Experimental Urban Ecosystems Accounting (URBAN-EEA): improving the decision-support relevance for municipal planning and policy

Synopsis

The URBAN EEA project will demonstrate synergies between experimental ecosystem accounting (EEA) for the national system of economic and environmental accounts (SEEA), and municipal level mapping of urban ecosystems and their services to urban inhabitants. Mapping and valuation methods will assessed in the Greater Oslo region aimed at identifying potential trade-offs and synergies in ecosystem services where green infrastructure is subject to urban development. Spatial mapping databases will be developed that are compatible with standards for national accounting, that can be accessed and updated by land use planners and policy makers, and that provide periodically updated information to the public on the status of urban ecosystems.

1. Background and state of knowledge

As more than two thirds of the world's population will live in cities by 2050, achieving more sustainable, resilient and livable cities stands among the greatest challenges of the 21st century[3]. Conserving, restoring and managing 'green infrastructure' (GI) is increasingly seen as essential to enhance quality of life in cities while decreasing vulnerability to climate change through the provision of ecosystem services (ES) [1,4]. GI in urban areas encompasses a mosaic of habitats for biodiversity, including urban trees and parks, gardens, surface water, coastal zones, agricultural soil and landscapes, as well as peri-urban forests.

Valuation methods can contribute to recognizing, demonstrating and capturing ecosystem service values in urban policy, planning and management [5]. Different non-economic and economic valuation methods are fit for different decision-contexts[1,6]. One purpose is to account for the economic degradation of ecosystems as assets in national accounts. The System of Environmental-Economic Accounting 2012 - Experimental Ecosystem Accounting (SEEA EEA) [7] recommends principles for ecosystem asset mapping and valuation that are compatible with the system of national accounts (SNA). The United Nations Statistics Division (UNSD) expects that SEEA-EEA will become increasingly important for policy-making and an essential tool in monitoring the progress on the Millennium Development Goals[8]. While recommendations to make national natural capital accounting relevant for policy are not new[2,9-11], there is a need to examine how ecosystem services mapping[12] can be done in an accounting conform manner at the regional and municipal level where most landuse decisions are made. EU member states are investing significant resources in mapping and assessment of ecosystems [11] and their services (MAES) [13] as part of fulfilling the aims of the EU Biodiversity Strategy 2020. The Norwegian government has declared an interest in following these European initiatives in ecosystem mapping[14]. Advanced initiatives such as UK-NEA [15] and the Flanders Regional Ecosystem Assessment[16] have assessed the relevance of ecosystem services mapping and valuation for implementation of national biodiversity strategy and action plans.

Despite these advances there is currently a 'gap' between, on the one hand, biophysical mapping and valuation information required for ecosystem accounting at national level, and on the other, what is relevant for decision-support in municipal and regional planning and policy making [9,17-20]. Uncertainties in monetary valuation may be compounded through aggregation for national accounting purposes [7,9]. Also, exchange-based valuation measures conforming to accounting standards at national level, do not include consumer surplus measures recommended for economic benefit-cost analysis of policy and projects[9,21]. The ecosystem data currently collected often only allows for rough spatial representation in national accounting[7,22]. Spatially

aggregated data will in many cases not identify biodiversity and ecosystem functions impacted by local landuse changes[19].

Closing the gap may be possible in and around urban areas where coarse national ecosystem accounting indicators are more likely to be based on high resolution remote sensing data. High resolution data sources are useful for informing municipal land use planning and policy[17], both measured with biophysical indicators only, and in combination with economic valuation methods. However, to date there has been little research on *potential complementarities*[23] *between national level ecosystem accounts and local landuse planning and decision contexts* for ecosystem mapping and valuation (Figure 1). A critical question is if SEEA-EEA can be informative for local and regional policy decisions without starting from an overall analysis of policy questions regarding local trade-offs between capacity and use of different ecosystem services. This proposal aims at exploring synergies that could be achieved between current calls for mapping and assessing ecosystem services[24], for spatially explicit national accounting[7], and for more informed decision making at local level[25,26].

