Nordic Council
of Ministers

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*Scott Cole, Henrik Lindhjem, Marianne Zandersen,
Ioannis Angelidis and David N. Barton*

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Foreword

This report has been written by Scott Cole (EnviroEconomics Sweden), Henrik Lindhjem (Menon Centre for Environmental and Resource Economics, MERE & Norwegian Institute for Nature Research, NINA), Marianne Zandersen (Aarhus University), David N. Barton (Norwegian Institute for Nature Research) and Ioannis Angelidis (Aarhus University). John Magne Skjelvik (Vista Analysis) has reviewed the report.

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Scott Cole

Lead Author, EnviroEconomics Sweden

Executive summary

Background and motivation

The Nordic countries continue to experience increased migration to, and growth of, big and medium sized cities (hereafter “urban areas”), a pattern that is expected to continue: up to 90% of the population in Europe is projected to live in urban areas by the end of this century.¹

The expanding built environment provides benefits like economic growth, dynamic economies, employment, and increased standards of living, but it also imposes economic costs in terms of environmental and health impacts. City planners face a trade-off between the benefits of economic growth and the (oftentimes non-market) benefits provided by ecosystem services from urban nature: e.g., recreation and sports, climate mitigation and adaptation, provision of biodiversity, space for reflection and cognitive development, sense of community, artistic and educational development.

Since these non-market benefits are typically difficult to capture, they are often omitted from the decision-making process. For example, when values associated with cultural ecosystem services like hiking and cycling are not visible to decision-makers, these activities may be ignored or subsumed by land uses whose value is easier to calculate (e.g. housing or retail construction).

Objectives and scope

This report focuses on urban nature recreation – i.e., outdoor activities that can be conducted by urban dwellers on a normal work or weekend day without having to stay overnight – and highlights economic methods and data that can help capture the non-market welfare benefits associated with outdoor recreation. The key contribution is

¹ See US National Center for Atmospheric Research (NCAR) model across all Social Economic Pathways (SSP) scenarios by year 2100, which suggests a range of 70–96% for the countries around the Baltic Sea. (SSP Database version 1.1).

three case studies from the cities of Oslo, Östersund and Aarhus, which illustrate how to *estimate and then integrate* information on economic values so that they are more visible in decision-making. This information, which we see as a complement to other existing planning tools used today, can help policy makers better evaluate trade-offs in cost-benefit analysis and spatial planning, not least in urban areas where competition for land is intense. The examples also highlight how measurement of economic values can complement physical indicators of use across different types of beneficiaries.

The underlying ecosystems that make urban nature recreation possible may, in some cases, provide other co-benefits in urban areas, e.g. related to biodiversity protection, groundwater protection and climate change adaptation. However, there may also be trade-offs between recreation and biodiversity and climate adaptation. This report emphasizes the direct impacts on recreation values rather than investigating co-benefits or trade-offs explicitly.

Key findings

A focus on welfare benefits from urban nature recreation

The economic benefits of urban nature recreation can include (1) *market-based economic impacts* and (2) *broader social welfare*. Market-based benefits arise when e.g. out-of-town recreation users spend money resulting in income to labour and capital, job creation, economic output, and/or increased taxed revenue. Broader welfare effects are associated with improvements in an individual's well-being, which may be driven by material, spiritual or moral attitudes.

The former may be politically important on a local level, but since they can only capture market transactions they provide, at best, a partial assessment of economic impacts. Therefore, we focus instead on the broader social welfare impacts that typically manifest themselves outside markets. For example, filling leisure time with recreation opportunities may improve an individual's well-being as a result of physical exercise, improved health, improved mental well-being from stress reduction, etc. Assigning monetary values to these types of benefits is important for urban planners who wish to compare them to costs of investing in recreation or to better understand the negative impacts on recreation.

A framework for assessing welfare benefits from urban nature recreation

To consider the benefits of urban nature recreation, we adopt a simplified framework (Figure 1) that considers several dimensions in assessing recreation benefits in urban areas. This adopted framework considers the spectrum of recreation possibilities by summarizing both *resource supply* (e.g., built or abiotic structures that provide the basis for recreation) and *resource demand*, i.e., key drivers for a user's choice of *when*, *where* and *how* to recreate.

As illustrated in Figure 1, the characteristics of a recreation site near the city center (far left of the figure) differ from a site in a “wilderness”-like setting (far right). Further, the demand for recreation is, in part, a function of *distance from a user's home* and the supply of recreation sites depends, in part, on the *type of recreation opportunities* available in the vicinity of users. Importantly, the urban transect is a gradual transition across a landscape gradient rather than a distinct division into “urban” and “rural.” This can make classifications difficult as different gradients do not coincide in the same places. Many Nordic cities (except perhaps in Denmark) offer recreation areas within a short distance that nevertheless span each of these classifications. As indicated in the figure, the three case cities cover different parts of the spectrum. Oslo spans the whole spectrum, Östersund represents the two most wilderness-like types, while Aarhus stretches from the middle out toward the urban side of the spectrum.

Figure 1: Framework for assessing benefits of urban nature recreation

Source: Berit Köhler, NINA.

The purpose of this framework is to create a structure for considering a variety of factors that may affect the supply and demand for urban nature recreation, helping to provide a context for the economic values estimated in the case studies.

Key data needs

Estimating the economic value of urban nature recreation in a given area requires two key inputs: an economic measurement of how individuals value an urban nature experience and information on the number of individuals participating in a given activity in a given area. If the aim were to value the *change* in recreation value from a project or policy, information would then be needed about the impact on both individual values and visitation patterns.

A key concept underlying how economists view individual values from a recreation experience is *consumer surplus*. It can be estimated using a variety of economic methods measuring the magnitude of improved well-being that an individual experiences while also accounting for the possibility that he/she may have faced a cost in obtaining that (recreation) experience. A highly valued recreation experience will be reflected proportionally in the size of the consumer surplus. Consumer surplus is a measure that is net of expenditures² on recreation (travel, equipment rental etc.) (see e.g. the Aarhus case study, Chapter 6).

The *number of users* can be considered the quantity variable in a demand function and is an oftentimes overlooked input that requires projections or other “best guess” methods when actual data on visitation patterns are not available. Further, measures of time spent on-site can be considered a detailed measure of physical demand and/or a non-monetary valuation of visitation (see Oslo case study, Chapter 4).

These types of economic data – both *quantitative* (e.g., number of users, travel costs, etc.) and *qualitative* (e.g., user preferences for attributes of the site) – can be collected in a variety of ways including on-site surveys or counting machines, general population surveys (on-line or via post), and newer methods that rely on wearable GPS devices or mobile phone data (see below).

Selection of case studies

The case studies illustrate how relevant data can be collected and how economic values and methods can be integrated across policy applications relating to urban nature recreation. We select three case studies in Norway, Sweden, and Denmark based on

² Therefore, a simpler market-based measure of economic value is simply based on this type of expenditure, but this fails to capture the full welfare effect.

several criteria including, for example, how well each case demonstrates one of the ways in which economics can contribute to policy. Further, we ensure that each study illustrates different parts of the recreation spectrum from “urban to wild nature” (See Figure 1 and also Chapter 3).

Oslo: how to account for local nature recreation

The case study from Oslo demonstrates a valuation of public green spaces along the urban gradient from streets with trees out to wilderness areas on the city edge. Within a one-day roundtrip, inhabitants of Oslo can reach all of these public green spaces at very low cost. The low travel and equipment costs combined with “All Man’s right”, means that economic valuation methods only capture a small share of recreation value. We demonstrate how estimating self-reported number of visits and time spent on-site offers non-monetary indicators of demand that can be useful for managers to track trends in total use at an aggregate level. Furthermore, we demonstrate how time-on-site can be valued using an opportunity cost of time approach. Using this method we find that while total visitation to green spaces in the built area are several times higher than to the peri-urban forest, time spent on-site is higher in the latter, meaning that the “Marka forest” close to the city (peri-urban) is the most valuable green space. We use an average cost of time that does not vary by green space type to place a monetary value on the indicator “time spent on-site.” While this convention may be useful for calculating an expected aggregate value across the whole urban population, we discuss how it hides the diverse values of different user groups. It is reasonable to expect that different user groups with different income levels use green spaces differently across the urban transect. If higher income users were in the peri-urban forest this would further accentuate the economic importance of the peri-urban forest over green spaces within the built zone in total. We discuss the extent to which the data and valuation carried out for accounting purposes at an aggregate level, is also valid as a basis for decisions in spatial planning when these distributional aspects enter the equation.

Östersund: assessing benefits of a new recreation site and addressing user conflict

This case study highlights two ways in which economic insights can contribute to the management of a specific recreation site. The first example illustrates how a city might measure and compare up-front investment costs to a future flow of (non-market)

recreation benefits before deciding whether to invest in a given site. We focus on the welfare improvement to users themselves and demonstrate how to collect and analyze data relating to: *the number of projected visitors* and *how they will value the site*. Projecting visitors is challenging given that the site was “not yet built”, but we made assumptions and relied upon a previously conducted municipal survey on recreation. To value the site we used a benefit transfer (BT) approach, relying on another economic study that valued a similar recreation experience in monetary terms. This transfer of value in the Östersund case may over- or underestimate the true value but provides a cost-effective approach for benefits assessment. Finally, we illustrate how to compare the present value streams of costs and benefits to be able to say something about the net social welfare change that may result from investing in the proposed (hypothetical) recreation site.

The second example illustrates how investment in, and management of, a special use area can generate “added value” and potentially reduce user conflict. While the proposed investment could be financed by the municipality, local companies or the users themselves, we examined a “user pays instrument” that charges mountain bikers for access to an improved and highly specialized trail experience, which can reduce trail congestion for hikers while potentially improving welfare of bikers. We demonstrate how economics can highlight hidden assumptions underlying alternative approaches and also shed light on “who wins and who loses” under alternative financing mechanisms. Whether or not the cyclists at our local site will actually pay for access is, of course, an empirical question and should be assessed at the local level in Östersund, where both evolving social norms and user preferences affect recreation value. More information on user preferences, together with input from political leaders, could inform a dialog about pricing and economic value.

Aarhus: valuing new recreation areas for a growing city

This case study illustrates the use of monetary valuation to raise awareness of potential values of expanding the supply of recreation opportunities at municipal level. The municipality of Aarhus, the second largest city in Denmark, has an ambitious political goal to double the total nature area to ensure a multitude of ecosystem services including recreation, biodiversity, groundwater protection and enhancing the attractiveness of the city. The monetary valuation approach applied in this case study is a more complex benefit transfer method than in Östersund, making use of a functional benefit transfer, and relies on how far users have to travel. Data originated

from a Danish national representative survey on recreation to nature areas. The economic benefit transfer model also considered future population growth projections.

Findings indicate a significant increase in welfare from both the expansion of existing sites and the establishment of new ones. The spatially explicit monetary estimates of recreation value associated with urban and peri-urban sites and parks provide important information for local decision-makers and managers, including: (1) the importance of ensuring recreation access to the local population; (2) the significant variation in value provided by different sites; and (3) the welfare impacts in monetary terms of changing site characteristics or establishing new sites. This type of information within a municipal administration can help in priority-setting and support budget requests to further enhance and develop outdoor recreation opportunities.

Observations and ways forward

This final section reflects on the key lessons learned from the case studies and provides general guidance and perspectives on how to integrate economic values into recreation planning in urban areas. We also include resources for planners in Appendix A:

- *More economic evidence needed.* Increasing the evidence and raising the awareness of monetary and non-monetary values of urban green space is essential to ensure a socially optimal provision, especially when municipal budgets are strained. These values risk being neglected as the cultural ecosystem services upon which they are based do not generate a direct flow of income to municipalities and landowners. These values can be sharpened by relying on spatially explicit valuation approaches, which can help establish priorities and plan recreation investment strategies.
- *Economics contributes only rarely to the recreation policy context today.* As our case studies demonstrate, there is a variety of policy contexts in which welfare values can be integrated in a more comprehensive and holistic manner with existing planning tools to provide complementary information for urban planners. However, none of the three cities we analyzed had previously relied on non-market values to inform planning. Although Scandinavian tradition tends to rely on public hearings to articulate public values for recreation, they rarely if ever rely on stated or revealed preference data. A previous effort in Norway to map recreation resources to inform future investment – which is now being simulated

and piloted in Sweden (see Karlsson 2017³) – does not explicitly rely on economic theory or economic valuation, despite its relevance in this context (A more recent effort, the OSLOpenNESS project, has started to test approaches to economic valuation of recreation in this mapping context, including non-market valuation methods, see Barton et al. 2015).

