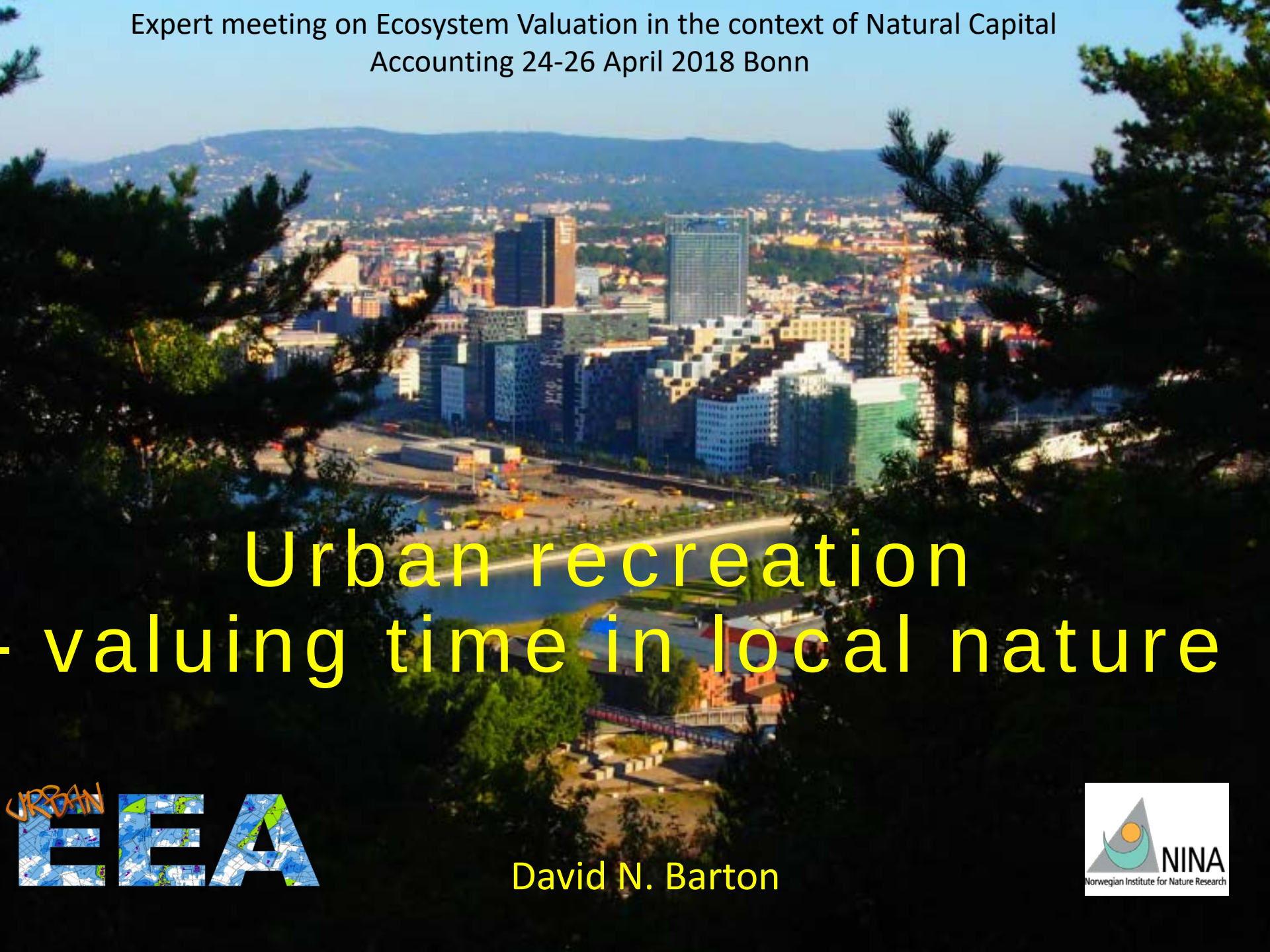
Expert meeting on Ecosystem Valuation in the context of Natural Capital Accounting 24-26 April 2018 Bonn



# Urban recreation - valuing time in local nature

David N. Barton

# Recreation time in local nature

Photo: David N. Barton

Input to SNA benefit: Labour input to subsistence berry and mushroom picking

Input to non-SNA benefit: Labour input to human physical subsistence & psychological maintenance (…«Vitamin G»)

Input to SNA benefit: Labour input to construction & maintenance of recreation infrastructure

# Oslo urban ecosystem


Legend
- water
- tree
- mire
- grass
- development
- agriculture

Source: Map by M. Nowell, Sentinel-2 data

Total area: 454 km$^2$ - 287 km$^2$ forest - 28 km$^2$ green space in built zone. Human population 666 000