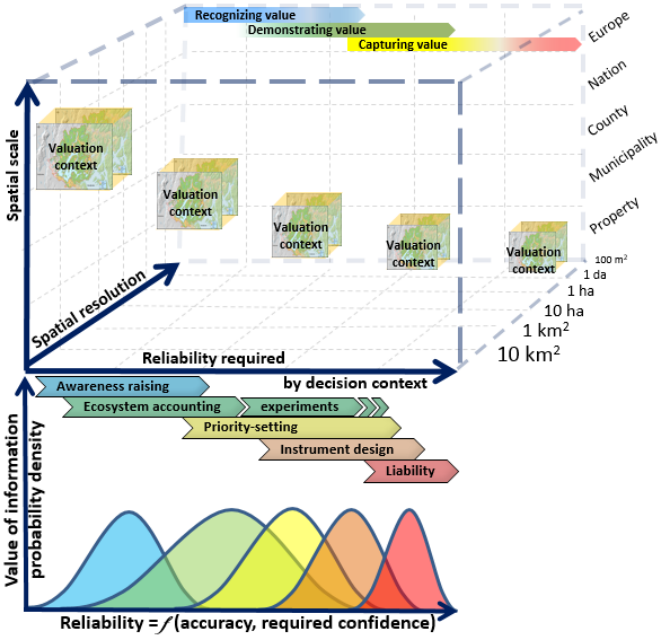

Figure 1. Conceptual framework - ecosystem accounting designed for the system of national accounts is complementary to decision-support for other policy purposes. Decisions at different spatial scales and resolutions have different reliability requirements. Research is needed on extending the relevance of ecosystem accounting beyond only recognizing and demonstrating value at national level, to also capturing value in support of different local decision contexts such as priority-setting, instrument design and economic liability assessments. The value of ecosystem accounting information for decision support depends on its reliability which is defined by the accuracy of GIS data and methods, as well as decision-makers' required confidence levels in specific contexts. Source: based on[1,2]

The municipalities of Greater Oslo - including neighbouring municipalities of Akershus County - represent a model system for addressing these questions. Oslo is one of the fastest growing capitals in Europe. Greater Oslo has forest remnants and other biodiversity hotspot remnants within the built zone, coastline and islands, active agricultural landscapes and large forest areas with nature reserves within municipal boundaries, providing strong wilderness-rural-urban gradients both within and between Oslo and its neighbouring municipalities. A recent scoping study estimated cultural ecosystem services from green infrastructure within Oslo Municipality alone at billions of Norwegian kroner annually [17]. Despite these high per unit area ES values, small, fragmented urban ecosystems may not be recognized by ecosystem accounting units designed for national indicators and focusing mostly on 'natural resources' found outside cities[27]. The Office of the Auditor General in Norway has asked for better control and monitoring of loss of urban green infrastructure[28].

2. Approach

The project will combine ecosystem service mapping with experimental ecosystem accounting methodology, focused on urban green infrastructure. We will start by collating GIS zoning plans for municipalities of the Greater Oslo region in order to identify areas that are likely to

undergo landuse change and are subject to planning priority. Next, for scoping purposes we will carry out mapping based on expert assessment matching landuse types to ecosystem services in a qualitative matrix approach[29]. Preliminary ecosystem service hot spots and landuse planning maps will then be compared in order to identify high ecosystem service areas that are also a planning priority. In these areas we will test the SEEA-EEA guidelines for experimental ecosystem accounting on specific types of green infrastructure and their ecosystem services. Each type will be chosen in collaboration with a Stakeholder Advisory Group based on policy relevance. Selection of green infrastructure types will also consider the availability of fine spatial resolution data that allows testing of spatial aggregation assumptions in the ecosystem service accounting methodology.

3. Research questions

Studying ecosystem services in Greater Oslo raises a number of methodological accounting questions which have been identified as challenges in the scientific literature [19,20], and are of particular relevance for urban areas. Three groups of research questions will be addressed:

1. **Mapping.** What are the useful and policy-relevant spatial representations of nature types and ecosystem services in urban areas? More specifically,
   a) how sensitive is ecosystem services mapping to different spatial definitions of ecosystem accounting units?
   b) how can ecosystem service capacity be determined, particularly in light of ecosystem degradation in the small and fragmented areas of nature and green structures in and near cities?
   c) how can geographical database strategies, using technological innovations in GIS, achieve potential accounting synergies and reduce information costs across municipal, regional and national planning levels?

