwined by implementations of neoliberal policies (Bonneuil,

2015). Political ambitions of deregulation and privatization reached USA's Environmental Protection Agency and, consequently, a reliance of economic measures, such as cost-benefit analysis, emerged as a scheme for environmental management. Ecological issues were now perceived as economic concerns as the latter addressed the former in its economic models. Initially, these models mainly covered pollution rights. However, the policies that later evolved into BO was induced by the 1972 Clean Water Act. The act compelled developers to apply for permission of exploitation on wetlands. Due to developmental downturns that the act caused, developers opposed the regulation; to make the act flexible, the Reagan administration developed mitigation banks. The first pilot project let developers purchase nature reserves, thus also overtaking the responsibility for nature conservation practices, for permissions to exploit on wetlands. Moreover, the current design of BO in USA is dating back to 1990s (ibid.) and akin policy instruments have been implemented globally. For instance, in Germany, compensation pools are in use as a resource when offsetting is necessary. Colombia has enforced a national legislation, called environmental licensing, that require developers to compensate loss of trees close to the place of impact. A third example of compensation is from China where developers must pay a 'Forest Vegetation Restoration Fee' in case of exploitation in designated forestry zones (Madsen et al., 2010).

Despite these diverse implementations, a common ground for BO is the ambition of *no net loss* (NNL) of biodiversity (BBOP, 2009), which I discuss in the following section. But in practice, as Bull, Suttle, Gordon, et al. (2013) notes, there are different views on whether BO endeavour NNL of biodiversity, ecosystem functions or ecosystem services. For simplicity, "biodiversity is the sum total of all biotic variation from the level of genes to ecosystems" (Purvis & Hector, 2000, p. 212). On the contrary, ecosystem functions refer to the diverse functions provided by an ecosystem. Ecosystem services can thus in this context be understood as the services *for humans* provided by ecosystem functions, which implicitly implies that all functions do not necessarily have to be anthropocentric services. Ecosystem services are of today a contested concept that is argued to only benefitting human needs and obscuring the actual ecosystem functions (Peterson, Hall, Feldpausch-Parker, & Peterson, 2010).

Following this diversity of perceptions, Lapeyre et al. (2015) illustrate that there are different discourses of BO. They understand BO as an umbrella term that, depending on the role of the actors (scientist, implementers, politicians), can refer to wetland banking, habitat banking, ecological compensation, compensatory mitigation, etc. Norton (2009) assert that offsetting has regional connotations where North American implementers usually ties it to mitigation, while the European conception concerns compensation. Further, although varying discourses on BO, Lapeyre et al. (2015) identify a consensus saying that BO is a marked-based instrument. But, as I simply exemplified by the various national interpretations above, the authors argue that there is "a number of diverse modes of governance in biodiversity offsets." (ibid., p. 131). Thereto, they further contend that BO rarely is a pure marked-based instrument; rather, its governance consists of different partnerships following the 'rules' of prevailing policies (ibid.).

It can here be of relevance to highlight some linguistical differences and how I position myself to them. I am using the English term biodiversity offsetting, which is commonly used in the academic literature (alternatively biodiversity offsets). However, the Swedish term *ekologisk compensation* [ecological compensation] explicitly excludes the notion of

biodiversity and refers to compensation of ecology. This issue is discussed by Persson (2011, p. 15). His view on ecological compensation is that such denotation ignores the human attendance in nature. Rather, to highlight the human factor, the term *miljökompensation* [environmental compensation] is proposed in order to highlight human induced environmental degradation which further will be captured by compensation. Thus, as we can see, interpretations of the term(s) in use could be a problem in itself in designing objectives for BO-projects.

2.3 Five research interests on biodiversity offsetting

Until now I have explored the genealogy of BO and briefly discussed some perceptual differences on the concept. The present section continues by delving into five central issues of BO. Thus, the section is divided into five subsections, which discuss one central aspect of BO each. The first four subsections are topics that occur in literature on ecological elements of BO, while the fifth concentrates on notions from social and critical aspects.

2.3.1 How much to offset? – No net loss

In the nexus of BO lies the ambition of NNL, and sometimes even net gain of biodiversity. NNL is part of the widely adopted strategy called Mitigation Hierarchy (MH) [skadelindringshierarkin]. According to MH, loss of biodiversity shall first be avoided, thereafter minimized and finally, if the former measures are not achievable, compensated (BBOP, 2009; Persson, 2011, pp. 18-20; zu Ermgassen et al., 2019). However, MH globally differs (see section 2.4 below for the Swedish adaptation).

For BBOP, NNL are the “measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity” (BBOP, 2009, p. 8). In other words, actors must define a temporal baseline so that net loss, and later net gain, of biodiversity can be calculated. This is related to the discussion of ‘shifting baseline syndrome’, indicating that we socially define a loss of biodiversity but that involved actors sometimes disregard the subjectivity that it entails (cf. Papworth, Rist, Coad, & Milner-Gulland, 2009). However, the defined baseline will further function as the objective for a BO-project. But, as zu Ermgassen et al. (2019) notes, previous studies have pointed out the problem of data transparency hence evaluation whether of NNL is obtained or not is difficult to conclude. Although the mentioned issue, the authors review studies on NNL and find that wetland restoration is the most successful type of offset procedure (which is one of the oldest traditions within BO).

Indeed, the environment is dynamic, and compensated living species (particularly animals) are almost by default mobile. To prevent uncertainties and to secure NNL for mobile species, Bull, Suttle, Singh, et al. (2013) suggest ‘mobile protected areas’ which they admit is a rather hypothetical notion but should be elaborated with. Alternatively, ‘fixed’ protected areas can advantageously utilize corridors that facilitate the mapped movement. For migratory species, this implies that actors need to identify the species’ living patterns, and through offset measures maintain the target population’s seasonal habitats. However, the authors note that it is most likely better to mobilize resources to enhance the habitat rather than the only focusing on the target species. This refers to maintain species’ ability to still use a demarcated area for their existence (ibid.). It is without doubt that achieving NNL for mobile target species clearly forces actors to manage space and time strategically.

Lastly, Sullivan and Hannis (2015) discuss the etymology of NNL and provides an alternative metaphor of fishnets. They say that opponents of BO contend that the nets are too coarse which results in a capture of only a few selected species to offset. Other nonhumans in the impacted landscape “slip through unnoticed and be lost. These losses leads to errors in the summing up or ‘netting’ process, and hence can only lead to a ‘net loss’” (ibid., p. 172). This notion is related to the following issue to which the question of ‘what to offset?’ is addressed.

2.3.2 What to offset? – In-kind/out-of-kind

Discussion on *in-kind* versus *out-of-kind* mainly concerns the issue of equivalence (McKenney & Kiesecker, 2010; Persson, 2011, pp. 50-51). McKenney and Kiesecker (2010, p. 168) distinguish the concepts as follows: “‘In-kind’ offsets refer to compensatory mitigation that provides habitat, functions, values, or other attributes similar to those affected by the [impact] project, whereas ‘out-of-kind’ offsets allow for different forms of compensation”. Depending on context in terms of countries and impacted features (habitats, species, ecosystem functions, etc.), McKenney and Kiesecker further assert that policies globally differ. Offsets induced by encroachment in Natura 2000 areas are amongst others vaguely govern to be of similarities of the loss (akin policies are found in Australia). Even more stretchable are found in offset systems of Brazil where the same type of ecosystem is the only condition. The authors also note that there is a trend towards more out-of-kind policies (ibid.).

In terms of equivalence, Bull, Suttle, Gordon, et al. (2013) argue that it is difficult to offset similar ecological outcomes of the degraded ones. In its purest form, biodiversity will always differ, and some degree of out-of-kind will presumably occur. Therefore, according to the authors, trading up is possible to secure that the loss is covered, i.e. low values become high values (ibid.). No sharp division is made between in-kind and out-of-kind, but they are rather comprehended relationally to each other. Therefore, to the very unique feature, one could argue that in-kind is more of an idealistic ambition than a practical implementation. However, through the lens of NNL, equivalence are amongst many comprehended as adequate quantification of ecological values (Bull et al., 2014; Norton, 2009). In-kind/out-of-kind can further be determined either through habitat-based or species-based approach. The former usually defines a habitat’s condition and size, while the latter informs the measures through species’ spatial distribution together with suitability of habitats. Both approaches are based on quantitative rationales (Bull et al., 2014). Further, when actors have defined what to offset – or what to catch in their fishnet (Sullivan & Hannis, 2015) – offset localization must be determined, which yet again is referred to a dualism.

2.3.3 Where are offsets localized? – On-site/off-site

Offset localization is discussed through the dualism of *on-site* versus *off-site*, which refers to places for offsets’ spatial relations to the place of impact (McKenney & Kiesecker, 2010; Persson, 2011, pp. 50-51). A common opinion is that place for offset should be adjacent to where the loss occurred (on-site). After all, such ambition is many times a theoretical ideal than a practical outcome and therefore the place for offsets are not unusually localized off-site. McKenney and Kiesecker (2010) shows for instance that compensation of wetlands in USA are instructed to be located within the impacted watershed. Other examples (Australian native vegetation offsets and US conservation banking) allows off-site compensation when measures

are not feasible on-site and the environmental context of the off-site allows it. Furthermore, when impact occurs in Natura 2000 areas, the European Commission delineate the measure to be located within the biogeographical region that the loss occurred within and within the same member state (ibid.). As with in-kind/out-of-kind, Persson, Larsson, and Villarroya (2015) assert that there is a trend towards more off-site compensation, than in-site. Also related to the previous topic, any distinct delineation between on-site and off-site is not clarified in the literature. Localization of places for offsets are thus comprehended at the basis of relationality. While present subsection concentrated on spatial concerns, the subsequent subsection explores temporal considerations.

2.3.4 When and for how long to offset? – Time

Time is also highlighted as a practical challenge for BO. Nonetheless, in order to generate anticipated ecological outcomes, nature need time for recovery. Thereto, there is the complex calibration between time of exploitation (loss of biodiversity) and time for carrying out offset measures (temporal starting point for recovery) (McKenney & Kiesecker, 2010; Persson, 2011, p. 50). Thus, time must strategically be dealt with in order to achieve NNL.

Bull, Suttle, Gordon, et al. (2013) discuss *longevity* and *time lag* in relation to mentioned concerns. Longevity refers to for how long time a BO-project goes on in order to reach its NNL objective. BBOP (2009, p. 8) for instance desires that “at least as long as the project’s impacts and preferably in perpetuity [sic]”. Commenting on ‘perpetuity’, Bull, Suttle, Gordon, et al. (2013) rather suggest that the duration should be aligned with the timeframe of the development project. Besides, offset measures must be robust to temporal fluctuating environmental changes (ibid.; Bull, Suttle, Singh, et al., 2013; Norton, 2009). To cope with longevity, protection of places for offset can occur (e.g. Norton, 2009) or temporal responsibility for management (e.g. Koh, Hahn, & Ituarte-Lima, 2017; Kylin, 2017).

Time lag, however, regards the gap between exploitation and the anticipated ecological outcomes. Future events are truly uncertain, and actors must assess potential loss. Also, during the time for a BO-project, politics and regulations can change, suggesting other policies of which can influence how the project will develop (Bull, Suttle, Gordon, et al., 2013). Thereto, as the purpose of development usually is economic growth, ecological regrowth tends to require more time to reach anticipated value in relation to fast growth of economy (Norton, 2009).

Hitherto, as we have seen in the subsections, BO is without doubt a *social practice* that aims for NNL. With other words, there are human actors under the hood. Therefore, the following subsection examines a recently noticed dimension of BO, namely social and critical aspect, and, consequently, offset for whom?

2.3.5 Offset for whom? – Social and critical aspects

Recently, notions on affected people in BO-projects have been acknowledged. As a complement to NNL, Griffiths et al. (2019) suggest the principle of *No Worse Off* for people which is a conceptual assumption that affected peoples’ well-being must be considered in offset measures. They argue that a complete BO-project, on various spatial scales (individual to regional), should preferably not impact negatively on (average) well-being. Although Griffiths et al. occasionally admit that some values may not be quantifiable and that local communities should participate in decision-making, I say their approach should probably not be positioned

in a social critical stance. Their reasoning rest on a universalistic ontology; suggesting that it is possible from a top-down perspective to assume of what kind of nature communities' desires. Such assumptions could be comprehended as *to acquire* individual subjectivity and agency *from* residents *to* actors supporting and enabling economic growth.

Bonneuil (2015) see links between BO and deregulation and privatization of environmental management policies. Critical research (often departing from a post-Marxist tradition) contends that BO is yet another neoliberal alibi to extend economic growth at the expense of humans and nonhumans. For instance, Apostolopoulou and Adams (2019) examine seven BO-projects in the UK. By interviewing different actors involved in these offset measures, they argue that BO, through austerity politics, benefits landowners and developers of infrastructure and housing, and simultaneously neglect local participation. One outcome is the physical separation of humans and nonhumans; some places for offsets were selected to places of already protected areas with low public access, hence disrupting the everyday human-environment relation (ibid.). In a similar vein, Apostolopoulou (2016) finds out that selection of places for offsets where non-transparent and negotiated by landowner and developers, excluding local community to participate. In the same fashion, BO is asserted to:

...favours technocratic solutions to streamline policy debate about the value of nature. In the process, nature is essentially treated as a 'commodity', divorced from its social, ecological and geographical context. Only in the reductionist technical calculations of offsetting methodologies can offset sites be seen as equivalent to ecosystems and places destroyed by development. (Apostolopoulou & Adams, 2017, p. 28).

From the authors view, there is a clear picture that BO holds implicit politics of offset localization and valuation of nature. Furthermore, Bormpoudakis et al. (2019) argue that critical studies on BO should advantageously analyse cases through the lens of urbanization and the transport intensified globalization in order to understand how place of impact (through urban planning) in the first places are developing and thereafter causing offset measures. Considering nonhuman nature as transferable and exchangeable follows the logic of exploiting nonurban land use for accumulation of capital through urban and transport development. The authors further show how an oppositional social movement managed to interrupt a planned offsetting measure due to high attention of the rare nightingale (*Luscinia megarhynchos*). From this critical post-Marxist perspective, BO is not conceptualized as a solution for biodiversity loss during urban development, but rather as a measure that enable neoliberal capital accumulation through rhetoric of 'win-win'.

The subsection was introduced by recent attempts to include citizens, residents and affected local communities in the equations of BO. I followed this by explore critical stances of BO. However, although critical voices regarding lack of public participation, the literature review does not show any evidence of major attempts to include nonexperts actors in BO-projects. Allowing to deviate from the topic (BO), I contend it can be fruitful to have a look at akin research to BO, namely ecological restoration. Skriver Hansen and Sandberg (2019) for instance suggest *Ecological Restoration Education* (EFE) which include school children, with their own agency, to participate in ecological restoration projects. Not just be spectators watching the practices, but to materially engage. Yet such practices are not reported from BO-practices.

2.4 Policy and research on biodiversity offsetting in Sweden

I have throughout the present chapter shown that BO differs in implementations, and that there are mixed perceptions on the concept. Thus, it is necessary to outline how BO is distinguished in the Swedish context. The logics behind BO, compensating loss of nature in conjunction with exploitation, is however not a new venture in Sweden. As a matter of fact, a royal regulation from 1664 informed citizens to plant two trees for each cutdown tree on the land owned by the Crown (Persson, 2011, p. 10). Of obvious reasons, current policies concerning BO looks slightly different. Modern institutionalization of offset measure can be traced back to the so-called *Ramsar conventions*, suggesting that loss of wetlands in conjunction with development shall be compensated (SÖ 1975:76). In legal terms, BO is currently not of coherent structure – offset measures can be legally asserted for from several chapters in the SEC (introduced in 1999) (Enetjärn et al., 2015, pp. 65-67; SOU 2017:34, pp. 163-183).

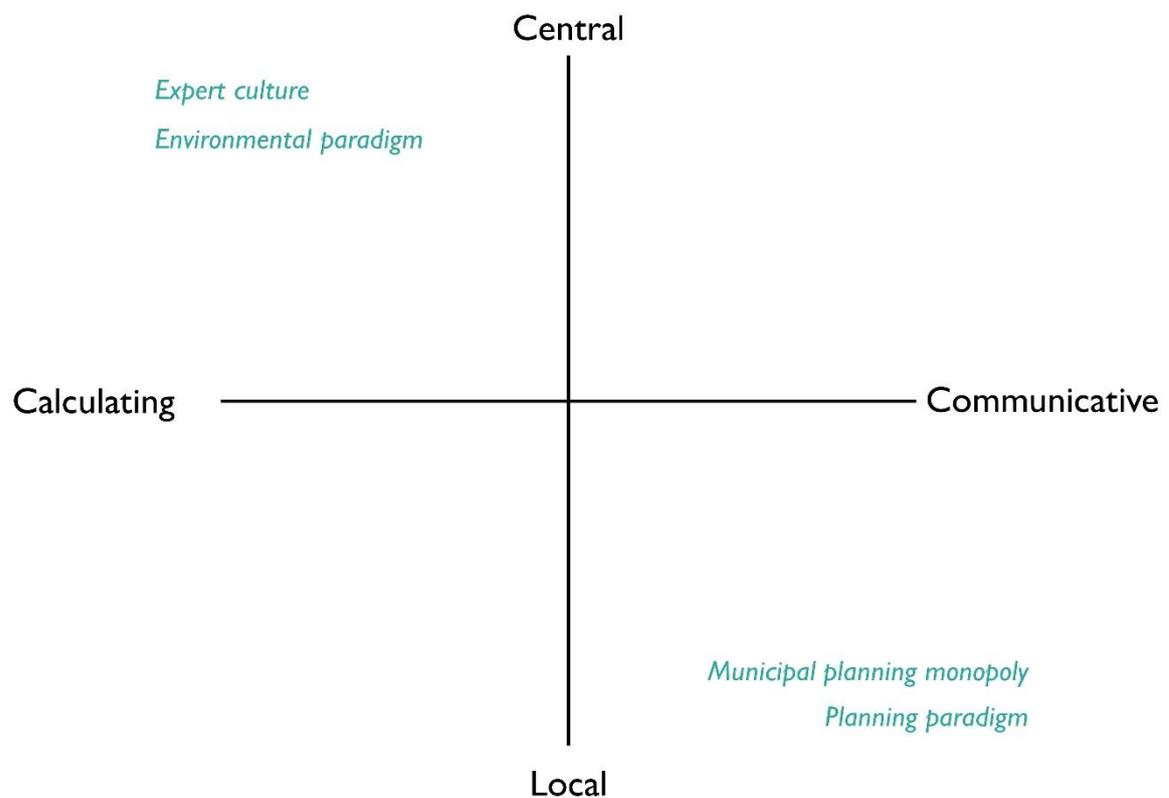


Figure 1. Two continuums of legal land use decision-making. Source: author's reproduction of Figure 1.1a in Emmelin and Lerman (2006, p. 15).

The two most central sections of the Swedish law which touch on urban and industrial development of unexploited land, are the SEC and the Swedish Planning and Building Act (SPBA). The SEC is distinguished by an *environmental paradigm*, where decisions on for example pollution rates, ecological endurance, water qualities, etc. are based on scientific knowledge. To a large extent, this knowledge is considered to be universal. Thus, the SEC becomes a centralized top-down field for experts. In contrast, the SPBA is characterized by a *planning paradigm*. Here, decisions are instead grounded in representative democratic principles. Rather than scientific 'truth', consensus is the virtue for support. Also, in Sweden,

the municipalities possess the planning monopoly. A municipality thus demarks a designated place where other actors are usually permitted to carry out predefined and political embedded development plans. The planning paradigm is besides characterized by more bottom-up local influences (Emmelin & Lerman, 2006, pp. 12-14). Further, Emmelin and Lerman put the two paradigms in a figure consisting of two continuums; ‘calculating/communicative’ and ‘central/local’ (Figure 1). In general, environmental management consider ‘central’ (or national) conservation issues and characterized by a ‘calculating rationality’. Its counterpart, urban planning targets local development where decisions rests on a ‘communicative rationality’ (ibid., pp. 15-16). Since BO is a measure for environmental management, it could plausible be situated in the upper left of Figure 1. But as for instance Bormpoudakis et al. (2019) argue, BO has strong connections to urban planning. Accordingly, BO as only a subject for the environmental paradigm has the potential to be reformulated.

Recently, however, the Government of Sweden inquired a state investigation (ended in 2017) in order to consider how BO legally can be utilized more in terms of efficiency and consistency within larger development projects (SOU 2017:34). Referral responses have been submitted by stakeholders (Government Office of Sweden, 2018), but no law has yet been voted for. Thereto, the Swedish Environmental Protection Agency (SEPA) has lately published national guidelines for BO that follows the MH, developed by BBOP (2009) (SEPA, 2016). The Swedish adaptation of MH consists of three steps whereof the first two steps are *avoid* and *minimize* and works as a ‘preventive filter’ prior to offsetting measures, i.e. potential damages of nature during exploitation in green areas must first be considered to be avoided for, and, subsequently, to minimize the damage (Persson, 2011, p. 19). The third, and final step, is in Sweden two-folded; first *restore* then *compensate*.⁵ Both refer to BO, however with a slightly unclear distinction (Persson, 2011, p. 20). In the guidelines by SEPA (2016, p. 21), restore should be interpreted as measure taken at the place of impact where loss has occurred, and compensation as a measure to increase lost values elsewhere. One can therefore understand them as in-site offsets (restore) and off-site offsets (compensate).

The written material on BO in the Swedish context is sparse, nonetheless regarding scientific scrutinizes. However, road and infrastructure development is the sector that thus far has been most involved with BO-measures (Wende, 2018, p. 242), hence most empirical studies have addressed road development (Koh et al., 2017; Persson et al., 2015; Rundcrantz, 2006). Examine not yet realized plans for road building projects in three Swedish regions during 2001-2002, Rundcrantz (2006) finds out that the one out of two most commonly discussed offset measures regarded encroachment in water. Some projects mentioned water ponds with multiple uses – collection of runoff water and enhanced biodiversity. The other most commonly observed measure concerned plantation of new vegetation after exploitation of valuable flora. In many cases, vegetation and water ponds were considered as combined within the same measure. Rundcrantz also notes that there are cases where actors have discussed to replace old roads with land uses of agricultural or natural environments. Further, Rundcrantz claim:

⁵ The linguistic issue cannot be ignored. The Swedish words for avoid, minimize, equalize and replace are *undvika*, *lindra*, *utjämna* and *ersätta*. Despite that they are ‘correct’ translations, connotations are lost and replaced with others. Other English-speaking countries uses other, similar, words for these steps (see discussion in Persson, 2011, pp. 19-20).

...that several of the projects lack the connection between the actual impacts and the functional environmental value. Most of the measures proposed focus on aesthetical issues such as the planting of trees. What is often also missing in the documents is the discussion of why environmental compensation should be used and that it is the next step to take if avoidance and mitigation measures are not enough. (ibid., p. 361).

There to, small biotopes, such as stone walls and solitary trees seem to be ignored in the examined projects, which Rundcrantz (2006) asserts that such ignorance is a critical threat to biodiversity. Moreover, between 1999 to 2012, Persson et al. (2015) illustrate that offset measures have been conducted 37 times (which they consider is a low number). The authors also examined two BO-projects in-depths, where they for instance disclose that legal and practical challenges are not unusual, even for the more experienced actor. Besides, within projects, different views and opinions can diverge amongst actors of various background. Localization of offset measures is further tied to issues of land ownership. Another study demonstrate that offset measures in conjunction with development of the E12 highway in Umeå municipality was guided by three principles: (i) localization of offset measures had to be at municipality owned land; (ii) close to the place of impact; and (iii) similarity in terms of equivalent ecological values (Koh et al., 2017). Further, in order to secure available sites for offsets, Koh et al. conclude that compensation pools could be beneficial to establish, which can according to them “decrease transaction costs of the present ad hoc system” (ibid., p. 196). They mean that the present system is grounded on demands for places for offsets, while they suggest that land access for places for offsets should rather be resting on the rationale of supply (through for instance a third part).

Beyond infrastructure project, other spatial and temporal related findings are for instance related to the case of Aitik mine, situated southeast of Gällivare. To secure that the places for offsets conserved targeted values, an easement agreement between the developer and the landowners was established. This agreement obliges the developer to manage the offset measures for 50 years, of which are anticipated to be turned into a protected area. Hence, ‘perpetuity’ protection (Kylin, 2017). Akin agreement is reported in the case Mertianen mine (similar actors where involved) (Koh et al., 2017). Alongside the Aitik-case, Kylin (2017) comparatively examined offset measures in conjunction with an industrial development site in Sigtuna municipality where management of the place for offsets was determined to four years. For both of Kylin’s cases, places of offsets were reported to be larger in terms of acreages than the places if impacts (ibid.). In the light of NNL, hence quantification of nature, issues are raised in terms of precision; old forests requires *time* for deliver equivalent loss of biodiversity (Koh et al., 2017), and the more comprehensive and complex offset measure becomes, the inaccurate biases are likely to intensify (Kylin, 2017).

The lack of social aspects and public participation seems to be persistent in the Swedish context, and there are risks that the whole procedure becomes govern by only experts when investigations adapts more advanced calculations (Koh et al., 2017). In order to variegate and pose other challenging questions of BO, in-depth studies departing from critical social theory (as the present thesis) are therefore much needed.