- *Key data need: primary economic valuation studies.* Our results illustrate the important role for primary economic valuation studies, in particular those that are well-designed (see also Wilson & Hoehn 2006). Key design features include data on how site *quality* can affect the value of a recreation site, both directly through the user experience and indirectly by influencing the number of visitors.
- *Cost-effective data collection: benefit transfer.* Well-designed valuation studies also contribute to the use of benefit transfer (BT), a cost-effective method for integrating economic values into decision-making. Our case studies relied on benefit transfer rather than a primary economic valuation study and, as several guidance documents suggest (see Appendix), BT can be a defensible approach under certain assumptions. For example, depending on the policy use, expected transfer errors from BT may be acceptable if the original study upholds a high economic standard and the change valued at the study site (where the primary survey was conducted) is sufficiently similar to the policy site being studied. We highlight the plethora of resources available to support the use of this cost-effective valuation approach, including several databases and relevant review studies in Appendix.
- *User data are critical, but sometimes overlooked or underemphasized.* Decisions-makers require quantitative and qualitative data on users and their preferences at urban nature sites in order to continuously evaluate recreation investments, both past and present. The lack of local data describing recreation demand is often a limiting factor for effective economic analyses and is moreover often a key driver of final results. For example, even if the transfer of a value per visit per person correctly reflects the marginal value at the policy site, the total value per site is sensitive to estimating or projecting the use of the area in terms of expected number of visits per year.

³ <http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Regeringsuppdrag/Redovisade-2016/Metod-att-kartlagga-friluftsomraden/>

There are several data collection methods, each with their own pros and cons. For example, on-site surveys reveal information from actual users, but are costly to collect and hard to scale up to measure total demand. General population surveys aim for total demand, but generally suffer from low response rates. Newer counting machines placed (or hidden) at trailheads and parking lots have shown promise, as they provide fairly reliable and cost effective “total visit counts.” Several new products have come onto the market in the last 10 years, which has armed municipalities with valuable data to support local debates about recreation demand and future needs. Finally, GPS technology is now offering opportunities to track very specific user movements via wearable devices or through mobile phone networks. This may provide even more useful in the future, depending on how data protection rules evolve:

- *Focus on welfare values, but consider complementary economic measures.* Although this study only looks at the non-market benefits, policy makers may also be interested in other market-based impacts that can arise when recreation users are attracted from outside a local region. Although these benefits may be relevant for decision-makers looking to *fund certain* recreation investments (via a tax or user fee) they cannot easily be added to the economic welfare measures captured in this report and should instead be seen as complementary measures of economic impacts from recreation. Instead, urban planners that are considering investment in a resource that provides non-market benefits (like urban nature recreation) should instead focus on measuring and integrating the types of economic values discussed in this report, and then compare these values to the up-front costs to determine whether investment may lead to a net gain in social welfare.

1. Urban nature recreation

Urban nature recreation contributes significantly to human well-being in crowded cities. Outdoor activities like hiking, biking, team sports and other leisure are dependent on the provision of important and underlying urban ecosystem services, which provide economic benefits. The space required for these services is at a premium in rapidly growing urban areas, which means they can be costly to provide. Further, since these values are not always "visible", they tend to be neglected in the decision-making process. To prevent this, urban planners need more information about these economic benefits and economic tools and approaches to help evaluate and communicate the values at stake.

1.1 Background

The Nordic countries continue to experience increased migration to, and growth of, big and medium sized cities (hereafter "urban areas"). This is driven internally by continued exodus from rural areas and externally via immigration to Nordic cities. The patterns of growth include both increased "densification" (intensifying use of "green and brown" urban areas for development) and "extension" into new peri-urban areas. These patterns are expected to continue into the future as up to 90% of the population in Europe is projected to live in urban areas by the end of this century.⁴

The expanding built environment – including housing, commerce and industry, transport and energy infrastructure – provides benefits like economic growth, dynamic economies, employment, and increased standards of living. But the expansion of such "grey infrastructure" also imposes economic costs in terms of environmental and health impacts and degradation of urban ecosystem services, which provide a variety of unique

⁴ US National Center for Atmospheric Research (NCAR) model across all Social Economic Pathways (SSP) scenarios by year 2100 suggest a range of 70–96% for the countries around the Baltic Sea. (SSP Database version 1.1).

benefits to city-dwellers.⁵ In fact, city planners now refer to “*blue green infrastructure*” – i.e., natural and semi-natural landscape elements, from individual trees to waterways to ecosystems – as a critical foundation for a variety of welfare benefits. Importantly, this naturally occurring infrastructure imposes a smaller economic burden (and requires less maintenance) than *grey infrastructure*, yet provides similar benefits. The juxtaposition of these two infrastructure concepts highlights the trade-off between the benefits of economic growth and the benefits provided by urban ecosystem services.

The benefits of urban ecosystem services have been documented by a number of studies (see e.g. references in Baggethun and Barton 2013). They include recreation and sports, climate mitigation and adaptation, provision of biodiversity, space for reflection and cognitive development, sense of community, artistic and educational development, etc. (e.g. Lindhjem and Sørheim 2012, an early study from Oslo). This report focuses on the benefits of recreation opportunities in an urban environment. We define *urban nature recreation* as a broad concept capturing a variety of leisure activities relying on urban parks, playing fields, sports facilities, forested areas, rivers, etc. both inside city centers and in the immediate surroundings of the cities (Gundersen et al. 2015; Barton 2015). We include activities that can be conducted by urban dwellers on a normal work or weekend day without having to stay overnight.

The welfare benefits of these types of goods and services are typically not captured by the price mechanism in a market. Hence, these non-market benefits are undervalued or excluded, which often means that cities tend to support projects that make society worse-off rather than better off, thus wasting scarce resources. For example, if the values associated with cultural ecosystem services like hiking and cycling are not visible to decision-makers, these valued activities may be ignored or subsumed by land uses whose value is easier to calculate (e.g. housing or retail construction).

Policy makers need information on how to value the benefits of recreation and tools to evaluate trade-offs in cost-benefit analysis and spatial planning, not least in urban areas where competition for land is intense. This report addresses knowledge gaps related to the following:

⁵ Bolund and Hunhammar (1999) first introduced the concept of urban ecosystem services, classifying seven ecosystems that led to benefits including “air filtration, micro climate regulation, noise reduction, rainwater drainage, sewage treatment, and recreation and cultural values.”

- Methods and information on valuing the benefits of urban nature recreation.
- Methods and data sources for evaluating these benefits in light of investment costs.
- Practical illustrations that demonstrate how to integrate this information to make recreation values more visible in decision-making.

The report aims to provide a source of assistance for urban land managers in meeting the increasing demands for recreation opportunities in cities. Rather than a comprehensive review of recreation valuation literature (see e.g. TemaNord 2015;2017 and Gisselman et al. 2017 for overviews), we rely primarily on data from three diverse and informative case studies (in Sweden, Norway, and Denmark) to demonstrate accessible approaches for integrating economics into decision-making. We present welfare economic concepts as complements to other planning tools used today and suggest that they be used to help urban planners steer public and private investments – in particular those that may have positive or negative impacts on recreation – toward projects with the highest net social return.

1.2 The challenge of integrating environmental values

Recent efforts to improve the visibility of environmental values have raised awareness of the values at stake (see e.g. the significant efforts under TEEB⁶ and UK NEA⁷). These sets of studies, some of which are based on a simple comparison between “having and not having” a resource, are important as they signify the potential magnitude of such values (and what we can lose by ignoring them), thus making these values more transparent. But such approaches are arguably less relevant for decision-makers. These actors must choose between “on the ground” alternatives, where the change in environmental values tend to be relatively small or marginal (e.g., the loss in recreation value from developing a recreation trail into a parking lot). Although these types of marginal valuation studies exist in the environmental economics literature, many are difficult to find, are not specifically focused on urban areas (where the availability of

⁶ The Economics of Ecosystems and Biodiversity, see. <http://www.teebweb.org/>

⁷ United Kingdom National Ecosystem Assessment, see <http://uknea.unep-wcmc.org/>

alternative sites can affect value) or are poorly understood. In some cases, the value of non-market benefits is identified but applied in the wrong way. Further, the valuation of recreation benefits at a particular location is heavily reliant on data capturing *the number of users*, which is frequently absent, missing or weakly supported in public statistics and other sources (Cole and Gisselman 2016a and 2016b). This weakens a study's conclusions and precludes clear policy implications and decision-support.

Thus, this report takes the natural next step: illustrating how these values can be integrated into decision making through case studies that rely on economic tools. The studies identify alternative and reasonable ways forward by for example highlighting trade-offs, suggesting alternative approaches, and describing possible “winners and losers” (i.e., those who are affected positively and negatively, respectively, from a given policy scenario). Such approaches can help identify policy options that provide little or negative benefit or those that benefit a (small) group at the expense of another (larger) group. These approaches can prevent wasteful spending and also help identify potential value in enhancement projects that could deliver improved welfare.

1.3 The relevant policy uses of economic values

The economic values and economic tools discussed in this report can be applied in a number of policy scenarios. Below we identify five typical policy uses for economic values (Baggethun and Barton 2013) and illustrate them in Figure 2. These uses are listed according to the typical need for accuracy – i.e., less precision is required of economic values used in *awareness raising* (e.g., total ecosystem service values) compared to values used in *instrument design* (e.g., a sensitive analysis such as setting the level of an environmental tax). With increasing demand for valuation accuracy comes increasing costs of obtaining information (e.g., more spatially refined units).

Figure 2: Range of potential policy uses of economic values in the context of urban nature recreation

Source: Authors' own summary, based in part on Baggethun and Barton 2013.

- *Awareness raising.* Economic values that are accurate to an order of magnitude can help raise awareness of the potential values at stake if development were to go forward. This can support cities' efforts to map and value sensitive areas in order to steer development away from high impact sites or toward less popular areas.
- *Accounting.* Economic values can support a broader concept of *wealth*, for both private and public entities. Assuming that "*wealth is the social worth of an economy's capital assets*" then ecosystems should be included as an important form of "natural capital" in this wealth (Grimsrud et al. 2018). Accounting of natural capital aims to track significant trends in physical units or monetary values. The level of accuracy required must be sufficient to observe trends between accounting periods, but the absolute value of natural capital may be subject to error as long as the error is consistent between periods. For example, estimates of annual recreation use based on web-surveys are subject to a number of errors (see Oslo case), but respondent biases are consistent.

- *Priority-setting.* Economic values can help municipalities identify where and when to invest in recreation resources to ensure the greatest social benefit at the lowest cost. This is particularly important for cities with shrinking budgets and can be used to prioritize investment in existing sites or to focus protection measures on areas under development risk.
- *Instrument design.* More precise economic values can for example be used to establish the level of an environmental tax⁸ or to support environmental markets through the pricing of e.g., habitat area or water quality/quantity.
- *Liability.* Compensating the public for environmental loss requires information on the value of environmental damage, either in monetary or nonmonetary terms in order to inform the appropriate scale of restoration (Cole 2011). Estimating these economic values are demanding as they tend to be used in court cases or settlement negotiations with liable parties (see e.g., Bishop et al. 2017 for a US example) and are likely to play an increasing role in Nordic countries and the EU (See Text Box 3).

1.4 Report structure

Chapter 2 presents a framework for evaluating urban nature recreation by examining several dimensions across which planning of urban nature recreation can take place. We also include explanations of key economic concepts. Chapter 3 introduces three case studies that illustrate practical approaches for integrating environmental values to support decision-making around urban nature recreation. These case studies – from Norway, Sweden, and Denmark – are presented in Chapters 4 to 6.

⁸ See e.g. the analyses of a tax on land or nature use in Norway (Lindhjem et al. 2015, Handberg et al. 2018).

2. Valuing the benefits of urban nature recreation

We define urban nature recreation and identify the welfare benefits we derive from it. We describe briefly how to value these benefits – which are dependent on ecosystem contributions – using economic tools and methods. We also define a framework for assessing this cultural ecosystem service and explain relevant economic concepts.

2.1 What is urban nature recreation?

The increasing incomes in Nordic countries tend to increase the amount of time individuals want to spend on leisure, especially in rapidly growing urban areas. Increased leisure time, in turn, is strongly correlated with a rising demand for recreation and outdoor activities including walking in the forest, swimming, running, cycling, skiing, fishing, berry-picking, etc. (e.g. TemaNord 2015, NOU 2013).

Urban recreation is a broad concept that captures a variety of leisure activities across a variety of sites inside and in the vicinity of cities: urban public places including urban parks, playing fields, sports facilities, forested areas, rivers, etc. These green urban areas may be on public or private lands. Nordic countries (except perhaps Denmark) are somewhat unique: since urban recreation frequently occurs in semi-wilderness areas (e.g., thickly forested woods, rivers, mountains, etc.), the activities tend to resemble those that non-Nordic city-goers would pursue on weekend trips or longer holidays. Thus, the preferences for urban recreation areas may vary (see box 1, this page), which affects the types of economic studies that we select (see Chapters 3–6).

Box 1 Danish preferences

A fairly recent study in Copenhagen, Denmark, examined different uses of urban green space and their importance for urbanites in everyday life, the social functions of green urban areas, and the impact of landscape quality on inhabitants.

