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Treatment of Ecosystem Assets in Urban Areas

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About the WG1 Discussion Paper 1.2 on ecosystem assets in urban areas

- **SEEA EEA 2020 Revision Issues Note**:
  - "An emerging interest concerns ecosystem accounting for urban areas considering the large proportion of the work population living in cities. These should be distinguished from areas defined in terms of land cover or use as built-up areas and instead considered as combinations of multiple ecosystem types. In this sense, urban areas may be considered a specific form of ecosystem accounting area, but one requiring specific definition to support policy and decision making."

- **Urban Ecosystem Accounting Area:**
  1. Ecosystem assets and their services in urban areas may be the most used and valued.
  2. Ecosystem assets may be different than their "natural" and semi-natural" counterparts.
  3. Ecosystems in urban areas may deliver a different basket of ecosystem services.
  4. Ecosystem assets may potentially require a different accounting approach.

Summary of issues covered in Discussion Paper 1.2

1. **The urban ecosystem accounting area**
   1. What size urban area should be included in ecosystem accounts for urban areas?
   2. How to delineate the urban ecosystem accounting area?
   3. How much urban periphery should be included?
2. **Classification of urban ecosystem assets and types**
   1. What urban ecosystem asset categories are relevant for a hierarchical urban/built-up ecosystem type classification?
   2. What are the physical and other characteristics of an urban green/blue area that differentiate it from non-urban ecosystem types?
   3. To what extent do these characteristics reflect the urban ecosystem extent or the condition?
3. **The question of scale**

1. Urban Ecosystem Accounting Area (EAA)

- **Scope for urban ecosystem accounts:**
  - Large metropolitan areas and cities only; or including towns and villages; or all identifiable settlements?
  - Should they cover the detail of the urban structure and gradient, including embedded artificial and natural/semi-natural green and blue infrastructure in urban core, suburban and periurban areas?
- **Different approaches that have been or could be used to set the boundary for urban EAAs:**
  - Built-up area + variable buffer (UK ONS and DEFRA; NINA)
  - Functional urban area – (MAES (FUA core and commuting zones), StatCan (CMA))
  - Administrative boundaries – (specific cities)

Question for reviewers A: Should SEEA EEA provide guidance on defining the scope or the boundary of urban EAA?

- Many indicated it should be flexible and country-specific based on policy needs and data availability.
- However others indicate some guidance or harmonized approach with existing standards (e.g., Functional Urban Areas (FUA) or Degree of Urbanization) would improve comparability between countries and support other reporting efforts (e.g., SDGs).

2. Defining urban ecosystem assets by type of area

- **Hierarchical urban/built-up sub-type classification could be defined based on:**
  - use (e.g., industrial, residential, commercial, mixed use),
  - intensity of use or density (e.g., high/medium/low density, could be based on % of soil cover, building floor space ratio, or other)
  - land cover (e.g., buildings, road/pavement, urban green/blue cover—lawns, trees, other vegetation),
  - property ownership (e.g., public, private)
  - other criteria (e.g., accessibility)

Question for reviewers C: Which structural and functional characteristics of urban areas are most important for an urban ecosystem typology and how might they be most logically ordered in a hierarchical structure?

- Some responses show general comfort with the characteristics (and order) shown above. Others add that public accessibility is important to include.
- Some indicate this level of detail is not necessary in an urban ecosystem type classification: from a single level or two-level classification only, to recognition that the highest level urban ecosystems types might be clearly defined but sub-types could be defined by users.
- One indicates urban is a management boundary not an ecosystem type – classify all urban/green within urban EAA according to a natural ET with an urban tag (urban lake, urban beach), or functional characteristics (areas of trees for cooling, for pollutant removal, or other issues of interest such as green walls or roofs).