2. **Valuation**. To what extent does accounting methodology address the full societal value of urban ecosystem services? More specifically,
   a) how large are the differences in values based on market exchange-based values used in systems of national accounts, versus welfare-based methods used in benefit-cost analyses?
   b) how do we account for the multiplicity of stakeholder values at small scales in dense urban areas, and in particular for cultural services and ecosystem disservices?
   c) how do we account for low or negative resource rents from ecosystem services, particularly as input to publicly subsidized land uses and municipal utilities?

3. **Policy.** How can ecosystem mapping and valuation in an urban region be scaled in order to contribute to both national accounting and municipal planning & policy? More specifically,
   a) what policy inconsistencies can arise when applying different valuation principles for ecosystem assets?
   b) what opportunities for cross-municipal policy can be identified by accounting for flows of ecosystem services across municipal administrative boundaries?

4. Choice of methods and activities

WP 1 Policy-science collaboration and public outreach

Task 1.1 Stakeholder advisory group (SAG) – science-policy communication The stakeholder advisory group will be a forum for actively promoting data sharing and discussion of preliminary research findings between the project researchers and stakeholders in greater Oslo Region. It also aims at generating ideas for cross-municipal and public-private

collaboration in green infrastructure mapping and ecosystem accounting. The initial stakeholder advisory group includes interests from public and private sectors at different planning levels (Table 1), to be extended with additional members. In particular, the stakeholder advisory group will assist the project in identifying a core group of municipalities which will participate in testing EEA, including as a minimum Oslo and 2 neighbouring municipalities, chosen based on their importance as urban growth zones. A larger subset of municipalities will be included in an ecosystem service map scoping exercise (Task 2.3), drawn from the participants of the Oslo Region Alliance based on collaboration interest and GIS data availability. The SAG will meet regularly once a year, as well as ad hoc with individual member constellations depending on expressed stakeholder needs.

Table 1 Stakeholder Advisory Group (SAG)

Stakeholder	**Planning level**
Oslo Housing and Saving Society (OBOS) (confirmed)	Property*
Municipality of Oslo, agencies for Planning & Building and Urban Environment (invited, tbc)	City - municipal
Municipality of Bærum, Planning, culture and environment section (invited, tbc)	Suburb -municipal
County Environment Agencies (to be invited)	County
Oslo Regional Alliance (composed of 78 municipalities, 6 county councils), Technical Group for Landuse Planning and Transport (confirmed)	Regional
Norwegian Environment Agency, Environmental economics unit (invited, tbc)	National(public)
Norwegian Biodiversity Network (SABIMA) (confirmed)	National(NGO)

*we aim to strengthen the representation of private enterprise in the SAG early in the project

Task 1.2 Scientific advisory panel (SAP) – national and international research network The scientific advisory panel is composed of leading international scientists in research fields intersecting ecosystem accounting for policy in Norway, in the EU, and in UNSD supported work on SEEA EEA (Table 2). The scientific advisory panel will meet once a year coinciding with a "Urban EEA" research symposium (see Task 1.4).

Table 2 Scientific Advisory Panel (SAP)

Institute	**Researcher**	**Special relevance**
Wageningen University, **Netherlands**	Dr. Lars Hein	SEEA EEA
Melbourne Sustainable Society Institute, **Australia**	Dr. Carl Obst	SEEA EEA
Kiel University, **Germany** & www.esmeralda-project.eu	Dr. Benjamin Burkhard	ES matrix mapping
Joint Research Centre of European Commission (EC-JRC), **Italy** & MAES http://biodiversity.europa.eu/maes	Dr. Grazia Zulian	ESTIMAP ES mapping Urban Pilot Survey
German Centre for Integrative Biodiversity Research (iDiv), **Germany**	Dr. Matthias Schröter	ES modeling
Finish Environment Institute (SYKE), **Finland** & OpenNESS Urban	Dr. Leena Kopperoinen	Helsinki, ES mapping for municipal planning
CICERO - Center for International Climate and Environmental Research **Norway** and CIENS (http://www.ciens.no/english /)	Dr. Asbjørn Aaheim	Macro-economic modeling
Norwegian University of Life Sciences (NMBU), **Norway**	Prof. Arild Vatn	Institutional economics

Task 1.3 Geodata management - coordination with municipal geodata units In order to make data and processes efficient, reusable and repeatable, management of geospatial data (including metadata), as well as spatial analysis will be conducted using powerful open source software packages (www.osgeo.org). Meta-data will conform to SEEA accounting standards. We aim at establishing a spatial database from where data will be made publicly available e.g. using OpenGIS Web Services (OWS), so it can be accessed by end users directly using Geographic Information Systems (GIS) or online maps. We will establish a Metadata Catalogue (CSW) so data can be discovered more easily.