The study found that urban blue-green spaces represent a vital organ in everyday urban life. Urban green/blue areas offer space for numerous different activities from sports, relaxation, meals, party, learning, nature experiences to public meetings. The intricate use relationships with natural areas in urban systems makes it important to ensure sufficient amounts of varied green spaces close to where people live and work, including travel corridors between home and work/school.

A significant quality for inhabitants is the presence of city and nature at the same time in terms of easy access to large contiguous nature areas and the presence of trees and other nature elements and “pocket parks” within the dense urban fabric. Variation in green space and their aesthetics is another significant quality, allowing inhabitants to navigate according to their mood, needs and time available.

Source: Petersen and Nielsen (2011)

For the purpose of this report, we consider urban nature recreation to include activities that can be conducted by urban dwellers on a normal work or weekend day and that does not require overnight stay.

2.2 Welfare benefits

The economic benefits of urban nature recreation can be diffuse and somewhat challenging to capture. They include:

1. *market-based economic impacts* that can arise when out of town recreation users spend money in a local economy (e.g., income from labor and capital, job creation, economic output, increased taxed revenue, etc.), and
2. *broader welfare* associated with improvements in an individual’s well-being, which may be driven by material, spiritual or moral attitudes (Freeman et al. 2014; Gisselman et al. 2017).

The former may be politically important on a local level, but since they only capture market transactions, they provide, at best, a partial assessment of economic impacts. Broader/social welfare, on the other hand, manifest outside typical market indicators and, as such, require special economic valuation methods (see “consumer surplus” in Section 2.5 below). For example, filling leisure time with recreation opportunities may improve an individual’s well-being as a result of physical exercise, improved health, improved mental well-being from stress reduction, etc. Assigning monetary values to these types of benefits is important for urban planners who wish to compare them to costs of investing in recreation or to avoid negative impacts on recreation. As such, this report focuses on welfare benefits rather than market-based economic impacts that may arise from urban nature recreation. Market-based impacts, even if captured accurately, cannot always be added to welfare benefits, which are generally captured using different methods.⁹

The underlying ecosystems that make urban nature recreation possible may, in some cases, provide other co-benefits in urban areas, in particular related to biodiversity protection, groundwater protection and climate change adaptation. For example, land protection or restoration measures to improve hiking or picnicking opportunities may also provide benefits associated with biodiversity, water quality, climate change adaptation if the measures are designed in accordance with blue-green infrastructure principles. However, there may also be cases of trade-offs between recreation and biodiversity and climate adaptation.¹⁰ In this report, we do not investigate these co-benefits or trade-offs explicitly, but emphasize the direct impacts on recreation values.

⁹ Some market-based impacts are real welfare impacts that should count, while others may be transfers between groups, businesses etc. that do not represent net welfare impacts.

¹⁰ In addition, climate is related to recreation in that climate change is an important factor that changes both the conditions for recreation (e.g. reducing the length of the skiing season) and probably people’s preferences and values over time.

2.3 Valuing recreation services

Measuring the link between nature's services (e.g., recreation opportunities) and human well-being requires several interdisciplinary steps. The connection between the underlying biological processes/structures and the resulting economic benefits to humans involves a process of ecosystem mapping (see also the "cascade" figure from Haines-Young and Potschin 2010). It generally includes five components:

- *Biophysical structure or process.* The underlying biological basis that gives rise to certain ecosystem functions. This could be a forested woodland providing an arena for certain activities (e.g., mountain biking or hiking).
- *Ecosystem function.* The resulting ecosystem functions which, in the case of recreation, may include a river that gives rise to fishing.
- *Ecosystem service.* Resulting ecosystem service that may include fishing populations for fishermen.
- *Economic benefit.* Resulting (tangible or intangible) economic benefits provided to human populations, such as the enjoyment from fishing or mountain biking.
- *Value.* The final step is to apply valuation methods to quantify the economic benefits themselves, which can be done in monetary or non-monetary terms.

The first four steps are generally referred to as ecosystem mapping and provides the basis for economic valuation in the final step (see e.g. Burkhard and Maes 2017). The fifth step teases out how an asset (e.g., a forest, lake, river, trail, etc.) provides benefits to people (Atkins and Obst 2017), which requires both a *classification of values* and *methods for estimation*.

Economists have classified the types of instrumental¹¹ values generated from ecosystems. The Total Economic Value (TEV) framework suggests that goods and services generated by an ecosystem can contribute to people's welfare either by being used directly or indirectly (use value) or be valued even if it is not used (non-use value)

¹¹ Our report necessarily focuses on instrumental values, i.e., values that provide a means to reach a human-focused end (e.g., improved health or satisfaction from access to nature-based recreation). In this context intrinsic values are less relevant as they capture non-anthropocentric benefits, i.e., the value in and of itself that a forest exists, independent of any direct or indirect benefit it may provide humans.

(Mitchell and Carson 1989; Pearce and Turner 1990; and Balmford et al. 2011). Some ecosystem services provide *final* value to end-users (e.g., trees give wood production), while others are *intermediate* since they provide a basis for a final “valued” product (e.g., soil supports forestry). To facilitate economic valuation, Atkins and Obst (2017, p. 17) consider three categories of ecosystem services:

- [those that] are used *as inputs* to economic production ... Water regulation and water purification services are inputs to those economic (producing) units that need a supply of clean water as an input, usually alongside other factors of production. [1] [SEP]
- [those that] act as *joint inputs* to household final [production]....Examples include (final) ecosystem services which in combination with travel expenditures are used to produce recreation benefits.
- [those that] *directly contribute to household wellbeing*. That is, there is no existing economic production or household consumption where these services are inputs. Examples are by their nature rather abstract, but include those services that are valued for reasons of what is usually termed “non-use” or “passive- use”.

Methods for estimating values considers how an individual assigns value to a specific benefit, which naturally varies from person to person. Non-market valuation methods include stated and revealed preference methods, production/damage function approaches, cost-based methods and benefit or value transfer methods (see box 2). Estimating monetary values for non-market benefits is not straightforward and a full explanation is beyond the scope of this study (for theoretical and practical details on valuation techniques see e.g. TemaNord 2011, Freeman et al. 2014, Champ et al. 2017; and other sources in the box below).

Box 2 Non-market valuation methods for ecosystems services

Stated preference methods: Willingness to pay/or to accept compensation for changes in provision of ecosystem services/benefits are elicited from respondents in surveys using structured questionnaires. Stated preference methods are the only methods that can cover non-use/existence values. Well-known methods include contingent valuation and choice experiments.

Revealed preference methods: Values are “revealed” through studying consumers’ choices and the resulting price changes in actual markets, that can then be associated with changes in provision of ecosystem services. A well-known method is hedonic pricing of property characteristics, i.e. where the impact of environmental quality attributes on prices of properties is distinguished from other factors that affect prices. Travel cost methods used to value recreation benefits of ecosystems are often also included in this category.

Production/damage function approaches: A group of methods used to value an ecosystem service, where intermediate ecosystem services are one of several “inputs” to the final service or good enjoyed by people. Ecosystems’ marginal contribution to the final service is valued.

Cost-based methods: Assume that expenditures involved in preventing, avoiding (“averting”), mitigating or replacing losses of ecosystem services represent a minimum value estimate of what people are willing to pay for the ecosystem service. In ecosystem accounting a distinction is made between replacement cost (of a particular ecosystem service) and restoration cost (of an ecosystem asset and its bundle of ecosystem services).

Benefit/value transfer methods: Refer to the use of secondary, existing study valuation estimates, from any of the valuation methods mentioned above, transferred to the “policy context” in need of value information. Values can either be transferred using unit value transfer methods or more advanced function-based transfers (e.g. based on meta-analysis of the literature).

Sources: Champ et al. (2017), Barton and Harrison (2017), Johnston et al. (2015), Koetse et al. (2015).

2.4 A framework for assessing urban nature recreation

To focus the theoretical discussion of valuation to the specific case of the cultural ecosystem service, we adopt a framework that considers several dimensions in assessing recreation benefits in urban areas (Baggethun and Barton 2013, Gundersen et al. 2015). Our simplified framework in Figure 3 considers the spectrum of recreation possibilities by summarizing both *resource supply* (e.g., built or abiotic structures that provide the basis for recreation) and *resource demand* as a function of site attributes (i.e., choice possibilities for users).¹²

¹² Our approach is inspired by the recreation opportunity spectrum (ROS) framework, originating from the USA as a continuum of land use types that is used to characterize recreation opportunities in terms of setting, activity, and experience opportunities. Variants of this framework have also been applied in Europe (Paracchini et al. 2014).

The characteristics of a recreation site near the city center (far left of the figure) differ from a site in a “wilderness”-like setting (far right). Further, the demand for recreation is, in part, a function of *distance from a user’s home* and the supply of recreation sites depends, in part, on the *type of recreation* available in the vicinity of users. Importantly, the urban transect is a gradual transition across a landscape gradient rather than a distinct division into “urban” and “rural.” This can make classifications difficult as different gradients do not coincide in the same places. Many Nordic cities (except perhaps in Denmark) offer recreation areas within a short distance that span each of these classifications (i.e. not requiring overnight stay).

Figure 3: Framework for assessing benefits of urban nature recreation

Source: Berit Köhler, NINA.

Other dimensions not explicitly captured in Figure 3 but nonetheless relevant include the geographic scale of assessment (e.g., building, property, neighborhood, region, etc.), the resulting units of measurement on a spatial resolution (square meters to hectares), and external factors such as climate change, which impacts both user preferences and the availability of activities (e.g., cross-country skiing).

From the supply side, policy makers need quantitative and qualitative information about the underlying resources that make the provision of recreation possible, such as natural capital (e.g., landscape attributes), physical capital (sports facilities), location (relative to large populations), etc. For example, a shortage of sites can drive up value in a densely populated area. Similarly, the value of an urban recreation experience will be higher than a rural experience for the same activity (all things equal) given the tendency for higher demand and shorter supply in dense urban areas (see e.g., Ambrey and Fleming 2014).

From the demand side, policy makers require information on key drivers for a user's choice of *when, where and how* to recreate. A key driver of demand for urban nature recreation is user preferences for site attributes. For example, mountain bikers may tend to prefer (and are willing to pay for) artificially designed and engineered trails while hikers may prefer a "wilder" trail (Table 1 identifies some common attributes that provide welfare for different recreation users). Note also that the availability of nearby substitutes sites can affect the value of a given site. For example, the cost of degrading a given site will be less if there are several alternative sites that can be used instead (all else equal).

While user preferences for a certain type of activity, or attribute, can affect value, preferences are not static and can vary over time, space, and location. For example, the value of a site can be affected when quality is improved or degraded: not only does value associated with the experience increase/decrease but this may also affect the number of people who visit the area, which affects overall value. Further, some users (e.g., mountain bikers and skiers) have become more accustomed over time in some areas to paying an entrance fee, compared to other types of uses. This suggests the importance of collecting appropriate data on user preferences and attitudes.

Table 1: Some common attributes associated with selected activity types that provide welfare to users in an urban nature recreation setting

Mountain biking	Hiking	Cross country skiing	Swimming	Common across all activities
Level of congestion from other users	Vegetation	Early season opening	Water clarity	Distance to site
Sign posts with distances/maps	Aesthetics	Width of trail	Type of sand on beach	Accessibility
parking	Level of noise and human disturbance	Frequency of trail grooming	Width of sandy beach	The season
Washing facilities		Cost/fee	Parking	
Bathrooms			Showers	
Cost/fee			Noise-free	

Note: For mountain bike attributes see e.g., Buchanan et al. 1998; Fix and Loomis 1998; Morey et al. 2002; Preez and Lee 2016; Koemle and Morawetz 2016; Olofsson 2018. For other recreation users see e.g., Nordh and Østby 2013; Fezzi et al. 2014; Sever and Verbic 2018.

2.5 Economic data

Estimating the economic value of urban nature recreation in a given area requires two key inputs:

- *Value of the experience* – subjective importance to an individual of a recreation activity in a given area.
- *Number of users* – count of individuals participating in a given activity in a given area.

The *value of a recreation experience* can be measured using monetary and non-monetary metrics such as time use (see Oslo case study in Chapter 4 for an example of the latter).

Commonly-used monetary metrics are based on the price a participant is willing to pay to gain access to a site and it can be estimated using a variety of economic methods. The key concept underlying these valuation methods is *consumer surplus* (Freeman et al. 2014). In the case of recreation, the concept measures the magnitude of improved well-being that an individual experiences while also accounting for the possibility that he/she may have faced a cost in obtaining that (recreation) experience. The consumer surplus is zero if a user chooses not to participate in an activity (i.e., stays at home); it is negative if the experience is taken away (e.g., contamination closes a swimming beach); and it is positive if the experience is undertaken in some form.