2.5 Final remarks on biodiversity offsetting's geographical dimensions

From a geographical standpoint, we certainly are interested in the spatial dimension of issues. Some of us, even the temporality of phenomena. The aspects which I have reviewed are without doubt related to a geographical analysis. First, on-site/off-site is a spatial concern since this issue helps us to understand *where* offsets are located in relation to place of impact. Second, in-kind/out-of-kind is infused by a phenomenological tension of being. The being of offset species/habitats can be categorized in a very general manner (e.g. a plant) or distinguished as the specific non-exchangeable thing (e.g. that plant). The geographical concern of in-kind/out-of-kind is that regardless of what to offset, the targeted unit occupies a piece of space (Hägerstrand, 1996). The dualism answers the question of *what* is compensated on a conceptual level. But it also corresponds to the question of where on a smaller scale than the on-site/off-site dualism. Also taken into account is that both off-site and out-of-kind offset measures are reported to increase (in relation to their counterparts) (McKenney & Kiesecker, 2010; Persson et al., 2015). This implies that actors abandon particularities of place-specific nonhuman natures (Apostolopoulou & Adams, 2017). Third, temporality must be highlighted as we are dealing with the dynamic nature. Therefore, the ‘where’ and ‘what’ can be answered differently depending on *when* and *for how long* events unfold. In addition, NNL cannot be perceived as an absolute objective; it must be compared relatively to a past situation of which the measures are evaluated from. Fourth, in the end of the day, there are social actors that define, value, plan and carry out offset measures. In human societies, myriads of opinions and interests thrive and consequently ‘*for whom* is offsetting carried out for?’ is a last and crucial guiding question one should ask. In the next chapter, I will outline a theoretical framework of which purpose is to cover these four notions.

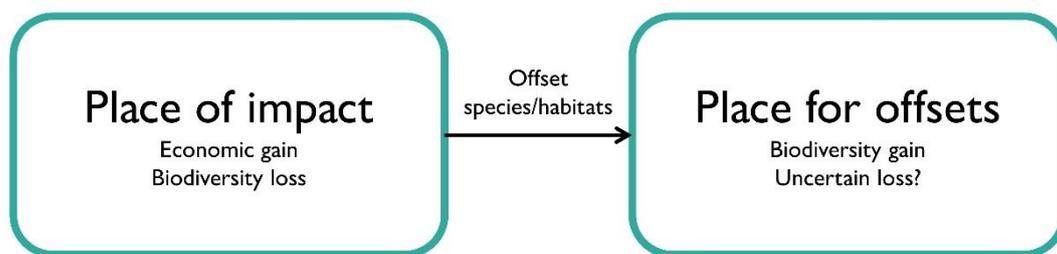


Figure 2. Place of impact, place for offsets and offset species. Due to development, economic gain occurs at the place of impact. Consequently, there is some degree of biodiversity loss, which is transacted to the place for offsets. As the transaction in shape of offset measures are implemented at the place for offsets, some other – yet unclear – features must be relocated or rearranged.

Thus far, BO from a geographical perspective can simply be summarized in Figure 2. There will always be a *place of impact* and a *place for offset*. What binds them together is the transfer of offset species/habitats – either defined and conceptualized as universal units, particularities or anything in-between. Offset species works as a ‘transaction’ of biodiversity loss from place of impact to place for offsets. However, as the loss of biodiversity at place of impact is due to increased economic activity, the actual loss at the place of offsets is yet unclear. Lastly, temporality is the latent medium, which implicitly influences the measure’s outcome in space.

3 Theoretical framework

3.1 Introduction

Drawing on notions from the literature review of BO, this chapter outlines the theoretical framework for the present thesis. The chapter is divided into three parts. First, I review Hägerstrand's all-ecology. Second, political ecology in terms of categorization, valuation and abstraction of environments is discussed. Third, I summarize the theoretical framework where my attempt is to illustrate the various functions of the outlined sections and how they together can interpret empirical materials.

3.2 All-ecology

In present section, I explore three aspects of Hägerstrand's all-ecology. First, the notion of *situation* and its interdependencies of material *presence* and *absence* is outlined. Here, I argue that every moment is a unique fragment of material spacetime interactions. Together, ongoing situations are thereafter described as the building blocks of the rather elusive concept of *landscape*. Throughout this subsection, I emphasize the importance of material constraints. Second, I explore *projects* and *intentions*, which in short are informing formative actions caused by humans. Thus, stressing the critical insight that actions are contributing to rearrange situations through projects and intentions. Third, I followingly begin to link Hägerstrand's ontology to political ecology by his concept of *pockets of local order* as a bridge.

3.2.1 Material situations and constrained realities

A basic principle of Hägerstrand's ontology is that things constantly move in time, and occasionally, in space too. Admittedly, things constantly move in space too – stones erode and living trees are growing. It is just a matter of relation between the observer and time. Furthermore, in order to exist, every material thing, regardless whether it is a bush, a bird, a human, a city or even an air molecule, continuously requires occupying a certain amount of space. A thing *takes place somewhere* (Hägerstrand, 1996).⁶ Therefore, Hägerstrand argues, space is a conceptual necessity, a precondition for things, but space itself cannot be observed. Instead, what we observe are things that inhabits different volumes of space. A logical consequence is therefore that two (or more) things can impossibly not occupy the very same volume of space. Such is the material world. When a thing moves – either by its own inner action or by external processes – to another place in space, a spatiotemporal competition emergence. The relocated thing forces the earlier spatial occupier(s) to relocate elsewhere. At the place of 'elsewhere', the very same material process happens (ibid.). By offsetting things from a place of impact to a place for offsets, the relocated thing will consequently occupy another thing's space at the former's final destination (see for instance Figure 2).

⁶ The Swedish phrase that Hägerstrand (1996) use, "att äga rum", is a bit tricky to translate. It can be referred to that something is occupying space. The most accessible use of it in English may be "to take place". But "att äga rum" also connotes ownership; a more correct translation would rather be "to own space".

Further, every *situation* is composed by *present* things that together form a unique context. This uniqueness is also relationally defined by *absent* things; all things that do not take place in the given context make the composition of present things unique. Therefore, by emphasize situation, we underline the geographical complex collection of presence and absence and the interaction of all present things, which we often refer to reality. The context itself is thus crucial for understanding causality (Hägerstrand, 1984). Not that contexts have inherent a priori attributes, but rather that contexts are structured around a myriad of material relations that arrange unique unfolding in every situation. This can be aligned with the notion of *webs of relation*, i.e. what comes into being in one place are outcome of a multitude of horizontal and vertical entangled material attachments (Rocheleau, 2008).

Hägerstrand usually returns to the concept of *diorama* to exemplify how we should approach a situational thinking (Hägerstrand, 1982a, 1984). Diorama is a technique to portray how different things of interest in a given context are spatially related to each other. Diorama is therefore often found in museums. For example, to portray a premodern farm, a museum can by models depict the location of a barn, a house for living, animals, farmers, various types of vegetation and technical aids (such as a wheeler). It should not be considered as a map because maps tend to reduce present unique things to points, lines, polygons or pixels. Therefore, by dioramas, we should conceptualize situations, however “the essential characteristic does not lie in the visual property, but in the *thereness* aspect” (Hägerstrand, 1982a, p. 326, italic in original).

The situational *thereness* of things must also be considered in relation to previously induced mechanism. A situation is just a moment in an order of successions that can be compared to *taskscape* discussed by Ingold (1993). *Taskscape* highlight all the formative activities in a landscape, which encompasses the interaction between humans and other components, and includes the conception that what is perceived in a given moment is a rendered frame of preexisting formative activities (ibid.). When Hägerstrand (2009, pp. 94-96) clarifies the dimension of time, things may rather be understood as a *continuities*, implying that things occupy space within the law of constantly ongoing time. To distinguish *continuities*' spatial occupancies, the term *trajectory* is employed to indicate the spatial mobility of *continuities*. The mobility of a trajectory (composed many much smaller trajectories) can, according to Hägerstrand, be influenced by “a mixture of selecting, exercise of power, causality and random outcome, which has manifested itself in the continuous suite of now after now.” (2009, p. 129, own translation). Explanatory variables for the trajectory of offset species/habitats are in the present thesis mainly understood as social negotiations between actors involved in the BO-projects of interests. Of course, there are other variables too, but since movement of species in BO especially rests on social interests and political ambitions in terms of NNL in development, this delimitation is sufficient.

It is here appropriate to outline the relation between situation and landscape, or rather *processual landscape* [förloppslandskap] as Hägerstrand (1993, p. 26) prefers to address it. In contrast to more conventional understandings of landscape (commonly emphasising a spatial view and its static arrangement), *processual landscape* in Hägerstrand's ontology stresses the temporal presence of things and that past processes have caused the present time's material presence and absence. Therefore, while *processual landscape* is every present thing, the flows and the encounter in a given area, situation is comprehended as a given material moment of the

landscape and simultaneously a temporal cross-section of the ongoing processual landscape. Also, processual landscape is based on integrative conceptualization since it considers the thereness from a delimited area (in contrast to systematic conceptualization of which outset by isolating one or a few relations, and further add more assumed related relations).

In this context, it is important to emphasize that the togetherness of entities within a landscape together construct a ‘resistance’ for which event or action to be possible to unfolds. Consequently, the landscape is a *filter* that arrange possibilities/impossibilities (Hägerstrand, 2000). Thus argues Hägerstrand (1993, p. 27, own translation) that “cause and effect is not only a matter of before-after [...] but also of the opportunities for emergence in the budget space due to the neighbourhood’s resistance or willingness to open up.” ‘Neighbourhood’ in this context is comprehended as adjacent things that occupies space (cf. Hägerstrand, 1996). We can here distinguish an emergence of political elements within the processual landscape. However, regarding nonhuman processes, politics should be taken with a grain of salt and rather be understood as a metaphor of physical competition of being present. In an ecological perspective, it can be translated to habitats or territories of animals. The take home is however that possible actions and events are dependent on and restricted to the immediate material situation.

Highlighting the material world’s restrictions, the previous paragraph yet misses one component: The social intention to overcome spatiotemporal frictions. The subsequent subsection therefore explores formative behaviour by humans, as a landscape process.

3.2.2 Humans and projects as intentional formative processes

By centring around the notion of situation, I above outlined Hägerstrand’s material ontology. Situation and the thereness of present things thus create material possibilities and constraints for humans. Identification of ore in the Earth’s crust can have a positive influence of a region’s future, while a wide river may imply high cost – either by construction of a bridge or necessary travel time to circumvent it. The present subsection portrays the social dimension of all-ecology. As Hägerstrand’s writings carefully consider processes, the human behaviour is understood as formative activities. A point of departure is that humans plan and organize our ambient situations, thus we are *intentional* beings. Important to remember is the temporality of an human action; actions that we plan are not intended to unfold in the present situation, but in a *future* setting (Hägerstrand, 1993, p. 29). Thereto, we often base our decisions on *past* experiences.

Further, the relationship between material (constrained) situations and social (idealized) intentions is therefore an ongoing contingency. When social intentions become materialized, humans engage in rearrangement of situations. Hägerstrand (1993, pp. 28-29) acknowledges social formative impact alongside with two other processes; *abiotic*, *biotic* and *cultural*.⁷ Abiotic processes are situational consequences of encounters between the landscape and events cause by physical laws, as for example wind erosion, evaporation, sedimentation, river meandering and precipitation. Biotic processes are actions generated by living nonhumans,

⁷ I assert that political ecologists should advantageously undertake this notion of formative processes, as a common critic against political ecology that “it frequently privileges social processes/theories in the explanation of biophysical situations” (Lave et al., 2014, p. 3).

while cultural processes refer human-induced actions. It can be tempting to organize processes by humans and living nonhumans within the same concept since both are living and evolutionary beings. But according to Hägerstrand it is above all the intention that distinguish humans from living nonhumans.⁸ Further, in this conceptualization, living nonhumans are covered by *programs* and humans by *projects*. Animals, vegetations and so on, sustain their lives through evolutionary-based instincts, while for humans, we have to add the intentional dimension. Programmed behaviour is for example a cow grazing on a meadow, or a tree spreading its seeds to expand its ‘territory’. London is thus an example of project-based behaviour.

In this context, it is crucial to clarify projects in relation to BO. In terms of conventional principles of project management, all BO-cases are presumably managed as projects. On the contrary, for the present thesis, I go beyond such comprehension and explore BO-projects through Hägerstrand’s notion of projects. In doing so, there is an emphasis on the planned intentions that precede offset measures (human actions). Comparing to conventional understanding of projects, Hägerstrand’s notion is more than measurable defined goals to be achieved; ‘projects’ are namely a conceptual tool for geographers in order to comprehend social meanings, strivings and aims prior to formations in the landscape (Hägerstrand, 1982a). Thus, rather than the question of ‘what will the project achieve?’, we instead explore other questions like ‘which social perceptions and political ambitions induce the material formations caused by a project?’ or ‘which are the other projects or programs that will spatially coincide or compete with the materialized project?’.

Comparing the previous subsection with this one, a two-world system emerges: a material (‘situations’) and a social (‘intentions’), or as Hägerstrand (1996, p. 106, own translation) puts it: “Two different worlds are contrasted, one outer and one inner.” Accordingly, an inescapable issue in the history of mankind, is that:

Ideas and feelings are divisible in the sense that they can move on to receivers and still remain in the possession of the senders. Organisms and things are different. They are indivisible – in other words, there are bound to be either here or there but cannot be in both places. (Hägerstrand, 1982a, p. 325).

The ability of humans to construct inner immaterial categories also entails that our narratives cannot capture the whole outer original context, and that narratives can ‘move’ independently of their original contexts. This issue enables idealistic intentions of material rearrangement that may not always be possible or may be considered as disadvantages for the project’s outsiders. Furthermore, Hägerstrand was concerned by an exceeding separation of the inner and the outer worlds, which I interpret was his observation of the state of society in regards to its unsustainable behaviour (cf. Hägerstrand, 2009, pp. 18-23). This observation can be traced to that the modern society indicates on a greater separation between social intentions and the material world than the premodern society. Especially in terms of environmental management. In contrast to premodern societies, the modern societal arrangement has given institutions of environmental management larger spatial responsibilities, and many times these institutions are

⁸ Note the difference to scholars of more-than-human geography (e.g. Poe, LeCompte, McLain, & Hurley, 2014; Staddon, 2009) where they occasionally ascribe agency to living nonhumans.

situated away from the causing/managing actions in the landscape (Hägerstrand, 2001, 1993). Accordingly, premodern environmental management was planned and conducted by for instance farmers that operated in the landscape, while modern environmental management is characterized by manifestation of overarching political decisions by public authorities, that later on become materialized in the field distant from the decision-making. Thus, today there is ‘more space’ for systematic idealistic ambitions than the impending integrative reality.

In terms of narratives’ ‘weightlessness’ character (see the quote above), the importance here is that descriptions of the world are *always* generalizations that fail to capture some fragments. Dominant abstract narratives of species, habitats or ecosystem (hence, neglect of individual particularities) have good chances to be mirrored and spatially distributed. Thus the challenge is that features and attributes in a situation becomes congealed narratives at the same time as the dynamics of reality continue (Bornemark, 2018; Dahlberg, 2015; Fisher, 2016; Jones, 2009). To correctly talk about a dynamic world, we need to frequently revise our categories. If not, humans’ intentional environmental management practices are informed by stranded idealisms far away from the current togetherness of abiotic, biotic and cultural processes. I return to this issue in subsection 3.3.1 below.

In an attempt to piece together the socio-material separation, Hägerstrand recognize the social sphere as a sensible element of nature. Such recognition is the totality of all-ecology. Since humans are conscious existing things that occupies space, we have an ethical responsibility to manage natural resources by considering all spatial outcomes (Hägerstrand, 1993). In that fashion, the following subsection explores Hägerstrand’s notions on the political geography of environmental management, which also works as a bridge to political ecology.

3.2.3 Pockets of local order as a bridge to political ecology

The present subsection is based on the ambition to highlight a political element of Hägerstrand and bridge it to political ecology. It is indeed in the intersections between the social and biophysical spheres of which I assert that we can use Hägerstrand’s ontology as a logical foundation for political ecology. Since political ecology emphasize human-induced impact on the ecology (ecology as political) (Robbins, 2011), we have also seen how Hägerstrand argue in a similar manner. Thereto, Widgren (2015) illustrates how Nordic landscape research (which Hägerstrand can be tied to) advantageously can be linked to political ecology. Although, as already noted, while political ecology rests on a critical stance, Hägerstrand is rather descriptive in his writings, which is also asserted by others (e.g. Stenseke, Lindborg, Dahlberg, & Slätmo, 2012, p. 86).

First of all, Hägerstrand (2000, p. 129, own translation) hints that appropriate issues to examine “are the concrete recorded contacts between the choreographic outcomes of the interest profiles of organisms and humans.” Regarding (intentional) environmental management, Hägerstrand (2001, pp. 37-38) means that “[t]he critical link between human society and the terrain with its living content is constituted by the parcelling of land and water in spatial domains of various size and shape.” Domains are immediately governed by legal tenure – an actor within his/her domain possess the power to directly influence the delineated landscape but has no right to perform any actions outside the border. The domains are here comprehended as *pockets of local order* (ibid., p. 38), or ‘local political ecologies’ if one prefer. Therefore,

places for offsets may be conceptualized as such controlled pockets since a BO-project's ambition is to preserve selected species or habitats in a given locality.

To understand the arrangement of pockets of local order, two other concepts need to be employed; *spatial competence* and *territorial competence* (Hägerstrand, 2001, 1993). The former refers to the prevailing regulative structure of environmental management mechanisms. That can be of taxes, policies, laws, subsidies, etc. These systems vary from country to country, but commonly, any variant of regulative public management exists (Hägerstrand, 2001, pp. 38-39). Using a tree as a metaphor, spatial competence is also described as a “foliage of word exchange [that] is kept in practice by the rather rigid trunks of social institutions” (Hägerstrand, 1993, p. 43, own translation). Thus, flexible intentions and visions at the hierarchical top set the frame of what is (morally) ‘possible’ in the practical reality. The “rigid trunks” embed the institution in corresponding “pocket of responsibility” (Hägerstrand, 2001, p. 40) and work as the means of social transactions. Top-down social transactions become regulative guidelines for the physical actions in the landscape. (Hägerstrand, 1993, pp. 43-44). In short, we can consider legal regulations and expert/scientific (systematic) knowledge as spatial competences of environmental management. Hence, remote top-down decision-making's purpose is to control environmental management. Further, territorial competence signifies lived and experienced practices of actors on the ground in each situation (e.g. farmers). This implies that these actors are the ones that are positioned in direct contact with the material landscape – the tenures of pockets of local order. They are the ones that experience the presences of constraints – the immediate thereness (Hägerstrand, 1982a) – of which remote (idealized) decision-making might have obscured. Actors of territorial competence are thereby interplaying in the filtering of the landscape (Hägerstrand, 2000).

Consequently, conflicts are likely to occur between direct situational practices and remotely constructed regulations and policies. To give an empirical example, Setten (2004), for instance, shows how farmers in southwest of Norway – strongly associated by inherited, place-bound, practical knowledge – understand the concepts ‘biodiversity’ and ‘environment’ as political enforcement by bureaucrats, hence not part of their practical experience. By talking about these concepts, bureaucrats implicitly outline moral judgements of top-down ‘correct’ ways to cultivate the landscape. A clash between practical actors in the landscape and administrative actors with regulatory power of land is observed. In a similar fashion, Sandberg (2017) illustrates how farmers must relate to EU's tree policy on pasture land in order to obtain financial assistance for maintaining remotely defined biodiversity. However, it is important to note that the presented examples target distinct actors of territorial competence, that are not members of the same project as those with spatial competence. For BO, these distinctions may be more blurred since the implementers are not land-owning farmers, but actors tied to the BO-project.

Through the concept of pockets of local order, the present subsection outlined Hägerstrand's view on the politics that govern land use in environmental management. Relevant to the context of present thesis, pockets of local order could be understood as attempts by actors to control and design the content at a place for offsets. However, Hägerstrand only provides vague indications on social power but no thorough clarification on how actors control and manage ‘pockets’. Nonetheless, social power is inevitably inherent within BO-projects since they aim

for a certain achievement (conducting offset measures). Therefore, in the next section, I add critical insights which are tied to political ecology.

3.3 Political ecology

Present section departs from the normative assumption that the ecology is not an apolitical element of the world, but rather, ecological configurations are infused with politics. Thus, the ecology is constantly affected by how humans organize the socioecological realm. In such manner, scholars in political ecology have hitherto addressed questions of anthropogenic impact on ecosystem, usually from a Marxist/post-Marxist perspective. They thereby understand destructive anthropogenic influences as the mechanisms of capitalism; current ecological crises (e.g. climate change, biodiversity loss or acidification) are thus usually ascribed as outcomes of how the political economy is structured (Robbins, 2011, pp. 14-18). However, all literature used for present section is not from political ecologists, but the notions used can be borrowed to fit in the above outlined argument.

The section is divided into three subsections. First, I describe *categorization* as a social practice. Of particular interest for political ecology, I discuss how categorization is used as a strategy to conceptually *stabilize* the everlasting dynamic ecology. Second, selection of offset species is not only a consequence of categorization; valuation is nonetheless an inescapable social practice (with strong ties to categorization). I here outline a conceptual approach of *value articulation process*, which describes how we should understand values as socially constructed and political. Third, a side effect of valuation through categorization is *abstraction*. Hence, some notes on abstraction in relation to environmental management in general and BO in particular are highlighted.

3.3.1 Categories and spatiotemporal stabilization

To grasp ‘what to offset’ (viz., in-kind/out-of-kind, see subsection 2.3.2), the present thesis assumes that actors within a BO-project must analyse a situation at the place of impact (before impact) through categorization, i.e. sorting out desirable species and habitats to preserve. More general, for humans to orientate in the world, we construct categories in which we label things and distinguish them from each other. Categorization is therefore a socially necessary practice; without categories, we would be lost in the complex messiness of things that inhabit our ambient contexts (Bornemark, 2018). But construing categories will not be without complications; categorization distinguish a set of things by a common quality, which ‘packs’ diverse things into a generalized language. Categorization thereby conceptually ‘peels off’ attributes that yet proceeds to materially exist (Bornemark, 2018; Cloke & Johnston, 2005; Dahlberg, 2015; Jones, 2009).

Categorization also entail conceptual congealment. To make sense of constant movement in space and time, categories help us to simplify and stabilize the disorder of things. In order to unpack how categorization works, I employ an argument by Bornemark (2018). By adopting the concepts of *ratio* and *intellectus*, she describes how the categories socially emerge and

evolve.⁹ Ratio and intellectus are two separate dimensions of how our reason works, i.e. how we make sense of the world. Ratio is the reason's ability to organize impressions and experiences from our senses into patterns and structures. Thus, things become meaningful since we can group and contrast them on a more abstract level. By structuring empirical experiences into categories, generalization of diverse moments consequently occurs; multitude complexities of reality are simplified into units and similarities of things (e.g. deciduous and conifer) which can be organized into more general units (e.g. tree). The delight of equalize disparities is that we later on can quantify the units collected under the very same category.

A critical challenge that we consequently must accept – and acknowledge – is that categories can never cover the whole world. We live in a constantly simplified social existence where some particularities are not captured by our categories. But we can question the content of categories that are constructed by the ratio. *What* are they made up of? Can we make subcategories within the category? Are there other excluded qualities that we should include in the given category? (Bornemark, 2018, pp. 37-40).

It is here where intellectus – the second dimension of reason – fulfills its function. To organize our empirical experiences into patterns and structures, we must first start by defined qualities of things. Intellectus is therefore the reason's ability to critical reflect upon the quality. Likewise, it has the ability to recognizes and grasps things constant alterations. In terms of processual change over time, this is critical. Consequently, the function of intellectus occurs before categorization begins, which mainly is to catch up a quality of interest and begin to define the concept of which the generalization will emanate from. Thereby, intellectus catches up values of which we consider are important for a given context, while ratio preserves these values into generalized patterns and partitions (Bornemark, 2018, pp. 42-44). Categorization without input of adequate intellectus therefore risk to exclude particularities and stabilize qualities in past conceptualizations.

To exemplify this somewhat elusive argument, Bornemark (2018, pp. 210-211) touches on prevailing ecological crises: The capitalistic modern society was enunciated through virtues of economic productivity and efficiency (ratios). But as research indicates on, relying on these two concepts has contributed to both climate change and loss of biodiversity. Through the open-minded intellectus, we may thus renegotiate such concepts and also construct new guiding concepts for a sustainable world.

An akin challenge of categorization is what Jones (2009, p. 179) refers to as *the paradox of categories*: “when we are trying to think of the boundaries between categories as open and porous – which, intellectually, we know they are – we tend cognitively to understand categories as closed and bounded containers.” Jones further contends that instead of looking at the content of a category, we should analyse the boundaries between categories. Production of boundaries is prior capturing the content. Thereto, a boundary that delineates a category from another construct the meaning we thence relate to. The relation between social power and categorization lies thereby in the question of ‘who produces and reproduces the boundary of a category?’. In this context, possessing power of categorization means control (ibid.).

⁹ By acquiring the concepts ratio and intellectus from the Renaissance philosopher Nicolaus Cusanus (1401-1464), Bornemark (2018) analyses the Swedish context of New Public Management's imprint on the welfare system, with a particular emphasis on health care and social work.