2. Defining urban ecosystem assets by type of area (cont.)

- **More detailed urban/built-up sub-types may be relevant in developing ecosystem accounts for urban areas, though a more limited set of urban sub-types may be needed for national-level accounts**
  - Recognizing that there is a potential conflict between the detail required to develop useful accounts for urban areas and the definition of an ecosystem asset (EA) in SEEA TR.
- **High resolution data is required for reporting on urban green/blue assets:**
  - Extent and/or condition of private yards or public gardens and other urban green or blue spaces distinguishable from adjacent homes and buildings;
  - Extent and/or condition of street trees, green roofs, walls
  - This resolution of data is not available for all countries.

Additional comments:

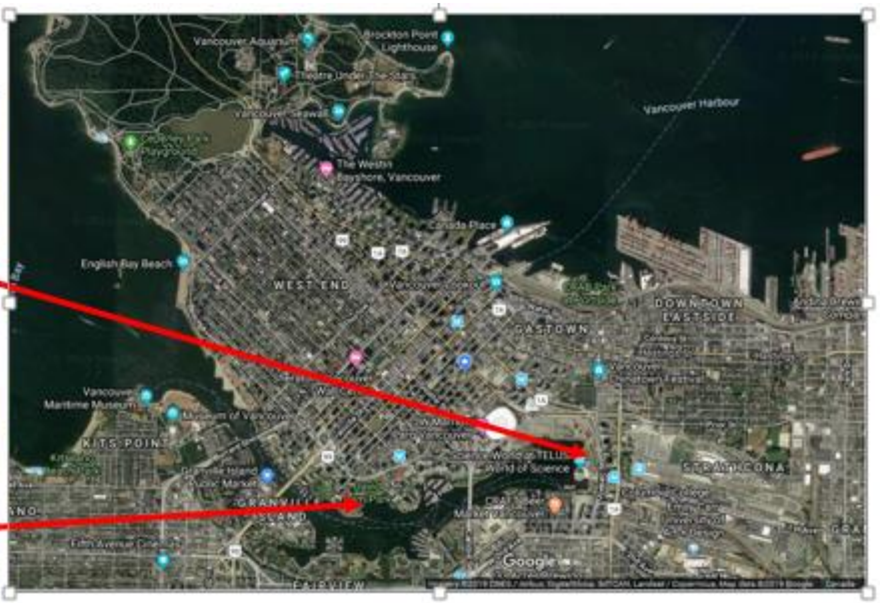
- Definition of ecosystem asset—that they be continuous and that they have all the biotic/abiotic components to function—is problematic in urban areas. Very fragmented areas can still act as an asset (e.g., street trees and pocket parks in cities) but small fragments of habitat may not have all the components to function. The definition does not allow for human-determined/dominated ecosystems (e.g., urban, cropland). If we would like to ensure internal consistency, it should be adjusted.

2. Defining urban ecosystem assets and types (subtypes) cont.

- **Urban green and blue sub-classes should not duplicate natural and semi-natural class types. Consider:**
  - **Urban green/blue assets:** embedded/adjacent to built-up area and significantly altered or managed (e.g. outdoor yard areas, urban parks, sports fields, street trees)
  - **Natural and semi-natural ecosystem assets in urban areas:** larger, retain more natural features and/or clearly fit within an alternate ET (e.g., cropland, forest)
- **However, in practice this may be difficult to determine, depending on size and scale**

Figures 1 and 2: Distinguishing between urban green/blue assets and natural or semi-natural assets

Is it grassland or is it accessible urban green space?