A highly valued recreation experience will be reflected proportionally in the size of the consumer surplus and, while an entrance price or high cost of access may reduce the total surplus experienced by a user, it will never be zero. The consumer surplus (value) from a recreation experience may change over time: the quality of the site may be altered (improvements will increase surplus while a deterioration will decrease it), external factors may influence the experience (increased congestion for bikers or lack of snow for cross-country skiers may decrease surplus), and user preferences may evolve (new activities may introduce new opportunities to capture a surplus).

The *number of users* can be considered the quantity variable in a demand function: a simple count of users to a site. This important and oftentimes overlooked input affects the overall value of a recreation site. For example, if two sandy beaches provide a similar urban swimming opportunity, but Beach A has an adjacent population of 10,000 while Beach B has an adjacent population of 500,000, the economic value at stake is

much higher at Beach B. One implication is that a restoration measure that generates value, or a contamination event that causes economic damage, would be experienced as a more significant economic impact at Beach B.

These types of economic data – both *quantitative* (e.g., number of users, travel costs, etc.) and *qualitative* (e.g., user preferences) – can be collected in a variety of ways.

The most common are:

- *On-site surveys*: Researchers are on-site and intercept a sample of recreation users to ask them about their experience, their reasons for visiting, etc.
- *General population surveys*: Researchers use phone, web or personal interviews to capture a representative sample of the relevant population (e.g., currently active and potentially active recreationists), rather than only targeting users on-site. Questions may focus on current (or planned) recreation frequency.
- *Counting machines*: Newer products on the market allow automatic counting of visitors that pass by a hidden counter at a trailhead, parking area, or other access point. Quantitative data can be uploaded via satellites, but this approach only captures limited data on user preferences.
- *Wearable GPS devices*: The increasing sophistication of some recreation users provide a new opportunity for data collection via smartphones or other wearable GPS devices that capture visitation patterns at a site (e.g., precise movements and total time on-site). The detailed data allows for spatial analysis of user behavior for a subsample of these sophisticated users (see e.g., Cord et al. 2015 who use social media to track urban recreation patterns).
- *Aggregate mobile phone data*: Mobile phone operators collect a vast amount of information about people's movements based on base stations. Some operators make such information available, under certain and often strict conditions from public authorities.

In the next chapters we provide practical illustration in how to assess the value of urban nature recreation.

3. Case studies: urban nature recreation in nordic countries

Chapters 4 to 6 illustrate how to collect relevant data and integrate economic values and methods across three policy applications relating to urban nature recreation. This chapter introduces the case studies.

3.1 Background

City managers face land-use conflicts as cities and user groups expand. Political leaders often have different opinions on how scarce urban lands can be managed to generate economic benefits for public and private actors. While cities tend to have information on the costs of protecting or investing in recreation sites, they may have limited information on relevant non-market values at stake, including the values that might be lost due to land conversion or how to improve these values through site enhancement. We select three case studies from Östersund, Oslo, and Aarhus, to illustrate how to measure and integrate non-market economic values into recreation planning.

3.2 Selection of case studies

We select the case studies based on a number of criteria. First, we ensure the studies illustrate how economics can contribute across a variety of policy uses, as discussed in Chapter 1 (See Figure 4). Oslo covers awareness raising and welfare accounting, Aarhus covers accounting and priority setting, and Östersund covers priority setting and instrument design. While our case studies do not cover liability, we discuss its relevance in Nordic countries in the future (Box 3).

Figure 4: How three Nordic case studies illustrate policy uses of economic values

Source: :Authors' own summary, based in part on Baggethun and Barton 2013.

Box 3 The importance of economic values for addressing liability

The three case studies do not specifically illustrate the use of economic values to support liability, i.e., the measurement of the welfare loss associated with environmental injuries and how these losses can be compensated in resource terms. In other countries, in particular the US, economics has played an important role in assessing the scale of compensation and considering the distribution of impacts (Bishop et al 2017). Following a number of EU Directives that address environmental compensation – not least being the Environmental Liability Directive – the European Commission funded the REMEDE project to develop and adapt interdisciplinary approaches for measuring liability (Lipton et al 2008). A recent report by the Nordic Council of Ministers identified the need for more active use of compensation measures to address impacts to both biodiversity and ecosystem services (including recreation) (Enetjärn et al 2015). Therefore, an increasing demand for the use of economic values to support environmental liability assessments in Nordic countries is likely.

The following text (Cole 2011) gives a brief overview of the role economics can play in assessing and scaling compensation in non-monetary terms:

- Without economics, an environmental loss could be replaced with an environmental gain on a simple 1:1 ratio: e.g. X birds lost can be replaced with X birds gained. But an economist would assert that the value society places on a bird lost or gained may depend on: (1) timing (a loss/gain in 50 years may be valued lower than a loss/gain that occurs today); (2) type of environmental loss/gain (the public may prefer, for example, on-site restoration gains for contamination losses but off-site conservation gains for development losses); (3) scarcity (the public may place a higher

value on losing the last bird in a population than on losing the first); and/or (4) proximity of compensation (it is often argued that the segment of society that suffers an ecological loss should be the one that benefits from the subsequent compensation). Economics can address these interdisciplinary issues: (1) is addressed through discounting; (2) can be addressed by measuring public preferences when the resource/service provided through compensation differs from that which was lost; and (3) and (4) are addressed through criteria for compensatory project selection.

Second, the selection encompasses the most important aspects of the spectrum of recreation possibilities discussed in Chapter 2. Figure 5 illustrates the placement of the three case studies on the scale of urban to wild nature. Oslo spans the whole spectrum, Östersund represents the two most wilderness-like types, while Aarhus stretches from the middle to the urban side of the spectrum.

Figure 5: Placement of the case studies in the framework for assessing benefits of urban nature recreation

Source: Berit Köhler, NINA.

We also ensure a spread across other aspects relevant to the valuation of urban nature recreation such as the size of the city, geographic spread across Nordic countries, the type of activities, and the complexity of the economic valuation method used.

Table 2 identifies key attributes of each case study across recreation experience, decision-making context and valuation of the benefits.

Table 2: Key attributes of the three case studies

Characteristic	Östersund	Arhus	Oslo
Recreation experience	A single recreation site in a semi-wilderness setting	A sample of new or improved recreation sites compared to existing sites in the municipality	A complete and varied set of recreation sites stretching from the urban core to wild nature
Decision-making context	<i>Priority setting</i> – Economic considerations of cleaning up an abandoned military site for future recreation <i>Instrument design</i> – Considerations for developing a fee-based cycling area	<i>Priority setting</i> – Information on economic values generated when expanding and improving recreation opportunities at municipal and regional level	<i>Awareness raising</i> – Captures data on the frequency and type of recreation use to understand use patterns <i>Accounting</i> – Discusses how recreation use values can be captured in a wealth accounting framework
Benefits valuation	Relies on existing economic literature to support different policy uses with varying demands on accuracy	Uses a discrete choice model with location-specific data to estimate monetary values associated with changes to existing/establishment of new recreation sites	A model encompassing a wide range of sites that estimates both monetary and non-monetary values

3.3 Case study structure

In the following chapters each case study is described using a common approach:

- *Background.* We consider how different levels of government (federal, state, and local agencies) address recreation and provide context to these types of decisions including, if relevant, the past use of economic data.
- *Policy Challenge.* We describe the (real or hypothetical) policy challenge to be addressed in the case study, including the policy use to which the economic values will be applied.
- *Illustration: Applying economic values.* We illustrate an approach for measuring and integrating economic values to address the policy challenge.
- *Discussions and conclusions.* Key lessons learned and practical take-home messages for local managers charged with handling recreation sites

4. Case study 1: Oslo, Norway

This case study focuses on how to capture recreation values in a wealth accounting framework.

4.1 Background

Oslo is Norway's capital city with a population of approximately 673,500 people (1.1.2018), predicted to grow by approximately 200 000 persons by 2030. Oslo Municipality's total area is 454 km², including 287 km² of forest and approximately 28 km² of registered public green space in the built zone.

Oslo's total area is roughly 69% green space, 6% freshwater and fjord and 25% built area (Figure 6). Approximately 75% of the green spaces in Oslo's built up zone are protected through zoning plans (Oslo Kommune 2013). During the period 2000–2010 the zoned green areas increased by 100 hectares.

Figure 6: Oslo municipal boundaries and built area with blue-green infrastructure

Source: Oslo Kommune (2013).

4.2 Policy challenge

Oslo municipality and city districts build, upgrade and manage green spaces for the public. While Oslo has good statistics on the area of green spaces they manage, including parks, cemeteries, natural areas, and peri-urban forests, it reports little data on how much these areas are used in terms of number of visits and the amount of time each park is used (Oslo Kommune 2016). Consequently, the municipality has no account of whether demand for, and the value of, their efforts in green space management is changing over time. They have no way of evaluating whether their management has impacts on trends in green space use and value. Finding indicators for green space use is part of a larger effort to map and value Oslo municipality's outdoor recreation areas ("friluftslivsområder") as part of a nationwide effort coordinated by the Norwegian Environment Agency (Rapport M98, Miljødirektoratet 2013). The M98 definition of outdoor recreation areas does not include urban open spaces like squares and streetscapes. Oslo Municipality is also in charge of managing green and blue structures in streets. These recreation spaces complement one another. The city's green space accounting is in need of an approach that covers the whole recreation opportunity spectrum, from streetscapes to peri-urban forest.

4.3 Illustration: Applying economic values

In this case study we provide some simple calculations of accounting of green open space visits, time on site and economic value. We use the valuation example for a discussion of possible improvements in accounting for green space use. The example illustrates the use of time on site as a non-monetary indicator of recreation value, as well as monetary valuation.

4.3.1 Visit frequency

A web-based survey was carried out by NORSTAT summer 2016 with responses from 1,157 residents in Oslo sampled at random from NORSTAT's panel of respondents (Figure 7). The survey response rate was 16%.

Figure 7: Self-reported location of OpenNESS survey by NORSTAT, summer 2016. N=1157

Source: Miljødirektoratet 2013.

The survey contained a subset of questions about the frequency with which respondents visited 6 different types of green space across a gradient from the urban core to outside the built area in Oslo municipality (cf. also Figures 6 and Figure 3):

- built areas with trees,
- managed parks including cemeteries,
- natural areas in the built zone ("friområder"),
- entry areas to the peri-urban Marka forest,
- Marka forest interior and wilderness areas in Marka.

Respondents were reminded of the areas in question using GIS maps of each set of areas, as well as a text and illustration of which areas were included in the six types of outdoor recreation area. For each of the six types respondents were asked to recall the previous 12 months" visitation frequency divided across spring, summer, autumn and winter. Respondents were asked to consider only visits for recreation purposes, not including visits connected with errands or work. The visitation data in Figure 8 show a gradient of visitation frequency from built areas to wilderness areas in Marka. There is a relatively stable use across seasons, particularly outside the built area. Use of urban recreation areas is somewhat lower in winter and autumn. More than half the population are unfamiliar with Oslo's wilderness areas (nature reserves and "fairytail" forests). At least 10% of the population never recreate in the built area.

Figure 8: Proportion of sample using different open recreation spaces by season

Source: Miljødirektoratet 2013.

There is a concern that stated trips is positively biased in surveys, as recreation is a positive social norm. We cross-checked the total estimated number of visits for the whole of Marka conducted using a similar methodology by Synnovate (2011) with our data and found our expected visitation frequency to be 7% higher. However, these studies use the same stated question format and the same assumptions regarding interpretation of frequency. Few studies have compared an external data source – e.g. count data – with stated visitation data to forests. In Denmark, Jensen (2003) found stated visitation rates to overestimate actual visitation by 65%. Jensen (2003) recommended a correction factor of 1.5–2 for self-reported/actual visitation data. We applied Jensen’s recommendations to the report of “daily” recreation by using a correction factor of 1.5. We also used a conservative assumption for frequency implied by visitation rates as “weekly” (once/week), “monthly” (once/month) and “more seldom” (once/year).

The total visitation per year for the six different outdoor recreation area types was estimated based on these conservative assumptions.¹³ Based on these assumptions Marka old growth forest has about 2.7 million visits per year. Marka forest in total has about 19 million visits per year. Parks and cemeteries and nature areas in the built zone have similar visitation. Recreation walks in streets with trees has a visitation frequency similar to the total use of the whole of Marka (Figure 9).