If uncontested and stabilized categories become the only prevailing narratives that inform top-down directives of environmental management, we risk to be stuck in past categorizations of nature (cf. Nustad, 2020; Stenseke, 2016). Nustad (2020), for instance, asserts that restoration practices tend to aim for a past ‘timeless’ and ‘untouched’ landscape, before human encounter with nature. Using such ‘nostalgic’ categories when planning for future environment neglects the human dimension of nature. Focusing on South Africa, he claims that “[t]his idea of restoring the land to what it was in precolonial times involves elements of seeking to undo the temporal unfolding that has shaped the landscape as it is today” (ibid., p. 98).

Fisher (2016) calls this *freeze-framing*, which he further argues is a conceptual tool of which humans historically have utilized in order to exercise power over land. By demarking a delineated space and thereafter designating the land use to a given timeframe (sometimes for perpetuity), those in power only allow certain activities during this ‘permanence’. To sustain intentions of planned place-based measures, actors need to conceptually freeze-frame spacetime in order to make the landscape tenable (ibid.) and simultaneously exclude undesirable processes. By categorization, humans strategically rationalize spacetime to certain duties. Here, the link to pockets of local order (Hägerstrand, 2001, p. 38) is not farfetched, however described more in details.

Furthermore, in terms of landscape management, Stenseke (2016) highlights that conservations of past nature are indeed conservations of past interactions between humans and nonhumans; past landscapes created out of past ongoing and interacting abiotic, biotic and cultural processes. In a similar vein, Nustad (2020) notes that restoration and conservation rest on a rationale that the planned future of a nature reserve aims to mirror a past landscape and hence endeavour to undo processes that formed the present situation.

Regarding offset measure, such undo-processes are plausibly even more complex; not only are actors undoing processes at the place of impact, but in addition, the activity is stretched to the place for offsets. However, in order to clarify how categorization of offset species occurs between actors, policies and other legal writings, I now turn to the subject of values.

3.3.2 Value articulation process

To emphasize that offset measures for selected species or habitats are political actions, the present thesis employs the notion of *value articulation process*. In doing so, there is more distinct attention to that some values are politically selected from the place of impact and thence ‘rendered’ into the place for offsets. Value articulation process is however borrowed from the conceptual framework of socially produced ecosystem services, which is provided by Ernstson (2013). Ernstson’s ambition is to highlight how ecosystem services are socially defined and negotiated. In order to understand this socio-political process, his analytic toolbox is equipped with three concepts whereof one of them is value articulation process. For the present thesis, I explicitly borrow Ernstson’s notion of valuation of nature, but all three concepts are explained since they should be understood in relation to each other.

First, *protective capacity* signifies the sustaining power balance of green space in urban areas. It could be organized by grassroot movements resisting imminent exploitation. It can also depend on remote top-down political decisions of nature conservation (spatial competence). Thereto, protective capacity of green spaces can be determined by its ‘inherent’ biophysical character (e.g. wetlands) for regulating its sustainment since exploitation in the given moment

may be difficult or impossible in regard to economic cost and technical insufficiency (Ernstson, 2013). Protective capacity is therefore relatable to Hägerstrand's 'situation', particularly in terms of material constraints.

Second, *management capacity* refers to "the capacity to carry out management practices that sustain ecological flows through the individual green areas in the ecological network" Ernstson (2013, p. 12). Thus, the ability by various (human) actors associated to institution to maintain a green space. It is thus strongly tied to available resources and their spatial distribution. Here, too, we can link above mentioned notions; management capacity can be comprehended as the intentions within projects of environmental management. Therefore, management can differ through time, as some species or habitats in the past were considered less important or unthreatened while they presently may be present on a regulative red list. To clarify this, next concept will help.

Third, *value articulation processes* imply the recognition that valuation of ecosystems services (or other ecological features) is grounded in social practices. This rests on the assumption that objects (e.g. eelgrass) or processes (e.g. photosynthesis) have no inherent value, hence value is socially constructed within the domains of a certain group of actors (Ernstson, 2013). The valuation of an ecosystem service is therefore inherent in immaterial social conventions, which Ernstson followingly exemplifies:

These actors produce artifacts such as paintings, maps, and scientific reports that can be used (by other actors) to construct narratives able to describe a phenomenon, and attach and explain its value. Such narratives, in turn, can be performed on social arenas, especially media, public meetings, exhibitions, and in parliament, that serves to circulate and eventually establish, if successful, the value of a phenomenon. All these entities—actors, artifacts and social arenas—forms part of value articulation. (ibid., p. 12)

Values should thus be comprehended as relational, i.e. we both perceive the general environment and place-specific features in particular as meaningful values (Stenseke, 2018). Relational values are truly subjective and also foundational to understand how we relate to the present things in the landscape. Therefore, as Stenseke points at, participation of environmental management should advantageously include local communities and everyday users of a landscape in order to shed light on 'mundane' relations that can be obscured by experts or scientists (ibid.). The emphasis on actors as value articulators (Ernstson, 2013), and who those actors are is crucial for understanding the inclusiveness of environmental management.

Studying conservation policies of the Scottish wildcat (*Felis silvestris*), domestic cats (*Felis catus*) and interbreeders between the two (all populating the Scottish 'wilderness'), Fredriksen (2016) contributes with an empirical example of how valuation articulation is materialized in practice.¹⁰ She contends that biological conservation discourse and public discursive expectations of 'wilderness' are the bases for valuation of wildcats and devaluation of domestic cats and hybrids. Such examination shows how values of nature is a social practice strongly associated with prevailing congealed social conventions that have constructed a situation of 'taken for granted'.

¹⁰ She is not using the concept of value articulation; rather it is my interpretation of here study.

Indeed, the three concepts developed by Ernstson (2013) can be translated onto the context of BO; protective capacity can be applied to both the place of impact and the place for offsets. We can use it to understand how social movements and other type of resistances to land exploitation oppose development projects for the sake of ecological, social and cultural loss (cf. Apostolopoulou & Adams, 2019; Bormpoudakis et al., 2019). Protective capacity also covers protected areas or protected species (if no dispensation has been granted), and terrain considered as too costly and difficult to exploit (too much of material constraints). Management capacity is rather more relevant for the place for offsets, since its management should be regulated by a timeframe (BBOP, 2009; Bull, Suttle, Gordon, et al., 2013). Value articulation process is multifaceted and can be applied differently depending on each case. But as outlined by Ernstson (2013), attention to articulations by actors through artefacts performed on social arenas can reasonably be the guiding principle. Offset species/habitats are nonetheless socially valued by taxonomy and inventory practices.

Next subsection discuss abstraction, which is a logical consequence of obscuring the function of intellectus and thus become settled in categories embedded in only ratio-rationales (Bornemark, 2018). Abstractions are however necessities, but they simultaneously ignore unevaluated aspects of nature – things can truly get lost in abstractions.

3.3.3 Lost in abstraction

Generalization by calculation, as metrics and units, risks to simplify the complexity of nature (Apostolopoulou & Adams, 2017; Sullivan & Hannis, 2015). In terms of BO, Apostolopoulou and Adams (2017) assert that compensation tends to ‘reframe’ nonhuman natures in four steps. First, BO reduces complex ecological assemblages into a selected ecosystem, habitat, species, etc. Nonhuman natures are radically simplified into isolated scores that schematically (mis)represent origin complexities of biodiversity. Second, offsetting neglects place-specific settings of nature by reducing nonhumans into biodiversity units. This entails the notion of replication of the unique context of a place of impact into a place for offsets. In the same vein, sociocultural histories of green spaces are simultaneously neglected. Third, biodiversity units are translatable into monetary terms. The economic value can thus functions as an exchange credit, from place of impact to place for offsets. However, this aspect is more relevant to procedures of habitat banking and might not (yet) be of importance for the Swedish context. Fourth, BO unites urban development with nature conservation. The necessary economic growth within the neoliberal paradigm in conjunction with ecological crises have thus created a third way to negotiate the colliding interests (as discussed in section 2.2 above).

More generally, Ernstson and Sörlin (2013) argue that if environmental management employs measures developed in other contexts, hence ignoring place-specific attributes, we may endanger to universalize and totalize unique local landscapes in terms of “locality, process, social anchoring, and history” (ibid., p. 280). By using standardizing environmental management, informed by only criteria of general scientific knowledge and not including local relational values (cf. Stenseke, 2018), common green and blue spaces risk to be governed by technocratic principles. Such processes will obscure local democratic influences (see also Swyngedouw, 2009). This has thus strong ties to the discussion of environmental paradigm and planning paradigm in section 2.4.

As abstraction of nonhuman nature facilitates exploitations by developers, Erixon Aalto and Ernstson (2017) portray how integrative narratives, where the given unique context is emphasized rather than universal valuations of it, become *protective narratives* of urban nature. Drawing on value articulation process (Ernstson, 2013) and examining three cases, Aalto Erixon and Ernstson:

...believe that this can help to profoundly rethink policy, planning, and practice in terms of: (i) how urban nature can be re-humanized and historicized by being embedded in vernacular stories about the city; (ii) how expert categorizations, such as city versus nature, can be undermined; and (iii) how various skills and ways of knowing can be brought into planning processes. (Erixon Aalto & Ernstson, 2017, p. 319)

Although capitalistic efforts blur distinctions and simplify contexts, we can here distinguish a counteract that rejects excessive generalizations.

3.4 Summarizing theoretical framework

Arriving at the end of the theoretical framework, I here summarize a few critical aspects. First of all, the framework can be grouped into two overarching themes: Hägerstrand's all-ecology (section 3.2) and political ecology (section 3.3). To organize these and to understand their functions in the theoretical apparatus, the distinction between *grand theories* and *middle-range theories* is appropriate to incorporate in this discussion. In short, the former refers to more abstract theoretical explanations of how the world appears, while the latter are theories that focus on more delineated fields. Middle-range theories thus provide more distinct and detailed explanations for a research problem of interest (Bryman, 2016, pp. 18-19).

For the present thesis, Hägerstrand's all-ecology is comprehended as a grand theory. In section 3.2, we have experienced overarching narratives of how the material world and social intentions coincide that together work as landscape filtering (Hägerstrand, 2000). These explanations are however difficult to operationalize alone and thereby require more detailed tools for analysis. In addition, this is carefully admitted by Hägerstrand: "As a whole, the thought structure is hardly researchable at present. It hides very complicated mathematics. It may possibly be a guide for selecting of sub-questions" (ibid., p. 129, own translation). It is therefore in the "selecting of sub-questions" the various notions of which together are related to political ecology enter the stage and are in the context utilized as middle-range theories. These concepts – above all value articulation process (Ernstson, 2013) and freeze-framing (Fisher, 2016) – are together an 'analytical hand net' in the subsequent thematic analysis. Middle-range theories – or to be specific, analytical tools of political ecology – have a 'closer' contact to the empirical materials. Figure 3 captures relations between grand theory, middle-

range theory and empirical materials. The arrows indicate on the moving back and forth (Herbert, 2010) which is explained in the following chapter.

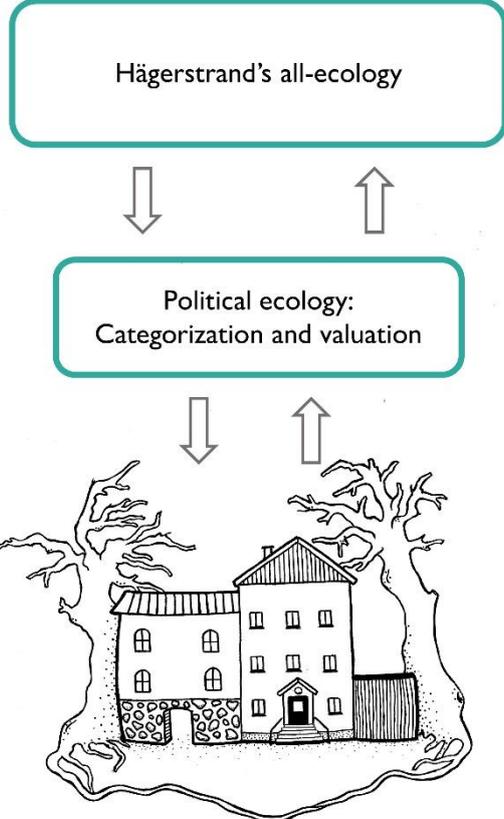


Figure 3. Grand theory, middle-range theory and empirical materials as the overarching structure of the analytical framework. Political ecology (middle-range theory) is used as an analytical toolset, which will interpret the empirical materials and fit claims into the broader perspective of all-ecology (grand theory). Source: author and Amanda Lundblad.

4 Methodology

4.1 Introduction

Through the lens of the previously demonstrated theoretical framework, present chapter outlines the methodology. Already touched upon, the methodology orbits around *thematic analysis*, which is a method used for qualitative data analysis (Braun & Clarke, 2006). However, the chapter consists of six parts. First, I describe general rationales of thematic analysis, i.e. the ‘theory’ of the analysis. In doing so, I implicitly provide assumptions why other components (e.g. interviews) of the methodology are of importance. Second, the study design is presented. Two BO-cases are the subjects of scrutiny, hence covered by the term *comparative study*. Third, relevant details are provided for the two cases. Moreover, since both cases are tied to Port of Gothenburg’s spatial expansions, a brief description of its history is outlined. Fourth, the process of data sampling is in detail explained and argued for. As a primary source of data, I interviewed informants linked to the projects. Secondary sources consist of collected documents corresponding to each case. Fifth, the practical utilization of thematic analysis is clarified. Here, I draw on thematic analysis in theory and adopt it to the analysis of the cases. Sixth, as no method can be completely exhaustive, I give a critical review of the conducted methods. This section is divided into three subsections; (i) interpretations; (ii) trustworthiness; and (iii) biases and quandaries.

4.2 Thematic analysis as the overarching method

The methodological core of the present thesis rests upon the rationale of thematic analysis. Thematic analysis is a common method for social scientists that are interested in qualitative dimensions of the world. As I am not focusing on quantitative metrics of BO in themselves but how they are constructed, and how places for offsets strategically are selected, thematic analysis suits the present thesis well. In simplicity, thematic analysis is described as an analysis of talked and written texts. These are coded into similar cohorts of observations, and later on abstracted to more overarching themes (Braun & Clarke, 2006). This section focuses on a few theoretical considerations of the method. Later, I return to practical application of thematic analysis.

Braun and Clarke (2006) provide a thorough guidance of thematic analysis. Initially, they suggest qualitative researchers to consider five crucial decisions before the analysis is carried out. These decisions are important to highlight since no rigid rules determine how the method shall be employed, and implementations of thematic analysis besides differ among research projects. Thus, Braun and Clark underline that the researcher possesses the capability to form the analysis in a way that suits the project in general. One of the benefits with thematic analysis is in fact that it can be applied to any theoretical framework, and not as for instance discourse analysis that requires a careful consideration of theory (ibid.; Phillips & Jørgensen, 2002, pp. 3-4). In remaining parts I describe each of the five decisions suggested by Braun and Clarke (2006), and in relation to those issues where transparent considerations shall be done, I discuss how the present thesis relates to it.

First, what to consider as a theme must be clarified. Simply explained, a theme is something found in the collected material that is of interest in relation to the research question(s). These interests should also occur as patterns through the data set. That said, and as thematic analysis is a qualitative method, frequency of themes is not dependent of quantitative measurements; the prevalence of a theme does not have to be present at a minimum level (e.g. represented at a minimum of 30% within the text material). Rather, a theme obtains its relevance based on the researcher's judgment. Hence, how important it is in relation to what is examined. A theme is therefore an active analytical construction made by the researcher with a great emphasis on flexibility and consciousness (Braun & Clarke, 2006). There will therefore *always* be subjective links between themes and the researcher.

Second, the analysis should either provide an overall rich description of the collected material or an in-depth focus on a particular interest. In the former, the researcher provides themes that contribute to describe all parts of the collected material, which can be useful when a research project scrutinizes unexplored terrain. The disadvantage here is that such analysis tends to lose some of the complexity of the examined case(s). The latter rather focuses on a smaller set of themes, hence a narrower approach. This strategy provides the analysis with more nuanced themes and relates to a specific interest (Braun & Clarke, 2006). As the present thesis concerns valuation of offset species/habitats, localization of offsets measure, and practical experiences reported from the field, I furnished the analysis with in-depth themes. It consequently implies that notions regarding BO in general were left aside.

Third, a thematic analysis can range from an inductive to theoretical approach. Inductive analysis can be compared to the method of grounded theory, i.e. the researcher strives to ignore theoretical presumptions of the research object and instead generates codes that do not necessarily correspond with pre-existing theory. Theoretical analysis, on the other hand, is guided by the theoretical framework. Thus, codes and themes are analytically related to a theory that will be tested or developed. Braun and Clarke (2006) notes that inductive analysis is usually compatible with an analysis strategy of the overall richness presented above. However, this is not carved in stone; the theoretical framework outlined in chapter 3 has been closely attendant throughout the analysis. Rather, as Herbert (2010) suggest, it is usually advantageous to go back and forth between empirical data and theoretical assumptions. Such back and forth is an honest description of my approach. However, both types of analysis were adopted; themes presented in chapter 5 (results) are more of inductive character and the more analytical claims in chapter 6 (analysis and discussion) shall be considered as rather theoretical themes.

Fourth, themes can occur at different 'levels', namely semantic or latent. For a semantic approach, the researcher generates themes that portray experiences, meanings and opinions of collected materials. On the contrary, latent themes depict the underlying structure of experiences, meanings and opinion. Hence, the ontological difference is that semantic themes are usually based on a realist perception, while latent themes tend to rest on social constructivism. Braun and Clarke distinguish the semantic and the latent as follows:

If we imagine our data three-dimensionally as an uneven blob of jelly, the semantic approach would seek to describe the surface of the jelly, its form and meaning, while the latent approach would seek to identify the features that gave it that particular form and meaning. (ibid., p. 84).

As the inductive and theoretical distinction, generated themes are both of semantic and latent characters; results in chapter 5 are semantic and mirror proclamations of informants and documents, while analyses and discussions in chapter 6, through the lens of theory, seek to explain how the proclamations are socially constructed.

Fifth, and this is related to the fourth, an epistemological decision must be made. Braun and Clarke (2006) argue that the research would either have an essentialist/realist or a social constructivist approach. Such considerations should in advance be decided since the theoretical interest of a research project will additionally disclose the epistemological (and ontological) position of the researcher. Dealing with human-environment relations, it is however problematic to conclude an 'either/or' decision in terms of epistemology (cf. Whatmore, 2006). This, mainly since the material world exists independently of human presence (hence realistic ontology), but our social relations to the world are – as I have argued for in section 3.3.1 and 3.3.2 – filtered through subjective and socially constructed categories. But as I examine social relations of nature, I confidently assert that humans' experiences, to large extent, are based on social constructivism. An immediate critique would however be that every material experience cannot be captured by words but becomes real through affection and performativity. Such assertion, derived from *non-represented theory* (Couper, 2015, pp. 98-100), is beyond the scope of the present thesis since I explore *uttered* social relations of nature.

Lastly, as Braun and Clarke (2006) highlight, various types of questions are posed within the frame of a qualitative research project. First of all, there are the research questions that provide a general compass direction for the study. They can be broad or narrow. Secondly, if interviews or focus group are utilized as sampling methods, other questions will be posed in the encounter with participants. And finally, the coding process of thematic analysis is driven by a third type of questions. Braun and Clarke (2006) remind us that these three types of questions do not necessarily have to be the same, but rather it is desirable that they diverge. As the present thesis above all concentrates on offset species/habitats and selections of places for offsets, the research questions, questions posed in interviews and 'inner' guiding questions that guided the coding process, all these questions concerned these two topics however in various manners. Conceptually, the overarching analytical method has now been outlined, hence I move further to the study design.

4.3 A comparative study

The research design of the present study is of *comparative design*, and in particular terms for qualitative research, referred to as *multiple-case study*. For social scrutiny, it is advantageous to compare cases to one another by analogous methods; contrasts between cases shed light on differences (Bryman, 2016, pp. 64-68). Thus, by utilize a comparative strategy in human geographic inquiries, the overall strength is considered to be that generation of knowledge is embedded in interspatial differences and similarities among cases. Distinctions between the cases will hence contribute to analytical explanations (Herbert, 2010, pp. 77-78). Further, comparative studies in qualitative research tend to contribute with more coherent findings as inter-cases generalizations are acknowledged, theories can be challenged, and new concepts of embryotic theories can emerge. Additionally, by including more than one case, conclusions regarding causality can be drawn of the similarities among cases that points towards the same direction (ibid., pp. 67-68). In terms of situated analyses for socioecologies, where different

place-specific observations response on similar issues are of interest, comparative case studies provide findings that can reject universalist understandings of nature. This due to that differences become exposed through the lens of comparability. Hence, textured situations of multiple divergent context are emphasized (Ernstson & Sörlin, 2019a, pp. 367-375). In short, using multiple cases, we can shed light on both spatial similarities and differences. However, a critical consideration suggests that “the differences that are observed between the contrasting cases may not be due exclusively to the distinguishing features of the cases” (Bryman, 2016, p. 67). Discussion of results should therefore carefully consider plausible situational influences.

For the present thesis, the comparison lies in the realm between two different BO-projects. The two cases are situated within the border of City of Gothenburg since both are consequences of Port of Gothenburg’s spatial expansion. The cases are diverse in characters, which we now turn the attention to.

4.4 Cases of interest and some notes on Port of Gothenburg

The data of the present thesis originates from two cases where offset measures have been and still are conducted. The cases are different in character but are both linked to Port of Gothenburg’s spatial expansion, wherefore it is important to account for both past and present activities. First of all, it shall be stressed that since this study explores BO, which in Sweden has not been used to a greater extent, it was slightly troublesome to find cases that could provide useful and thick information. However, the selection of the two cases is based on the logic that they are both considered extensive in the history of BO in Sweden, and both connected to the very same developer (Gothenburg Port Authority). A consequence of this sampling is that one of the cases (Case 2) is not yet completed and is preliminary planned to endure until 2023.

Table 1. Attributes of the examined cases.

Attributes	Case 1	Case 2
Place of impact	Warehouse development (land activity)	Quay development (water activity)
Place for offsets	Svarte Mosse; forested area in the vicinity of urban land use	Final locations are yet unknown; test plantations occur, final decision in 2023
Preconditions of the place for offsets	Forested land	Sea (saltwater), shallow bays below water surface
Offset species/habitats	Lesser spotted woodpecker (<i>Dendrocopos minor</i>); smooth snake (<i>Coronella austriaca</i>)	Marine eelgrass (<i>Zostera marina</i>)
Type of offsetting	Legal	Legal
Project duration	2015-2017	2015-2023

Cases in the present thesis are summarized in Table 1. Both cases are so-called legal offsetting, i.e. the very fact that they are realized are based on legal manners. Case 1 is a consequence of a dispensation from the SPO, which was decided by the County Administrative Board of Västra Götaland (CABVG). Listed on the red list (tied to the SPO), Lesser spotted woodpecker and smooth snake (*Coronella austriaca*) were recognized to be present on the place of impact, and thus the offset measures were arranged to their living preferences (Larsson & Goblirsch, 2014). On the contrary, Case 2 is an outcome of a permit judgement [tillåtlighetsprövning] in the Land and Environmental Court that resulted in a suspended sentence [villkorlig dom]. In that legal

case (which also covered other permit applications), a recognized eelgrass (*Zostera marina*) bed of 1.7 ha was decided to offset ("Case No M 4523-13," November 24, 2015). Although both cases are linked to developments of Port of Gothenburg, the places of impact diverge. Case 1 is land activity and mainly concerns development of logistical facilities for an affiliated company to Gothenburg Port Authority that is called Scandinavian Distripoint AB (City of Gothenburg, 2014). The development of the facilities is materialized in Halvorsäng, just north of Port of Gothenburg's location (Figure 4). Case 2's place of impact, on the other hand, is situated in Göta river, hence a water activity. To meet future demands of boat traffic, the development will result in new quays ("Case No M 4523-13," November 24, 2015). Place of impact of Case 2 is located just west of Port of Gothenburg (Figure 4). However, the case specific differences of offset species/habitats (land-based animals dwelling in forested conditions and a plant growing below the water surface in the sea) therefore demands two different types of places for offsets. The recreational area of Svarte Mosse was selected as the place for offsets in Case 1 (north east of the place of impact, see Figure 4). Case 2, as already stressed, is not completed but sites have been test planted in order to decide the final place for offsets (Figure 4). A general note regarding human activities is that many urban and peri-urban areas of Hisingen are subject for urban (re)development. A consequence is therefore the Swedish Transport Administration's ongoing plans for the road 'Hisingsleden', which is supposed to be located adjacent to Case 1's place for offsets (Park and Nature Administration, 2017; Swedish Transport Administration, 2016, 2019). Thereto, an akin remark on Case 1 is that the its offset measurers were coordinated together with another BO-project. The place of impact for that project was a logistic centre of AB Volvo, located some 3 km north of Halvorsäng. In that case, smooth snake along with two other species were targets for offset measures (Park and Nature Administration, 2017). In the analysis, I have not included that third case but a critical discussion of its potential influence on the findings is included in the critical review.

Before going further to subsequent sections of methodology, I shall here reserve some space for a brief description of Port of Gothenburg (Figure 5) and its historical context. This, because human induced morphology of socioecologies requires to put its existence into a greater context of global structures (Bormpoudakis et al., 2019; Ernstson & Sörlin, 2019a). Anyhow, Port of Gothenburg has been of economic interest since its establishment in 1620. The initial location of the port was on the mainland and in the vicinity of central Gothenburg (Stora Hamnkanalen), however the depth was too limited and larger ships had to anchor further south in the Göta river. In 1731, the Swedish East India Company was established and trade with parts of East Asia increased the port's economic activity. The history of the Company lasted until 1813, with a decrease of activity during the latter part of 18th century. Further, as the technology of ships developed during the Industrial revolution (mainly through steam power), they now managed to go further up in the Göta river. Therefore, a demand for places to load and unload arriving ships turned in 1845 Stenpiren into the first modern quay. Industrialization of Sweden took off and in the latter part of 19th century, export became a crucial component of the national economy. This entailed that the Port of Gothenburg expanded spatially and the fairway to the quays was thereby dredged. This coincide with development of railroads that connected port activities to other economic important hubs in Sweden (Gothenburg Port Authority, n.d.-a).