Task 1.4 Public outreach The simplest purpose of ecosystem service mapping and valuation is general awareness raising, before progressing to accounting and different forms of decision-support (Figure 1). We will organise "information days" at the Oslo Centre for Interdisciplinary Environmental and Social Research (CIENS) aimed at attracting a policy

oriented municipal, private and NGO audience. An annual "Urban EEA" research symposium will be organized at the CIENS 'Top Centre' aimed at bringing together different Norwegian research community. NINAs staff includes a journalist and graphic designer for designing public dissemination and outreach material online, and assisting researchers in writing feature articles for local and national newspapers. See the dissemination below (section 5.2).

WP 2 Scoping of SEEA EEA

Task 2.1 Review of methodological challenges of implementing SEEA EEA in urban policy contexts Further development of SEEA-EEA requires resolving interlinked methodological questions in a research field in rapid development. In this task we will synthesize methodological challenges in accounting for urban ecosystem services, showing conceptual linkages between nationally relevant accounting challenges and on-the-ground planning problems in the Greater Oslo case study. We will assess how methodological challenges are interlinked through the accounting tables (Table 3), in particular how valuation of the capacity and use accounts are conditional on reliable biophysical quantification. We will identify challenges that have particular relevance for the Norwegian climate and landscapes (e.g., climate variability and snow cover determining seasonality of recreational and flood mitigation services, invasive species, ecosystem (dis)services of vegetation shading and blocking views).

		Accounts:			
	Methodological questions	**Ecosystem condition**	**Ecosystem capacity**	**ES supply**	**ES use**
1.Mapping	1.1 spatial definitions of ecosystem accounting units	x	x	x	x
	1.2 small and fragmented areas of nature and green structures		x		
	1.3 accounting synergies through reduced information costs	x	x	x	x
2.Valuation	2.1 valuation approaches – exchange versus welfare methods				x
	2.2 ecosystem disservices				x
	2.3 low or negative resource rents				x
3.Policy	3.1 policy inconsistencies due to different valuation approaches				x
	3.2 cross-municipal policy instruments			x	x

Table 3 Research questions are interlinked through different accounts. The table is indicative of where specific questions may be initially most relevant. "x":particularly important based on EEA literature review.

Task 2.2 Collating urban development plans & scenario analysis This task builds on AHO research in collating municipal land use and regulation plans into a consistent GIS database for the Greater Oslo region. It aims to identify areas were land use change is regulated and development likely to occur. The geographic data will be gathered from available sources, particularly The Norwegian Mapping Authority (Norway Digital) and the individual municipalities. The GIS database mapping of transformation areas in municipal zoning plans will be the basis for identifying specific areas of potential conflicting interests and evaluating alternative scenarios [30]. Scenario analysis will involve the Stakeholder Advisory Group in identifying planned transformation zones that are most likely to be developed under different assumptions about drivers exogenous to municipal planning.

Task 2.3 Scoping and screening: Ecosystem service mapping using expert-based matrix method 'Wall-to-wall' comprehensive ES mapping can expend considerable analysis time on landuses that may not reflect policy priorities. A recent study for Europe required expert elicitation of 1364 matrix combinations of CORINE landcover and ecosystem services [29]. For this reason, the ES mapping matrix approach[29] will be used as a screening exercise to focus where detailed EEA should be applied. We will simplify matrices mapping ecosystem services on landuse classes to those combinations relevant for the Greater Oslo region. The 'reduced dimension' matrices will be assessed by the research team over generic landuse types for (i) ecosystem service potential, (ii) ecosystem service flow, (iii) ecosystem service demand, and (iv) ecosystem service flow-demand budget matrices[29]. Uncertainty in matrix scores will be derived based on spatial variation of landuse in the study region. Where GIS data on qualitative

variation in landcover classes are available probability distributions will be calculated to describe uncertainty in ES assessments (e.g. forest site productivity indices).