4.3.2 Valuation – time on site

The survey did not ask respondents for a break-down of time on-site in different recreation areas, considering problems with obtaining credible data based on recall of a year of recreation activity. In order to estimate expected time on site we used available estimates from on-site recreation surveys:

- *Interviews of Marka forest users.* Gundersen et al. (2015) found that average trip length in Oslomarka in 2012 was 4.2 hours for wilderness areas, 3.6 hours for Special consideration areas, and 2.7 hours for Service areas. “Wilderness areas”

¹³ Note that Barton et al. (2015) used less conservative assumptions in estimating total use of only Marka.

are deliberately left free of obvious human influence. These categories correspond quite well to our three types of Marka forest.¹⁴

- *Interview of park users in Oslo.* Detailed studies of preferences for park qualities have recorded visitation frequency, but not recorded time use (to our knowledge). See for example Nordh and Østby (2013). We use a single available on-site study of time use, and scale the value by park size to extrapolate to other parks. Reinvang et al. (2014) conducted a user survey in Svartdalen park summer 2014 and found a mean time on site of 45 minutes (35–54 minutes, 90% confidence). Svartdalen is a medium sized mixed park and nature area of about 15 hectares in size within the city. Lacking detailed data on time use across different green space locations, we use the estimate for Svartdalen as a first order estimate for time on site for trips to parks and nature areas within the city.
- *Transfer of duration statistics for urban recreation walking.* National time use statistics are not disaggregated by day of the week, which would make it easier to allocate time use to different types of recreation area. The national time use survey 2010 recorded that on an average day time spent for recreation and sports for people who practice these activities was 97 minutes,¹⁵ while the average across the whole population was 31 minutes/day¹⁶ (a factor 3 difference). Travel time for recreation is accounted separately. Our data on number of visits to different green spaces is among active users, rather than the population at large. We do not have data on a breakdown of this time across types of green space.

Lacking any other data on trip length in the built environment with trees we look to studies from other countries. The US National Travel Survey (2009) recorded distances, durations and purposes of trips in different rural-urban settings. Average trip time for walkers in an urban setting for “recreation”¹⁷ walking was about 10 minutes (Yang and Diez-Roux 2012). The figures are low because they include walking from a car to a recreation activity, in addition to walking for relaxation.

¹⁴ “Special considerations forests” have intermediate levels of human influence, and “Service areas” offer more extensive infrastructure designed specifically for recreation: sport facilities, forest parks, and visitor centers.

¹⁵ Tidsbruksundersøkelsen. SSB

¹⁶ <https://www.ssb.no/kultur-og-fritid/statistikker/tidsbruk/hvert-10-aar>

¹⁷ Defined as to gym/exercise/play sports, and rest or relaxation/vacation

Millward et al. (2013) studied duration times for different modes of transport in Halifax, Canada.¹⁸ Recreation walks (non-roundtrip) had a mean duration of 17.3 minutes (distance 1.02 km) while bicycle durations were 18.3 minutes. The authors also estimated the time spent on active transport walking from home to different destinations – active transport walking from home to outdoors had a duration of an average 7.4 minutes. Estimates depend on urban morphology, and recreation walks will cover both streets and green spaces. We used the estimates of recreation walking as first order approximations for Oslo. We use the mean recreation walking duration of 17 minutes, or about 1km walking distance, as estimate for duration of walks in built zone with trees in Oslo.

Figure 9 shows a gradient of visit frequency from built areas with trees in the urban core to Marka forest wilderness, as would be expected by a distance decay function for recreation demand. The importance of visits can be valued non-monetarily by the amount of time spent on site for each visit.

Figure 9: Estimate of recreation demand for green spaces in Oslo municipality comparing number of trips and time on-site

Source: OpenNESS Survey 2016 by NORSTAT. N=1147 Note: recreation trips only in built areas with trees.

¹⁸ Urban population 316 000, urban population density 1,349.3/km² in 2014.

Time spent on site per person is largest for wilderness areas and lowest for built areas with trees (Table 3). Combining the data suggests that the part of the Marka forest that is closest to the city is the most important green space in Oslo in terms of total time spent on site for recreation. Our estimate of total time spent on site also suggest that Marka wilderness areas, although visited much less frequently, may be as important in terms of time on-site as parks and cemeteries or nature areas within the city.

Barton et al. (2015) tested several different approaches for an accounting price for recreation time, including opportunity cost of time in terms of wages after tax, cost of a replacement recreation activity (fitness gym), travel cost and willingness to pay. For simplicity and to focus the discussion of valuation on distributional issues, we use opportunity cost of time, measured as the disposable income (after tax) that is foregone from not spending the same time in paid work. Fezzi et al. (2014) find that the opportunity cost of travel time should be approximately 75% of the wage rate. We found no studies discussing the opportunity cost of time on-site. However, we expect the value of the time at destination to be higher than the value of time in travel. Here we therefore value time on-site at 100% of average personal income after tax in Oslo of 100 NOK/hour.³⁹

Using an accounting price of 100 NOK/hour across all green spaces the total value of 86 million recreation hours in green space in Oslo Municipality is approximately 8,6 billion NOK/year.

4.4 Discussion and conclusion

Our case study is limited in scope by the fact that the survey data did not capture recreation use of the Oslofjord and its islands, which predominates summer season recreation in the city. However, we focus the discussion on the issue of valuation.

Barton et al. (2015) used a higher accounting price (183 NOK/hour) transferring wages after tax of users of Svartdalen Park in Oslo to the whole population. In this study we use a more conservative accounting price in terms of median per person income after tax for the whole of Oslo's population.

³⁹ Median household income after tax in Oslo 193 NOK/hour and in Akershus County 257 NOK/hour (2016). Mean household size in Oslo-Akershus 1.94 persons (2012).

Table 3: Valuation of time on-site in green spaces across a recreation opportunity gradient in Oslo

	Total visits/yr.	Hours onsite/trup	Total hours onsite/yr	Time value (NOK/hour)	Total time value/yr (NOK)
Marka Wilderness	2,708,000	4.20	11,370,000	100	1,133,000,00
Marka interior	6,726,000	3.60	24,210,000	100	2,413,000,000
Entry points Marka	9,552,000	2.70	25,790,000	100	2,570,000,000
Natural areas in built zone	12,361,000	0.75	9,270,000	100	924,000,000
Park & cemeteries	13,261,000	0.75	9,950,000	100	991,000,000
Built area with trees	18,559,000	0.28	5,260,000	100	524,000,000
Total	63,167,000		85,850,000		8,556,000,000

This includes non-users of some green space types. Income after tax for a standard working year may be an accounting price that is compatible with ecosystem accounting recommendations to use exchange-based prices (UN 2014). However, using average or median opportunity costs for a geographically distributed population hides some distributional choices.

For example, our case discussed here has been limited to the population of Oslo municipality, although a number of people in municipalities in neighboring Akershus County also use the Marka forest. Oslo median per person income per hour after tax is 100 NOK/hour, while in neighboring Akershus County, where users can access the same forest, it is 133 NOK/hour.

Different socio-economic groups live in different locations and use different green spaces, based both on distance and preferences of their life situation. Using group specific personal income after tax would capture some differences in willingness-to-pay across individuals. A more fine-tuned valuation of recreation time on site should weight mean accounting prices by the proportional use by different socio-economic groups of different types of green space. This requires recreation surveys that map both respondent residence and distribution of their time across the recreation opportunity spectrum.

Differences in income-based opportunity costs of time reveal some issues regarding the distributional impacts of valuation. Different groups use different sites and have a different time-stake in these sites, as well as different income and ability to pay. For example, time spent in green spaces by families with young children will be weighted as less important than families with older children. However, it is likely that families with younger children are greater users of local green spaces than families with

teenagers. Couples with children have broadly higher income per person than people living alone without children. Single people tend to live in apartments in the urban center of Oslo, while couples with children live in larger housing units further from the center. This would raise the monetary value of the peri-urban parks and forest per unit area, relative to parks in the urban core. Note that because time on-site is also expected to vary across socio-economic groups, this non-monetary value indicator also has distributional implications.

The use of monetary valuation versus non-monetary time-based valuation makes very different assumptions about who's preferences count in policy analysis, and which green spaces are prioritized. Based on visitation frequency, green structure in the built area has the highest recreation use. Based on time-on site the peri-urban Marka forest close to the city has the highest non-monetary value. Using opportunity costs of time based on income in policy analysis, has distributional implications for whose green space preferences count most, and which green spaces are economically most important per unit area. There are distributional implications to choosing both non-monetary and monetary indicators of recreation value.

5. Case study 2: Östersund, Sweden

This case study focuses on assessing net benefits of creating a new recreation site and considering special use areas to reduce user conflict.

5.1 Background

In 2016, Östersund employed for the first time a full-time staff to focus exclusively on recreation issues and to develop a planning document to help reach recreation goals in the coming years (Nilsson-Vaara, 2017). These two measures helped increase the city's standing in the Swedish EPA's ranking of Swedish municipalities with the best opportunities for outdoor recreation – a recognition that has proved important to local politicians.

The City recently developed a new recreation area 12 km west of the city (Figure 10): Bynäset, a forested peninsula surrounded by Sweden's 5th largest lake, offers swimming, hiking, biking and picnicking (winter use could include cross-country skiing, but facilities are not developed). Visitors enjoy spectacular views of the surrounding mountains and access is primarily by car (20 minutes drive from city center), but access by bicycle and boat are also possible.

Bynäset was previously used for military training until 2005. The area was *officially* opened as a new recreation site in June 2017, after a decision to undertake an expensive clean-up of past contamination from unexploded ordnance (OXA). In addition to cleaning up the waterfront areas, several measures were undertaken to improve recreation value (e.g., fences, signs, parking area).

Figure 10: Bynäset recreation site

Source: Östersund's Kommun.

Figure 11: Map of Bynäset recreation area, Östersund, Sweden

Source: Östersund's Kommun.

5.2 Policy Challenges

This case study highlights two ways in which economic insights can contribute to the management of a specific recreation site. In both cases Bynäset is used as inspiration but the illustration relies, in part, on hypotheticalal data.

5.2.1 *Net benefits of a new recreation site (priority-setting)*

The first example illustrates an approach for assessing whether an abandoned site may provide adequate recreation value to justify clean-up/restoration (*priority-setting*). Östersund identified a need for new recreational opportunities but, with limited funds, needed to find an optimal site to develop. Key questions include: should existing sites be improved or expanded? Should new sites be purchased and protected? Should abandoned sites be cleaned up or improved? All proposals require up-front investment cost but generate future (non-market) benefits. We illustrate an approach for a preliminary scoping analysis for how the city can identify, measure and weigh the costs and benefits of alternative proposals (a detailed economic analysis would be needed in an eventual follow up stage).

5.2.2 *Addressing user conflict (Instrument design)*

The second example illustrates how an economic instrument might help identify and finance enhancements to the user experience (*instrument design*). Conflict between users – real or perceived – is a significant management issue. The initial plan to restrict one user group (mountain bikers) at Bynäset was met with vocal opposition, which eventually led to a reversal of the restriction.²⁰ An alternative approach could be to invest in the development of a special use area, which improves the resource and generates “added value”. We discuss how economics can assist in this approach.

²⁰ This was partly due to legal concerns about restricting a user group under Sweden’s “All Man’s Right” legal precedent.

5.3 Illustration 1: Net benefits of a new recreation site (priority setting)

Conversion of abandoned sites for future recreation has provided new options in Nordic countries (see e.g. Hagen et al (2013) for an example from Norway). A socioeconomic analysis can help determine *ex ante* whether investment in cleaning up a site can generate sufficient benefits to cover costs. This type of assessment, sometimes called a cost-benefit analysis, is site-specific and generally includes four key steps:

- *Define a valuation scenario.* A valuation scenario should define site development alternative(s) through a detailed description of *measures* to make recreation more accessible (e.g., site assessment, clean-up plan, active restoration measures, etc.) and specific and expected *outcomes* in terms of recreation activity (i.e., total site visits, type of users and activities, etc.). The scenario should be defined quantitatively to the extent possible and should define the change to be valued: in this case, rehabilitating a site to allow for recreation where it was previously inaccessible. The alternatives need to be compared with a baseline, i.e., a “do nothing” scenario. Table 4 illustrates how a valuation scenario might be summarized for Bynäset.
- *Estimate future benefits.* The welfare benefits of an additional recreation site may include *improved health for users* (measured as reduced governmental investment in health care), *a more attractive “outdoor” profile* for the city (increased tax revenue from net immigration of productive workers) and/or *improved well-being* for residents who like to engage in recreation activities (willingness to pay to undertake such activities). There may also be *market-based economic impacts* (e.g., increased tax revenue to the city or profits to local businesses) that can arise when out of town recreation users spend money in a local economy, but these benefits are not directly additive with the above (see Chapter 2).

Table 4: Two hypothetical proposals for recreation development of at Bynäset

Impacts	"Primitive" development proposal	"Extensive" development proposal
Measures		
Toilet	Outhouse at trail parking area	<i>Same as primitive proposal</i>
Picnic tables	3 picnic tables/BBQ rings	<i>Same as primitive proposal</i>
Trail work	Trail signs, markers, etc	<i>Same as primitive proposal</i> + a new "adventure trail" with obstacles.
Map	Design trail map that is freely available to site visitors	<i>Same as primitive proposal</i> + information campaign to entice more visitors
Gym		Outside gym with training obstacles
Concessions		Conversion of military buildings to concessions/ indoor activities
Expected Outcomes		
Length of season	15 May–1 October	1 May–15 October
Östersund residents engaging in forest recreation ¹	44,000	
Total visits to Bynäset ²	17,600	26,400
Total trips to Bynäset ³	44,000	66,000

Note: ¹ Based on a survey conducted by City of Östersund: 3,000 surveys with 32% response rate (Ankre et al 2016). A total of 88% of respondents have taken a walk in the forest around Östersund (population 50,000).