Examined cases Gothenburg, Sweden

Legend

- Case 1**
- Place of impact
 - ◆ Place for offsets
- Case 2**
- Place of impact
 - ◆ Places for offsets: Ongoing test plantations
 - ◆ Places for offsets: Past test plantations
- Other features**
- Port of Gothenburg
 - Municipality border
 - Roads
 - Water
 - Forested land
 - Urban land
 - Open land

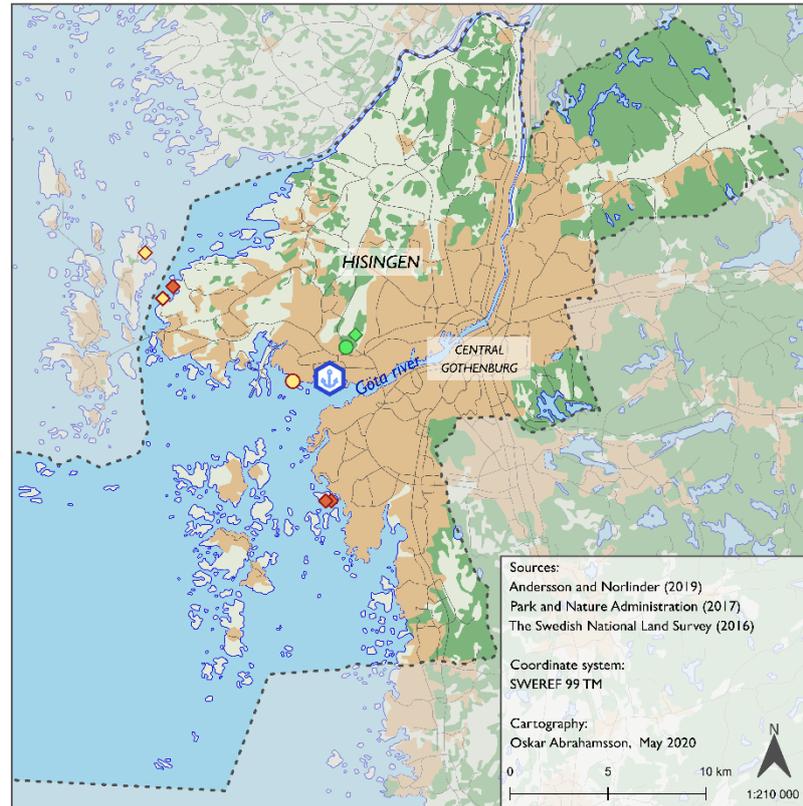


Figure 4. Map illustrating the positions of the cases' corresponding places of impact and places for offsets. Sources: Andersson and Norlinder (2019); Park and Nature Administration (2017); The Swedish National Land Survey (2016).

Along with the expansion, migration of Swedes to North America resulted in that Gothenburg became the last resort in Sweden before shipping off, first to the UK and later on to North American. Parallel to the economic activities, the flows of migration consequently extended the port's activities and new facilities were built. In the beginning of the 20th century, the port expanded to Hisingen with the establishment of Sannegårdshamen between 1908-1914. In 1915, the first direct departure for passengers to New York took place. These ships departed from Stigbergskajen (which is where Gothenburg Port Authority's contemporary headquarter is situated). The main interest of these voyages was now tourism in terms of Swedes visiting emigrated relatives in USA. During the 1900s, activities substantially increased, hence more quays and shipyards along the riverbanks of Götta river emerged (Eriksberg, Frihamnen, Ryahamnen, Lindholmen, Lundbyhamnen, Skarvikshamen, Torshamnen, Skandiahammen and Älvsborgshammen). In 1978, the last development of the port (until today) was completed, consisting of roro functions (Gothenburg Port Authority, n.d.-a).

Currently, Port of Gothenburg is the largest port in the Nordics and is of regional and national importance. Since May 15, 2000, Port of Gothenburg is a national interest, i.e. a marked interest of which existence and maintenance is protected by the national law (Slättberg & Bertilson, 2009). In addition, in their transport policy *Trans-European Transport Network* (TEN-T), the port is marked by the European Commission as a crucial node (EP and Council, 2013). Today, Gothenburg Port Authority (who runs Port of Gothenburg) is a corporation owned by City of Gothenburg (Gothenburg Port Authority, n.d.-b).

To summarize, Port of Gothenburg has historically been an important activity for the urban development of Gothenburg and there is no doubt that it is still such an activity. As stressed, its importance is stretching all the way to the European commission's policy documents, which is critical to note in an analysis of the spatial and temporal dimensions BO (Bormpoudakis et al., 2019). As the cases' contexts now have been described, it is time to describe the data sampling.



Figure 5. View over parts of Port of Gothenburg (from 'behind'). Source: author.

4.5 Encountering data – interviewing informants and collecting documents

The collected materials for the present thesis were sampled in two separate procedures. First, interviews with different informants linked in the cases were conducted. Second, documents produced within the frame of the cases were collected. I throughout the study treated interviews as the primary source and documents as the secondary. The guiding rationale was grounded in actors (interviewees) and artefacts (documents) of value articulation process (Ernstson, 2013). The subsequent thematic analysis was based on both types of sources.

To obtain data in qualitative research, interviewing actors is a conventional technique. This, however, does not mean that there is a formula for the procedure. Rather, the strategy for sampling qualitative data through interaction with informants is a dynamic process. First of all, as McDowell (2010, p. 157) notes, interviews refers to in-depth studies (commonly case studies) where the researcher is sensitive to details of the phenomena of interest. Comparing to methods of quantitative data sampling, where such research aims to cover normality and hence strive for wide sampling, qualitative methods rather look for how humans act, think, perceive, feel and experience within certain situations. The question of “how?” therefore refers to patterns of subjectivity and a main task for the researcher is to interpret perceptions of someone else. But before going deeper in ethical and political complexities of interviewing others, it is necessary to outline a short description of what kind of interview the present thesis rests on.

A common definition of interviews is how structured the questions to the interviewees are. In qualitative research, the level of structuration mainly relates to either *unstructured* or *semi-*

structured interviews.¹¹ The difference between these two is simply that unstructured interviews lack predefined questions, or only include one initial question. The content is thus a consequence of various topics emerged during interviews, wherefore the interviewee possesses a relatively free ability to steer the direction – as long as the discussion roams within the analytical interest of the researcher. Semi-structured interviews rather emanate from predefined themes of which the researcher in advanced have identified as interesting to explore. Usually, questions that belong to each theme is prepared. In both types of the presented strategies, the researcher can temporarily leave the chosen structure and follow up an emerged topic of interest (Bryman, 2016, p. 468). The ability to temporarily abandon the structure is extra important in exploratory studies since in the long run such events may enrich theory development. Above all, unexpected content in the moment of verbal exchange could in the analysis be of vital importance.

My interpretation of the distinction between unstructured and semi-structured interviews is not understood as a strict contrast between two mutually exclusive methods. I rather prefer to see it as a strategic continuum where the researcher has to be conscious of where to place oneself in the given situation. However, before the interviews were conducted, I departed from a semi-structured strategy and constructed an interview guide containing four themes (see Appendix X). Occasions occurred when I had to be more unstructured.

Sampling informants for the interviews started early of the project and lasted into the phase of data collection. As I desired informants that possessed direct and indirect experiences of the cases, I adopted *purposive sampling*. Purposive sampling mainly refers to a mode of sampling where the research questions guide the researcher to select participants (Bryman, 2016, p. 410). In relation to the opposite *random sampling*, purposive sampling enhances the credibility of a qualitative study since purposively selected informants are those of crucial voices (Baxter & Eyles, 1997). Additionally, as I started to contact participants of interest, I thereto asked them about other involved actors. Such strategy is common in qualitative research and referred to as *snowball sampling*. The strategy is mainly used to initially (purposely) sample a few participants and thereafter benefitting their contact network to sample more participants (Bryman, 2016, p. 415). This is not exactly how the approach was carried it out; for the present study, a master's thesis with a time budget of four months, some degree of efficiency had to be considered for every phase. Rather, the actual procedure initially contacted actors linked to the cases, and thereafter I asked whether they knew other involved persons. Many persons I first contacted thereby forwarded me to more relevant persons. In Table 2, all informants that participated in the present study are listed. All are more or less linked to either Case 1 or Case 2, except Informant 2 since this actor represents Gothenburg Port Authority and thus has been involved in both cases.

Before every interview, I communicated some general information about the event by email. In order to prepare the informants of which aspects of BO I was interested in, themes of which questions were group into were announced. Thereto, I informed them that their name will not be published but that I later in the thesis will refer to them based on the role they have/had. Therefore, no absolute anonymity was promised. Additionally, I also informed them that after

¹¹ Structured interviews are a third alternative, but are mainly used in quantitative inquiries (e.g. for questionnaires) due to its low degree of flexibility (Bryman, 2016, pp. 466-467).

the analysis was done, I desired to consult them with the result; a process referred to as *member checking* (Baxter & Eyles, 1997), which I later return to in subsection 4.7.1. Further, in order to facilitate the following analysis, all interviews were recorded by the informants' permission.

Table 2. List of all interviewed informants.

<i>Informant</i>	<i>Case</i>	<i>Role</i>	<i>Date</i>
Informant 1	Case 2	Marin biologist consultant and project manager of Case 2	February 26, 2020
Informant 2	Case 1 & 2	Senior Manager Port Development (Gothenburg Port Authority). Involved in both Case 1 and Case 2	March 2, 2020
Informant 3	Case 1	Senior Environment Consultant who investigated offsetting measures of Case 1	March 4, 2020
Informant 4	Case 1	Civil servant at the CABVG. Participated in decision-making of dispensation from the SPO in Case 1	March 9, 2020
Informant 5	Case 1	Former civil servant at City of Gothenburg's Administration of Properties. Participated in planning for offsetting measure in Case 1	March 11, 2020
Informant 6	Case 2	Civil servant at CABVG and is contemporary supervisory administrator of Case 2	March 12, 2020
Informant 7	Case 2	Civil servant and investigator at SwAM. Project manager of <i>Handbook for eelgrass restoration</i>	March 16, 2020
Informant 8	Case 2	Researcher and docent at the department of Marine science (University of Gothenburg). Main author of the <i>Handbook for eelgrass restoration</i> and long experience of eelgrass	March 16, 2020
Informant 9	Case 1	Lawyer involved in dispense application of Case 1	March 23, 2020

As the moment of an interview is an encounter of two (or more) persons, complex situation of power relations is rather an commonness than an anomaly (McDowell, 2010, p. 161). What McDowell in this context is referring to is that due to the social roles we obtain (regardless whether they are voluntary, involuntary, assumed or 'true') and social roles we expect of the each other, we put ourselves in situations where sociocultural norms privilege someone and disadvantage others. It means that the asymmetrical power distribution in an encounter between two or more persons always, may it be explicit or implicit, represses one part to a certain degree. However, it is not a universal truth that the researcher in an interview situation is the one that benefits from these power relations – but it is likely to assume that, particularly in terms of interviews with nonexpert respondents. But as McDowell note, doing interviews with powerful persons, such as politicians, bosses of firms or experts, the researcher can be regarded as the less privileged (ibid., p. 161). However, the reality is often more complex, and we have layers of roles and expectations (in terms of gender, age, socioeconomic status, ethnicity, etc.). Not to circumvent, but with hope to mitigate unequal power relations, I let each informant decide where the interview would take place (I additionally offered all informants my own suggestions of places if they could not provide own ones). Most of the interviews were physically conducted at their workplace. For two separate reasons, remaining interviews were carried out non-physically (via telephone, Microsoft Teams and Zoom). First, one informant does not live in the vicinity of Gothenburg and therefore online meeting was preferable. Second, the end of the interview phase conjured with the global outbreak of COVID-19 pandemic and the measures

made by University of Gothenburg recommended nonphysical meetings in order to mitigate the spread of the virus.

Table 3. Collected documents (artefacts) that were used in analysis.

Document	Case	Type of document	Source
Document 1	Case 1	Investigation about dispense from the SPO in Halvorsäng	(Nittérus, Askling, Kircher, Sörensen, & Stahre, 2012)
Document 2	Case 1	Offset plan for Svarte Mosse	(Askling, Stahre, & Sörensen, 2013)
Document 3	Case 1	Approved dispensation from the SPO (regulating artefact)	(Larsson & Goblirsch, 2014)
Document 4	Case 1	Description of offset measures in Svarte Mosse	(Park and Nature Administration, 2017)
Document 5	Case 2	Suspended sentence (regulating artefact)	("Case No M 4523-13," November 24, 2015)
Document 6	Case 2	Handbook of eelgrass restoration	(Moksnes et al., 2016b)
Document 7	Case 2	Stand-alone appendix to (Moksnes et al., 2016b) concerning offset restoration of eelgrass.	(Moksnes et al., 2016c)
Document 8	Case 2	Overview of management and restoration of eelgrass	(Moksnes et al., 2016a)
Document 9	Case 2	Updated plan for identification of places for offsets	(Andersson & Norlinder, 2019)

Regarding the sampling of (secondary) document materials for the analysis, the process was slightly simpler however based on the same rationale; their content should possess valuable data in relation to the research questions. Also, there was a so-called snowball sampling here too since some informants frequently referred to produced documents of the specific case, which additionally strengthen the decision to include documents in the thematic analysis. Using produced text materials as complementary materials can thereto provide validation of what informants proclaim, and also function as additional sources of contextual information (McDowell, 2010, p. 158). In Table 3, all sampled documents are listed. For the cases, these are regarded as what Ernstson (2013) refers to as ‘artefacts’; materials which actors refer to as regulating and that construct narratives of offset species/habitats.

4.6 Practical implementation of thematic analysis

When data has been collected, it is time for analysis. Not only do Braun and Clarke (2006) provide a theoretical description of thematic analysis, they also suggest six practical phases for the method. In Figure 6, these six phases are presented. It is important to note that a thematic analysis is far from linear process (as the figure portrays it), but rather it is a process of going back and forth between the phases. Subsequently, for the first three phases, I discuss each phase in relation to the present thesis adaptation of them. Phase 4-6 are presented together, then followed by the practical implementation. This, because the latter phases became more entangled than the former ones.

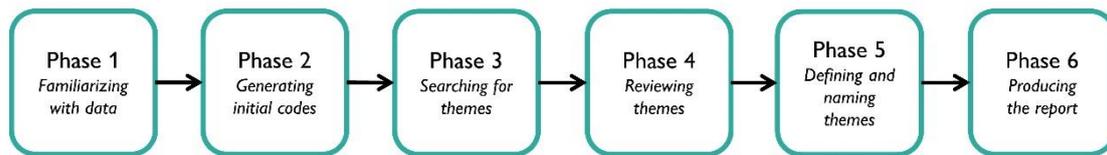


Figure 6. Six phases of thematic analysis. Source: author's interpretation and conceptualization of the suggested approach by Braun and Clarke (2006).

Phase 1 is the initial contact with the collected material. As Braun and Clarke (2006) note, if the data set is derived from interviews or focus groups, the familiarization already starts here. Data that originally is text material (e.g. documents) should be read through in order to get some notions of its content. Unwritten data, as recorded interviews, should be transcribed. After every interview, close in time to the event, I transcribed the recorded material. Transcription is not only a process of mirroring the spoken words into a textual twin, but it is also an opportunity to once again familiarize with the data (ibid.). Also, transcribing is an extremely time-consuming activity; details in transcription can vary widely from analysis to analysis (Gee, 2011, p. 117). Another issue is that “[w]e seldom speak in ‘sentences’ with capitals at the beginning and a fullstop at the end” (MacKian, 2010, p. 362). A careful consciousness was therefore the ambition of such interpretation (see introduction to section 4.7 below for a discussion on interpretation). Regarding details, too much of them (as non-word utterances) can nonetheless draw attention away from the meaning of the text itself (Gee, 2011, pp. 120-121). The level of details in the produced transcripts was a consequence of the tension between extensive time consumption and enough details to carry out an adequate analysis. More concrete, the procedure was simply to transcribe every verbalized word from the interview session, including those by me, with some additional attention to body language (memorized from the sessions), laugh and emphasis. For thematic analysis, Braun and Clarke (2006) contend that such level of details is sufficient. Due to mishearing, transcriptions can usually be ‘contaminated’ with inaccurate interpretations (Braun & Clarke, 2006; Bryman, 2016, pp. 481-483). Therefore, close in time after every transcription was done, I listened through the recording while I followed the transcript and corrected such errors (they truly existed). By first transcribe, and afterwards listen through the recordings again, initial constructions of codes already begun here since this process is an “interpretative act, where meanings are created” (Braun & Clarke, 2006, pp. 87-88).

The second phase of thematic analysis is characterized by coding of data. Nevertheless, codes can be generated before and after this phase, but here these are the main focus. Codes are simplest described as building blocks of a theme, and they do not hold the same abstraction level as a theme (Braun & Clarke, 2006). In short, codes can be considered as the ‘first’ level of abstraction of a text extract. Also:

What is of interest is not so much the codes as the text they denote, not how often they occur but what is in them. The codes are not there to be rigidly reproduced, nor to be counted, but as an aid to the researcher in making sense of the material. (Crang, 2005, p. 224)

Codes are thus an early analytic interpretation of data. Further, the coding process relies on the five decisions made prior to analysis (see section 4.2); almost the whole content on every data item was coded into inductive codes. Further, a text extract is not restricted to only one code, but can be labelled with as many codes as it logically correspond to (Braun & Clarke, 2006).

Coding of the text materials was manually performed in the CAQDAS program *NVivo 12*.¹² The initial coding was structured as presented in Figure 7. I used case specific main nodes for each case and further distinguished codes in regard to either ‘offset species’ or ‘place for offsets’. It shall be noted that such division is occasionally more idealistic than realistic since many codes had an obvious tie to both ‘offset species’ and ‘place for offsets’. Lastly, text materials of interest but not concerning neither offset species nor place for offsets, were sorted under a main node (‘Biodiversity offsetting in general’ in Figure 7).

After all the data items were coded, I began to look for themes amongst the codes, which is the following third phase. Mainly, it entails to sort the codes into embryotic themes. The sorting process transforms some codes to main themes and other to subthemes. A subtheme is a theme that provides a structure for the ‘hosting’ main theme. Additionally, some codes will here be unsorted (however, not yet totally rejected) as they in this phase cannot be sorted into any aggregated theme (Braun & Clarke, 2006). In the present analysis, I decided that all themes had to be covered by observations from both cases – a strategy referred to as *negative case analysis*, which I discuss in subsection 4.7.1.

The following three remaining phases became less linear, thus these three are first conceptually described. Secondly, I explain my adaptation of them. When potential themes have been generated, it is time for reviewing them. Braun and Clarke (2006) suggest dividing phase 4 into two levels of reviewing. First, each code for all generated themes should be scrutinized. In order to see whether the codes can participate in the analytic claim of a theme, all text extracts that build up the codes have to be carefully considered in relation to the theme. If they appear irrational, they should be omitted from the theme. Second, the whole data set should be considered in relation to the themes in order to see if they logically correspond to the collected material. The second level therefore also provides an opportunity to include codes that had been missed out in phase 3. Hypothetically, this process can go on forever: “It is impossible to provide clear guidelines on when to stop, but when your refinements are not adding anything substantial, stop!” (ibid., p. 92).

When themes are finally generated, it is time for the fifth phase; defining and naming themes. The goal here is that in the end, the researcher should be able to clearly describe the themes’ content and their analytical arguments. Every theme should have its own individual ‘identity’, i.e. a theme should be coherent, solid and it should not overlap with other themes (Braun & Clarke, 2006).

The sixth and final phase is to write-up the produced themes. Writing in itself is a crucial part of qualitative research and should not begin in the last phase. Rather, taking notes should advantageously start already in the first contact with the data. However, writing-up the results entails that the researcher must prepare text extracts that provide themes with arguments of the analytical claims that one contends. In addition to referring to text extracts from the data set, the researcher has to provide the results with analytical narratives that will tie together the content of the thematic ‘stories’ (Braun & Clarke, 2006).

¹² CAQDAS is an abbreviation of *Computer-Assisted Qualitative Data Analysis Software*.

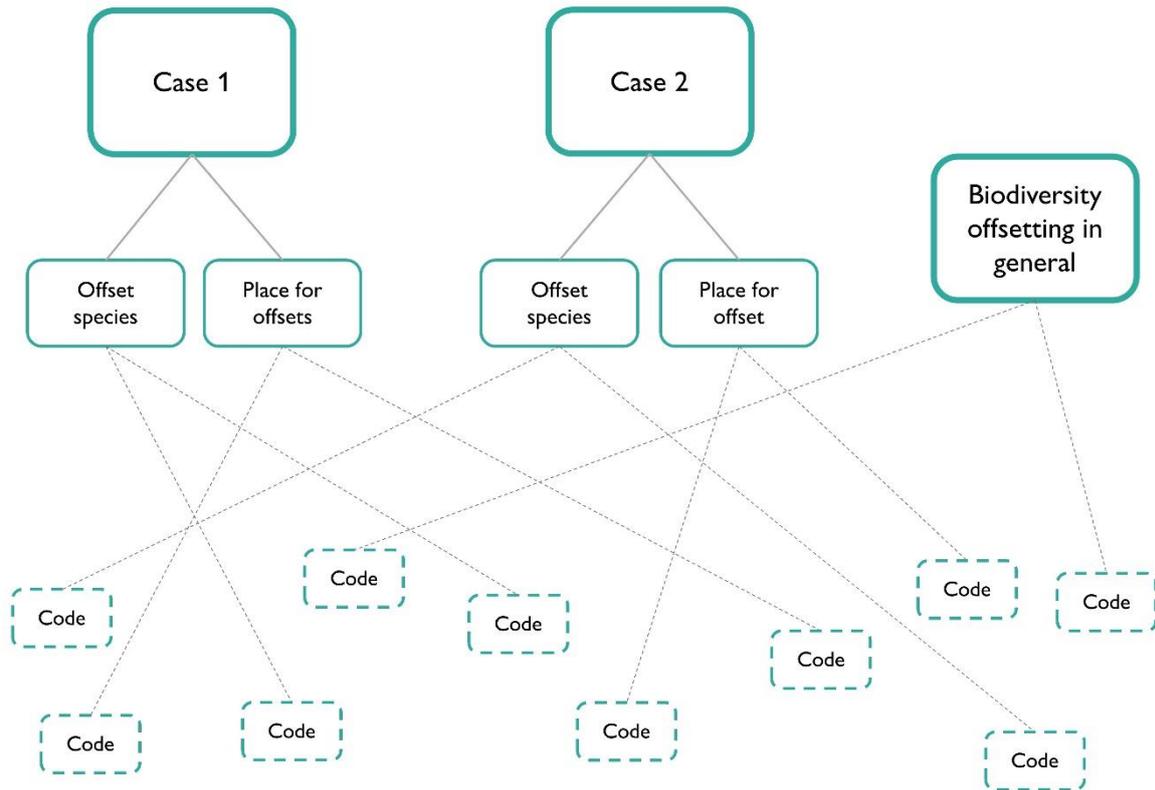


Figure 7. Conceptualization of the initial coding phase. Codes were sorted into 'Case 1', 'Case 2' or 'Biodiversity offsetting in general'. Both 'Case 1' and 'Case 2' consisted of a identical substructure that sorted codes into either 'Offset species' or 'Place for offsets'.

From the fourth phase and forward, the process became more nonlinear and an intellectual journey began that moved back and forth between data and theory. In other words, the approach was both inspired by inductive and deductive strategies to generate themes. As Herbert (2010, p. 74) truthfully contend, inductivism and deductivism in qualitative social science are rather more helpful to consider as a continuum than two mutually exclusive strategies. More concrete, when codes and themes of more inductive nature emerged, I returned to theory in order to distinguish logical links to the data. Such procedure entailed to temporally return to coding process again and rereading data material (phase three and four). It may simply be associated to relations between 'emic' and 'etic' codes described by Crang (2005, pp. 224-225). Emic codes are codes of which informants themselves have articulated during the interview, or proclamations from documents. On the contrary, as codes theoretically mature (by moving back and forth between data and theory) codes are reconstructed as etic ones, namely of how theory is relating to text extracts. Crang continues by illustrating that emic codes do not all 'evolve' into etic ones; etic codes are the one higher up on the abstraction level (closer to theory) while emic codes yet practically guide how data relates to theory. This distinction between emic and etic sorting was later utilized as a strategy to distinguish results (emic) from analysis and discussion (etic). However, preliminary themes were discussed and reviewed together with my supervisor. This consultation led to a rearrangement of themes. Lastly, all quotes used in the result were translated from Swedish to English. Naming, defining and writing-up are not discussed here, since these dimensions are explored in chapter 5 and 6.