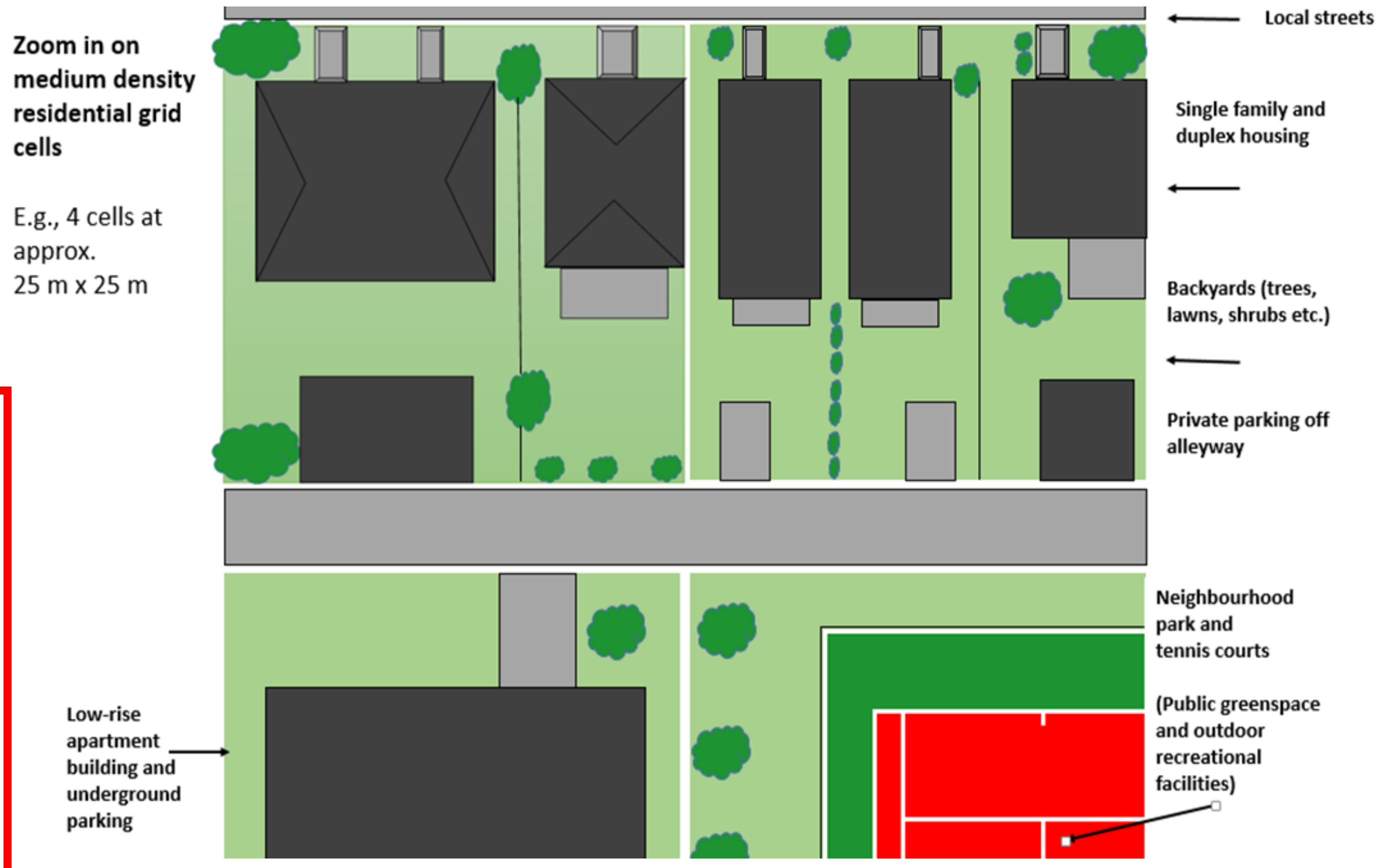
3. The question of scale

- Choice of scale will affect the ability to delineate and track urban green and blue infrastructure as well as natural and semi-natural ecosystem types within or adjacent to urban areas.
- A top-down approach relies on the concept of dominance in determining ecosystem type and can have a large influence on results.

Question for reviewers D: Any specific comments on the scale or size of urban ecosystem assets that should be identified in a set of ecosystem accounts for urban areas?

- Leave to countries to determine
- As detailed as possible depending on data availability – e.g., 10m, 1m
- Proposed a size limit of 200 ha limit to differentiate urban green asset from green natural asset
- May require distinction between units of observation and aggregation

Figures 3 and 4: Scale issues



What this might mean for the extent table?

Discussion options 1, 2, or hybrid?