# Accounting for recreation time across urban ecosystem gradient

Marka
old growth
forests

Marka
mixed use
forests

Marka forest
access
areas

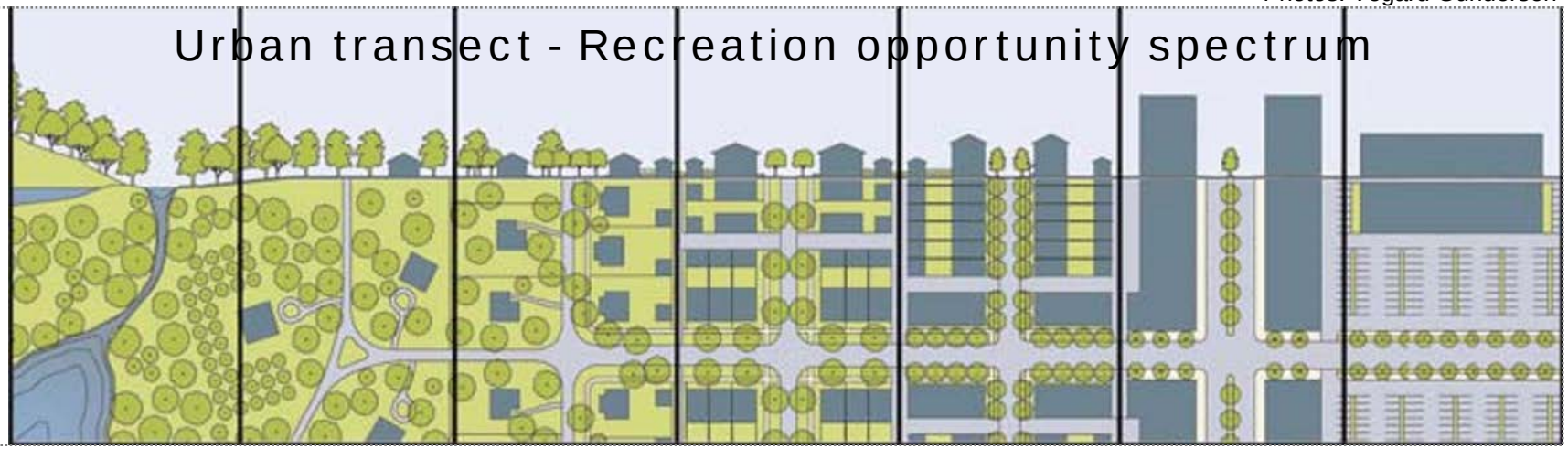
Nature areas
in built zone

Parks & cemetaries
in the built zone

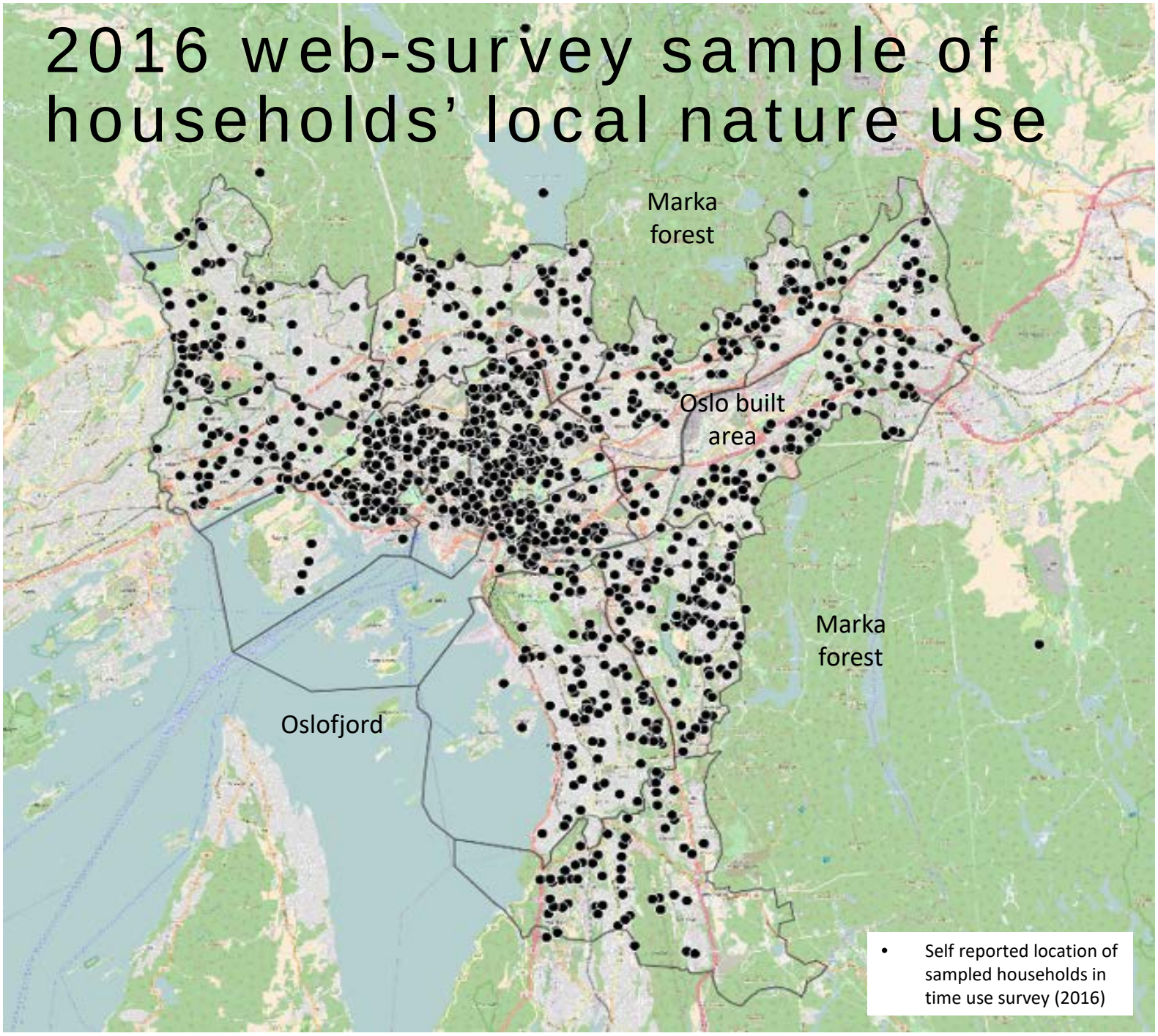
Streets with trees

Photos: Vegard Gundersen

## Urban transect - Recreation opportunity spectrum



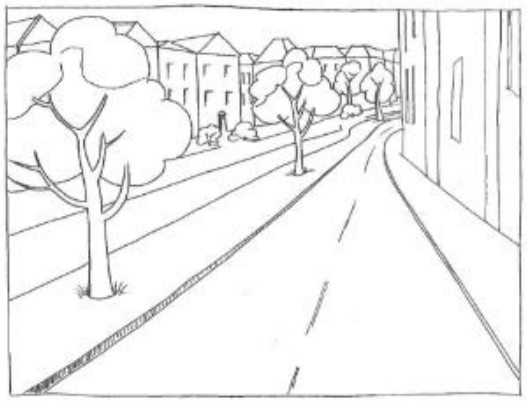
# 2016 web-survey sample of households' local nature use




86% of adult population >15 yrs (450 000 people)

visit Marka at least once a year

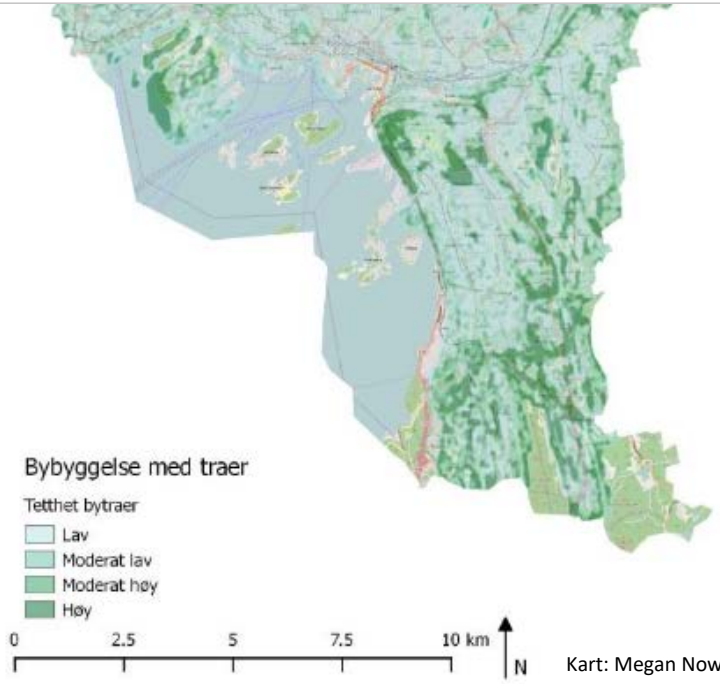
(Synnovate 2011)



**Hvor ofte har du tatt en tur for turen skyld i bebyggelse med trær de siste 12 månedene? (dvs. ikke bare som transportetappe). Sett kun ett kryss for hver årstid.**