4.7 A critical review of the methodology

As a lead-in to the critical discussion of present thesis's methodology, I briefly illuminate "the mysterious gap between fieldwork and 'final report'" (MacKian, 2010, p. 359) – viz., interpretation. Interpretation is an ongoing process, from the very start of a project, via closure to future readers. Despite that interpretation perhaps is the inevitable competent of all scientific inquires, explicit accounts on analysis are often privileged over implicit 'taken for granted' interpretations. MacKain means that analysis above all refers to an 'external' portrayal of the world based on systemized coding, thematizing and categorizing of data. For example, the generated themes which I later convey and argue for. Interpretation, on the other hand, is an 'internal' process of being in the world. We make sense of the reality through various perspectives, beyond the frontiers of data. Indeed, analysis therefore depends on previous interpretations (ibid., pp. 360-361). Out of this statement, and as validity of qualitative research in social science is especially a matter of interpretations, the following subsections concern different aspects of interpretations (trustworthiness, potential sampling biases, and ontological and epistemological quandaries). Or ought I say, aspects of *my* interpretations and how these have been critically reviewed throughout the project.

4.7.1 Trustworthiness

Of scientific importance, an honest and critical review of methodology is necessary. Unlike quantitative research, where statistical relationships of various qualities are analysed, and objectivity is desirable, qualitative research relies on methodological self-reflections. In order to audit a qualitative study's accuracy, critical discussions in the light of *trustworthiness* must be carried out (Baxter & Eyles, 1997; Bryman, 2016, p. 384). Four criteria constitute trustworthiness: (i) credibility; (ii) transferability; (iii) dependability; and (iv) confirmability.

First, a fundamental assumption within social science asserts that the reality is diversely perceived, hence the social world is collectively constituted by *multiple* realities. *Credibility* consequently concerns to which extent the collected data adequately is interpreted from the perspective of those who the data is obtain from (informants), and external viewers" received understanding (external audience) (Baxter & Eyles, 1997; Bryman, 2016, p. 384). Nonetheless, a researcher's subjective understanding provides logical links between empirical data and conceptualization through the lens of theory. However, the subjectivity is also tinged by the researcher's underlying motives, interests and so on (Baxter & Eyles, 1997). In the present thesis, the methodology holds two apparent type of interpretation (even though interpretation is an ongoing process as outlined in previous subsection). First, encountered data (particularly data from interviewees) are interpretations of *others'* perspectives and experiences. They are not of mine, and I can never fully put myself into their contextual and everyday affections. Followingly, second, as data is interpreted and assigned to specific codes (and later on abstracted to themes), a theoretical interpretation is added. I interpret the interpreted empirical data through an a priori interpreted theoretical framework. Outputs of such a manifolded interpretation – infused with my subjectivity – are the mere 'unfiltered' thematic findings. Trustful representations thereby become a critical onus: "One of the main threats to ensuring qualitative validity is the misrepresentation of meanings expressed through interview conversation" (ibid., p. 509). Any kind of 'filtration' is consequently urgent and to ensure credibility, some measures should be undertaken of which four of them I have implemented.

First, *member checking* is simply to give informants the possibility to verify whether interpretations by the researcher are adequate or not (Baxter & Eyles, 1997; Bryman, 2016, p. 385). However, how and what to expose for participants lack consensus. McDowell (2010, p. 168), for example, means that there could be an uninterest amongst participants to comment, and academic writings can thereto be perceived as inaccessible, particularly in occasions when one provides a fully accomplished analysis to the participants. Baxter and Eyles (1997, p. 512) however assert that member checking is an essential requirement in qualitative studies: “It is apparent that research practices should involve strategies of returning interpretations to respondents for commentary (and perhaps revision)”. At a minimum, the authors fill in, the researcher’s interpretation of participants’ experiences and opinions should be audited, but it can besides be insightful to expose them for the complete analysis for an external ‘nonexpert’ review. Additionally, as Bryman (2016, p. 385) observes, it is uncertain to assume that participants outside academic jargons have the capability to validate an analysis. For the thesis context, the whole result chapter was sent to all informants. I highlighted the corresponding text extracts to each informant since I wanted them to validate my interpretation, but also provide them the opportunity to obtain the whole content so they could understand the context. However, the latter analysis (chapter 6) was not communicated because its content depends on access to the theoretical framework. They had two weeks to respond; all but one replied. If comments were provided, they concerned clarifications of pieces of which I later corrected. As proclaims can be lost in translation, the member checking also function as validation of the translation from Swedish to English. Second, *triangulation* refers to the common scientific technique of converging various sources, methods, theories and researchers. By embedding the findings through the rationale of diversity, credibility is strengthened since more than one source or method strengthen the analytical claims (Baxter & Eyles, 1997; Bryman, 2016, p. 386). The simplest example of triangulation is perhaps analytical claims through multiple quotations from various participants and other text based sources (Baxter & Eyles, 1997). Triangulation in present thesis has implied (i) two types of sources (informants and documents), and (ii) an elaboration with theoretical notions (broadly Hägerstrand’s ontology combined with critical perspectives from political ecology). Third, *peer debriefing* refers to consultation with colleagues or other skilled persons that possess vital theoretical and analytical knowledge (ibid.). For this, I give an extra thanks to my supervisor who carefully set aside time for reviewing the themes generated out of the analysis. Fourth, *negative case analysis* bears upon a continuing inductive examination of themes through hypotheses; to which degree is constructed themes covered amongst encountered material (ibid.). The rationale I used in the analysis was vaguely founded of this principle. In particular, the scopes of all themes are covered by observations in both Case 1 and Case 2 but not necessarily by all informants since they had different roles (experiences) linked to the cases. Consequently, themes only attended in one case were set aside.

Second, although generalization is precarious in context-dependent qualitative studies – that corresponds to my argumentation throughout chapter 3 – studies must at minimum obtain some degree of *transferability*. The researcher should therefore shoulder the task of contrasting the findings in relation to external akin contexts. In order to ensure that external receivers can recognize details, a prevalent strategy to enhance transferability is therefore to provide *thick descriptions* of findings and other relevant contextual information (Baxter & Eyles, 1997;

Bryman, 2016, p. 384). Throughout the thesis, I have shed light on the importance of diversity amongst situations, which also is aligned with the texturized details of urban nature (Ernstson & Sörlin, 2019a). Such descriptions continue in remaining chapters. Thereto, as knowledge production of present thesis emanates from multiple cases (and in combination with negative case analysis), transferability between situations is already in the internal analysis argued for (Baxter & Eyles, 1997).

Third, of obvious reasons, a study must be of reliable manners, “[t]hus *dependability* refers to the plausibility of accounts” (Baxter & Eyles, 1997, p. 516, italic added). Bryman (2016, pp. 384-386) discusses dependability in relation to auditing, arguing that transparency of materials, strategies and decisions should be accessible for external peers so they can familiarize with the researcher’s undertaken processes. Additionally, Baxter and Eyles (1997) stress that it is crucial to highlight methodological changes during a research project. In total, transcripts from the interviews cover 115 pages of text and thus of obvious reasons, these are not published in appendixes. However, the interview guide (Appendix) and sources of secondary data (Table 3) are made public. Besides, in subsection 4.7.2 below I expose and discuss early theoretical and methodological strategies and how these (aligned with some critical considerations) evolved into the currently adopted approach. Moreover, in regards to analysis, finishing off too early (incomplete analysis) and deficient themes are common pitfalls for inadequate dependability (ibid.). Along with the mentioned transparency, some strategies to ensure dependability have already been listed (triangulation and peer debriefing). Peer debriefing in this context can also be stretched to a final seminar where the thesis was audited by an opponent and an examiner.

Fourth, in terms of *confirmability*, (again) objectivity in qualitative inquiries is regarded as an insufficient demonstration of the social world, but the researcher must to some degree transparently portray how her/his own subjectivity may have influenced the knowledge production. Subjective positionality is regarded to both the encountering with informants and also during later interpretations of informants’ shared experiences. Implicit motives, social roles and certain interests are all potential influences (Baxter & Eyles, 1997; Bryman, 2016, p. 386). And as McDowell (2010, p. 170) notes, interviews as an ongoing procedure of interpretation (through layers of subjectivity) require a careful outline of own positionality. Therefore, I reproduce the tradition of *a view from somewhere by the socially situated researcher* (cf. Jensen & Glasmeier, 2010, p. 83) by the following reflexive account of my own subjectivity and how it is positioned to both methodological conclusions, theoretical assumptions and interpretation of data. First of all, I am a nearly 31 years old white male who was born and raised in a middle-class context. Currently, my main social role is a university student; the informants I interviewed are all based on their professional role (hence informants and not respondents) and in relation to a student, one may assume that underlying power occasionally hindered me to go further with ‘momentary follow-up questions’ (cf. McDowell, 2010, p. 161). In a similar vein, due to prevailing patriarchal tendencies that characterize our society, some of the informants are females and could have perceived just mentioned power issue, however the other way around. To make all participants feel comfortable and respected, I (as earlier mentioned) let the informants decide time and place for their interview in order to address them with some initial agency. As best I could, I informed them with the content of the thesis – both in advance through email and right before each interview. I also explained that the interviews were not like interrogations, but rather as a conversation or discussion between interviewee and me. Further,

my interpretations and selection of theoretical framework can without doubt be derived from my own subjective values; I make sense of the world through a pair of conceptual egalitarian glasses (including nonhumans). A view that through my nearly five years as a student has fortified. In a society portrayed by – according to me – inequalities, I often interpret situations critically. Thus, the analysis becomes implicitly tinged by subjective interest of what I personally believe is important to highlight. However, even though the content of the present thesis is tinged by my positionality, I assert that findings and analytical claims yet remain of scientific interest. Further, my inner deductive deliberation has throughout the project been omnipresent, and therefore in the following two subsections I illustrate how it has influenced the project's trajectory.

4.7.2 Potential sampling biases

The purpose of present subsection is to discuss in what ways the collected data is biased. Baxter and Eyles (1997) argue that we must discuss *whose voices* we have listened to – and consequently whose voices we have not privileged. Likewise, selected documents shall be critically reviewed. The difference is however that documents are fairly easy to add more of if needed. Presumably, only inaccessibility (e.g. secrecy) can hinder us. On the contrary, informant interviews rely more on accessibility in space and time – after all, informants are human beings with packed schemes and due to the thesis's time budget, constraints were obvious. In retrospect, shared experiences amongst informant diverged; some had worked or still were working very close to the given BO-project and provided important insight of practical involvement. Others, in particular Informant 7 and Informant 8 (see Table 2), were not tied to the BO-project but yet contributed with their knowledge about eelgrass. Further, in Case 1, I contacted a civil servant at Park and Nature Administration (City of Gothenburg) who had practically performed the offset measures in Svarte Mosse. Due to his tight schedule, he could not participate. Through snowballing, I managed to get another name of a similar actor but who did not work there anymore. Attempts to contact him was made, but without success. However, other informants (as Informant 2 and Informant 5) had worked very close to the practical implementation and could therefore add up such loss of data. Additionally, for both cases, documents as a secondary source were advantageous complements – partly due to 'filling in gaps' but also to triangulate statements. Consequently, more documents were added through the process, especially due to informants' frequently referring to important writings (artefacts). All documents included were all relevant to corresponding cases. Some of them were of legal character, hence had explicit directing functions for the projects. Other were investigations or considered as 'handbooks'.

In this context, the third BO-project briefly noted in section 4.4 should be discussed. First of all, that case was also prompted by the SPO. Some of the interviewees touched upon that project's relevance for Case 1. It has most likely had some influence on the selection of place for offsets (Svarte Mosse) since that project was initiated right before Case 1. Thereto, due to that the SPO was a rather new regulation at the current time, the CABVG (whose task amongst others is to review plans) approved the first zoning plan without dispensations. This despite the presumption that the species in question were present in Halvorsäng. The third case, which was initiated before Case 1, had begun to conduct an investigation of species protection dispensation, and of several reasons, the same consultation firm that investigated the third case,

was hired for Case 1. Therefore, a complexity of Case 1 is that exploitation of Halvorsäng began before a thorough investigations of the species spatiotemporal presence (Informant 3, personal communication, March 4, 2020). During the interviews, it nonetheless became clear that the actors had perceived the two projects as individual ones, but in terms of efficiency, offset measures were implemented together. I therefore decided to disregard that case. If more time was available, or if I had discovered that project earlier, it would of course had been of interest for scrutiny.

Therefore, more cases would had enriched the findings and also the transferability through the strategy of negative case analysis. But as stated in section 4.4, some time was spent on examination of case candidates; SEPA and CABVG were for example contacted in hope for databases or lists of achieved BO-projects. Unfortunately, they did not possess any of such. This matches the reported lack of data collection of BO-projects (zu Ermgassen et al., 2019). After a while, I decided to concentrate on the two examined cases based on three rationales: (i) both are considered as major BO-projects in Gothenburg and in its vicinity; (ii) both are linked to spatial expansions of Port of Gothenburg (driving forces behind place of impacts are akin); and (iii) in relation to each other, both cases are truly assembled by different contexts, thus equip the analysis with interesting diversities.

By including voices of everyday users of both places of impacts and places for offsets, the cases could further had been more variegated. In doing so, other aspects of human-environment relations could probably had been distinguished (see Stenseke, 2018). And maybe also some voices of protective narratives (c.f. Erixon Aalto & Ernstson, 2017), which in the current analysis is absent. Such analysis (as for instance Apostolopoulou & Adams, 2019; Bormpoudakis et al., 2019) has the possibility to highlight local participation and public embedding of human induced landscape changes (Stenseke, 2018). The thought of including nonexperts, everyday users and local communities of the places was initially a potential aspect of interest. However, as both places of impacts are situated away from residential areas, it was complicated to distinguish directly affected people. Similar reasons for the places for offsets, but here Svarte Mosse is located adjacent to Biskopsgården (a residential area). Thereto, Case 2 is a marine BO-project and it thus is almost by default 'invisible' for nonexperts. Yet the problem of whom to encountered remained. It is nonetheless easier to distinguish people involved in a process rather than those excluded.

4.7.3 Ontological and epistemological quandaries

This last subsection sheds light on critical theoretical and methodological decisions conducted throughout the project. I here follow the critique asserted by Baxter and Eyles (1997, p. 521) contending that “researchers need to be more explicit about the research process including the rationale(s) for [...] key changes in research direction”. Indeed, the fulfilment of the thesis has been more of a bumpy ride than a straightforward journey. First of all, the initially idea aimed to carry out a discourse analysis based on Ernesto Laclau and Chantal Mouffe’s discourse theory (cf. Phillips & Jørgensen, 2002). Discourse theory was planned to align notions of more-than-human geographies and political ecology. Two critical reconsiderations have however been done since then. First, after reviewing more-than-human geography, I realized that one concern within its ontology was for me difficult to endorse; given the fact that more-than-human geographies, especially the most excessive interpretation of it, argue for that the unfolding the

world occurs in the intersection between *agencies* of both human and nonhuman actors (cf. Hinchliffe, 2007; Hitchings, 2003; Whatmore, 2006). In doing so, I assert that we thereby construct a space of interpretation inherent of too much uncertainty. By ascribing nonhumans as active agents, commonly based performative practices (e.g. Hitchings, 2003; Staddon, 2009), which are interpreted by humans, we can cause undermined reflexivity. For examine human agency, employing these methods, we who are engaged in social science and humanities, can review our interpretation of the researched subject by encountering it through the strategy of e.g. member checking (Baxter & Eyles, 1997). Misunderstandings are still happening between humans, yet we can *communicate* it. For nonhumans, on the other hand, we lose our most essential tool, viz., language. Language in more-than-human geographies is used to describe findings from performative practices, but thus far, the nonhumans cannot correspond whether the way we portray their agency rhymes with their ‘intentions’. If the language is the tool of the social scientist, and our language lack abilities of reciprocal communication with nonhumans, then I must, due to ethical implications, reject it. Eventually, as Dowling, Lloyd, and Suchet-Pearson (2017) notes, we humans will write-up our findings in order to communicate observations to other human beings. The rejection of more-than-human ontology entailed a theoretical gap and Hägerstrand’s ontology was instead obtained. On the contrary, as outlined in subsection 3.2.2, he does not argue that nonhumans possess agencies, rather nonhumans are processes just like human behaviours, although he differentiate human and biological nonhumans as ‘projects’ and ‘programs’ (Hägerstrand, 1993). I understand the categorization of projects and programs as a necessary compromise; currently, humans lack the communicative ability of encounter nonhumans at an in-depth level, but living nonhumans seem to possess some degree of autonomous behavior.

Second, despite that Hägerstrand occasionally are sensitive to language and how it by categories collectively influence the material world, I hesitated the alignment between theory (Hägerstrand and political ecology) and discourse analysis. As widely known, discourse analysis also pays close attention to linguistic structure of texts, however occasionally, the text itself get too much attention. And as Whatmore (2006) truthfully assert, reality is an intermix of practices and discourses. Thereto, discourse analysis are seldomly presented in details (Lees, 2004), and in particular discourse analysis grounded in discourse theory lacks apparent methodological principles (Phillips & Jørgensen, 2002, p. 49), although some guidance are accessible (to name a few, see Carpentier, 2010; Cruickshank, 2012; Cruickshank, Lysgård, & Magnussen, 2009; Weber, 2016). However, the finial establishment of premises for analysis becomes an ad hoc assemblage consisting of a myriad of suggestions. Altogether, and as the aim of the present thesis partly strives to highlight practical encounter with the material world, I decided to adjust the analysis from discourse analysis to thematic analysis. If more emphasis had been made on policy documents and other regulating writings of BO, discourse analysis would most likely perform well. But for present analysis, it became sufficient to exclusively concentrate on categorization in thematic analysis as the social practice of collectively organizing the world. Thematic analysis is besides an incredibly flexible method (it could be the most common in qualitative research), which also allows the researcher to focus on practical experiences along social production of regulative categorizations (Braun & Clarke, 2006).

5 Result

5.1 Introduction

Present chapter demonstrates thematic findings constructed through previous explained analysis. These themes are of emic character, hence themes based on the interviewed informants voices and experiences, and explicit proclaims in examined documents (Crang, 2005, pp. 224-225). Two main themes with corresponding subthemes are demonstrated. The two main themes, named *Selection of offset species* and *Localization of offset measures*, are dedicated one section each. Further, each section is composed by three corresponding subsections where subthemes are illustrated.

5.2 Selection of offset species

The first theme regards selections of species of which the examined cases have been obliged to offset. In Figure 8, the main theme with its corresponding subthemes is portrayed. Two subthemes, *Lesser spotted woodpecker and smooth snake*, and *Eelgrass*, concentrate on the offset species for each case, and on legal provision that regulate each case. From a relational perspective, a third subtheme regarding *Port development* is critical in this context. Port development is obviously not any selection of species, but an important factor for why both BO-projects were initiated. Solid indications show that port development plans have influenced both projects. However, in the following three subsections, subthemes of the three offset species are firstly delved into. Secondly, findings concerning port development are illustrated.

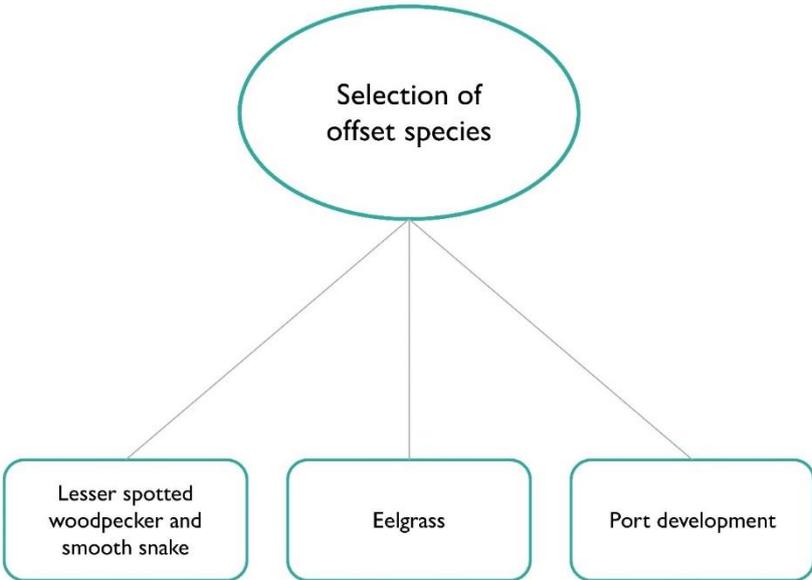


Figure 8. Mind map of the theme *Selection of offset species*. Two of the subthemes (*Lesser spotted woodpecker and smooth snake* and *Eelgrass*) concern the species that have been selected for the cases' offset measures. The third subtheme, *Port development* regards findings that emphasize the importance of Port of Gothenburg.

5.2.1 Lesser spotted woodpecker and smooth snake – ‘conventional’ threatened species compensated by ‘offset proxies’

Lesser spotted woodpecker and smooth snake as the selected species to offset in Case 1 were both derived from a dispensation of the legal regulation of the SPO. Applied by Scandinavian Distripoint AB (Gothenburg Port Authority’s subsidiary) and the Administration of Properties (City of Gothenburg), the dispense application was later approved by the CABVG. Through the rationale of MH (protective measures could not align the loss), offsetting was termed to target habitats for lesser spotted woodpecker and smooth snake in order to sustain ‘Favourable Conservation Status’ [Gynnsam bevarandestatus]. In the permission, the focus was directed to the selected species habitats:

The County Administrative Board gives dispensation for within the selected area [...] in conjunction with the implementation of zoning plan for *Operations at Halvorsäng in the district of Biskopsgården in the City of Gothenburg* [Verksamheter vid Halvorsäng inom stadsdelen Biskopsgården i Göteborgs Stad], removing breeding areas and resting places for lesser spotted woodpecker (*Dendrocorpos minor*) and smooth snake (*Coronella austriaca*) and intentionally catch smooth snake. (Document 3, p. 1, italic in original).

As lastly stated, and which usually is against the law, actors were allowed to catch observed smooth snakes and thereafter move them to the place for offsets. By offsetting species through their habitats is understood as also covering residual lost ecological values at Halvorsäng. One of the consultants who produced the investigation of species protection dispense (Document 1) and the offset plan (Document 2) explains that the environment of Halvorsäng is in tandem understood as habitats for the selected species. Thus, residual important ecological values in Halvorsäng (beyond lesser spotted woodpecker and smooth snake) are covered by the offset measures because the measures compensate species through habitat restoration:

Now you can probably say that both of these species [smooth snake and lesser spotted woodpecker] have a habitat and are linked to the environments that also had [other] natural values. So, actually, they [offset species and their habitats] really coincide. So that it... There were really no other significant natural values. (Informant 3, personal communication, March 4, 2020).

In short, this approach turns the less immobile environmental features, such as plants, stones and so on, into ‘offset proxies’ for lesser spotted woodpecker and smooth snakes. Further noted by the same informant, the fact that the SPO determines which species to offset or not is occasionally problematic:

...it is a legal selection. It really is, of course, that the Species Protection Ordinance applies only to the species that are actually pointed out. This means, of course, that you can have red listed species that have a much worse threat class, but who really have no legal protection at all, while one such common [species], which is covered by the Species Protection Ordinance, you have to [relocate]. Sometimes projects get very skewed by [this rationale]. [...] Actually, trying to make a legislation that is that static when the ecology is not static, it gets a little strange. For birds it works well; [...] the Species Protection Ordinance follows the red list there. But this does not apply to any other species. (Informant 3, personal communication, March 4, 2020).

BO-projects induced by the SPO can thus be misleading since less threatened species may become subjects for compensations, while more threatened species could be neglected by the law. However, the above-mentioned informant asserts that this was not the case for the offset measures in Svarte Mosse.

For a species to become a subject of offsetting, indications on their presence are necessary. Past observations are therefore premises for selection of species. Prior to the approved dispense application, lesser spotted woodpecker and smooth snake had been recognized by local municipal authorities:

The Environmental Administration and the Park and Nature Administration in Gothenburg have noted that species listed in the Species Regulation Ordinance may be affected by the new logistics area [Halvorsäng]. Therefore, the effects on these species need to be investigated.

[The consulting firm's] investigative assignments include investigating possible effects of the planned activities on the local populations of two occurring species in the vicinity; lesser spotted woodpecker (*Dendrocopos minor*) and smooth snake (*Coronella austriaca*). The assignment also includes proposing some general offsetting measures in the immediate vicinity of the planned area to counteract any adverse consequences for these two species. (Document 1, p. 3).

Supported by past observations of the two species, local municipal authorities initiated the foundation of which later became the current offset species. In comparison to trees or other immobile features, it is yet more difficult to determine whether more mobile species are temporary present or not. Such unclearness became an issue for the smooth snake. In the investigation of species protection dispense from 2012, the authors state that:

Within the zoning plan area, there are probably no longer any remaining individuals of smooth snake, since the location of the most recently noted finding has been exploited (blown up) since 2008. The species is therefore considered to have disappeared/extinct from the area [Halvorsäng]. (Document 3, p. 34)

Responsible for the implementation of for the zoning plan and who worked close to implementers on the ground, one informant witnesses about when smooth snakes were unexpectedly encountered in Halvorsäng, after exploitation had begun:

But the animals adapt and are still there as well. Like I said, they were in there at Halvorsäng – Vikan [crusher] – where you had a quarry. And they [smooth snakes] were also later found at some inventory, it was still there, although they had developed the quarry even more by then. So, it might not be such a bad environment [for smooth snakes], you later notice, for some [individuals]. (Informant 5, personal communication, March 11, 2020).

In short, and what is of importance regarding the offset species in Case 1, elsewhere restoration of *habitats* was the key approach for the offset measures. For this purpose, a segment of deciduous swamp was preserved in Halvorsäng in order to serve as a corridor for lesser spotted woodpecker. As we will see in the next subsection, the eelgrass is not handled through offset proxies, but instead treated as transplantable seaweed.