- **Option 1 – extent table example for discussion (not all potential levels shown in graphic due to space)**
  - UEZ1 – continuously built-up area
  - UEZ1.1 – use characteristic (e.g., industrial, commercial, residential)
  - UEZ1.1a – intensity or density characteristic (e.g., high density, medium, low)
  - UEZ1.1ax – asset type (e.g., building, road/artificial surface, green/blue (e.g., sports field, residential yard, green roof)
  - Additional levels as needed (e.g., accessibility, ownership or other)

	Ecosystem types in urban areas																			
	Urban/built-up type and sub-classes												Natural and semi-natural types							Total area
	Residential			Commercial			Industrial			Total			Cropland	Grassland	Shrubland	Forest	Barren	Wetland	Inland water	
	Built-up	Road	Green/ Blue	Built-up	Road	Green/ Blue	Built-up	Road	Green/ Blue	Built-up	Road	Green/ Blue								
Opening extent (km2)																				
Additions to extent																				
Reductions in extent																				
Net change in extent																				
Closing extent (km2)																				

What this might mean for the extent table?

Discussion options 1, 2, or hybrid?

- **Option 2 extent table example for discussion**
  - Basic extent table for urban area, with potential for high-level sub-classes (e.g. commercial, industrial, residential).
  - Urban green/blue reported as a condition of the urban area in the condition tables

	Urban EAA			
	Commercial	Industrial	Residential	Total urban area
Opening extent (km2)				
Additions to extent				
Reductions in extent				
Net change in extent				
Closing extent (km2)				

- **Hybrid option**
  - Delineate and track the larger urban green and blue (e.g., large parks, cemeteries) and larger natural and semi-natural ecosystem types within an urban EAA as part of the extent table.
  - Report on the smaller embedded urban green and blue features (small parks, private yards, gardens e.g., as a % green area) in the condition table (size or scale of assets that should be separately identified tbd).

What this might mean for the condition table?

- Example Condition table with green/blue assets reported as a condition of the urban area (i.e. Option 2)

Example indicators of condition		Urban EAA			
		Commercial	Industrial	Residential	Total urban
Species (e.g. population and other)	Opening condition				
	Closing condition				
Vegetation (e.g., % canopy cover, green roof ha, street tree or hedgerow length)	Opening condition				
	Closing condition				
Water quality (e.g., stormwater discharge, turbidity, etc.)	Opening condition				
	Closing condition				
Air pollutant concentrations	Opening condition				
	Closing condition				
Soil (e.g., pH, metals, etc.)	Opening condition				
	Closing condition				
Soil sealing (% impervious cover)	Opening condition				
	Closing condition				
Infrastructure density (e.g., site coverage, floor space ratio)	Opening condition				
	Closing condition				
Access (e.g., Average distance to green space, walkability)	Opening condition				
	Closing condition				
Forest	Opening condition				
	Closing condition				
Cropland	Opening condition				
	Closing condition				
Shrubland	Opening condition				
	Closing condition				
Wetland	Opening condition				
	Closing condition				
Other natural land	Opening condition				
	Closing condition				
Urban green space	Opening condition				
	Closing condition				
Water	Opening condition				
	Closing condition				

What this might mean for the extent and condition tables?
Discussion options A, B, or combination?

- **Question for reviewers B: For ecosystem accounts focused on urban areas, would you prefer the approach of reporting the relative significance of urban green/blue as part of the extent tables or as part of the condition of the broader urban area? Why?**
  - Very mixed response.
  - As extent – because of logic of reporting areas as extent; so that condition can be reported for that asset type;
  - As condition – because green/blue is a condition of the urban area; where less data is available it makes sense; because having too many ET categories is not functional
  - As hybrid – report larger continuous natural ET in urban areas as extent, report embedded green/blue urban assets as part of the larger built-up and can be reported on as condition indicators