² Based on own assumption and recreation survey: 40% and 60%, respectively, for each development proposal. Some visitors may make multiple trips per year.

³ To illustrate how to calculate total trips to Bynäset, we simply assume that an individual takes, on average, 2.5 trips to Bynäset each year. But this is for illustration only.

This illustration quantifies only one benefit: *improved individual well-being* associated with forest recreation. This requires information on number of users and how users value a visit.

Number of users. Estimating the number of recreation users at a new site is challenging in the absence of an actual site. However, visitation can be projected based on statistics at similar and nearby sites using a variety of methods (see Chapter 2). For

example, Östersund conducted a mail survey to assess current and future recreation demand (Ankre et al 2016), which can provide valuable data for this type of assessment. In this illustration, we rely on data from this survey and make a simple assumption about the total number of visitors to our hypothetical recreation site under the two development scenarios (Table 4). Further, if we knew how many trips a user takes, on average, to the Bynäset site, then we could convert *total visitors* to *total trips*, as shown in Table 4 (which assumes 2.5 trips/person/year for illustration purposes).

Importantly, visitation at nearby sites may decrease as existing users may instead choose to come to this new site, which means “net recreation visits” in Östersund may not increase by as much as Table 4 suggests. Other more sophisticated economic modeling approaches can “net out” this substitution effect by observing how users make decisions about which recreation site to visit.

How users value a visit. Rather than relying on “time on site” as an indicator of value for a recreation site (see Oslo example), we rely instead on a monetary metric. We rely on previously estimated monetary values at similar recreation sites and transfer them to the studied site (see benefits/value transfer in Box 1). We searched economic valuation studies from, among other places, valuation databases in Sweden (See Appendix A) to identify a valuation estimate that could defensibly be applied to Bynäset. We selected a study by Mattsson and Li (1994) (see also Bostedt and Mattsson 2006) after considering the following list of important, but non-exhaustive, criteria:²¹

- *Country.* As preferred, the Mattsson and Li (1994) study is in the same country (Sweden) as our policy site at Bynäset.
- *Type of activity.* As preferred, the study captures the same activity that we wish to value at Bynäset: forest recreation including hiking, picking berries, mushrooms, etc.
- *User group.* As preferred, the analysis covers a similar user population: Both Västerbotten (Mattsson and Li) and Jämtland (Bynäset) are sparsely populated counties in Northern Sweden with similar forest landscapes and income levels (218,000 vs 215,000 SEK GDP per capita).

²¹ A more comprehensive and rigorous analysis of the literature might consider additional criteria before deciding on the appropriateness of transferring a specific value, see Appendix A for guidelines.

- *The change being valued.* Mattsson and Li (1994) examine willingness to pay for improving forest aesthetics at a particular site to enhance recreation value. However, in our hypothetical case, a forest is being “opened” to recreation for the first time, rather than going through a transformation. We nonetheless consider this change to be fairly similar.
- *Valuation method.* Mattsson and Li (1994) rely on a willingness to pay survey using the contingent valuation method, which is a robust valuation technique.
- *Year.* The study is almost 25 years old, which makes it less ideal for a benefit transfer. For example, advances in environmental valuation techniques have improved and the determinants of willingness to pay are unlikely to remain stable over this long time period. A more recent study would be strongly preferred.

An overall review suggests that Mattsson and Li (1994) meet some of the key criteria for a defensible transfer across *space*, but the age of the study indicates that there may be large transfer errors over *time*. For illustration purposes, we nonetheless rely on this study to demonstrate a benefit transfer approach.

Mattsson and Li (1994) considered the value of altering forest management to better accommodate recreation (i.e., changes in silviculture practices) and estimate that local citizens are willing to pay between 750 SEK and 3,700 SEK per year (1994 values) for access to a forest with more favorable characteristics. In the calculations below, we apply a value of between 956 – 4,715 SEK (2016 values) to represent the marginal annual value of gaining access to a new site for forest recreation, where the range is assumed to capture the variation in willingness to pay for slightly different forest landscapes and recreation development scenarios (Table 5.1 above). Further, we assume each user considered the cost of getting to the site in their stated willingness to pay.

Total recreation value of a site. The data above can be combined to estimate the welfare benefit (e.g., consumer surplus) of opening a new forest recreation site at Bynäset. We multiply the annual willingness to pay for forest recreation times the number of people who would visit the site each year, over a 20 year time period²² to

²² We choose 20 years as a typical investment horizon for a municipality. In our case, where a large and steady flow of future benefits is compared to a relatively small investment cost nearer to the present, the choice of time horizon has very little impact on our results. When benefit and cost impacts are uneven and incurred far into the future, the choice of time horizon will influence results.

obtain the total value in nominal terms (336 mil. SEK “Primitive” scenario). We convert this future flow of benefits to a single number in *present value* terms using a discount rate of 4% (219 mil. SEK “Primitive” scenario).

Note that if we had actual data on the number of trips that each individual took (we used hypothetical data in Table 4), then we could combine that with information about the *value per trip*, rather than value per visitor.

Table 5: Estimating value from creating a new forest recreation site at Bynäset

	“Primitive” Scenario	“Extensive” Scenario
Willingness to pay for forest recreation (per person, per year in 2016 SEK)	956 SEK	4,715 SEK
Expected number of visitors per year	17,600	26,400
Total number of summer seasons (2018–2037)	20	
Recreation value per year, Nominal	16,819,000 SEK	25,229,000 SEK
Recreation value total (2018–2037), Nominal	336,387,000 SEK	504,580,000 SEK
Recreation value total (2018–2037), Present value	219,788,000 SEK	329,683,000 SEK

Note: Present values based on 4% discount rate and 20 year time horizon. Willingness to pay inflated from 1994 to 2016 SEK using the Swedish Consumer Price Index ratio of 1.27 (SCB 2018). 2016 was the most current year for which data were available.

- *Estimate costs.* The actual monetary costs of rehabilitating or restoring an abandoned site for the purpose of creating a new recreation site may vary depending on the measures undertaken (see e.g., Holgen and Mattsson (2000) for an example involving forest measures aimed at improving recreation). Estimates are generally based on engineering estimates and/or comparisons to similar projects. The cost assessment may include upfront costs associated with land purchase, site clean-up (contamination), site preparation (e.g., afforestation), site enhancement (e.g., trail construction), improved accessibility (e.g., trailhead parking areas) and regular maintenance (trail work, etc). In the case of Bynäset, we know that the following costs were relevant:
 - *Land purchase.* The City of Östersund purchased 35 ha. of land from the military where the price (810 mil. SEK) was based on the existing timber value in 2017 rather than the potential recreation value (Fortifikationsverket 2017; Frykberg, 2018).
 - *Clean up.* The Swedish Fortifications Agency reported that clean-up costs totaled approximately 12 mil. SEK in 2016 (e.g., removal of unexploded

ordnance, fence construction to prevent users from visiting dangerous areas, and road improvements). (Bolander 2018)

- *Site enhancement.* The city created signs, benches, a trail entrance and road blocks to prevent car traffic. In addition, the forest was thinned to improve views. Although figures were not available, we estimate that these costs were relatively small and unlikely to exceed 250,000 SEK in 2017.
- *Annual maintenance.* Although figures were not available, we assume continued maintenance of the site would cost no more than 10% of the initial setup cost of 250,000 SEK each year during the time period of our analysis (2018–2036).
- *Compare benefits and costs.* To assess the net benefits, we convert²³ the flow of future benefits and costs over 20 years to *net present values*, i.e., a common currency in “today’s value” (2016 SEK). This allows a comparison of costs and benefits using a similar unit of measurement (“the value of a Swedish Krona in 2016”). In other words, we compare the total *present value* of costs over the next 20 years (the vast majority of which are up-front) to the total *present value* of benefits over the same time period to determine “net present value.” A positive value (+) indicates a social profit (or gain in welfare), while a negative value suggests a decrease in welfare.

Table 6 quantifies in monetary terms a portion of the total benefits related to recreation (other welfare benefits may also be relevant, but not included). Further, total cost estimates are based on the best available information at Bynäset and our own assumptions. (We present only one cost estimate, as data were not available to discriminate between the two development scenarios). In our example, the net social benefit (benefits minus costs) is between 206 and 316 mil SEK, indicating that the proposed enhancements would be socially profitable.²⁴

²³ The conversion of future impacts (costs/benefits) to 2016 Swedish Kronor uses a discount rate, which tells us how much less we value future consumption compared to current consumption, i.e., the cost of having to wait to obtain something.

²⁴ Since data inputs can be uncertain, we recommend a sensitivity analysis that varies key inputs

Table 6: Comparing benefits and costs of creating a new site offering forest recreation

Economic impacts (2018–2037)	"Primitive" scenario (2016 SEK)	"Extensive" Scenario (2016 SEK)
BENEFITS		
Improved health	- ^a	
Increased tax revenue	- ^a	
Recreation value ^b	219,788,000	329,683,000
COSTS^c		
Land purchase, clean up & enhancement (2017) ^b	13,018,000	
Maintenance (annual)	310,000	
Total	13,328,000	
Social profitability (benefits – costs)	206,460,000	316,355,000

Note: a Not included in analysis.

b Measured as net present value of the flow of impacts (benefits & costs) from approximately 2018 to 2037. Present value based on 4% discount rate and a 20 time horizon.

c Net present value of costs is based on spreading out the upfront costs associated with land purchase, clean up, and site enhancement to an annualized amount and then adding the annual maintenance costs.

5.4 Discussions and conclusions 1: Priority-setting

There are several types of benefits associated with improved recreation access and several methods for quantifying these benefits. The estimation of total benefits of opening a site is dependent on data about future expected visits to the site. Besides survey approaches, an increasingly popular approach is to rely on "user counters" that are hidden at trailheads.

The recreation value estimated in this study is dependent on an earlier study that may not entirely capture the full range of values at a hypothetical site like Bynäset, which is why a primary valuation study would be better, but more expensive. For example, the relied-upon study only captures "use value." This means that any value that people may hold for the simple existence of the Bynäset site – independent of whether a person actually visits – is not included here. Further, this approach may underestimate the true value of Bynäset since it does not explicitly capture use values associated with water-based recreation like kayaking, boating or swimming which are relevant at Bynäset. However, this approach may *overestimate* value since we assume that all the visitors to Bynäset do *not* consider "substitute sites" (i.e., alternative places

to pursue forest recreation). If they do in fact visit other sites, our values may overestimate total value (see Arhus study consideration of substitute sites).

The net social benefit (benefit minus costs) is relatively easy to calculate, given accurate cost figures. In the absence of cost figures (which may be difficult to project), one can assume that the total costs of investment should be below “X” for the project to generate net social profits (where X is present value of costs).

5.5 Illustration 2: Using economic values to address user conflict (Instrument design)

Developing a separate network of trails in a mountain bike park, which would be designed “by and for” cyclists, could improve both the biking experience and the welfare of non-bikers who may be negatively affected from meeting a biker on the trail (Chiu and Kriwoken 2003; Koemle and Morawetz^[1]_{SEP} 2016; Sever and Verbic 2018). The incentive-based approach may improve net welfare, depending on the comparison of up-front investment costs to future recreation benefits. We briefly illustrate how economics can help inform an approach for financing a special use area. We address four key questions:

5.5.1 1 Why create a mountain bike park?

The motivation might be to reduce conflict (Preez and Lee 2016) or simply to meet demand for an increasingly popular activity. Other possible motivations may be to generate income, to ensure a durable and sustainable trail network and/or to improve safety (e.g., by reducing the risk of collision with other users).

5.5.2 2 What are the costs of building a mountain bike park?

The cost of a mountain bike trail depends on the design and local factors like access for trail building machines, cost of gravel, etc. A typical trail might cost between 200–400 SEK per meter (2–4 mil. SEK per 10 km), although highly-stylized trails can be up to 700 SEK per meter (Olofsson 2018). A trail network requires signage, maps, and an employee(s) to maintain the trail, monitor use and undertake enforcement to prevent “free riding.” A typical 10–25 km trail network that requires attention for 5 summer

months, might cost around 1 million SEK (wages and supplies), plus an annual maintenance roughly equivalent to 5% of this cost (or around 50,000 SEK, but this assumes a large enough network of trails to make this cost scale-able).