5.2.2 Eelgrass – (trans)planting an important ‘newcomer’ in the marine environment

Eelgrass as the offset species in Case 2 is legally determined by a suspended sentence. More specific, during an eight-years period, stretching from 2015 to 2023, Gothenburg Port Authority is obliged to test plant eelgrass. If succeeded, the port must hence establish new eelgrass beds of in total 1.7 ha (Document 5, p. 7). If Gothenburg Port Authority has not achieved this term after eight years, they might be obliged to either continue with the eelgrass (trans)plantation-project, pay a fishing fee that corresponds to the loss of the former eelgrass bed’s ecosystem services, or something else; the unfolding is based on how far the BO-project has come and how the Land and Environmental Court assesses the progress of the case.

In comparison to lesser spotted woodpecker and smooth snake, eelgrass is not covered by the same regulation (the SPO) but are protected through a legal issue of permit. Likewise, previous observations and notices have induced the protection of eelgrass of where several informants witnessing of an increased consciousness; both in terms of eelgrass as a significant ecological feature, and that loss of eelgrass in the Swedish west coast has occurred. One informant who is a researcher of marine science has studied eelgrass for many years. His work has also resulted in an ambition to spread the importance of eelgrass to a more public audience. He conveys that the last 10 years has been an increase of public awareness, and within the last 3-5 years or so, the attention of eelgrass has intensified (Informant 8, personal communication, March 16, 2020). In a similar vein, the informant who conducts the test plantations also witnesses about this phenomenon: “We have known that eelgrass has disappeared for a long time – since the early 2000s – but not much has happened until lately. Which is a bit strange. But then, *now* everything is happening” (Informant 1, personal communication, February 26, 2020). Further, the suspended sentence has since its clinch in 2015 raised the issue of eelgrass to another level and one informant working as a civil servant at the CABVG believes that it has influenced their work: “We have some here with us who are experts [on eelgrass], but it is also the case that other administrators also need to get in and learn more about eelgrass and other” (Informant 6, personal communication, March 12, 2020). The ecological importance of eelgrass is underlined by the civil servant at SwAM: “[Eelgrass] provides structures in [ecological] functions in the coastal marine environment. It is an ecosystem engineer who improves the [surrounding] environment. Extremely biologically productive environment too, so much ecosystem services from there. So, it’s one of the priority habitats” (Informant 7, March 16, 2020). In this context, the epithet ‘ecosystem engineer’ is by the handbook of eelgrass restoration described as “[a]n organism capable of creating or modifying its physical and/or biological habitat, and which affecting a variety of other organisms” (Document 6, p. 13). To summarize, eelgrass has lately emerged from a marine seaweed only acknowledged by a few interested to a widespread audience. Whether the suspended sentence of Case 2 is the major cause for this spread or not is beyond the scope of the present findings to claim, but it has truly contributed to the awareness.

Prior to exploitation of Arendal 2, the site was not only consisting of eelgrass. Beyond the loss of the 1.7 ha eelgrass bed, the affected seabed also consisted of around 3.1 ha soft bottoms (Document 5, p. 39). The interviewed researcher asserts that these features are important places for reproduction of flatfish:

Sometimes it is forgotten. I have been [disseminated knowledge] for the eelgrass for many years. But sometimes it feels like if a developer finds a bare bottom, it is considered worthless because then there is no eelgrass. And then it has gone too far. For example, plaice [*Pleuronectes platessa*] and flounder [*Platichthys flesus*] [...] they need bare shallow soft bottom, sand or clay bottom to grow up during the spring. These shallow areas are heated faster so there is more food production. So that is where they are. It is believed that such shallow areas can be limiting how many plaice that can be [reproduced]. So, it is like what determines how much it gets. [...] They are absolutely valuable. (Informant 8, March 16, 2020).

The informant thereafter adds that the value of one soft bottom must be perceived in a greater perspective in order to understand whether such feature is considered threatened or not. In the suspended sentence, the CABVG urged that Gothenburg Port Authority should compensate the loss of the 3.1 ha soft bottom by a corresponding fishing fee. In the final judgement, this fishing fee was disregarded – following the demands by the SwAM to exclusively offset the eelgrass bed (Document 5, p. 45, 80).

5.2.3 Above all, port development – the driving force for the offset measures

Thus far, accounts for targeted offset species have been demonstrated. However, for both cases to even become BO-projects, emphasis on port development is frequently articulated throughout the empirical materials (see Figure 9 for Case 1’s place of impact). Above all, it is evident that Port of Gothenburg and the planned port developments are of “overriding public interest” (marked by law as a national interest) including both societal and economic importance. Its substantial valuation is supported from municipality scale (Gothenburg) to international scale (European union).



Figure 9. View over Halvorsäng, Case 1’s place of impact. Spatial transformation; from biodiversity to economy. Source: author.

Accounted for the application of species protection dispensation for lesser spotted woodpecker and smooth snake, the involved layer proclaims that approved dispenses of this type are rare. Further, she emphasizes that the main reason for its approval is due to that the zoning plan had an overriding public interest because its activities are connected to Port of Gothenburg:

And then I assert that the reason for this case [Case 1] got a dispensation had a lot to do with the fact that we were pressing [...] that it was Port of Gothenburg. Where the need was so to speak. Port of Gothenburg as a national interest and also as a core port. That the EU has even pointed out that this is an important port for the European [Union's] infrastructure. (Informant 9, personal communication, March 23, 2020).

The combination of both Swedish and European interests makes it hard to reject such an application. Similar tendency is identified in the case for eelgrass. In the background section of the suspended sentence, the present and future importance of Port of Gothenburg is underlined:

The Port of Gothenburg [...] has a special position as the most important node for freight transport to and from Sweden and for the development of the Swedish business sector in a globalized market.

Freight volumes handled in the port are expected to increase over the next ten-year period. To cope with the increased volumes of goods, [Gothenburg Port Authority] is planning an expansion of additional berths in connection with the existing terminal area and the quays at Arendal. (Document 5, p. 10).

Aligned with the concern that the existing parts of Port of Gothenburg are of importance, there is a consensus amongst the informants that port developments are crucial components for future sustainability of the society. When one of the civil servants at the CABVG speculates, the relational account between port development and eelgrass is touched upon:

[I] think the eelgrass bed [had] a very small chance of winning against the economic and important reasons [...] [for] port [development] – it [eelgrass] is not important enough for the marine environment to say no to this huge port activity. So, it is good that there is an opportunity then to be able to compensate. (Informant 6, personal communication, March 12, 2020).

As a compromise to not only ignore the eelgrass bed at Arendal 2, the quotation refers to the ability to carry out the BO-project as middle course that benefits socioeconomic interests and ecological endurance. The other civil servant at the CABVG (but linked to Case 1) participated in decision-making of the dispense application. He discusses the spatial constraints of port development as an inevitable requirement of proximity to the core activities and in relation to other urban development projects:

Other developments, such as urban development for housing, have significant, yes, usually there is not sufficiently strong reason [for dispense]. You can also think that the [Port of Gothenburg] is quite limited in its own, yes, they have quite limited location possibilities; they cannot [for example] locate in Partille [a municipality east of Gothenburg]. Then you lose the whole function, or the connection to the activity. While building for housing, you can slightly build 'everywhere', or at least to a greater extent. So, there was still a lot of talk that, ah, that, that, it is an important activity and it needs to be here somewhere. And, our investigation concluded that this was still the best suitable solution. Although not good for lesser spotted woodpecker

[and smooth snake], it was still from the common point of view of the most appropriate. (Informant 4, personal communication, March 9, 2020)

Both cases are truly consequences of critical considerations infused with compromises, mainly due to the immense consensus of Port of Gothenburg's value.

5.3 Localization of offset measures

Selected offset species must eventually be compensated elsewhere. This notion of elsewhere is explored in the second main theme that is named *Localization of offset measures*. Three subthemes that together constitute the present theme are identified (see Figure 10); two concerning decisions on two spatial scales, and one regarding temporal challenges: (i) *Macro decisions* refer to more coarse guiding principles for localizations; (ii) *Micro decisions* are compromises and choices that implementers must deal with in the practical reality; (iii) *Tricky timing and future viability* imply concerns of time-related challenges. The first two subthemes occasionally converge and may rather be understood as a continuum instead of the exclusive subthemes. However, for simplicity, I have arranged them in a subsection each.

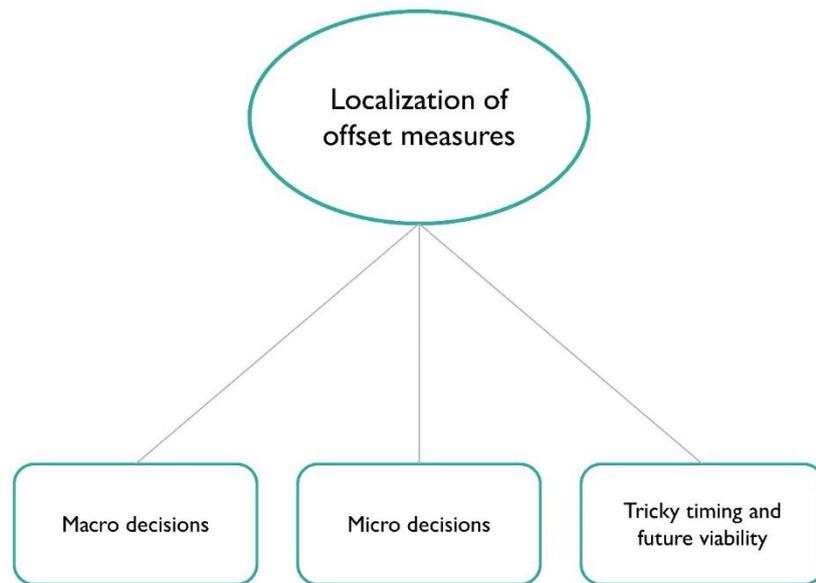


Figure 10. Mind map of the theme *Localization of offset measures*. The subthemes *Macro decisions* and *Micro decisions* regard selections and localizations on two different scales. The third subtheme, *Tricky timing and future viability* concentrates on time-related issues.

5.3.1 Macro decisions – proxime places with similar preconditions

An initial phase when identifying places for offsets is to conduct what I identify as *macro decisions*, i.e. to designate a type of inventory area. Throughout the empirical materials, there are two overarching guiding principles directing macro decisions for offset measures. First, *proximity* to the place of impact and, second, environmental precondition *similar* to the place of impact. Similarity should therefore be understood as similarity of loss and gain where the new place holds suitable conditions to be transformed into similarity. To manage these two principles, investigative actors of Case 1 included both of them in their localization analysis.

To define the maximum distance for localization of lesser spotted woodpecker, they defined an inventory circle of a 2 kilometres radius from the centre of Halvorsäng. This inventory circle represented the subpopulation of lesser spotted woodpecker (Document 1, p. 7). Within this inventory circle, the project thereafter assumed that the designated area consisted of lower habitat qualities for lesser spotted woodpecker of which by measures can become enhanced to suitable habitats. By classifying candidates into three classes (very suitable habitat; suitable habitat; less suitable habitat/future potential), areas not classified as ‘very suitable habitat’ becomes candidates (Document 1, pp. 8-10). Svarte Mosse, located just north east of Halvorsäng, held enough acreage to be enhanced for both lesser spotted woodpecker and smooth snake. The lawyer who worked in the project explains the rationale as follows:

...the offset area should be accepted based on the reviewing authority, [...] that it has preconditions to be able to have these species. Because that is not the question of creating a whole new environment, but here are the preconditions for smooth snake, here are the preconditions for lesser spotted woodpecker – but we want to improve and strengthen them [the preconditions]. (Informant 9, personal communication, March 23, 2020).

Since Svarte Mosse is located rather close to the place of impact, other candidates were relatively outplayed. Regarding enough acreage of Svarte Mosse for offset measures (a precondition for similarity) the offset plan states the following:

If the compensation is divided between the two species, it consists of 57,5 ha for lesser spotted woodpecker. It is possible that a maximum of 8 ha will be added if Hisingsleden is drawn in a more westerly stretch. This should be compared to the 37 ha that disappear within the planned area. Overall, it is an overcompensation to be on the safe side, but it is also the case that the areas are not directly comparable due to quality differences. For lesser spotted woodpecker, it is not possible to achieve as high habitat qualities in Svartemosse as in Halvorsäng and this is an explanation for the compensated area being larger in Svartemosse.

The equivalent for smooth snake is that 45 ha will be deposited in Svartemosse, which will be compared with the 26,5 ha that will disappear in Halvorsäng. However, it should be remembered that in Svartemosse there are already optimal environments for smooth snake, and these should not be taken into account as compensation. The total compensation will nevertheless be a new addition of smooth snake habitat. (Document 2, p. 19).

From a quantitative perspective, the result is in total considered as an overcompensation, but as enhanced habitats in Svarte Mosse are of other qualities a type of equivalence is thus achieved. Thereto, in order to define ‘how much’ (a presumption for NNL) the project had to define when loss of habitats had begun. This, and also to assure that the selected places for offsets will not be subjects for future exploitation, the analysis included three timeframes (before 2008; between 2008-2012; after 2012) where each of them represented assumed habitat situations for lesser spotted woodpecker and smooth snake (Document 1, p. 12). Due to that the initial exploitation already had begun prior to the procedure of species protection dispense, past habitats had to be estimated: “The presence of lesser spotted woodpecker may therefore be linked to a situation that prevailed before 2008 and that its continued existence is uncertain” (Document 2, p. 9).

Macro decisions in terms of proximity and similarity are also important guiding principles for test plantation of eelgrass. Regarding proximity, the suspended sentence that demands

Gothenburg Port Authority to offset eelgrass beds distinctly states the following: “The measures shall concern the creation of at least 1.7 ha new eelgrass areas at suitable sites primarily in the municipality of Gothenburg, secondly in neighbouring water areas” (Document 5, p. 7). Similarity in this manner are places with suitable preconditions for restoring at minimum 1.7 ha of eelgrass beds. The requirement that offset measures shall be implemented within or in the vicinity of City of Gothenburg has been the project’s major challenge for identifying places of similar precondition for eelgrass restoration. The interviewed researcher who is not directly tied to the project but follows its progression, means that it is not much of a selection of places for offsets, but rather to distinguish possible sites: “So in [Case 2], they have trouble finding where it works; where there is space and where it works. And then it is not so much a choice, but rather where it works.” (Informant 8, personal communication, March 16, 2020). Thus far in the project, involved actors have discovered that the current situation of eelgrass within the designated area is relatively satisfying. The marine biologist who conduct the measures asserts that: “Just in this case, I think it would have worked well to do [it] somewhere else as well. First of all, we have a lot of eelgrass in Gothenburg, and then we have areas [outside Gothenburg] that are more exposed” (Informant 1, February 26, 2020). Potential places for offsets outside the designated area may thus cause more anticipated effects. However, the suspended sentence is adamant and one of the civil servants at the CABVG here illustrates on its solidity:

...I know that the Port [of Gothenburg] very much wanted to try [further up north] in, at for instance the Sannäs fjord, where you have found that it works [to restore eelgrass]. But there we [the CABVG] were quite clear on the basis that the [suspended] sentence then says that it should be in water bodies adjacent to Gothenburg municipality. (Informant 6, personal communication, March 12, 2020).

The Sannäs fjord is located somewhat 125 km (Euclidian distance) north of central Gothenburg and therefore comprehended far outside of adjacent water bodies. Further, a strategic intermix of proximity and similarity has played another important role for identification of places for offsets. As above stated, the implementers have not so many selectable candidates. The test plantations have thus far been ongoing for two summers (2018 and 2019) and after the first summer, the test plantations resulted in one out of four successful sites. The manager at Gothenburg Port Authority here discuss the rationale of this strategy:

Informant 2: ...there are not so many areas, but you have almost ‘vacuumed’ the whole of Gothenburg for suitable areas. The outset you had when looking at the first investigation was that you were not allowed to offset near an existing [eelgrass] bed then, because there is a certain distance. It is because [...] the existing eelgrass bed [needs space to] grow itself so to speak. So that has been a challenge. But now you have looked... we made an updated offset plan last year and then it was that you have reviewed at what are quite sparse eelgrass beds; can you make sure they become denser? And yet you can, when you notice then that ‘okay, this eelgrass [bed] has not grown for a number of years, like, can we make sure that maybe, that we help grow a little to plant...’

Author: To push it a little bit?

Informant 2: To push it a little bit, right. So, there it has been a difficulty [to] actually find in proximity of the exploitation area, because that is what has been the most important thing; that it should be *nearby*. (Informant 2, March 2, 2020).

This ‘pushing’ is by the marine biologist explained as a similarity-strategy related to temporary presence and absence of eelgrass beds:

Author: But is it appropriate to try to plant in, if you say this: where it has been, but does not exist, but close to where it is present, if you understand what I mean? Is it like a strategy [of yours]?

Informant 1: Mm, that is a really important question actually [chuckle]. Because it is actually like this, this place we succeeded [to plant eelgrass at] now, or yeah, I should not say too much, but where it looked best, there is existing eelgrass. But we have inventoried the eelgrass on several occasions in [other] assignments, and the one where there has historically been a dense [eelgrass] beds, there have been isolated ‘patches’ [...]. And they are not spread in the area, but they are there. And then we have thought in this way: But if they are there, then they can still grow there, but it is something that does not allow them to spread. And then the idea is like that if we boost them and build a [eelgrass] bed, then it will be a bit like this self-generating effect that them, ah, improve the water quality and stuff like that. (Informant 1, February 26, 2020).

Hence, by selecting a place in the vicinity of past growth of eelgrass beds, but has currently ceased the growth of eelgrass, the intention is to enliven the weak eelgrass bed. Also, in the empirical material, it becomes clear that not only do they (who) identify a suitable place in terms of ‘emptiness’ to be ‘filled’ with eelgrass and the habitat that it ‘is’/creates and requires. The preconditions of a place for offsets must thereto consist of multiple variables. To name a few, water depth, light conditions, salinity, water temperature, oxygen ratio, and various types of algae are all crucial influencing factors for eelgrass suitability. To this ‘equation’ donor beds are added, which the handbook describes as “[a] fresh eelgrass bed where plant material (flower shoots or vegetative shoots) is harvested for use in restoration” (Document, 6, p. 13). Donor beds are therefore existing eelgrass beds that are located rather close to the prospective places for offsets. In other words, when places have been identified, many further considerations must be done, which in the next section are further explored.

Comparing the cases, both principles are considered important amongst the empirical materials. However, proximity and similarity are occasionally not negotiable with each other, as Case 2 shows – and may also be a plausible partial explanation for why their offset measures thus far have not succeeded. When actors must choose between the principles, similarity becomes superior and proximity subordinated. This mainly since similarity in terms of finding a suitable environmental precondition allows viability, however further away from the place of impact. For the offset measures in Case 1, the intention to enhance selected places in Svarte Mosse into suitable habitats for lesser spotted woodpecker and smooth snake has been possible. Therefore, no major struggles between proximity and similarity were expressed. On the contrary, for the eelgrass offsetting, the designated area of proximity causes a challenge for identifying suitable places.

5.3.2 Micro decisions – reports from the field

As macro decisions of places for offsets are an initial phase, implementers must thereafter practically operate within these designated areas of proximity. Such practical work is here covered under the epithet of *Micro decisions*. If the previous theme concentrated more on ‘remote working’, present theme addresses the implementers surrounded by constraints and possibilities within the physical landscape. Operating within the designated area, test

plantations of eelgrass has only identified a small share of places. Thereto, being quite weather-dependent, the micro decisions of eelgrass plantation have been challenging. Initially, eelgrass must be test planted, advantageously on more than one place – first during a summer, and if succeeded the test period extends to one year (Document 6, p. 60). The interviewed practical implementer proclaims that the first round of test plantations was conducted at four places during the summer of 2018. A summer mostly remembered by its exceptional warm air temperature in Sweden:

Informant 1: And then we planted, on these [four] sites. This fantastic hot summer.

Author: Ah, [year] 2018, right?

Informant 1: Yes!

Author: You remember that one.

Informant 1: Mm, then if it has affected the eelgrass plantations, it is difficult to say. Because things did not go so well that time.

Author: No, I understand. But can heat impact [negatively], you think?

Informant 1: Yes, it can matter. Now I do not know exactly the limit, but if it goes over [20 degree Celsius] in the water it can influence. Then there are also other influences. After all, there were a lot of bathers and boat traffic. In these shallow bays, these [sites] are shallow bays and there are boats going in, so it can be anchor damage and propeller damage; that they [boats] create waves that [impact negatively]. Because when you plant [eelgrass], they let loose quite easily in the beginning. So that might be a reason, too. Because otherwise the conditions looked pretty good. It should have worked. (Informant 1, personal communication, February 26, 2020).

Despite that the informant and colleagues had carefully followed the thorough instructions of the handbook (Document 6), the situation of summer 2018 was not favourable and three out of four test plantations were considered unsuccessful. The fourth remaining site was decided to give another, enlarged, attempt (the site called ‘Tummen’ portrayed in Figure 11), together with a fifth place at the north east side of Björkö (an island just outside City of Gothenburg’s border):

Informant 1: And then we went on and remade the design a little bit [...]. So, we planted again then, last summer [2019], in two areas. And then we deviated the handbook [Document 6] a bit and did some larger planting [than suggested by the handbook]. And now this year [2020], I will not say too much, but, the last visit in September looked really good. At that time, in one site it had increased from 20 shots to 80-90 shots. So that is a pretty big increase.

Author: When will you check it next time?

Informant 1: In May. [...] Although there have been quite a few storms now, so I do not know. It is also one of those factors that can [influence]. (Informant 1, personal communication, February 26, 2020).



Figure 11. Test plantation of eelgrass at the site called ‘Tummen’. The bed is demarked by two buoys that float on the water surface. Source: author.

The expectation is that at least one of the two test plantations will be a future candidate for the offset project. Most likely, according to the informants, these two places do not provide enough space for the demanded 1.7 ha and the macro decisions for identifying other places that hold suitable preconditions will continue. On the micro scale, finding a place with suitable living conditions for an eelgrass bed is difficult. The civil servant at SwAM has worked a lot with eelgrass and has been active in the production of the handbook, expresses following:

I have been working with eelgrass for 8 to 10 years, quite intensively. And if not good conditions, it is extremely difficult to [let it] grow in other places... Which also strengthens this that [...] biodiversity offsetting is not to be used in an institutional manner just because you think that you can move values in the landscape. Because it is not. Because things grow in the place where they are, so to speak, for a reason. And it can be very difficult to grow [eelgrass] in other places. (Informant 7, personal communication, March 16, 2020).

Using BO without a critical intention, and with a particular emphasis on eelgrass, this informant asserts that measures can be misused, and its important purpose may get lost. Another issue to consider is that eelgrass is a truly dynamic species. Over a longer time, the researcher asserts that swallow bays are temporally covered and uncovered by eelgrass:

But there is a complication here that I myself see as the Achilles heel of the entire biodiversity offsetting-procedure [for eelgrass]. It is often the case that when you make a compensation you will find an empty area somewhere, [regarding] eelgrass on the seabed: ‘And here’s fine, here I can compensate.’ But there are no *free spaces* anywhere. [...] And if it is empty somewhere where eelgrass can grow, then you can probably assume that eelgrass has naturally grown there before. For the eelgrass, you can see it moves slightly like an amoeba. The fact that it is knocked

out by a storm and then recolonized over time, but there are always some empty areas [because of] some storm or other natural disturbance [which] has caused it to be disturbed. (Informant 8, personal communication, March 16, 2020).

The informant further contends that eelgrass offsetting rather ought to be considered as a biodiversity offsetting *restoration* due to the historical abundant presence of eelgrass at the Swedish west coast. For eelgrass offsetting in general, it is actually problematic to distinguish a past baseline of when the loss started. He further asserts that the loss in conjunction with development at Arendal 2 is fairly easy to estimate, but it will never be a rightful NNL-compensation since every potential place candidate has most likely in the past consisted of eelgrass beds (Informant 8, personal communication, March 16, 2020). An additional situational precondition for even carry out plantations of eelgrass is stressed by the marine biologist:

...you should be able to do the work even though it may be a bit windy, because it is actually not calm days every day in June. And then it is good to have an area where you can successfully get your plants down during that time. Or it almost is, even though there might have been a [more suitable] place [for eelgrass], in an environment where you actually cannot work. So, the practical must be considered. It is not just nature that can control. (Informant 1, personal communication, February 26, 2020).

The fact that the work is conducted under the water surface in diving suits indicates on how difficult it can be, and as she stresses in the quotation, there might be places of suitable precondition that are not accessible for a longstanding work by humans.



Figure 12. Traces of lesser spotted woodpecker in Svarte Mosse? Source: author.

In contrast to the above explored micro decisions that eventually is intended to offset eelgrass, the empirical materials of the other project (which already carried out offset measures for lesser spotted woodpecker and smooth snake) indicate that Svarte Mosse has been improved in terms of enhanced habitats. The current situation of Svarte Mosse is therefore more favourable for the species in comparison to past conditions. The former civil servant at the Administration of Properties, who worked close to the practical implementers of the Park and Nature Administration describes how measures have enhanced the environment of today, so it favours lesser spotted woodpeckers:

Among other things, that you have to curb up [water], so it becomes some rotten trees; [...] [less spotted woodpecker] has too soft beak then to be able to, they need some rotten trees to simply get the food. So, they would like to have some swampy forest. Dead wood and such [see Figure 12]. (Informant 5, personal communication, March 11, 2020).