Task 2.4 Identification of areas for EEA testing Until a concerted national level ecosystem accounting effort is undertaken in Norway, the high information costs of SEEA-EEA suggest that accounts should be built progressively through addressing policy-driven mapping needs as they arise locally, while taking care to use a consistent accounting framework than can be updated and completed over time. Based on the 'expert' ecosystem service flow-demand budget matrix (Task 2.3), and priority development areas in municipal plans (Task 2.2), high ecosystem service land uses that are particularly prone to transformation will be selected for detailed assessment using SEEA EEA accounting methodology. Focus areas for assessing landuses and ecosystem services in detail will be validated in collaboration with the Stakeholder Advisory Group**.**

WP3 Ecosystem accounting experiments on targeted green infrastructure Methodological accounting questions will be addressed through application of SEEA EEA methodology to the accounts in tasks 3.1-3.4 below. All accounts will be in physical units, while alternative economic valuation methods will be explored in task 3.4. In all accounts we will evaluate the geodata resolution required to assess trade-offs between ecosystem services in the planning and policy priorities identified in Task 2.4; the final selection of methodologies in task 3.1-3.4 will be subject to the composition of focus areas.

Task 3.1 Ecosystem condition account To account for ecosystem condition we will use a set of indicators based on the Nature Index for Norway (NI) [31]. Despite lack of indicators for some ecosystem services, NI has several useful properties[32], including a set of ecosystem accounting units and a system for quantification and information aggregation based on indicator reference states. There are several unresolved challenges and methodological questions. NI was originally designed for the national level and currently has only municipal resolution[33]. We will generate indicators for the same ecosystem accounting spatial units as the NI at sub-municipal resolution. In particular we will explore how to account for species presence and biodiversity in the rural-urban gradient across focus areas (Task 2.4). We will focus on indicators of urban green infrastructure relating to and connecting selected supporting, provisioning, regulating and cultural ecosystem services (examples include pollinator and bird habitat condition, soil productivity, run-off properties of land cover, and landscape structural elements for recreation). Existing species data sets in NI will be extended through mobilization of a network of biologists from professional interest groups and organizations, and by modelling of individual observations to get a broader geographic coverage.

Task 3.2 Ecosystem capacity account Accounting for the capacity for sustained supply of ecosystem services requires scaling (normalizing) and aggregation of ecosystem service indicators within the ecosystem accounting units, which in turn requires determination of reference states (normalizing constants). We will address the challenge of variable spatial resolutions needed to describe ecosystem capacity for selected services. For *biodiversity habitat*, we will determine the reference state of biodiversity in NI for the rural-urban landuse mosaic with small fragmented urban nature and managed green spaces. This entails relating the reference condition of remaining ecosystems in the urban areas to characteristics of the natural reference condition of accounting units along a rural-urban gradient. To our knowledge this has not previously been done for urban areas[34]. Other services identified as possible municipal policy priorities may include[17]: *agricultural and forest productivity* where we will use site indices from Digital Norway differentiated by soil types, drainage conditions, topography; *run-off control* capacity where we will employ a simple curve-number urban hydrological model[35] connected to GIS raster maps of soil types, landcover and urban watershed boundaries ; *recreation* where we will use the recreational opportunity spectrum approach[36] implemented

using the ESTIMAP GIS approach[37]. Monetary valuation of the capacity account is highly explorative and will depend on findings in Task 2.1 and the reliability of biophysical quantification and index methods in this task. Drilling down to higher resolutions we will demonstrate how indices for structural diversity[38] and blue-green factors[17,39]can describe biotic, abiotic and built structures capacity to co-produce urban ecosystem services at property level. The testing of multiple ES capacity modeling methods is made possible by the team's experience through OpenNESS[17,40] and the Norway NI projects[31]. Final selection of methods will be subject to the scoping in Tasks 2.3-2.4.

Task 3.3 Ecosystem services supply account (SSB) Based on ecosystem condition and capacity accounting, this task attributes the generation of ecosystem services to types of economic unit (e.g. households, private and public enterprises, municipal and state institutions) [41]. Methodological questions of special interest include assumptions required to attribute ecosystem services from ecosystem accounting units to cadaster units, adjusting for differences in supply by nature of ownership and management. This is expected to be particularly challenging for selected regulating and cultural services[2]. Identifying spatial mismatches between the spatial accounting definitions of supply and use (task 3.4) will provide maps of 'potential externalities' that may constitute a useful 'by-product' for planning from SEEA accounting process.