5.5.3 2 *What values may be generated for this user group?*

According to an experienced trail builder in Sweden, there are two key aspects that should be considered if the goal is to improve the user experience for mountain bikers (Olofsson 2018):

- *The trail network should be specially built for mountain biking.* This may include velodrome-like “banked” turns, bridges to ensure rider “flow”, gravel to cover wet areas, obstacles to provide a challenge, etc. The trail network should be well thought-out and provide for a variety of different abilities and ages (see also Koemle and Morawetz 2016).
- *The trail network should include local complementary services* in the direct vicinity of the trail network including parking, bike washing, bathrooms, etc. Further, if the goal is to generate income for local business rather than just improve the welfare of local users, then other services may also be needed like hotels, restaurants, bike rentals, etc.

The economics literature suggests that users may be willing to pay for these improvements (Atkinson and Whitehead 2015). For example, Fix and Loomis (1998) examined a “popular and spectacular” mountain bike destination in the US and found a willingness to pay of between 205 and 235 USD to visit the site. Alleyne (2008) showed that mountain bikers in San Francisco were willing to travel 15–45 minutes longer per trip (and pay 3 to 5 USD more) to gain access to trails with less crowding. Similarly, Bakthiari (2014) showed that mountain bikers in Denmark were willing to travel 4 km longer (compared to an “average visitor”) to gain access to a forested area if it meant less trail congestion. Buchanan et al 1998 and Morey et al 2002 suggest that changes in the attributes of a mountain bike trail can impact a user’s welfare. An assessment of ecosystem services at risk in a fast-growing city (Umeå, Sweden) indicated through interviews that it was important to build new trails suited to mountain biking (Enetjärn 2015).

If economic studies and observed behavior suggest that users are willing to pay for specifically designed mountain biking trails that differ from unimproved trails, then this value could be captured and used to finance costly trail improvements. But, should users pay or should somebody else?

5.5.4 4 *Distributional impacts: Who should pay?*

There are several ways of paying for these investments. Taxpayer funds could finance a mountain bike park as this could, in theory, improve the welfare of both hikers (who avoid collisions with bikers and enjoy a quieter hiking trail) and cyclists (who avoid congestion and gain access to “improved” trails). Alternatively, the mountain bike users themselves could pay. A third option could be that local businesses who stand to “win” could agree to tax themselves to finance the improvements. *But who wins and who loses under these alternatives?*

The question of “who should pay” addresses not only economic efficiency (by finding welfare-improving outcomes), but also raises philosophical questions about access and fairness. For example, the right of access to nature in Nordic countries has traditionally fell to the user, rather than the landowner through the system of “All Man’s Right”. The Nordic approach assumes that the user owns the resource and he/she (or the state, through taxpayer funds) does not need to compensate the landowner for access. In contrast, a “user pays approach,” which is more common in the US, assumes that ownership of the resource lies with the landowner (public or private) who must receive compensation for granting access.

Despite the long-established tradition, some Nordic recreation sites are experimenting with “user pays” approaches. Privately owned cycling and cross-country ski tracks have long charged users in Nordic countries,²⁵ but recently public facilities have started to do the same. The City of Östersund’s ski track has, since 2016, required payment for “early” access to artificially-produced snow on regularly-maintained trails until late December when other fee-free tracks open with natural snow. Interestingly, the daily user fee at this track increased from 40 to 60 SEK in 2017, and now applies for the entire winter period.

²⁵ See e.g., Trysil (Norway), Gotland Bike Park (Sweden), Högbo brukand (Sweden), Orsa Grönklipp (Sweden) or Skovhuggeren (Denmark).

5.6 Discussion and conclusions 2: Instrument design

User conflicts are common, but in some cases welfare may be improved by investing in special access areas to reduce conflict and improve the welfare of all users. The financing of these types of special use areas is of course a political decision – but as discussed above, economics can highlight hidden assumptions underlying alternative approaches and also shed light on “who wins and who loses” under alternative financing mechanisms.

Today, taxpayers in Nordic countries often contribute to the construction of hockey rinks, sporting fields, horse riding centers, etc, which tend to be concentrated in urban areas. An alternative way to contribute to sports is through investment in urban nature recreation via multiple (and geographically spread) sites that generate welfare benefits. Both approaches require investment, but may generate different values per user, depending on preferences of local residents and out of town visitors.

If a “user pays” approach is to be considered, then it is important that the user be offered an *improved* experience relative to the status quo – otherwise their willingness to pay is likely to be very small and the scheme will likely be rejected. Further, if a “user-pays” site is driven commercially rather than with public funds, then it will likely require a higher level of service and amenities.

Economics can help identify impacts on different user groups. But whether or not cyclists in Bynäset will pay for access is, of course, an empirical question and should be assessed at the local level in Östersund, where both evolving social norms and user preferences affect recreation value. A more detailed analysis of how an economic instrument could be applied at Bynäset would require data collection on e.g., user preferences for trail attributes, willingness to pay on the local level, the potential number of users, and a robust plan that identifies costs, benefits, and possible financing options. These data, together with input from political leaders, could inform a dialog about pricing and economic value.

6. Case study 3: Aarhus, Denmark

This case study focuses on valuing new recreation areas for a growing city for the purpose of priority-setting.

6.1 Background

Aarhus is the second largest city in Denmark with two ambitious targets: (1) grow the city in terms of population and housing and (2) increase the quality and amount of nature areas.

By 2030, Aarhus anticipates additional 75,000 inhabitants, 50,000 housing units and 10–15,000 students.²⁶ In addition, the city council voted to double the total nature area in the municipality by 2030 from 20 km² to 40 km² (Aarhus Kommune 2008–2011; 2017) and to improve the quality of nature in the municipality (Aarhus Kommune, 2013).

Aarhus works with the following visions (Aarhus Kommune, 2013):

- to develop into a green energy and sustainable city that protects and enhances forests and open landscapes;
- to become a green municipality with more and better nature across open landscapes and forests;
- to be a front-runner municipality by developing new solutions and collaborating around nature management and nature restoration;
- to improve the conditions of nature and biodiversity;

²⁶ <https://www.aarhus.dk/da/aarhus/business-aarhus.aspx>

- to view nature as a valuable asset that contributes positively to the future development of the municipality; and
- to incorporate nature and biodiversity as a strengthening element in planning in relation to e.g., new residential areas, climate adaptation, green areas and outdoor recreation.

Aarhus seeks to combine nature management and nature restoration with urban development and adaptation to climate change. Current projects aiming for climate adaptation also provide rich opportunities for improved outdoor recreation and enhanced biodiversity through habitat restoration (e.g. Egå lake). Afforestation projects provide both improved access to recreation, enhanced groundwater protection (by reducing contamination from pesticide application for agriculture) and over time improved conditions for biodiversity.

Current land use patterns reveal a relatively low share of forest and other nature areas (14% compared to 23% nationally). Other relevant statistics from the municipality include:

- Protected area is 5% of total (10% nationally).
- Forest is 9% (13% nationally).
- Urban area is 30% (15% nationally).
- Agriculture is 56% (6% below national average); agriculture represents 80% of the non-urban area in the municipality compared with 73% at national scale.

6.2 Policy challenge

The municipality's ambitious goals for expanding nature areas provide multiple benefits – biodiversity, groundwater protection, recreation, attraction of new residents etc., but these require significant investments. Therefore, the municipality needs economic evidence to support the above-stated benefits in order to motivate implementation of such costly municipal-wide projects. This case study demonstrates how non-market services like recreation can be captured using economic valuation methods and how these can be integrated into decision-making to avoid the status quo: *the systematic undervaluing of recreation opportunities*. The results of this case study

provide the municipal administration with economic welfare estimates associated with creating new (and improving existing) recreation sites, which can aid them in priority setting and budget requests to support at least a portion of their policy goals.

6.3 Illustration: Applying economic values

6.3.1 *Economic valuation method*

The economic valuation approach applied to three case areas in Aarhus Municipality is a spatially explicit discrete choice model called the Random Utility Model (RUM). The RUM considers a user's travel cost to value recreation sites. The information from the model can help policy makers assess changes in value associated with e.g., changes in *access costs* for a recreation site, *elimination* of an existing recreation site due to e.g., contamination or policy changes, addition of a *new* recreation site and/or changes in *environmental quality* at a recreation site. The Travel Cost Method (TCM) is based on *observing the behavior* of recreation users regarding the choices they make from available and specific recreation sites. For example, TCM can capture the costs incurred in travelling to a forested site by car (gasoline, insurance, depreciation etc.) and the time spent travelling (e.g. by bike), which indicates a "price" of access to a site that users are willing to pay. The longer the distance that users travel to a site, the less frequently they will go due to the costs involved, all else equal. RUMs are based on the principle that the individual makes a choice among a set of available recreation sites, given a variety of site characteristics, where the choice is between a finite number of mutually exclusive alternatives.

The value of access to a recreation site is estimated based on the number of trips taken by a sample of individuals that face varying travel & time costs. This is similar to estimating peoples' willingness to pay for a market good based on the quantity demanded at different prices: the more expensive the good, the less it will be demanded. The RUM is based on the utility maximization premises, assuming that an individual will select a site that maximizes her utility, given the set of characteristics of the different sites in her choice set. Characteristics include elements such as travel distance, accessibility, infrastructure, size of site, type of nature within and around the site, the presence of freshwater on-site or coastal location. The method applied is

described in more detail in Termansen et al. (2013) and the approach is documented in Bjørner et al. (2014)

6.3.2 Survey data

The RUM/TCM model is applied to a national representative survey conducted by the Danish Economic Council in 2013, covering 2,475 nature sites, beaches and large urban parks across Denmark (Bjørner and Termansen 2014; DØRS 2014). 1,752 respondents were included, based on an internet panel data to ensure a representative national sample. Respondents were i.a. asked about the number of trips to nature areas during the past 12 months, and the destination of the last visit, which was selected by the respondent via an interactive map. Travel distances to visited and potential recreation sites within 125 km distance were calculated using shortest distance in the Danish road network. Running costs of travelling is assumed at 1.65 DKK/km (Bjørner & Termansen, 2014). Site characteristics of recreation areas are derived from the national map Basemap (Levin et al. 2012), comprising size of the area, ownership, presence of Natura2000 and freshwater, share of private forest ownership and pathways within the area. In order to scale up the frequency of visits and welfare per visit, we apply regression parameters on national data of the whole adult population at a 1x1km grid scale and their distances and costs related to reach the different sites. This results in an annual consumer surplus per site and total number of visits per site.

6.3.3 Case study sites

We select two cases to illustrate how this valuation approach can measure welfare gains associated with: (1) developing new recreation sites or (2) expanding existing sites in and around Aarhus city.

True Forest is a new state-owned forest, established in 1994 on agricultural land. Currently, the forest occupies 385 ha but expansion calls for a final size of 650 ha through voluntary purchase of agricultural land. The forest is located at the outskirts of Aarhus city and when afforestation plans are fully implemented it will, together with the recreation park Skjoldhøjken, provide a green corridor into Aarhus city. The case study assesses the welfare value of expanding the existing forest area.

Geding Forest is not yet established. It has been selected to be a new state-owned forest after an afforestation project aiming to protect groundwater resources from pesticide pollution associated with continued agricultural use. The area is located not far from True Forest and will be linked to the biologically valuable nature area Kasted moor. The proximity to the city and expansion of the nature area is expected to create a valuable extension of the existing recreation area. The case study assesses the welfare value of adding a new forested area to the set of existing nature areas for recreation in and around Aarhus city. Table 7 provides an overview of (expected) site characteristics of the True and Geding sites.

Table 7: Site characteristics of the two case areas, current and planned

	Area (ha)		Forest cover (%)		Freshwater	Natura2000 (%)	Pathway density (km/ha)	Privately owned forest
	Current	Plan	Current	Plan				
True	181	238	49	81	Yes	1,4	0,16	No
Geding	0	25	17	91	Yes	0,2	0,12	No

Figure 12 shows the location of the two case areas in relation to the city of Aarhus and other recreation sites in the municipality.

Figure 12: Existing and new recreation sites in Aarhus Municipality

Source: Levin et al (2012); SDFE (2015).

6.3.4 *Assessing the value of new sites*

The two sites of True Forest and Geding are incorporated into the Random Utility Framework by either adding new sites (Geding) to the choice set of recreation sites, or by changing the characteristics of existing sites (True Forest). The parameter values of demand for recreation and site preferences estimated based on the nationally representative respondents remain unchanged. The two sites are then included in the choice set for the full population, where the parameter values are applied to calculate the utilities and trip frequencies of visiting different sites, including the new or expanded sites.

The spatial explicit model ensures that as recreation areas expand or the numbers of recreation areas increase, the amount of recreation for the given population may not increase in total, but the distribution of trips across sites will change.

We include also an additional 75,000 inhabitants in Aarhus Municipality to reflect the expected population growth in the municipality by 2030. For ease of analysis, we distribute the additional inhabitants equally among the urban 1x1 km grids within the Municipality.