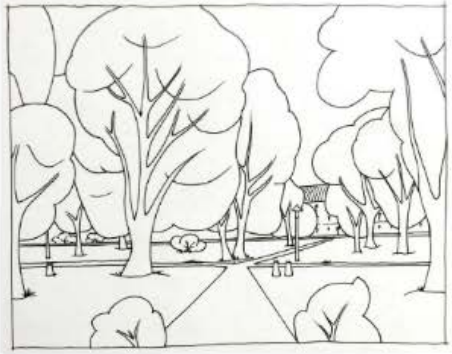
| | Daglig | Ukentlig | Månedlig | Sjeldnere | Aldri |
|---|---|---|---|---|---|
| Sommer 2016: juni-august | ○ | ○ | ○ | ○ | ◉ |
| Vår 2016: mars-mai | ○ | ○ | ○ | ○ | ◉ |
| Vinter 2015/16: desember-februar | ○ | ○ | ○ | ○ | ◉ |
| Ifjor høst 2015: september-november | ○ | ○ | ○ | ○ | ◉ |

**Bebyggelse med trær**– Dette er i bebygde områder i byen som inneholder enkelttrær eller små grupper av trær og busker. Det kan være gatemiljø, bakgård, plasser eller andre steder med offentlig tilgang. Du vil normalt møte svært mange andre mennesker.




Kart: Megan Nowell. Lidar data fra PBE

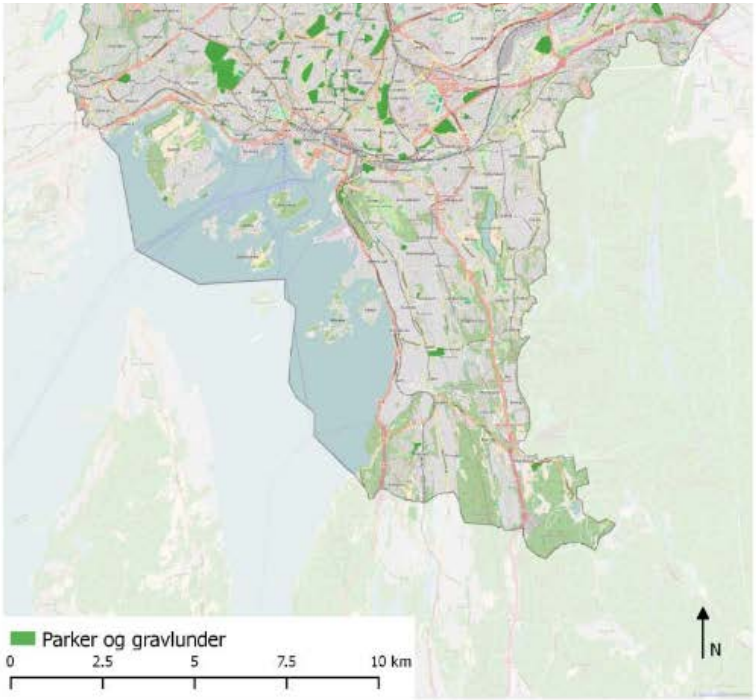
**Hvor ofte har du tatt en tur for turen skyld i bebyggelse med trær de siste 12 månedene? (dvs. ikke bare som transportetappe). Sett kun ett kryss for hver årstid.**



| Visitation distribution per season | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 7,4 % | 34,1 % | 28,0 % | 20,5 % | 10,1 % |
| Summer | 5,7 % | 26,5 % | 31,4 % | 25,1 % | 11,3 % |
| Autumn | 3,5 % | 13,7 % | 20,8 % | 40,8 % | 21,1 % |
| Winter | 4,7 % | 20,4 % | 25,9 % | 33,4 % | 15,6 % |

Source: NORSTAT data OSLOpenNESS

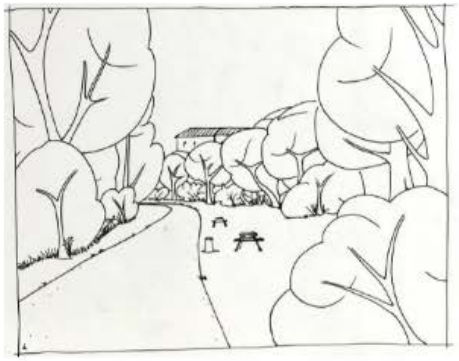
**Parker** – Dette er grøntområder som er opparbeidet, tilrettelagt og forvaltet av kommunen, inkludert kirkegårder. Det kan være varierende innhold av trær, hekker, blomsterbed, dammer og åpne plenarealer. Du vil oftest treffe mange andre besøkende.




Kart: Megan Nowell. Data Bymiljøetaten

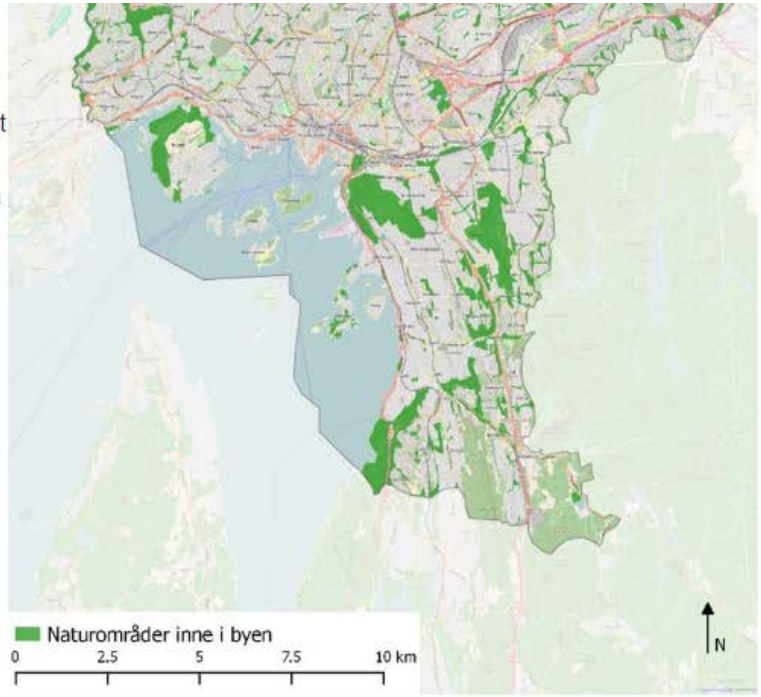
**Hvor ofte har du tatt en tur i parker de siste 12 månedene? Sett kun ett kryss for hver årstid.**

| | Daglig | Ukentlig | Månedlig | Sjeldnere | Aldri |
|---|---|---|---|---|---|
| Sommer 2016: juni-august | ○ | ○ | ○ | ○ | ◉ |



| Visitation distribution per season | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 6,1 % | 31,9 % | 28,8 % | 22,5 % | 10,7 % |
| Summer | 4,8 % | 26,6 % | 32,5 % | 25,1 % | 11,1 % |
| Autumn | 2,8 % | 14,9 % | 24,8 % | 39,2 % | 18,4 % |
| Winter | 4,1 % | 20,4 % | 29,4 % | 31,5 % | 14,7 % |
| Source: NORSTAT data OSLOpenNESS | | | | | |