Session Agenda

- **8:30 am - Introduction**
  - Summary of Working group 1 Discussion Paper 1.2 and comments received (François Soulard)
- **8:50 am - Country examples highlighting accounting concepts and methods**
  - Accounting for urban areas in Europe (Joachim Maes)
  - Integrating ecosystem extent and condition accounts using a flexible spatial concept: Conceptual issues and illustrations from the URBAN EEA project in the Oslo region (Per Arild Garnåsjordet)
  - Discussion and identification of main issues
- **9:45 am - Data issues, status and recommendations**
  - Digital platforms for municipal ecosystem accounting – testing the URBAN TEP in Oslo (David Barton)
  - Access to public open space in cities – SDG 11.7.1 (Steven King)
  - Discussion and recommendations

Appendix - Reviewer comments organized by question

Comments received on WG1 Discussion paper 1.2, May 2019.

Note: Some comments included here have been edited or interpreted

A. EAA definition and scope of urban ecosystem accounts

Definition of EAA boundary and city size thresholds:

Flexible:

- Flexible/country—specific; could amalgamate urban areas accounts for smaller urban areas
- The overview of what different methods used so far might be enough guidance.
- Provide a flexible framework that countries can report for different urban EAA boundaries
- SEEA EEA should not say anything about the delineation of the EAA (e.g. functional urban area vs. other – this should be left for implementing institutions
- The urban EAA boundary delineation depends on the intent of the urban ecosystem accounts, data availability and country-specific policy needs. Countries with data limitations can started with basic accounts focusing on large metropolitan areas and cities based on their population/population density; while countries with quality spatial data can use multiple levels of boundaries, regional, metropolitan, FUA etc.
- SEEA should not provide guidance for the delineation of the urban EAA boundary, but may be appropriate to outline existing practices. Note that the delineation of urban boundaries is being discussed by the broader statistical; community as part of the Degree of Urbanization methodology developed by the European Commission and partners (taking pop size and density into account). For national level reporting of SDGs, national definitions of urban-rural are used.
- Should not establish a city size threshold as this will depend on the scale and the ecosystem accounting units that countries define. An area-based boundary may minimize certain areas.
- No specific city size threshold that is suitable for all urban areas – thresholds should be country specific.
- A guideline for the urban areas is important as it facilitates comparability, but it must be flexible.

Some guidelines or alignment or other comments about the boundary:

- Should preferably align with harmonized approach urban delineation as part of DG region/Eurostat UN Habitat for 2030 SDG monitoring
- UN Habitat has a mandate globally in support of SDG 11 and other reasons – and it creates issues if SEEA advice is different.
- Ecosystem accounts developed for urban areas should take into account the thresholds set in the City definition developed by the European Commission and the OECD (i.e., minimum density and number of inhabitants.)
- For regions like Europe, recommendation to adopt a single method for cross-border comparability (i.e. commuting zones and FUA)
- One interesting metropolitan scale is the one based on the Functional Urban Areas (FUA) and the FUA core and commuting zones
- Analysis should be based on governance boundaries in order to better link the statistics and ensure relevance.
- Extent could be urbanized zone plus area demarcated for future expansion as part of local government urban plans
- The UK urban account with the variable urban area buffer worked well as a single urban boundary. Socio-economic patterns like administrative boundaries or commuting patterns are not about ecosystems so 2nd best. Significant overbounding of the core/actual settlement doesn't help identify what ecosystem assets have a higher value due to an urban-proximate location. Underbounding a problem if trying to capture the full value of ecosystems to people

Scope of what should be measured for green space:

- Important for SEEA to be clear what should be measured – all green space or a subset (used for people)
- To capture all urban green areas? Or just public green.

B. Urban green as extent or as a condition of urban?

Comments and preferences on the Options presented in Discussion paper 1.2:

Detailed green/blue is better as extent (e.g. like Option 1 tables):

- Important to have extent accounts for green/blue and separate condition for those g/b areas – this follows the normal logical/methodology.
- Prefer G/B as part of extent table, condition of g/b can then be attributed to them.
- Seems logical to classify urban green/areas as part of the extent tables as these also provide ecosystem services.
- Since the amount of them is being measured it should be in the extent tables. Measuring them as condition isn't intuitive to decision makers.
- Important to get an accurate and reliable estimate of the extent of the different types of green and blue space in the urban environment. Once we know the different types of green/blue space, we can more accurately estimate the ecosystem services that these provide. The extent of green and blue space in urban areas alone is a weak measure of condition.