Task 3.4 Ecosystem services use account A recent review of EEA pointed out that there are as yet no case studies that have developed ecosystem services use accounts[19]. This account attributes use of ecosystem services to types of economic unit. We will attribute current physical use of the selected ecosystem services to a raster along the rural-urban gradient – exploring information efficient ways to identify uses through e.g. variable resolution rasters scaled by user density. We will show how detailed user segmentation is needed to spatially identify cultural services and can be mapped to SEEA accounting categories. Regarding valuation, we will focus on an assessment of the difference between exchange based and welfare based valuation of cultural ecosystem services using primary[17,40] and value transfer methods[17,42]. A particular methodological challenge will be the potential for double counting when combining valuation methods that address multiple ES. First, we will test monetary valuation methods that are based on exchange values such as net profits to recreation businesses, replacement costs (e.g. city trees[17]), opportunity value of travel and recreation time[43,44] and hedonic property pricing[45,46]. Next, we will compare with consumer surplus based approaches, derived from meta-analyses of travel cost and stated preference studies previously compiled for the OpenNESS project[17]. Drilling down for greater spatial resolution we will focus on hedonic property pricing of green infrastructure as particularly promising for urban EEA, given its property level focus and exchange-based asset pricing approach. We will extend existing hedonic pricing of green infrastructure in Oslo [17,40] to municipalities of Greater Oslo, and experiment with statistical approaches for correcting spatial autocorrelation, improving measures of proximity and accessibility through calculating network distances[47], and implement corrections for perceived accessibility due to risks and amenities along access routes[48].

Task 3.5 Implications for policy and welfare indicators In this task we will draw lessons from the experimental ecosystem accounting of selected green infrastructure in the Greater Oslo region implemented in tasks 3.1-3.4. We will synthesize our experiences on the relevance of the mapping and accounting solutions developed for the case study regarding (i) opportunities for cross-municipal policy instruments[49] such as biodiversity offsets and ecological fiscal transfers and (ii) for the wider literature on national sustainability and welfare indicators[50,51].

5. Project implementation

5.1 Research group The consortium will be coordinated by the Norwegian Institute for Nature Research (NINA) with partners Statistics Norway (SSB) and the specialised university Oslo School of Architecture and Design (AHO). The research team has strong and complementary experience in ecosystem services research, environmental-economic accounting and urban planning. The team includes experienced female researchers and gives opportunity for further career building for a younger female researcher. Proposal coordinator Dr. **David N. Barton** (NINA) has led Research Council of Norway projects (Bioindicators, PESILA-REDD) and the EU FP7 POLICYMIX project (http://policymix.nina.no/), and is currently the coordinator of the work package on valuation in the EU FP7 OpenNESS project (http://www.openness-project.eu/). He led the recent scoping study on urban ecosystem services in Oslo[17]. Dr. **Erik Gómez-Baggethun** (NINA) is member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) task force, was a chapter lead author of The Economics of Biodiversity and Ecosystem services (TEEB), and WP coordinator in the Biodiversa project URBES (http://cbc.iclei.org/About-URBES). Dr. **Olav Skarpaas** (NINA) is an experienced plant ecologist who has contributed extensively to develop the methodology and implementation of the Nature Index for Norway, and together with Dr. Iulie Aslaksen and Per Arild Garnåsjordet played a key part in promoting the Nature Index as a sustainability indicator for Norway. Senior Researcher **Per Arild Garnåsjordet** (NINA) has expertise in natural resource accounting and has been member of the editorial board of the SEEA EEA guidelines[8] and is currently a participant in the UN expert group on SEEA EEA. Dr. **Iulie Aslaksen** (SSB) has led Research Council of Norway projects (SDI, BIOPOLICY, CLIMATE-LAND) and was member of a recent government-appointed expert committee on ecosystem services[14]. Dr. **Kristine Grimsrud** (SSB) has expertise in assessment and valuation of ecosystem services and has also participated in the UN expert group on SEEA EEA. Dr. **Mads Greaker** (SSB) has expertise in environmental-economic modelling and natural capital accounts for natural resources for Norway. Prof. **Karl Otto Ellefsen** (AHO) headed the Norwegian Urban Research Program financed by the Research Council of Norway (2000-2005) and the position as Rector at AHO from 2000-2013. Prof. **Bendik Manum** (AHO) is an expert on the spatial analysis of urban form. Dr. **Stefan Blumentrath** & Dr**. Megan Nowell** (NINA) and Ass. Prof. **Espen Aukrust Hauglin** (AHO) are experts in GIS analysis of landscape and urban planning, respectively. See researcher CVs for additional details. A number of M.Sc. theses in urban planning will be associated to the project through AHO's M.Sc. programme.