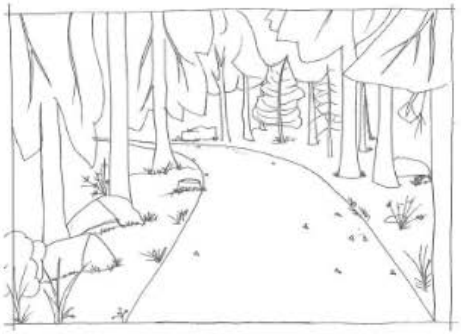
**Naturområder inne i byen** – Områdene ligger blant bebyggelsen. De består av naturlig vegetasjon, ofte trær, og som oftest i ulik alder. Områdene kan være godt tilrettelagt med turveier eller gang- og sykkelveier, informasjon og annen service til de besøkende, og også inkludere strandarealer mot vann og sjø. Skogene bærer ofte preg av stor bruk, med stier og snarveier på kryss og tvers. Du vil ofte treffe mange andre besøkende.




Kart: Megan Nowell. Data Bymiljøetaten

**Hvor ofte har du tatt en tur i naturområder inne i byen de siste 12 månedene? Sett kun ett kryss for hver årstid.**

| | Daglig | Ukentlig | Månedlig | Sjeldnere | Aldri |
|---|---|---|---|---|---|
| Sommer 2016: juni-august | ○ | ○ | ○ | ○ | ◉ |

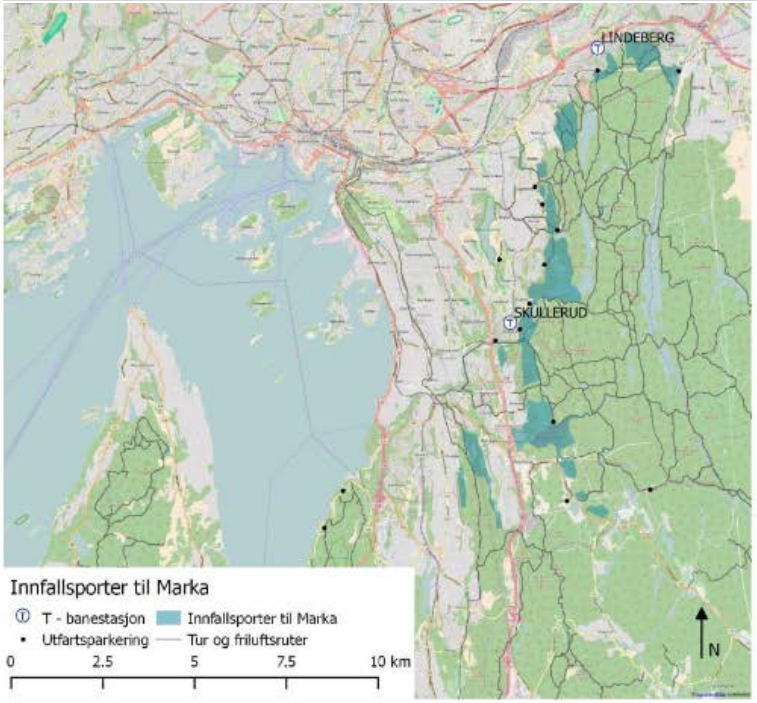


**Visitation distribution per season**

| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 3,3 % | 22,6 % | 32,8 % | 24,6 % | 16,9 % |
| Summer | 2,7 % | 21,1 % | 33,4 % | 24,9 % | 18,0 % |
| Autumn | 2,0 % | 16,3 % | 25,5 % | 33,1 % | 23,1 % |
| Winter | 2,4 % | 19,0 % | 29,6 % | 30,2 % | 18,8 % |

Source: NORSTAT data OSLOpenNESS

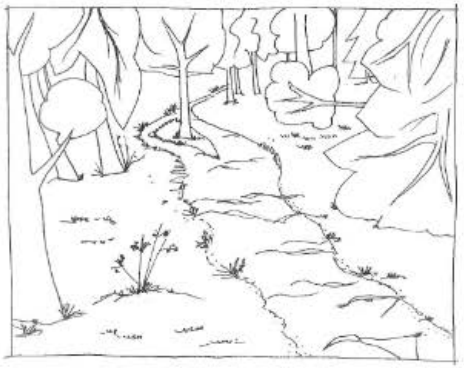
**Innfallsporter til Marka** – Dette er skogsområder som ligger nær Markagrensa og hvor det er høyere grad av tilrettelegging for idrett og friluftsliv enn lenger inn i Marka. I de bynære områdene av Marka er det flere innfallsporter hvor du vil finne kollektivholdeplasser, parkeringsplasser, gangveier, serveringssteder og mindre anlegg for en rekke ulike aktiviteter(f.eks alpint, aking, klatring). I denne sonen vil du treffe mange andre besøkende som utøver ulike former for friluftslivsaktivitet.




Kart: Megan Nowell. Data Bymiljøetaten

**Hvor ofte har du tatt en tur i innfallsporter til Marka de siste 12 månedene? Sett kun ett kryss for hver årstid.**

| | Daglig | Ukentlig | Månedlig | Sjeldnere | Aldri |
|---|---|---|---|---|---|
| Sommer 2016: juni-august | ○ | ○ | ○ | ○ | ◉ |

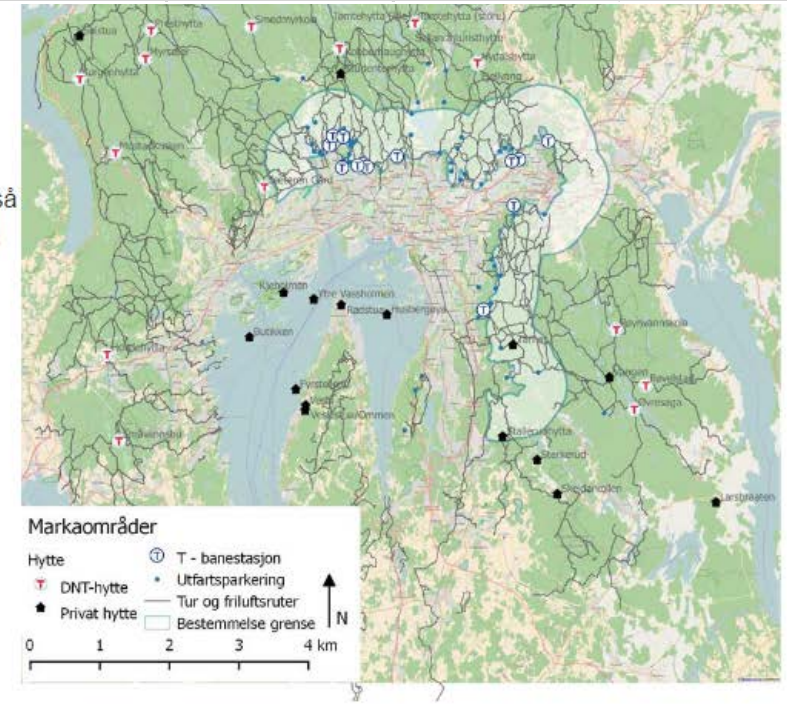


**Visitation distribution per season**

| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 2,1 % | 15,7 % | 24,8 % | 30,6 % | 26,8 % |
| Summer | 1,6 % | 14,1 % | 23,3 % | 32,6 % | 28,4 % |
| Autumn | 1,4 % | 11,2 % | 19,3 % | 32,7 % | 35,5 % |
| Winter | 1,6 % | 12,5 % | 22,7 % | 32,6 % | 30,6 % |