Further, the manager at Gothenburg Port Authority explains the measures for smooth snakes:

Regarding the smooth snake, it is more to clear up so that they get open spaces so that they can lie and sunbathe and get heat [see Figure 13]. We also had thoughts on creating new mound of stones and such too, but you did not. It was [rather] that [the implementers] cleared for that type of vegetation. [And] when you were looking for [smooth snakes] within Halvorsäng, you found two and then moved them over to the [place for offsets]. (Informant 2, personal communication, March 2, 2020).

As noted in subsection 5.2.1 above, the approved dispense application allowed the project to catch smooth snakes if they were encountered at Halvorsäng. This permission was utilized when two smooth snakes were found during exploitation.



Figure 13. Offset measures for smooth snakes in Svarte Mosse. Cleared up past overgrowth. Source: author.

As lesser spotted woodpecker and smooth snake require different type of environmental settings, the project had to partition the localization of offset measures in Svarte Mosse; the very same places could not be transformed into habitats for both species. Thus, multiple different locations were claimed for offset measures:

Actually, these species go against each other then – one [lesser spotted woodpecker] wants dead wood; then you should not clear up, then you should rather cut down [trees] [...] take down the high stumps. The other [smooth snake] wants open surfaces. So that was a challenge in that project. But there were some outcrops where we prepared. And then there was also vegetation that you could take down then and work with, so to speak. (Informant 2, persona communication, March 2, 2020).

In the practical implementation, an additional ‘habitat’ where considered – viz., interests of humans. Among citizens of Gothenburg, Svarte Mosse may mostly be known as a recreational area, adjacent to the urban district Biskopsgården. Thus, there are occasional flows of humans walking at unpaved roads, stretching through Svarte Mosse. To not interfere with human activities, some preventative actions had to be considered:

[Park and nature administration] mainly chose places where they [made] lots of high stumps, which may not be very charming when you are out and you [walk] in the woods [...]. So, they did not really choose [places for offset measures] very close to where there are paths and stuff like that, but they carried out the measures more secluded in the area of Svarte Mosse. (Informant 5, March 11, 2020).

On this micro scale, an implicit negotiation between interests (human contra offset species) emerged, however without any considerable conflict.

To summarize the offset measures in Svarte Mosse, the document describing the implemented measures concludes the following: “The offset measures carried out are considered successful and should have a positive effect on all target species.” (Document 4, p. 5). Comparing the projects between another, it is clear that eelgrass offsetting struggles with challenges to actually succeed while offset measures for lesser spotted woodpecker and smooth snake in the end are considered successful. To be successful however also entails some consideration of future viability, which the next subsection delves into.

5.3.3 Tricky timing and future viability

As a final theme, *tricky timing and future viability* refers to ambitions and anticipations and their associated challenges for the compensated species’ further endurance. In the document that approved the dispense application for lesser spotted woodpecker and smooth snake, the CABVG states that: “For 5 years from the completion of an offset area, the applicant is responsible for maintaining its conditions for affected species at least at the level specified by the compensation plan [Document 2]” (Document 3, p. 2). The legal outcome therefore is to preserve the area for these habitats during a five-year period. During the interview with the former civil servant at Administration of Properties, he reflects on this decision:

You have a certain time to implement and then you implement measures, that is, you clear up and take down [high stumps]; there is more sunlight coming in where there are suitable smooth snake environments that are a bit rocky [...] and south-facing then so they get a lot of heat, can

'log off'. But it will regrow as well, so will it be. So that... it feels a little short-term I think, these measures then. (Informant 5, March 11, 2020).

He further adds that Svarte Mosse is covered by a municipal management plan, however for recreational purpose. The civil servant at the CABVG who participated in the decision-making of the dispense application expresses a concern of these dispensations from SPO. In comparison to biotope protections and other place bound protections, the temporary term of five-year maintenance is nevertheless a consequence of how the SPO aims to protect species; red listed species are protected by using their habitats as a 'proxy' for their current presence:

Informant 4: But just this to [protect] areas in the long term, it is a difficult one, it is a difficult question, actually. We [colleagues at the CABVG] have talked about it quite a lot lately. How we... like, when there is no area protection. One thing you can do is, of course, to create obviously protected objects. This is often done in the context of biotope protection. If you replant a [tree] avenue, then it is [automatically] biotope protected. So then at least one juridical review is required, so actions like...

Author: [That] there is a barrier, a legal barrier?

Informant 4: Yes, exactly, exactly. That is of course good. And, of course, these areas in Svarte Mosse are protected by the Species Protection Ordinance. But... after all, it is a more, like, a fuzzy legal regulation that does not, it has no boundaries. It is the species that determines it. If for some reason the lesser spotted woodpecker stops breeding in this area, and does not breed there for a few years, then the area loses its protection for lesser spotted woodpecker – if it is judged that this area is as lost to the [lesser spotted] woodpecker then. [...] It is not only required that the species must have been in an area and is likely to recolonize it if the species has disappeared. So that [the species] disappears does not turn off the protection just like that. [...] Thus, the biotope, the habitat *itself* has no protection. The species must be there, too. (Informant 4, personal communication, March 9, 2020).

The SPO therefore permits areal protection for lesser spotted woodpecker and smooth snake. That means, slightly hypothetical, that if these species for any reason are not present (or are assumed as not being present), even though that habitats for those species have been restored in Svarte Mosse, the area eventually loses its protection status. However, by for instance clearing up vegetation, girdling trees and preparing high stumps in Svarte Mosse in order to arrange suitable habitats for lesser spotted woodpecker and smooth snake, are after all measures also beneficial for biodiversity in general. This is insured by the consultant who investigated the offset measures and planned the performed activities:

Informant 3: But say it had, that the overgrowth had gone on here longer, you had acquired other qualities, you might have got mosses and lichens, in more densely moist areas, which are red listed and so on. Then, of course, it would not have been appropriate to [clear up] areas.

Author: And then it could have [been located] somewhere else instead?

Informant 3: Yes, then you had to choose another place. Then this would not have been appropriate from the beginning. Now, this [Svarte Mosse] was an overgrowth area that holds fairly low qualities for biodiversity. [...] In earlier stages of overgrowth, there are lots of species that are associated with, butterflies and birds, etc. But right here, this when it starts to be thirty, forty years [of overgrowth], it is pretty trivial. (Informant 3, personal communication, March 4, 2020).

Despite the current favorability of biodiversity, the fact remains that the maintenance is legally limited in time.

As the offset measures for eelgrass plantation still are not completed, the future viability in Case 2 is even more uncertain. On a closer look, the directive suspended sentence is perceived as slightly unclear in terms of ‘what’ to be reported when the test period is over. One can sense a touch of disharmony when the port manager reflects upon what the future objective of 1.7 ha of eelgrass beds actually means:

...we will finally report in 2023 and then it says that then there must be at least 1.7 hectare. The difficulty there is, of course, how to measure these. Because when you plant, you put individual shots, maybe put from eight to sixteen shots on one square meter. There is nothing like what the density should be, for example, when doing a follow-up. Are there single shots [that counts] or how to do? The hope is that there will be at least 1.7 hectare. Hopefully even more. [Gothenburg Port Authority’s ambition is that] [i]t should be dense and viable. But what [only] is in the [suspended] sentence is that there should be at least 1.7 hectare there, so to speak. And if there are 1.7 [hectare] then there is also nothing [in the suspended sentence] about how you [follow up]. [...] But if, like, we have succeeded in replanting 1.7 hectare, however you choose to look at it, then we have fulfilled the term [...]. (Informant 2, March 2, 2020).



Figure 14. Information about eelgrass plantation at the site Tummen (see Figure 11). Translated from Swedish: “**Here we plant eelgrass. Swim calmly.** Do you see the buoys out there? There we plant eelgrass. Eelgrass beds are an important part of the ecosystem and nursery for several fish species. The grass also contributes to improving the water quality. This test planting is one of many projects that the Gothenburg Port Authority is doing to strengthen animal and plant species while expanding the port. The grass wants to grow in peace so swim calmly!” Source: author.

The port manager stresses that Gothenburg Port Authority’s ambition is to carry out the measure in a sustainable manner and not only do as little as possible. After all, they want the project to succeed in order to contribute with restoration of lost eelgrass (see Figure 14 for information provided by Gothenburg Port Authority at the site Tummen). The suspended sentence is

nonetheless vaguely formulated which indeed causes uncertainties. Further, if they eventually succeed to plant 1.7 ha of eelgrass beds, the handbook, which the implementers use as their main guidance, further recommend “that the restoration is evaluated and assessed by comparing primarily sprout density, biomass and areal distribution of the restored bed with the same variables in reference beds for 10 years” (Document 6, p. 10).¹³ As a whole, the project will consequently stretch for a long time.

¹³ Reference beds are “[n]atural unaffected [eelgrass] bed as close to the restoration area as possible used as a reference to evaluate the results of an eelgrass restoration” (Document 6, p. 14).

6 Analysis & discussion

6.1 Introduction

In the light of theoretical notions and previous research on BO, present chapter analyses and discusses the findings. The chapter is structured in five sections. First, I interpret and discuss the theme *Selection of offset species* (subsection 5.2 above) through the concept of value articulation process. Second, four ‘tacit challenges’ are demonstrated of which I argue are inherent within the theme *Localization of offset measures* (subsection 5.3 above). Third, I shed light on offset practical constraints of offset measure implementations. Here, I also compare the cases through the distinction between land and marine constraints. Fourth, since no nonexperts have been involved in the examined cases, I suggest how BO can include more nonexperts in the process. Fifth, the chapter is finished by highlighting aspects beyond the scope of present thesis that constitute directions for further research.

6.2 Politicizing the ecology through value articulations

In present section, I begin to interpret how findings regarding offset species and port development are understood in relation to value articulation processes (see Ernstson, 2013). The overarching argument behind the claims are based on the assumption that the ecology is political (Robbins, 2011). The section is divided into four subsections where I (i) locate port development as an overriding value; (ii) stress that offset species are recognized values, while (iii) residual features at places of impact are ignored non-values; and (iv) highlight that all these values are legitimized by ‘artefacts’ (i.e. regulative writings).

6.2.1 Axiomatic values of development

From a chronological perspective, *axiomatic values of development* are crucial to begin with. The actors interviewed, all professionally involved in or experts acquainted to the BO-projects, build their valuation of Port of Gothenburg and its development plans through artefacts such as the approved dispensation (Document 3), the suspended sentence (Document 5), and other legal writings that construe Port of Gothenburg as an “overriding public interest” (both at the national and European scales). If tracing the BO-project’s initial cause, I assert that such value articulations are first-hand articulations due to the port’s axiomatic value. Due to its overriding public interest, expansion of Port of Gothenburg is thus taken for granted. In a similar manner, Bormpoudakis et al. (2019) show how their examined BO-case becomes a concrete project in relation to urban and infrastructural growth, caused as a response to meet global demands. Thus, rather than be stuck in the field of ecology and biology, BO ought to be comprehended as an urban development measure. The offset measures may be localized far away from the urban frontier, but its inducement is strongly tied to activities of urban and infrastructural development. I return to this discussion in section 6.5.

It is thereto evident that axiomatic values of development are dependent on spatial proximity (port activities cannot be located far away from the main activities) which previous research also reports; Norton (2009) for instance shows how localization of a landfill in New Zealand

required specific logistical and geotechnical qualities. However, a BO-project is incomplete without values to offset, hence I now turn to a discussion on offset species as recognized values.

6.2.2 Recognized values – offset measures privilege some species

To carry out offset measures, projects need an additional ingredient, namely *recognized values*. In the examined cases, these are lesser spotted woodpecker, smooth snake and eelgrass. Again, these become socially articulated by actors that enable artefacts, however in two different ways. For lesser spotted woodpecker and smooth snake, their values are articulated and stabilised in advance to the project, due to their protection by the SPO. Conceptually, the species are already recognized by past value articulations. Such judgement is a clear illustration of systemized conceptualization (Hägerstrand, 2004).

Regarding eelgrass, no akin past legal protection is identified, hence its recognition is ‘newer’ than the other two species. As illustrated in subsection 5.2.2 above, experts on eelgrass witness about how its value articulation has dispersed and intensified over time – from a ‘mundane’ seaweed to a ‘divine’ and significant component of the marine ecosystem. While lesser spotted woodpecker and smooth snake have been identified by categories that can be referred to as ‘dormant’ and ‘timeless’ (cf. Nustad, 2020) – and are also protected by these types of categories – the value of eelgrass is a rather recent recognition. At least from a layman perspective. The artefact of the suspended sentence has nonetheless been a major processual component for the value articulation of eelgrass since it has legally manifested the seaweed as protectable. This shows that values considered as conservable are tied to temporal recognitions (cf. Stenseke, 2016).

Further, specific for the eelgrass, it is articulated as a valuable ecosystem function (or even an ecosystem engineer). We may therefore see a shift in articulations, from aesthetical to functional; Rundcrantz (2006) illustrates that proposed offset measures in Swedish road planning between 2001-2002 are articulated through features’ aesthetical qualities. This is only an indication, but almost two decades of increased ecological consciousness may have shifted focus within human-environment relations. ‘Nature’ is not only a beautiful element in the world, it is now recognized as a functional contributor.

Apart from that the recognized values were articulated in two different (yet legal) ways, they diverge from each other by another aspect too. Through SPO, lesser spotted woodpecker and smooth snake are recognized as (systemized) species. However, the species protection dispensation (Document 3) obliged the project to secure the species’ *habitats* and catch and move smooth snakes if they were observed. Animals, in comparison to plants, are more ‘moving targets’ (Bull, Suttle, Singh, et al., 2013) and thus it is more difficult to determine their spatiotemporal presence and absence. As suggested by Bull, Suttle, Singh, et al., when the ambition is to preserve and enhance biodiversity, it may be more efficient to target the habitats rather than the mobile animals (ibid.). This we have seen that implementers of Case 1 have done. Eelgrass, on the other hand, is both a species, a habitat and an ecosystem function. Depending on how we perceive it, its value thereby varies. Thus the question of ‘what to offset?’, i.e. in-kind/out-of-kind (McKenney & Kiesecker, 2010; Persson, 2011, pp. 50-51), become rather tricky for eelgrass, while for the other two species, offset measures clearly focus on their habitats.

Lastly, in the results, there are no evidence of any social movement that neither organizes itself as a protective capacity (cf. Ernstson, 2013), nor articulating protective narratives (cf. Erixon Aalto & Ernstson, 2017) for the recognized values. After all, no everyday users or particular interest group were not interviewed, but no informant and no document proclaimed that protection of recognized values was stretched to nonexperts. Thus, this study diverges from critical studies in the UK (Apostolopoulou & Adams, 2019; Bormpoudakis et al., 2019) where they report on local communities' organized resistance. One case even managed to halt a project based on a social movement's emphasis on the values of nightingale. Indeed, the authors note that aesthetical attributes of the species have been of important matter (Bormpoudakis et al., 2019). Hence, one can ask whether the beauty of lesser spotted woodpecker, smooth snake or eelgrass could have been important for nonexperts? Or dislike and even fear of snakes?

6.2.3 Ignored non-values – beyond recognitions or captured by 'offset proxies'?

All residual and unrecognized features at the places of impact are in this analysis identified as *ignored non-values*. Consequently, they are not targeted by the offset measures. Since axiomatic values of development and recognized values are covered by the empirical materials – hence inductive evidences – ignored non-values are rather deducted from the theoretical framework as 'empirical gaps'. They are the features that the too coarse fishnet fails to catch (Sullivan & Hannis, 2015). In this context, in relation to ignored non-values, recognized values become privileged ecological features. However, ignored non-values do not lack total coverage in the empirical material. In fact, as stated in subsection 5.2.2 above, prior to development Case 2's place of impact (Arendal 2) was consisted of 1.7 ha eelgrass beds *and* 3.1 ha soft bottoms (also a valuable submarine landscape according to the interviewed researcher, yet not as attentive as eelgrass). The loss of Arendal 2's submarine landscape was then reduced to only recognize the eelgrass bed (although an attempt was made by the CABVG to let Gothenburg Port Authority to pay an abstracted monetized fish fee for the loss of soft bottoms).

Further, losses in Halvorsäng are argued (mainly by Informant 3) to be safeguarded by habitat restorations for lesser spotted woodpecker and smooth snake (species becomes proxies for other ecological features). The deductive notion of ignored non-values is, I contend, nonetheless more radical as it rather points at lost unique assemblages of particular things. The unique thereness in a given context (Hägerstrand, 1982a). Based on such perspective, one can argue that the 1.7 ha of eelgrass is ignored too since the bed at Arendal 2 became demolished and the new test plantations are fabricated of eelgrass shots that originate from 'donor beds'. Referring back to Hägerstrand (1984), we need to be conscious and keep in mind of what we decide to cull from a material context. BO is nonetheless a measure that has the ambition to do that but does not succeed to preserve every lost value (which of course is rather impossible).

Comparing with previous research, Rundcrantz (2006) for instance shows that small biotopes tend to be ignored in offset measures. It is however a material impossibility to preserve *everything*. Moreover, together with values of development, the overweight of systemized conceptualization (facilitating and simplifying unique things into *socially constructed* and abstract categories) is the main reason, I argue, that enables the constituting practices of BO.

6.2.4 Legal ‘artefactication’ favouring certain values

In previous subsections, I have above all portrayed how value articulations benefit development plans for Port of Gothenburg (axiomatic values of development), and secondarily, how recognized values become (subordinated) privileged values. Logically, this leads to unarticulated ignored non-values. By elaborate with the vocabulary of Ernstson (2013), some features become ‘sacred’ through ‘artefactication’. Hence, without BO (and MH), all previous features existing at the places of impact would had been ignored non-values, but when BO is used, a few selected features become recognized. Recognized values are later on relocated into another situation.

As values in the present thesis are comprehended as relational (Stenseke, 2018), the relationality is not solely direct relations between humans and nonhumans, it is more complex. Compositions of thereness are infused by webs of relation and rest on past webs of relation (Rocheleau, 2008), stretching through time and space. Spatiotemporal contingency of ‘what is present?’, ‘what is absent?’, and ‘what made the current presence present and the current absence absent?’ are difficult to grasp. Especially with coarse and generic offset categories, induced by artefacts. However, as portrayed in section 5.2 above, it is obvious that in the given spacetime, values of development are more valuable than recognized values (and the ignored non-values). Although recognized values are in different ways legally protected, human anticipated expansion of urban and infrastructure land use are more eligible through artefactication.

6.3 The tacit challenges of ordering offset measures in local pockets

Present section unpacks, analyses and discusses localization of offsets. Here, I analytically trace four types of ‘tacit challenges’ that occur when to compensate species ‘elsewhere’. They are announced ‘tacit’ since they are only implicitly proclaimed by informants and documents but highlighted by theory. Also, in this argument, I understand places for offsets as ‘pockets of local order’ where members within a project reorganize, design and manage a place in order to fit a defined objective (cf. Hägerstrand, 2001), i.e. to implement certain offset measures. The four identified tacit challenges can also be comprehended as inherent social configuration of a BO-project’s cultural formative processes (Hägerstrand, 1993).

The section is structured into four subsections, each focusing on various aspects of political ambitions of space or time. First, I highlight how actors are defining when the biodiversity loss starts and how such negation makes species and habitats rather ‘timeless’. Second, I illustrate how the same abstractions enable actors to ‘mirror’ values from places of impact to places for offsets. Third, I argue that potential places for offsets-candidates are compared to lost values and thus are perceived as improvable places. Fourth, I demonstrate how the boundaries of localization are socially constructed and thus I discuss the impact of internal/external agency of that process.

6.3.1 Perceiving dynamic ecologies as abstract values - rendering values to the timeline

The first tacit challenge is related to>NNL and implies strategic negotiation of when loss starts and ends (BBOP, 2009). By timing loss and gain, actors of BO must estimate and represent the past condition of an offset species in quantifiable terms. This process kind of ‘rendering’ a measurable value onto the timeline. For example, the eelgrass bed is recurrently referred to as

‘1.7 ha’, which represents the observed eelgrass bed at Arendal 2. Or in Halvorsång, habitat loss of 37 ha (lesser spotted woodpecker) and 26,5 ha (smooth snake) serve as past values of the species. The difference between the cases is that the eelgrass offsetting aims to restore the same value as the lost one (1.7 ha), while lesser spotted woodpecker and smooth snake gain more acreage for habitats than they are losing (20,5 ha for the former and 18,5 for the latter)

I understand this social process as akin to freeze-framing, i.e. to conceptually designate a demarked area for a specific purpose and letting that purpose be permanent for a desired timeframe (Fisher, 2016). The challenge is however that ecology is not static and changes over time, hence construing beginnings and ends for NNL is a rather difficult task, as for instance are covered by the discussion of ‘shifting baseline syndrome’ (Papworth et al., 2009) But measurability requires stability, and by handling species and habitats as abstract units and not particular individuals (except the captured smooth snakes at the quarry), they become perceived as ‘timeless’ (cf. Apostolopoulou & Adams, 2017; Nustad, 2020), hence manageable. This is possible due to the logics of categorization (cf. Bornemark, 2018).

In terms of a future end, both cases show signs on challenges by achieving objectives of future preservation for corresponding offset species. The eelgrass-project struggles to cope with the very abstract term of 1.7 ha, which lacks further specification on quality. And besides, every potential place for offsets may historically hosted eelgrass beds. Further, the other project has admittedly conducted its offset measures, and even managed to overcompensate the losses. But by only being responsible for management for five years creates future uncertainties for the species and their habitats, even though conditions of today are advantageous. These reasonings of the cases strengthen the importance of acknowledging how the number of species, or the size of habitats or ecosystem at a particular site frequently increases and decreases over time, and that a given situation is just a temporary ‘local order’ that is stripped from its successions (Hägerstrand, 2001, 1984; Ingold, 1993).

In quantitative terms, it can be difficult to understand whether the projects are/will become successful or not. In terms of NNL, as zu Ermgassen et al. (2019) note, data transparency does not seem to be BO-projects prime strength. However, the purpose of the present section is not to evaluate NNL of the cases, but rather to highlight that behind these numbers and definitions are humans that renegotiate, control and order a truly dynamic environment.

6.3.2 Perceiving complex ecologies as abstract values – transferring same but different

In an akin fashion as in previous section, I here delve into abstraction of species. To handle complex and context dependent species or habitats, abstraction and simplification are yet again the key to tackle challenges of complexity. For instance, an approach within the eelgrass-project is to transplant eelgrass to more than one site. This, mainly since the suspended sentence does not allow test plantation outside the vicinity of City of Gothenburg’s border and the identified residual candidates cannot host 1.7 ha each. But by simple calculus, implementers can divide the 1.7 ha into multiple smaller partitions, where all partitions together equal 1.7 ha. Consequently, implementers can translate *one* place into *two or more* places. This notion is aligned with the argument by Apostolopoulou and Adams (2017), saying that BO reframe complex biodiversity into simplified exchangeable units. Again, this is possible since categorization reduces unique individual plants into a group of species (Bornemark, 2018). From a perspective interested in biodiversity gain, this may be an advantage approach in the

long run if all places for offsets over time will increase in growth. On the other hand, this approach enables Port of Gothenburg to ‘colonize’ many places while only one place was affected.

For the offset measures in Svarte Mosse, however without akin challenges, implementers succeeded to overcompensate the offset species. Representing offset species as acreage units (57,5 ha for lesser spotted woodpecker and 45 ha for smooth snake), they managed to ‘transfer’ habitats from Halvorsång to Svarte Mosse. However, it shall be noted that the process was not only based on quantifications (observations were also conducted), but this shows how actors within BO manage and order complex contexts in local pockets.

Present reasoning shows that the latent process of ‘what to offset’ (i.e. in-kind/out-of-kind) is infused with various levels of abstractions. As noted in previous research, offset measures of out-of-kind seem to increase in use (McKenney & Kiesecker, 2010), and therefore, we may consider whether it is positive or negative. From an ecological perspective, more out-of-kind (i.e. more abstraction) may be more efficient and less troublesome if the goal is to increase biodiversity. However, such approach can nonetheless enable developers to buy off easier.

Lastly, in the light of the four ways BO reframes biodiversity (Apostolopoulou & Adams, 2017), I question whether the offset measures in the examined cases really translate the units into explicit monetized ones. As noted in subsection 3.3.3, such assumption is rather relevant for contexts where transaction of biodiversity goes from one part to another. In the examined cases, the Gothenburg Port Authority is the developer and the compensator; they are yet directly responsible for both processes.

6.3.3 Comparing places and improving dormant candidates

Building on previous subsection, abstracted offset species represented by acreage units are the amount of space required for the offset measures. In line with this, actors must find areas with suitable preconditions for offset measures (this is referred to as the principle of similarity in subsection 5.3.1) to carry out offset measures. To find a place of suitable preconditions, a comparative process occurs; understanding existing qualities of neighboring places in relation to lost qualities enables actors to perceive localization candidates as improvable. This is the approach for identifying which local pockets to order, control and manage. Nonetheless, I understand valuation of places as relational (cf. Stenseke, 2018), thus environments do not possess a priori values, but humans socially contract these values and later compare them to one another; a process that not least is infused with politics (Ernstson, 2013).