Table 4 Project progress plan, task leads, and distribution of effort by task (payroll & indirect expenses)

PAYROLL & INDIRECT EXPENSES (Personmonths, pm)		Lead	2016-2019 kNOK	EFFORT PER YEAR TOTAL (pm)				EFFORT PER YEAR PER PARTNER (pm)											
				2016	2017	2018	2019	2016			2017			2018			2019		
								NINA	SSB	AHO	NINA	SSB	AHO	NINA	SSB	AHO	NINA	SSB	AHO
WP1	**Policy-science collaboration and public outreach**		**2249**																
Task 1.1	Stakeholder advisory board (SAB) - coordination	NINA	298	0,5	0,5	0,5	0,5	0,5			0,5			0,5			0,5		
Task 1.2	Scientific advisory panel (SAP) - coordination	NINA	383	0,7	0,7	0,7	0,7	0,5	0,1	0,1	0,5	0,1	0,1	0,5	0,1	0,1	0,5	0,1	0,1
Task 1.3	Geodata management	NINA	833	2	1,5	1,25	1,75	1	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,25	1	0,5	0,25
Task 1.4	Publication and outreach	NINA	735	0,5	1	1	3	0,5			1			1			1	1	1
WP2	**Scoping of SEEA EEA**		**2106**																
Task 2.1	Review of methodological challenges	SSB	397	3	0	0	0	1,5	1	0,5									
Task 2.2	Collating urban development plans & scenario analysis	AHO	983	5	5	0	0	0,5	0,5	4	1	1	3						
Task 2.3	Scoping and screening ES	NINA	471	0	3,5	0	0				2	1	0,5						
Task 2.4	Identification of planning areas for EEA testing	NINA	256	0	2	0	0				1	0,5	0,5						
WP3	**Ecosystem accounting experiments**		**4305**																
Task 3.1	Ecosystem condition account	NINA	1019	0	2,5	1,5	3				2	0,5		1,5			2	1	
Task 3.2	Ecosystem capacity account	NINA	870	0	2,5	1,5	2				2	0,5		1,5			1	1	
Task 3.3	Ecosystem services supply account	SSB	830	0	0	4	2							1	3		1	1	
Task 3.4	Ecosystem services use account	NINA	1304	0	0	7	3							4	2	1	1	1	1
Task 3.5	Implications for policy instruments & welfare indicators	SSB	282	0	0	0	2										1	1	
Total WP1-3			**8660**	11,7	19,2	17,45	17,95	4,5	2,1	5,1	10,5	4,1	4,6	10,5	5,6	1,35	9	6,6	2,35

5.2 Project management, progress and publication plan URBAN EEA will run over three years from mid-2016 to 2019 (Table 4), progressing from scoping activities in year 2016-2017 to a sequential development of accounts in 2017-2018. The final year of the project will focus on integrated analysis of cross-account consistency and publication of findings. Annual symposia on "urban EEA" will be organized to encourage science-policy

dialogue between the research team, members of the Stakeholder Advisory Group, the international Scientific Advisory Panel members, and researchers from the Norwegian urban ES & planning community. We will participate in annual meetings of the UNSD permanent expert group on EEA, and organize "urban ES accounting" special sessions at research fora such as the Ecosystem Service Partnership (ESP). Draft research papers will be prepared for these meetings, aiming for rapid follow-up publication in open access refereed journals. Please see "Dissemination of project results" (eApplication form) for detailed activities & deliverables.

5.3 Environmental impact The project is not expected to have negative environmental impacts apart from carbon emissions from air travel which will be offset by each partner using voluntary emissions reductions, following the approach adopted by http://policymix.nina.no/.

5.4 Ethical perspectives Data used for accounting will be available through Digital Norway and Global Commons licences, as well as municipal data sharing agreements for public non-profit use. Personal data will be protected in accordance with national guidelines and Statistics Norway's policy on providing access for research purposes.

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