Source: NORSTAT data OSLOpenNESS

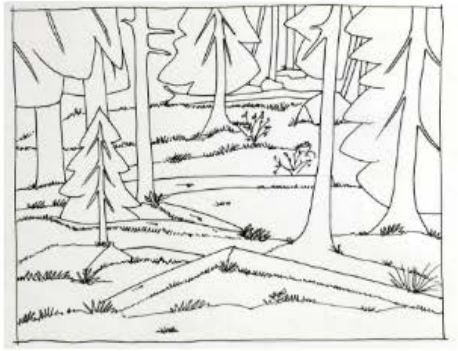
**Markaområder utenom innfallsporter**- Deler av de sammenhengende skogsområdene lenger inn I Marka innehar enkel tilrettelegging som merkede stier og løyper, lysløyper, bruer og klopper, gapahuker, serveringssteder osv. På grunn av skogsdrift er det også mange skogsbilveier innover i Marka. Du vil som oftest treffe andre besøkende som utøver ulike former for friluftslivsaktivitet.




Kart: Megan Nowell.

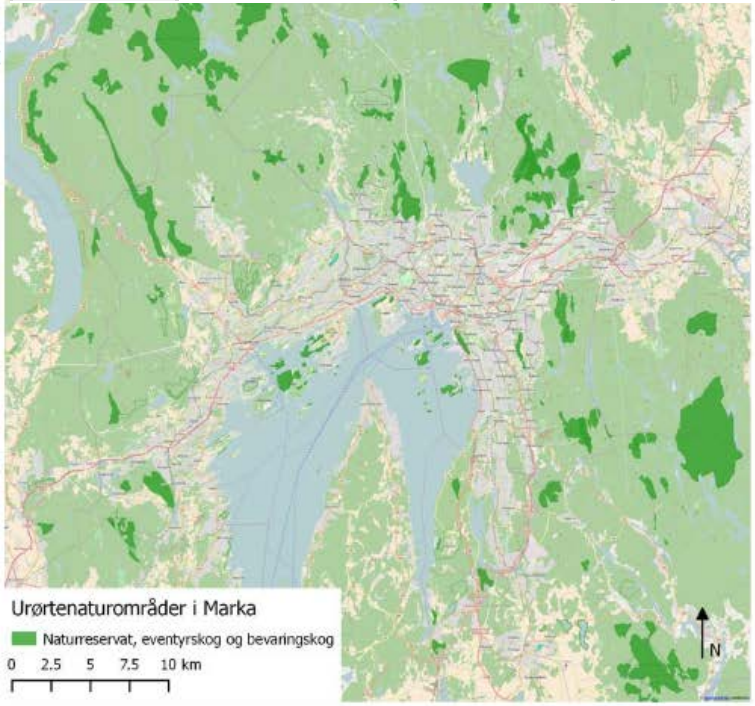
**Hvor ofte har du gått tur i Markaområder de siste 12 månedene (utenom innfallsport-områdene)? Sett kun ett kryss for hver årstid.**

Daglig Ukentlig Månedlig Sjeldnere Aldri



**Urørte naturområder i Marka** - Dette er områder lengst fra inngrep i Marka og der naturen stort sett får gå sin gang. Områdene er ofte vernet og innehar få spor etter menneskelig aktivitet. Det er ingen tilrettelegging annet enn tråkk og noen få merka stier, og du vil sjelden treffe andre besøkende.

| Urørte naturområder i Marka | | | | | |
|---|---|---|---|---|---|
| **Visitation distribution per season** | | | | | |
| | Daily | Weekly | Monthly | More seldom | Never |
| Spring | 0,7 % | 4,5 % | 13,7 % | 29,6 % | 51,4 % |
| Summer | 0,6 % | 3,2 % | 12,3 % | 29,8 % | 54,1 % |
| Autumn | 0,7 % | 3,3 % | 8,4 % | 28,9 % | 58,8 % |
| Winter | 0,7 % | 3,5 % | 11,5 % | 28,4 % | 55,9 % |

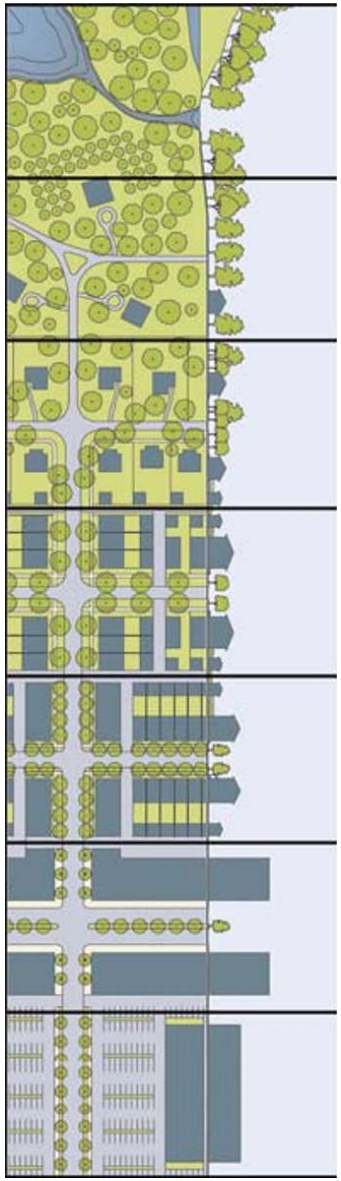



Kart: Megan Nowell..
Data: Naturbase og Naturvernforbundet

**Hvor ofte har du tatt en tur utenfor stier og veier i urørte naturområder i Marka de siste 12 månedene? Sett kun ett kryss for hver årstid.**

| | Daglig | Ukentlig | Månedlig | Sjeldnere | Aldri |
|---|---|---|---|---|---|

# Urban ecosystem transects



Marka old growth forests

Marka mixed used forests

Access areas to Marka

forest

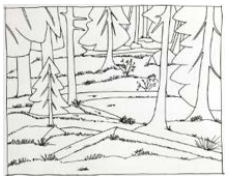
built zone

Nature areas in city

Parks & cemeteries

Streets with streets

# Relative recreation frequencies per season per ecosystem transect



**Visitation distribution per season**

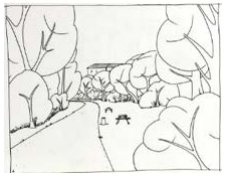
| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 0,7 % | 4,5 % | 13,7 % | 29,6 % | 51,4 % |
| Summer | 0,6 % | 3,2 % | 12,3 % | 29,8 % | 54,1 % |
| Autumn | 0,7 % | 3,3 % | 8,4 % | 28,9 % | 58,8 % |
| Winter | 0,7 % | 3,5 % | 11,5 % | 28,4 % | 55,9 % |