Examples from the findings for instance show that the utilized methods for investigate places for offsets for lesser spotted woodpecker and smooth snake explored habitats that currently were perceived as improvable and held the possibility to be enhanced into suitable habitats. Regarding the eelgrass offsetting, implementers have thus far selected places with empty bottoms, i.e. a future eelgrass bed is anticipated to enhance the chosen places’ marine environment. As noted in subsection 6.2.2, there are some indications on that we value the ecology based on functional manners. Also, I here see links to the process of gentrification in urban development, where values (economic values in gentrification, biodiversity values in BO) increases through strategic measures.

What ties valuation of species to valuation of places is above all the principle of similarity, which works a proxy. It is however difficult to state whether these approaches are habitat-based

or species-based (Bull et al., 2014). Obviously, in Case 1 actors articulate that the offset measures are primarily dedicated to the species, but the materialized measures are created habitats. However, Bull et al. (2014) assert that a species-based approach comprises the species' spatial distribution and measures are thereafter adjusted to compensate the lost distribution, which is akin to the approach of Case 1. For Case 2, no explicit articulations of eelgrass as neither a species nor a habitat are identified. Rather, its value builds on its ecosystem function.

6.3.4 The boundaries of localization – internal agency and external structural directions

In line with previous findings (Koh et al., 2017), this study shows that proximity and similarity (where the interviewed actors prefer proximate and similar places) are the first principles used in localization of offset measures. This is referred to as 'macro decisions', while the decisions of the specific location are referred to as 'micro decisions'. We can understand these two as two levels of strategic freeze-framing (Fisher, 2016), operating on various scales. Further, based on legal manners, both scales of decisions inter-manages the spatial selection of places for offsets. Macro decisions can be comprehended as a larger localization freeze-frame (2 km large inventory circle in Case 1, and for Case 2, within or adjacent to City of Gothenburg's border) and micro decisions are in this argumentation a smaller localization freeze-frame (Svarte Mosse for Case 1 and not yet finally decided in Case 2). However, the cases diverge; planned actions of Case 1 are more smoothly implemented in contrast to Case 2, where implementers struggle with the directing frames. Also, as we have seen, freeze-framing is also the concept that designates a land use to a given categorial purpose (habitats for lesser spotted woodpecker and smooth snake, and eelgrass plantations), wherefore it is appropriate to ask, 'who produced the frames?'. Or, 'who defined their boundaries?'. As Jones (2009) notes, those who define a category and its boundaries are those who possess the *agency*.

Regulating the eelgrass offsetting, the suspended sentence is produced by the Land and Environmental Court. Gothenburg Port Authority and other actors (such as the CABVG and the SwAM) could only demand desirable measures, but the Court made the final decision. Accordingly, the Land and Environmental Court constructed the directing boundaries for the eelgrass-project. Indeed, the other case is of legal character too, but the process was nevertheless different. Authored by Gothenburg Port Authority's hired consultants, the investigation of species protection dispensation suggested both localization frames through a thorough procedure based on previous utilized methods. No major revisions were made after the CABVG approved the dispensation (except for instance the time term of five years of management). Thus, the implementers constructed the boundaries for offset measures of lesser spotted woodpecker and smooth snake. In contrast to the UK, where Apostolopoulou (2016) shows that places for offsets were reported to be selected in secrecy, no such indication is applicable for the examined cases. Since both cases were filtered through public agencies, such acts and documents are by the law available for the public in Sweden.

Comparing the cases, actors of Case 1 possessed more *internal agency* due to their ability to plan in advance of legal decision-making. In contrast, actors of Case 2 are rather more subjected for *external structural* directions. Partly, this may be due to the embryonic knowledge of eelgrass restoration in Swedish coastal environment, compared to more established knowledge of habitat restoration for lesser spotted woodpecker and smooth snake. Thereto, if one constructs their own project objectives, the chance to success is probably greater. In contrast

to when top-down and remote environmental management policies hit the ground for farmer (Dahlberg, 2015; Sandberg, 2017; Setten, 2004), actors on the ground in offsetting-contexts seem to possess a greater ability to influence their legal directions. Not least is this evident for Case 1 since collaboration may have rewarded the success. But members of collaboration can be extended, which I discuss further in section 6.5 below. But first, I delve into difference of constraints in terms of the land/sea-based distinction.

6.4 Coarser landscape filtrations above sea level? Constraints are always present

Regardless of how much project members in advance plan the offset measures, practical implementers must eventually encounter the material landscape. When offset measures are carried out, the planned intentions appear as physical patterns that mirrors past political negotiations and decisions. In this context, material realities should not be perceived as frictionless landscapes holding some kind of ‘tabula rasa-attributes’. Rather, landscapes consist of constraints that retard the accessibility of implementers. As the marine biologist reminds us of, they have to be present to conduct the offset measures. Thus, we *are* in the world and we must always *relate to* the current constraining and/or enabling situation.

A distinct difference between the cases is that lesser spotted woodpeckers and smooth snakes live on land, while eelgrass is a submarine seaweed. A distinction between land and sea. Comparing the cases to one another, the eelgrass-project struggles more with the situational encounter while implementation of offset measures in Svarte Mosse are reported to face less constraints. For simplicity, we can understand it as the human habitat also encloses Svarte Mosse, while eelgrass dwells in the marine ecosystem, beyond everyday presence of humans. After all, for humans, the sea must be understood as a greater constraint than the forest. But even on land, constraints are always present.

The take-home here is that situational encounter – or filtering by the material landscape (Hägerstrand, 2000) – is a fact that should not be neglected. Thereby, perhaps BO-project ought to begin with illumination of issues as ‘which constraints prevent us from compensating this species/habitat?’. Such a question is however difficult to answer in advance, but we have to be cautious about constraints. If there are too many constraints, it could nonetheless be a good reason to discontinue. As Norton (2009) reminds us of, depending on context, there are ecosystems and habitats that could not be subjects for offsets measures. But in the contemporary society, where we usually are fed by the opposite mantra – “everything is possible!” – we rather emanate from the social intentions first, and thereafter rearrange the situation to align our intentions. In terms of environmental management, perhaps it is more sustainable to critically consider the situation first, and then, if too much socioecological degradation is part of its material manifestation, subordinating the planned intentions.

In the light of all-ecology and the findings, I here illustrate how intentions and actions encounter constraints. The intentions that guides a project mainly orbits the ambition of securing the viability of corresponding recognized value(s). Intentions are therefore guiding *formative* actions, which according to Hägerstrand (1993) are cultural processes. I therefore comprehend the intentions as central components of the discourse of BO since they are both something actors align to and later on informing the actions in the landscape. The remotely defined intentions are materialized by implementers as they ‘weave’ them into the situational material fabric. The further trajectories of materialized offset measures are due to the myriad

processes at the given situation, which unstoppable moves into the next situation whether we prefer it or not. We can control parts of their unfolding, but not the entire context since some processes occur beyond our perceptions (cf. Hägerstrand, 1984, 2009; Ingold, 1993).

Therefore, regardless of when and where implementers carry out offset measures, the given encountered situation is always unique – we can systematically plan activities in advance but the integrative thereness of diverse things (e.g. trees, lakes, mountains, buildings, and residents) must eventually be encountered. The exact outcome cannot be foreseen; minimal situational constraints can thus influence the spatial rearrangement: ‘Where can we work in diving suits for many hours?’; or, ‘how far from the transport mode can we walk into the forest carrying a chainsaw?’. Without reflections, we may obscure such and akin material constraints. Not least when macro decisions are remotely determined. In the empirical materials, it is evident that implementers of both cases had to reflect on influences of this micro scale; habitats of lesser spotted woodpecker and smooth snake diverges, and different locations within Svarte Mosse must eventually be privileged their dwelling conditions; the calculated habitat acreages for these two species could therefore not be located at the very same place. Eelgrass exists below sea level and already here we need technical aids in order to be present in their habitat. Fortunately for the project, diving equipment enables implementers to encounter the situations. But as noted in the findings, there are constraints with diving equipment (limited air, bodily stress and so on). Such notions may be observations on the most local (human) geography. Also evident in the empirical materials, a successful eelgrass restoration is dependent on multiple factors by which together makes the practical process complex where implementers are surrounded by constraints rather than possibilities.

6.5 Technocratic management of (socio)ecologies – towards a more inclusive model of biodiversity offsetting?

It is evident that BO is not only a measure of ecological concerns; it is also, as previous research has argued (Bormpoudakis et al., 2019) a measure tied to urban and infrastructural development. When BO is used, the required amount of space for exploitation is more than ‘conventional’ development projects; the frontier of exploitation is extending further away. Accordingly, without moral judgements, a developer undo processes (cf. Nustad, 2020) at a place of impact *and* at a place for offsets. At the place for offsets, some kind of existing ecological (and perhaps social) activity already takes place. For example, in Svarte Mosse, one informant proclaimed that measures were implemented away from human activity. Proximity to human activity is however rather relative/subjective; first, Svarte Mosse is adjacent to the urban district Biskopsgården, which also is considered to be a low-income area. Second, during a personal visit at Svarte Mosse, traces from the offset measure were clearly visible from the unpaved roads, sometimes directly adjacent to the road. Can we thus see evidences for ‘densification of nature’ that also are based on assumptions of what humans prefer/not prefer when various types of offset measures are localized in already ‘blue’ or ‘green’ areas?

As these amplified expansions are tied to urban and infrastructural development, I assert that it is time to renegotiate on whose terms BO is formulated. A common aspect of both examined cases is that they are results of legal regulations and behind these regulations hides a plethora of experts, bureaucrats and scientists, while nonexperts are decoupled from the process of BO. Despite that we can locate BO in urban and infrastructural development of which have

a tradition of consulting affected communities and residents (Emmelin & Lerman, 2006, pp. 12-16), such consultation is disregarded in the process of BO.

There is nonetheless a risk by *only* trusting universal truths grounded in natural scientific methods; Emmelin and Lerman (2006, p. 13) note that scientific knowledge tends to obscure a priori latent values of disciplines and scientists, hence decisions become perceived as rational universalities. But prior to knowledge production, our perceptions of the world are characterized by subjective assumptions. And after knowledge is produced, we interpret it through subjective ‘filters’ (MacKian, 2010). And indeed, value articulations of biodiversity are infused with politics (Ernstson, 2013). Not necessary contesting politics, but without doubt subjective ones. Through ‘artefactication’ and experts’ universal narratives of biodiversity, we begin to depoliticize situational and complex socioecologies (Ernstson & Sörilin, 2013). Consequently, we develop a state of ‘post-political’ society where fundamental democratic rights (especially local public influence) become stripped away (Swyngedouw, 2009). Indeed, interviewed informants showed signs on percipient and reflexive considerations; for instance, reflections on nonexpert use of nature (offset measures in Svarte Mosse considered the flow everyday walkers, and eelgrass plantations had to respect traffic of leisure boats). But these decisions were not *embedded* in communicate rationalities (cf. Emmelin & Lerman, 2006, p. 15). Thus, one piece is yet missing.

Findings in present thesis indicate that BO suffers from the top-down syndrome of the environmental paradigm (cf. Emmelin & Lerman, 2006, pp. 12-14). However, although that the Port of Gothenburg is marked as a national and European interest (EP and Council, 2013; Slättberg & Bertilson, 2009), the spatial outcomes of offset measures are yet local peri-urban phenomena. So, how do we ground the measures in a local point of view? As portrayed in Figure 15, I have situated contemporary BO as ‘calculating’ and ‘local’. Comparing with urban planning and realizations of zoning plans, planned intentions must pass through a democratic filter, i.e. consensus rather than universal truths are the virtue (Emmelin & Lerman, 2006, p. 15). I do not suggest that we should reject the scientific knowledge of environmental conditions – indeed, scientific insights provide us with important narratives that indicate on the ‘state of nature’. But inspirations from the planning paradigm is urgent for BO. Peri-urban natures are nonetheless common properties, partly through ‘the rights to roam’ [allemannsrätten], but especially if the land is owned by the municipality (which in the case of Svarte Mosse). In this manner, I suggest *consultative biodiversity offsetting*. Here instead, decisions are embedded in compromises between calculating and communicating rationalities. Such approach requires more resources (especially time), but more resource requirement should not be perceived as an obstacle. Longer processes that also embed decisions in everyday realities could maintain long-term collective trust and belonging.

Local participation of environmental decision-making is far from a novel suggestion. By including ‘everyday users’, other relational qualities beyond the scope of ‘universal truths’ can thus also be addressed (cf. Stenseke, 2018). Likewise, the selection of places for offsets can be embedded in nonexperts’ territorial reality. Advantageously, active learning of ‘nature’, such as in the ‘Ecological Restoration Education’ suggested by Skriver Hansen and Sandberg (2019) may also be considered. In doing so, decisions are not only embedded in nonexperts’ opinions, but also their in actions. Experts do not possess the ‘ultimate’ knowledge of nature; indeed,

understandings of socioecologies are collective and grounded in everyday practices (Ernstson & Sörlin, 2019a, 2019b).

Lastly, in the light of “What if we asked theory instead to help us see openings, to provide a space of freedom and possibility?” (Gibson-Graham, 2008, p. 619), I here see constructive opportunity to (i) situate decision-making for offset measures in between calculations and communications (‘consultative BO’), and (ii) furnish the communications with contextualized protective narratives (cf. Erixon Aalto & Ernstson, 2017). Regardless if we are in a state of depoliticized environmental management, or are approaching it, locally grounded narratives that emphasize place-specific values is a plausible way to improve current condition of the ‘environmental paradigm’ (cf. Emmelin & Lerman, 2006). In doing so, we will begin on a venture that also include experiences, opinions and subjectivities of everyday roamers’ territorial competence in the affected places. Past semblances of ‘nature’ are nonetheless sequels of complex webs of human-environment relations (Ernstson & Sörlin, 2019a; Ingold, 1993; Nustad, 2020; Rocheleau, 2008; Stenseke, 2016).

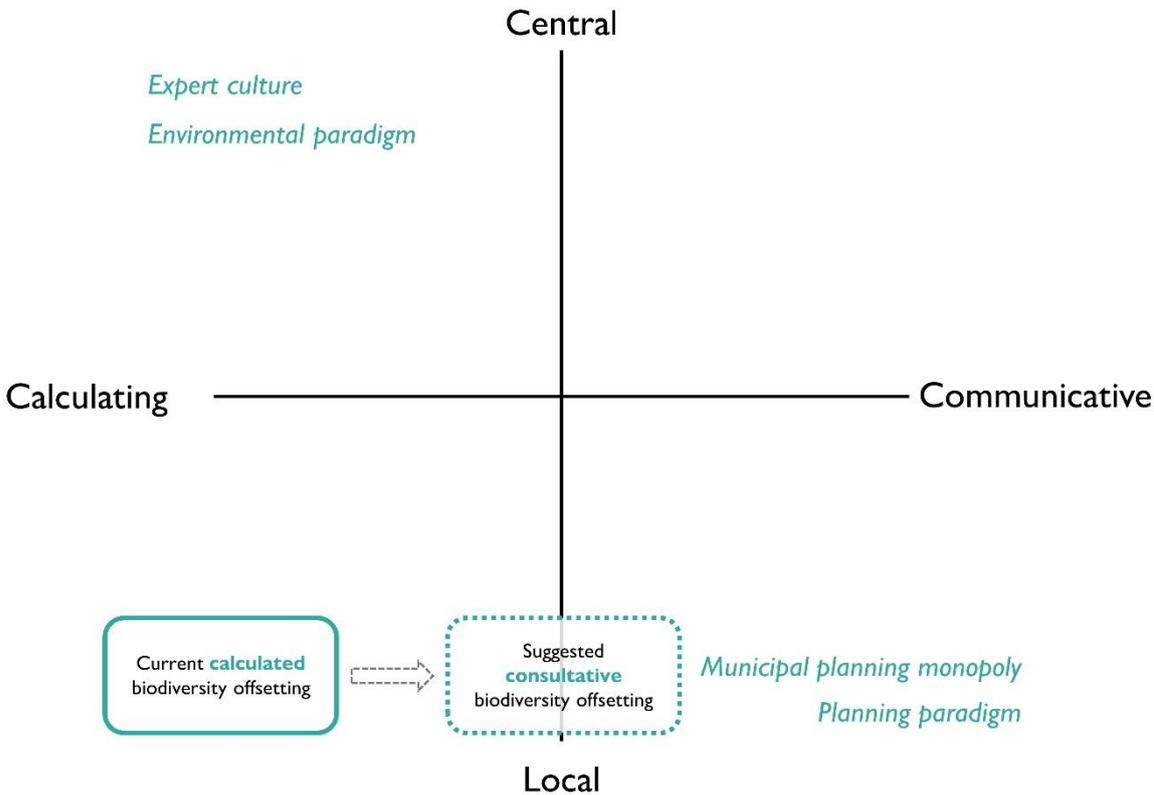


Figure 15. Revised version of Figure 1: Current calculated biodiversity offsetting (solid box) and the suggested consultative biodiversity offsetting (dashed box). Source: author’s reproduction of Figure 1.1a in Emmelin and Lerman (2006, p. 15).

6.6 In the light of the findings and beyond the thesis’s scope – suggestions for further research

For future research, I suggest three different directions – two plausible approaches for BO, and one more general theoretical proposal for environmental management. First, the present thesis is delimited to legal BO-projects and cannot claim anything about voluntary BO. It would therefore be fruitful to illustrate and contrast insights from this study in relation to voluntary

offset measures in Sweden, which recently has increased in adaptation. In addition, enunciation seems to diverges; e.g. in its comprehensive plan, Lomma municipality has actively designated some places as compensation pools that if offset measures cannot be carried out in the vicinity of the place of impact the compensation pools will host the offset species/habitats (Lomma municipality, 2011); in order to maintain ecosystem services, City of Gothenburg has developed a policy that includes BO in urban development (City of Gothenburg, 2018); in one of its five environmental goals, City of Borås has proclaimed BO as a measure for exploitation in green spaces (City of Borås, 2018). Interpretations on national guidelines (e.g. SEPA, 2016) are most likely diverging due to the contextual filtration.¹⁴

Second, when the time is ripe, and when more offset measures have been conducted, statistical analyses concerning perceived difficulties of implementations is desirable. Such analyses can test present thesis findings in relations to explanatory variables of for example (i) whether projects address species, habitats, ecosystem services etc; (ii) differences between marine-based and land-based projects (findings from present thesis show clearly that marine-based is more difficult); (iii) divergence of legal and voluntary offsetting (here I think one can critically reflect upon who produces the boundaries (Jones, 2009) since voluntary BO are plausibly planned by same actors that later implement them); (iv) and lastly, variations between urban development and infrastructure development. As noted in section 2.4, BO has been utilized more in infrastructure development than urban development and there could therefore be more developed methods for the former.

Third, in the light of combining Nordic landscape research with political ecology (Widgren, 2015), I followingly contend that the theoretical merge of Hägerstrand's all-ecology with insights from political ecology has been a fruitful venture. Above all, I see three elements of where political ecology intersect with all-ecology. First, both approaches critically acknowledge and highlight anthropogenic impact on and use of ecology (although on various levels, see Figure 3). Second, nonhumans are recognized as entities possessing individual 'behaviours'. Rather descriptive, Hägerstrand (1993) distinguish them as 'programs'. However, this notion varies within political ecology, but the more-than-human phalanx are more willingly to emphasize it (cf. Ernstson & Sörlin, 2019b, pp. 14-17; Poe et al., 2014; Staddon, 2009). Third, temporality has recently emerged as an interesting factor of scrutiny within political ecology (e.g. Ernstson & Sörlin, 2019a, pp. 372-373; Nustad, 2020). These three aspects are central analytical tools when we – humans and nonhumans together – now live in an overexploited world where strong forces have caused and still causing climate change, loss of biodiversity, overfertilization, acidification and great inequalities on all scales. In other words, akin theoretical elaboration as performed in the present thesis can advantageously be carried out in further research.

¹⁴ The guidelines provided by SEPA (2016) explicitly address legal aspects of BO. However, these guidelines are most likely influencing voluntary BO too.

7 Conclusion

The present thesis assumes that we can make sense of the material world based on two different approaches – we can systematically divide it into smaller parts, or we can embrace a delimited context on integrative manners. In the light of the generic ‘elsewhere’ as localization of offset measures, I formulated a thesis statement whereupon I suggested that offset measures informed by legal regulations are grounded on systematic conceptualization, but that implementers eventually must operate in a practical integrative reality consisting of constraints and frictions when carrying out offset measures. By referring to ‘elsewhere’, one truly obscures other complex contexts. This assumption was made due to previous lack of attention to challenging practical experiences in BO-research.

Focusing on two BO-projects, one land-based and one marine-based, tied to Port of Gothenburg’s expansion, and drawing on empirical materials consisting of interviewed informants and case-specific documents, which later were thematically analysed, I here conclude that this assumption to various degrees is correct. What clearly differs between the examined cases is their respective potential to influence on the legal directives. Compensating eelgrass, the marine-based case is directed by a suspended sentence from the Land and Environmental Court, which was produced beyond the agency of the involved actors. In the land-based case, targeting lesser spotted woodpecker and smooth snakes, involved actors possessed more agency in providing materials for the approved species protection dispensation. Thus, the latter case shows signs on a less hierarchical process, which may have benefitted them. In addition, knowledge of and possibilities for restoration differ; transplanting eelgrass is certainly a complex endeavour, depending on a myriad of factors. Also, offset measures for eelgrass are conducted in challenging practical situations. Habitat restoration for lesser spotted woodpecker and smooth snake entailed more established methods, which were conducted in more ‘familiar’ environments.

However, systematic procedures are evident for both cases. By value articulation of species and through macro decisions, actors *systematically* select offset species and places for offsets. The value articulation of species and their habitats rests on established classifications and on their functions. Thereto, I have illustrated that valuation of port development is central for both cases due Port of Gothenburg’s overriding public interest. Articulations of residual values, obscured by offset measures, are however not expressed to a larger extent. Altogether, offset measures informed by legal regulations are truly politicizing the ecology.

Macro decisions are informed by the abstract principles of similarity and proximity. Similarity is here the proxy between offset species and places for offsets, linking suitable conditions for offset species to localization of elsewhere. This proxy is above all evident for the land-based BO-project since its measures redesigned vegetation to be suitable for the offset species. Further, localizations of ‘elsewhere’ for offset measure are identified as being strategically negotiated through four tacit challenges of which I contend actors must relate to when spatially and temporally ‘order’ places for offsets. The challenges involves (i) construction of temporary beginnings of biodiversity loss by abstraction, and future

anticipations of complete restoration; (ii) abstraction of species to numbers that later on enables spatial exchangeability of complex and contextual biodiversity; (iii) comparability of places so that nearby places can be enhanced to anticipated conditions; and (iv) who produce the boundaries of offset localizations and what such agency entails.

Further, as practical implementers carry out offset plans in the material reality, constraints are encountered, and immediate micro decisions must be considered and evaluated. Considerations, actions and, thereafter, offset measures, become products of a synthesis between systematic knowledge and integrative reality. Agency encounter structure, and structure consequently informs the manifestation of the agency. Not least is this assumption evident for the eelgrass-project since there may be even more suitable places for offsets than the selected test sites. But due to submarine practical challenges, these places are rejected. Both systematic and integrative aspects of BO are therefore critical concerns for a project's achievement. What essentially sets them apart is that systematic aspects are easier to plan for in advance, while integrative aspects are more elusive and context dependent. Of course, they could be planned and prepared for, but there will always be parts of the world that we cannot anticipate.

Lastly, by letting systematic perceptions override the configuration of offset measure, we risk losing sight of integrative mundane realities, populated by both humans and nonhumans. I therefore suggest a model that includes nonexperts in the decision-making of BO. This is important since affected local communities, residents, everyday strollers and others should have the possibility to influence on the formative processes. In doing so, we include more territorial competence in mankind's ubiquitous project of reshaping Earth's surface.

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Appendix

Introduction

- Tell me a little about yourself and your role!
- What are your previous experiences of biodiversity offsetting?
- From your perspective, what does biodiversity offsetting means?
- Tell me briefly about your involvement in the offset measures concerning [Case 1/Case 2].
- What made the decision that offset measures were appropriate?
 - Who initiated it?
 - Based on which arguments, principles, etc.?

Offset values

- How was it decided that these offset values would be compensated?
 - Who participated?
 - Which regulations have been adhered to?
 - Are there any ecological values that 'should' have been compensated for?
- Did the perception of the offset values change during the project?
 - Were there new ones added?
 - Were any values excluded?
- How do you work to ensure that the offset value is 'endured' at the place for offsets?
 - Any strategies?
 - Any follow-up?
 - Is there any time frame?

Place for offsets

- In which part of the process was the choice of place for offsets discussed?
 - Was that an issue of priority?
 - What prompted discussion about the place?
- How did the discussion initially look like?
 - What was important/necessary?
 - Which restrictions were there?
 - Which opportunities were there?
 - Did you have to exclude places that would have been suitable?
- How did you find that the place for offsets was appropriate?
 - Were there other potential candidates?
 - If so, what decided that none of these became the place for offsets?
- Do the offset values of the place for offsets differ from the preexisting ones at the place of impact?
 - Are they translatable?
 - If not, how are the new values understood as a proxy for the old ones?

- How did the previous ‘content’ of the place for offsets affect as a candidate for the final location?
 - What was at the place before the offset measures were implemented?
 - Did anything had to be changed to suit the offset measures?

Prospects for ecological compensation

- What do you think became good with the project?
 - Which can be used in similar projects?
 - Which is specific to the current project?
- What do you think became less good with the project?
 - Which can be used in similar projects?
 - Which is specific to the current project?
- What do you think of biodiversity offsetting in the future?
 - Used more or less?
 - Any opportunities/risks?