6.3.5 *Valuation results*

For both the new and existing sites, the valuation example provides an assessment of welfare and estimated number of visits per site per year. This enables insights into the welfare creation that peri-urban afforestation projects can produce in terms of recreation benefits, while taking into account substitution effects. As more recreation sites are established, recreation demand will be redistributed across more sites without growing. By including a scenario of population growth, these results also comprise a growing demand for recreation sites.

Table 8 gives an overview of valuation results with the two new sites and 75,000 additional inhabitants in the urban areas of the municipality. Results are provided in terms of yearly welfare per site per year, annual number of visits, and welfare per hectare. For comparison, values of other recreation sites in the municipality are presented as well.

While the site Geding is not yet established and as such has no recreation value, True is today comprised of three separate forest areas, that in future is planned to be connected and expanded by some 30% and forestation cover increased from the current 50% to 80%.

Interestingly, running the Random Utility Framework without the change to the current recreation choices and population growth, the three combined sites at True represent an annual recreation value of 8.8 mil. DKK while the planned expanded and connected site at True would be worth 43.6mio. DKK per year. True forest is estimated to host almost 1.7 mil. visits per year, an increase from the currently estimated 412,858 visits to the present three smaller sites in the area. Welfare generated per hectare would be among the highest in the municipality (183,526 DKK/ha), only exceeded by the urban coastal site Risskov (red colored site in Figure 13 below).

Geding is a far smaller site (25 ha) and estimated to generate 3.1 mil. DKK welfare and host close to 128,000 visits per year. The welfare per hectare generated is close to the average of the other sites in the municipality, despite the site being relatively small.

Table 8: Expected yearly recreation values and number of visits provided by the two case areas

Project	Annual welfare (DKK/yr)	Annual number of visits	Area (ha)	Annual welfare per ha (DKK/ha)
True	43,587,342	1,697,404	237.5	183,526
Geding	3,112,605	127,721	24.8	125,508
All other recreation areas	Avg: 11,416,932	Avg: 450,435	Avg: 91	Avg: 125,659
in Aarhus Municipality	Max: 78.6mio Min: 767,427	Max: 2.9mio. Min: 31,549	Max: 560 Min: 9	Max: 189,363 Min: 535

Figure 13: Recreation value and visits estimates of scenario with two new peri-urban recreation sites and 75,000 additional inhabitants in Aarhus municipality

Source: Own calculations. Maps: Levin et al (2012), SDFE (2015).

Levin, G., M.R. Jepsen og M. Blemmer (2012): BASEMAP: Technical documentation of a model for elaboration of a land-use and land-cover map for Denmark. Technical Report from DCE – Danish Centre for Environment and Energy No. 11. Aarhus University.

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6.4 Conclusions

The spatially explicit monetary estimates of recreation values associated with urban and peri-urban sites and parks provide important information for local decision-makers and managers, including: (1) the importance of recreation to the local population; (2) the large value differences across sites; and (3) the welfare impacts in monetary terms of changing site characteristics or establishing entirely new sites. This type of

information within a municipal administration may help in priority-setting and support budget requests to further enhance and develop outdoor recreation opportunities.

Given the rapid growth in the city of Aarhus, together with a shift in activity trends, the municipality is actively pursuing a strategy of using outdoor recreation sites as substitutes and complements to sports facilities in town (Aarhus Municipality, personal communication). The use of urban and peri-urban nature sites for recreation is therefore likely to increase more than predicted by this model.

The values estimated by this model are conservative as they omit the opportunity cost of time that people spend to get to the sites. Also, the model only includes larger urban parks (>5ha), thus excluding values associated with small urban green areas.

The discrete choice framework is a flexible but data-intensive approach to obtain welfare and visit frequencies at site levels in different spatial locations, and it can be used to assess the value of changing site attributes and introducing new recreation sites. It is based on (self-reported) revealed behavior of users and thus avoids issues with hypothetical valuation approaches.

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Sammendrag

De nordiske landene fortsetter å oppleve økt migrasjon til og vekst av store og mellomstore byer. Større byområder gir fordeler som økonomisk vekst, men fører også til økonomiske kostnader i form av miljø- og helseeffekter. Byplanleggere står overfor en avveining mellom fordelene med økonomisk vekst og (ofte ikke-markedsmessige) goder som økosystemtjenester fra byområdene. Siden verdien av disse økosystemtjenestene er vanskelig å anslå, blir de ofte utelatt fra beslutningsprosessene. For eksempel, når verdier knyttet til kulturelle økosystemtjenester som fotturer og sykkelturner ikke er synlige for beslutningstakerne, kan disse aktivitetene ignoreres og prioriteres bort til fordel for arealbruk der verdiene er enklere å beregne og mer synlige (for eksempel boligbygging).

Denne rapporten fokuserer på naturbasert rekreasjon i byområder, det vil si utendørsaktiviteter som kan utføres av bybeboere på vanlige dager uten å reise så langt at en må overnatte – og fremhever økonomiske verdsettingsmetoder og data som kan bidra til å anslå velferdseffektene fra slike aktiviteter. Tre case-studier fra byene Oslo, Östersund og Århus illustrerer hvordan man kan estimere og deretter integrere informasjon om økonomiske verdier, slik at de blir mer synlige i beslutningsprosessen. Denne informasjonen kan hjelpe beslutningstakere til bedre å vurdere avveininger i nytte-kostnadsanalyser og arealplanlegging, ikke minst i byområder der konkurransen om arealene er intens.

Rapportens tilnærming vektlegger tre aspekter ved verdsetting av urban naturbasert rekreasjon. For det første identifiseres det to generelle kategorier av relevante økonomiske effekter: (1) markedsbaserte økonomiske effekter (f.eks. penger rekreasjonsutøvere bruker på reiser, sportsutstyr, mat osv.) og (2) de bredere, ikke-markedsbaserte velferdseffektene (f.eks. forbedringer i et individs helse og velvære). Mens førstnevnte kan være politisk viktig på lokalt nivå, inkluderer disse effektene kun markedsvirkninger og dekker i beste fall bare deler av den totale samfunnsøkonomiske verdien. Ved å beregne de økonomiske verdiene også for de bredere velferdseffektene, blir det enklere for byplanleggere å sammenligne dem med kostnadene ved å investere i rekreasjon eller å unngå de negative virkningene på rekreasjon.

For det andre, beskrives et rammeverk for vurdering av velferdseffekter fra urban naturbasert rekreasjon som inkluderer hele spekteret av rekreasjonsmuligheter - fra bysentrum (urbane parker) til periferien ("villmarks-lignende" områder) – samt både tilbud av og etterspørsel etter rekreasjonsmuligheter. Hensikten er å lage en tilnærming for å vurdere ulike faktorer som kan påvirke tilbud og etterspørsel, og bidra til å gi en kontekst for de økonomiske verdiene som beregnes i case-studiene.

For det tredje understreker rapporten behovet for data for å anvende rammeverket, inkludert: (1) informasjon om hvordan folk verdsetter naturbasert rekreasjon i byområder (dvs. det som kalles konsumentoverskudd) og (2) informasjon om antall personer som deltar i en gitt aktivitet i et gitt område. Disse typene økonomiske data - både kvantitative data (f.eks. antall brukere, reisekostnader osv.) og kvalitative (f.eks. brukerpreferanser for egenskaper ved ulike rekreasjonsområder) – kan samles på en rekke måter, inkludert gjennom undersøkelser på stedet eller automatiske tellemaskiner, generelle befolkningsundersøkelser, og nyere metoder som er avhengige av GPS-enheter som brukerne kan ha på seg eller mobiltelefondata.

Case-studien fra Oslo demonstrerer verdsetting av offentlige grønne områder langs den urbane gradienten fra gater med trær til villmarksområder i utkanten av byen. De lave reise- og utstyrs kostnadene som trengs kombinert med allemannsretten betyr at økonomiske verdsettingsmetoder kun dekker en liten andel av rekreasjonsverdien. Studien viser hvordan antall besøk og tid brukt på stedet kan gi ikke-monetære indikatorer på etterspørsel som kan være nyttige for forvaltningen når de skal spore trender i total rekreasjonsbruk på overordnet nivå.

Case-studien fra Östersund fremhever to måter der økonomisk innsikt kan bidra til forvaltningen av et bestemt rekreasjonsområde. Det første eksemplet illustrerer hvordan en by kan måle og sammenligne investeringskostnader som må tas med en gang med en fremtidig strøm av (ikke-markedsmessige) rekreasjonverdier, før de bestemmer seg for å investere i et gitt rekreasjonsområde. Det andre eksemplet illustrerer hvordan investering i og forvaltning av et spesialbruksområde kan generere "merverdi" og potensielt redusere brukerkonflikt, i dette tilfellet knyttet til terrengsykling.

Case-studien fra Århus illustrerer bruken av økonomisk verdsetting for å øke bevisstheten om mulige verdier for å utvide tilbudet av rekreasjonsmuligheter på kommunalt nivå. Studien er avhengig av en mer kompleks nytteoverføringsmetode basert på hvor langt brukerne reiser til et gitt rekreasjonssted, gitt de urbane

rekreasjonsvalgene de har tilgjengelig. Resultatene tyder på en betydelig økning i velferd fra både utvidelse av eksisterende rekreasjonsområder og etablering av nye.

Rapporten konkluderer med forslag til måter en kan gå videre. For det første konkluderes det at økonomiske verdier sjelden bidrar til rekreasjonsplanlegging slik situasjonen er i dag, i hvert fall for i de tre case-byene. For å bedre integrasjonen av disse verdiene mer generelt, foreslår rapporten ytterligere undersøkelser av de monetære og ikke-monetære verdiene av urbane grønne områder. Det er viktig å begynne med å samle inn grunnleggende brukerdata for bedre å forstå rekreasjonsmønstre og – preferanser, som deretter kan kombineres med økonomiske verdsettingsmetoder for å dokumentere samfunnsøkonomiske velferdseffektene forbundet med aktiviteter som for eksempel fotturer, sykling, skiturer og padling. Når disse effektene synliggjøres bedre vil beslutningstakere ha et bedre grunnlag for å balansere økonomisk vekst og utvikling med negativ påvirkning på urbane økosystemtjenester.

Til slutt gir rapporten i Vedlegg A eksempler på ressurser som interesserte lesere kan undersøke nærmere.

Appendix

Resources to support benefit transfer in Nordic countries: A plethora of resources exist today to support the use of benefit transfer.

Valuation databases:

- ValueBase^{SWE}, the Swedish Valuation Study Database for Environmental Change in Sweden (www.beijer.kva.se/valuebase.htm).²⁷
- Swedish unit value database on values and prices of environmental and nature goods (Jordbruksverket, 2017).
- Danish unit value database on values and prices of environmental and nature goods (COWI, 2014).²⁸
- EVRI database, a primarily North American Environmental Valuation Reference Inventory (www.evri.ca).
- ENVALUE, the Australian Environmental Valuation Database (www.epa.nsw.gov.au/envalue).
- NEVD, a Nordic database of valuation studies (TemaNord 2007:518).²⁹
- Recreation Use Values Database, is updated in 2016, focusing on North American outdoor recreation studies.³⁰

²⁷ an update of the original 2004 database can be found under: <http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Samhallsekonomska-analyser/Miljoekonomi/Miljovardering/ValueBaseSWE/>

²⁸ <http://mfvm.dk/miljoe/miljoeoekonomiske-noegletal/>

²⁹ <http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Samhallsekonomska-analyser/Miljoekonomi/Miljovardering/ValueBaseSWE/>

³⁰ <http://recvaluation.forestry.oregonstate.edu/database>

Relevant literature summaries:

- TemaNORD 2017:522: summarises literature on economic values from natural and cultural heritage in Nordic Countries. See Appendix 1 for a nearly non-complete list.
- Zandersen et al (2018): a current review of recreation valuation studies from Denmark.
- Söderqvist & Wallström (2017): report and database on socio-economic prices and values for environment and nature goods.³¹
- Jordbruksverket (2017): report and database on prices for socio-economic assessment of environmental and nature goods.³²

Benefit transfer guidelines:

- Barton (2007) provides guidelines and interpretations for understanding when a benefit transfer is defensible as does Johnston et al. (2015) criteria to consider for benefit transfer.

³¹ <http://www.naturvardsverket.se/stod-i-miljoarbetet/vagledning/samhallsekonomisk-analys/berakna-med-schablonvarden/>

³² <http://webbutiken.jordbruksverket.se/sv/artiklar/ra1712.html>

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Nordic urban nature recreation

The Nordic countries continue to experience growth of urban areas, which provides benefits like economic growth, but also imposes economic costs in terms of reduced ecosystem services. This report focuses on urban nature recreation and highlights economic methods and data that can help capture the associated nonmarket welfare benefits. The study stresses the need to collect user data to better understand visitation patterns, which can be combined with valuation methods to provide evidence of economic benefits associated with e.g., hiking, cycling, skiing, paddling and other recreation activities. Once these benefits are visible, decision-makers will have a better basis to balance economic growth with the environmental costs it imposes on urban ecosystem services.

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