**Visitation distribution per season**

| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 2,1 % | 15,7 % | 24,8 % | 30,6 % | 26,8 % |
| Summer | 1,6 % | 14,1 % | 23,3 % | 32,6 % | 28,4 % |
| Autumn | 1,4 % | 11,2 % | 19,3 % | 32,7 % | 35,5 % |
| Winter | 1,6 % | 12,5 % | 22,7 % | 32,6 % | 30,6 % |

**Visitation distribution per season**

| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 3,3 % | 22,6 % | 32,8 % | 24,6 % | 16,9 % |
| Summer | 2,7 % | 21,1 % | 33,4 % | 24,9 % | 18,0 % |
| Autumn | 2,0 % | 16,3 % | 25,5 % | 33,1 % | 23,1 % |
| Winter | 2,4 % | 19,0 % | 29,6 % | 30,2 % | 18,8 % |



**Visitation distribution per season**

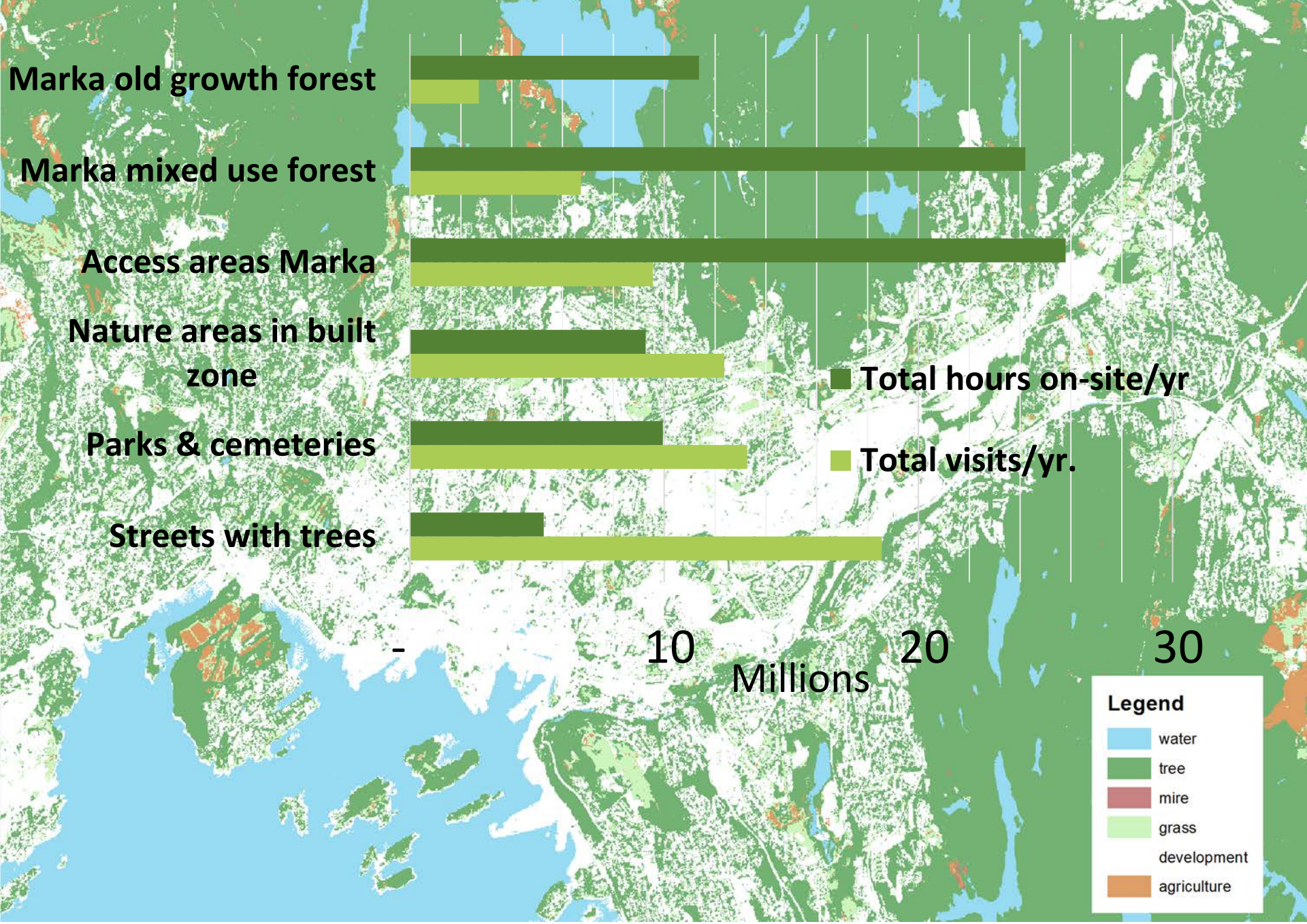
| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 6,1 % | 31,9 % | 28,8 % | 22,5 % | 10,7 % |
| Summer | 4,8 % | 26,6 % | 32,5 % | 25,1 % | 11,1 % |
| Autumn | 2,8 % | 14,9 % | 24,8 % | 39,2 % | 18,4 % |
| Winter | 4,1 % | 20,4 % | 29,4 % | 31,5 % | 14,7 % |

**Visitation distribution per season**

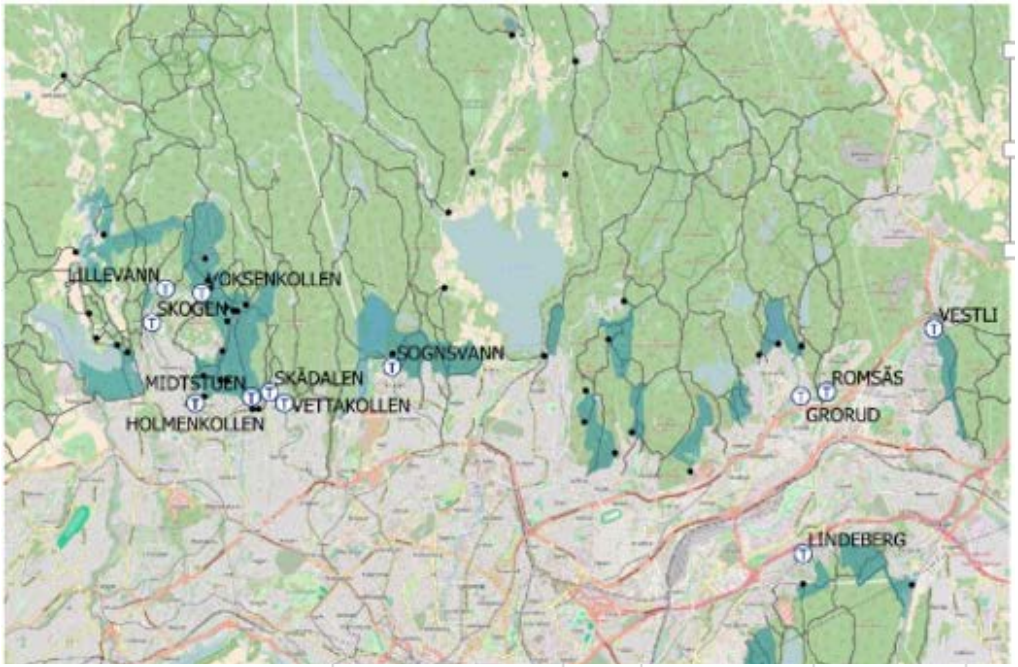
| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 7,4 % | 34,1 % | 28,0 % | 20,5 % | 10,1 % |
| Summer | 5,7 % | 26,5 % | 31,4 % | 25,1 % | 11,3 % |
| Autumn | 3,5 % | 13,7 % | 20,8 % | 40,8 % | 21,1 % |
| Winter | 4,7 % | 20,4 % | 25,9 % | 33,4 % | 15,6 % |

**Visitation distribution per season**

| | Daily | Weekly | Monthly | More seldom | Never |
|---|---|---|---|---|---|
| Spring | 10,8 % | 38,4 % | 24,0 % | 15,6 % | 11,2 % |
| Summer | 9,3 % | 34,6 % | 27,7 % | 17,7 % | 10,8 % |
| Autumn | 6,4 % | 23,3 % | 25,2 % | 27,6 % | 17,6 % |
| Winter | 8,1 % | 30,6 % | 27,7 % | 20,7 % | 12,9 % |




*Data on trip durations on-site transferred from other local studies.




# Urban transect: access areas to Marka peri-urban forest

Comparison of exchange based and consumer surplus valuation estimates:

| VALUATION METHOD: | Per month | Per hour | Per trip | Total value (NOK/yr) |
|---|---|---|---|---|
| **Opportunity cost of time** | | | | **Opportunity cost of time in nature area** |
| Foregone income after tax (100% ) | | 100 | | 2 570 158 000 |
| Foregone income after (33.3%) | | 33 | | 855 863 000 |
| **Replacement cost** | | | | **Replacement cost** |
| Expenses of training in a gym | 453 | 38 | | 973 580 000 |
| **Willingness to pay (choice experiment)** | | | | **Willingness to pay (WTP) from choice experiment** |
| WTP (spring-summer-autumn) | | | 125 | 905 274 000 |
| WTP (winter) | | | 209 | 480 779 000 |
| WTP (total annual) | | | | 1 386 053 000 |
| **Consumer surplus (=WTP - travel expenses)** | | | | **Consumer surplus (= WTP - travel expenses)** |
| WTP - expenses (spring summer autumn) | | | 71 | 515 779 000 |
| WTP - expenses (winter) | | | 156 | 357 508 000 |
| WTP - expenses (total annual) | | | | 873 287 000 |
| **Consumer surplus - travel cost** | | | | **Consumer surplus: travel cost benefit transfer** |
| Expected consumer surplus(TCM) | | | 144 | 1 371 561 000 |

# Valuing recreation time in local nature - conceptual or measurement problem?

**Compatible with SEEA EEA Technical Recommendation criteria?:**

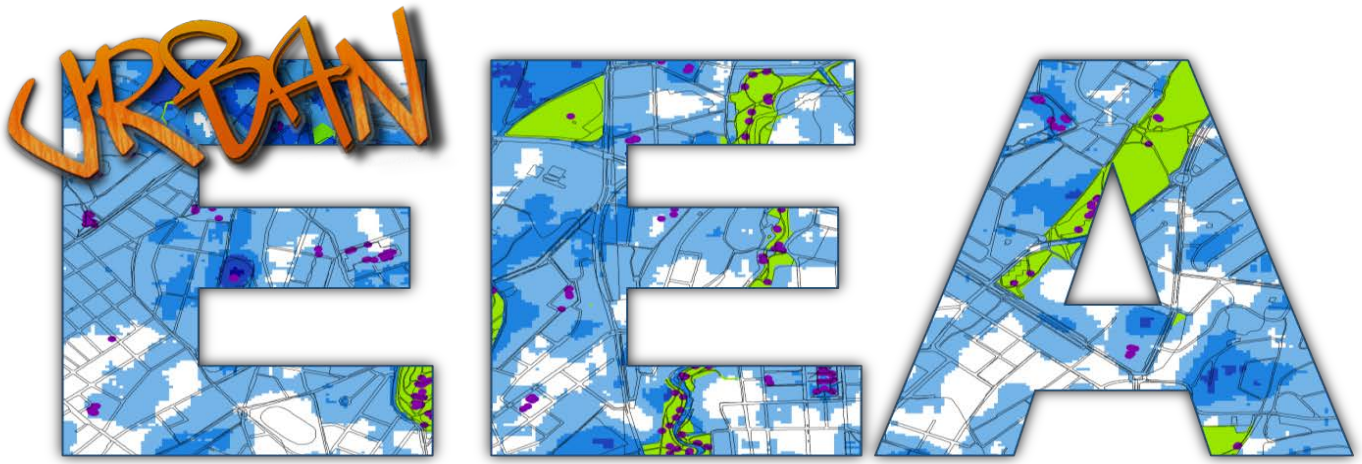
- Within **production boundary? No,** but is this any different from ecosystem contribution to other non-SNA benefits? (e.g. wetlands flood control)
- Avoid **double counting? Yes,** (but avoid combining with hedonic pricing of neighbourhood amenities)
- **Exchange values: Yes,** labour exchange value after tax
- **Significance** ? **Yes**, substantial values compared to other monetary methods

**Additional criteria?:**

- **Indicator sensitivity**- **Not yet.** Requires correlating time on-site with rec.opp.
- **Accurate**? **OK**. Self-reported accuracy improved with diary; GSM/GPS tracking
- **Reliability**? **Good.** Low number of modeling assumptions.
- **Cost of information**? **Moderate**. Web-survey, or GSM tracking.
- **Institutional compatibility**? **Yes.** No entry fee assumptions required
- **Non-monetary value indicator? Yes,** physical time on-site


Valuing recreation time
in local nature...
...valuing labour input to subsistence production of "vitamin G".
Photo: David N. Barton

# THANK YOU




The Research Council of Norway

Statistics Norway
Statistisk sentralbyrå

NINA
Norwegian Institute for Nature Research

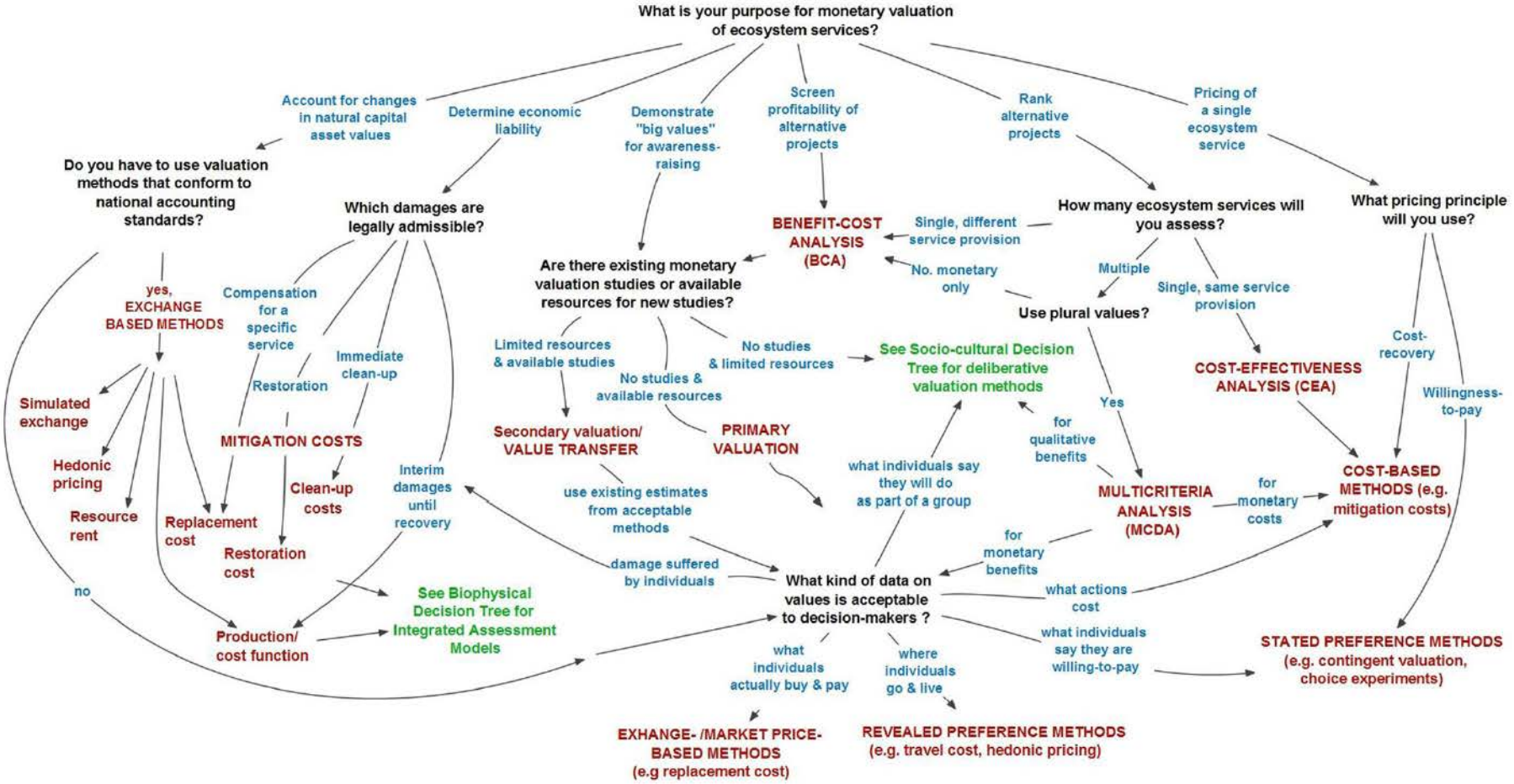
AHO
Arkitektur- og designhøgskolen i Oslo
The Oslo School of Architecture and Design

Contact: david.barton@nina.no

# Answer to session discussion questions

- **What is it exactly that you are valuing? Recreation time on-site, opportunity cost of foregone income after tax from recreation time**
- **What methods are most commonly used when valuing this service?** Travel cost, stated preference
- **What pathways (from service to beneficiary) are commonly assumed?** Recreation time on-site as a function of accessibility and attractiveness
- **Is it possible to isolate this service from other services?** No, but the recreation use value can be subdivided into short and long term mental and physical well-being effects
- **Is there any risk of double counting with other services ?** Not with regulating, provisioning or supporting
- **Local scale.** Could be scaled up to the national level using larger surveys
- **Strengths and weaknesses** of the method In more detail: Statistical uncertainty? Repeatability? Are annual changes relevant/statistically significant?
- **Ranking of methods?** See matrix

# Purposeful context specific monetary valuation




Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

Selecting methods for ecosystem service assessment: A decision tree approach

Paula A. Harrison [a,*], Rob Dunford [a,b], David N. Barton [c], Eszter Kelemen [d,e], Berta Martín-López [f], Lisa Norton [a], Mette Termansen [g], Heli Saarikoski [h], Kees Hendriks [i], Erik Gómez-Baggethun [j], Bálint Czúcz [k,l], Marina García-Llorente [m,n], David Howard [a], Sander Jacobs [o], Martin Karlsen [p], Leena Kopperoinen [h], Andes Madsen [p,q], Graciela Rusch [c], Michiel van Eupen [i], Peter Verweij [i], Ron Smith [r], Diana Tuomasjukka [s], Grazia Zulian [t]

# References

Presentation based on:

Barton et al. (2017a): LG/23/C17 Experimental ecosystem accounting in urban areas - challenges for valuation techniques and relevance for municpal policy and planning with examples from the Oslo metropolitan area

Other references:

Barton et al. (2017b) Narrowing the gap between ecosystem service appraisal and governance support (Chapter 4) in Barton, D.N. and P.A. Harrison, eds. Integrated valuation of ecosystem services. Guidelines and experiences. European Commission FP7, 2017. EU FP7 OpenNESS Project Deliverable 33-44. 2017. (in press, draft provided upon request)

Barton, D.N., 2016. Monetary valuation of urban ecosystem services-operationalization or tragedy of well-intentioned valuation? An illustrated example. Ecosystem services : concepts, methodologies and instruments for research and applied use / Sergi Nuss-Girona, Mita Castañer (eds.). https://www.researchgate.net/publication/301205154_Monetary_valuation_of_urban_ecosystem_services_-_operationalization_or_tragedy_of_well-intentioned_valuation_An_illustrated_example

Barton et al. (2017c) Diverse valuation and accounting of nature. OpenNESS Policy Brief No. 5 http://www.openness-project.eu/sites/default/files/Policy%20brief%20%235%20Capturing%20diverse%20nature%20values_Final.pdf

Gómez-Baggethun, E. and D.N. Barton, Classifying and valuing ecosystem services for urban planning. Ecological Economics, 2013. **86: p. 235 – 245.**

Kallis et al. (2013) To value or not to value? That is not the question. Ecological Economics 94 97-105

SEEA EEA 2016 Technical Recommendations Draft 2 v4.1 20 March 2016

Vatn, A. (2005), Rationality, institutions and environmental policy. Ecological Economics, 55(2): 203–217.

Vatn, A., Institutions and the environment. 2005, Cheltenham, UK ; Northampton, MA: Edward Elgar Pub. 481 p.