Some kind of hybrid:

- Where data exists it can be part of the extent tables, as it increases capacity to report on the local urban green/blue extents and their condition. However, where it is not available, the data can be reported as a landscape-level characteristic of the urban area in the condition tables. Depends on scale of data.
- Extent tables for blue green areas for high resolution accounts focused on urban areas (specific cities). For national or sub national application where urban ecosystems are presented as part of a much bigger whole, these should be integrated with a condition metric that communicates the area of blue green.
- As Hybrid - Large contiguous areas of green blue in urban areas would be reported according to their 'normal' ET class (forest, grassland), while green/blue occurring within the urban grid/mosaic be reported as condition indicators for a single urban type. The point of having indicators for ecosystem condition is that we create a better (and more flexible) rendering of reality with fewer ecosystem types – in this case a single urban type. This 'urban ecosystem type' could occur regardless of the EAA (i.e. city, rural area, military base etc.), and specific condition indicators could be elaborated for that single type (e.g., greenness, blueness, imperviousness).

Detailed green/blue is better as condition (e.g. like Option 2 tables):

- Urban green / blue should be part of the condition of the broader urban area
- Reporting urban green/blue as part of the condition of the broader urban area is more appealing since condition accounts provide information on the capacity of ecosystems to deliver services.
- Reporting urban green as part of the condition is more appropriate. Considering the definition criteria, green areas influence the urban area condition.
- Approach of reporting green/blue as part of the condition seems appropriate since they characterize the urban area.
- Reporting relative significance of the urban green/blue as part of the condition of the broader urban area is a better approach because there are many implications between contiguous areas and sometimes ecosystem services involve neighbouring municipalilties.

C. Urban ecosystem type classification hierarchy

Comments on which functional and structural characteristics discussed (e.g., Option 1) are most important for an urban ecosystem typology and how might they best be ordered in a hierarchic structure?

Option 1 OK:

- Characteristics in Option 1 figure 4 seem reasonable, and similar hierarchical approach. Add a level for public/private, by using cadastre is important and should be standard practice.
- General agreement with the characteristics and order in Option 1 (continuously built, characteristic of use characteristic of intensity or density and type of asset).
- Think that option 1 example tables with the urban green/blue sub-type as extent is a good example of how an urban areas typology should be set in a hierarchical structure

Other categories and considerations that are important:

- Do not duplicate urban green subclasses with the natural and semi-natural. Public accessibility important.
- Access to g/b is also important to measure
- The choice of the most important structural and functional characteristics and a hierarchical structure should be individually analyzed taking into account data availability, work scale and the local particularities and demands.
- Some kind of nested accounting would seem appropriate
- A coarse (e.g. single level) urban area class is likely not enough for useful accounting
- The presence of urban green assets should be used, considering the urban green areas that is embedded or adjacent to a built-up area.

Simpler structure better:

- Administrative limits, total extent of urban area most important.
- Two level typology might be sufficient: Built-up area, Dense commercial area, Built-up area, Sparse residential area, Urban green, dense forest etc.
- The focus on a top level hierarchy would be more useful that a fully defined one. Countries with advanced ecosystems measurement are in a better place to determine their own classes, but need guidance at the top levels for international comparison etc.
- SEEA EEA should provide a standardized definition of the urban ecosystem type class including a discussion of potential boundary cases and guidance for selecting condition indicators. (i.e. define urban very precisely plus recommend ‘a few ‘compulsory’ condition indicators with the possibility to add more, but leave it free for users to define subtypes. No immediate need to identify different subtypes like low-density residential or high density commercial. The proliferation of ecosystem type classifications should be avoided. Large contiguous patches of homogeneous ecosystems (e.g. major urban forests / lakes) should be reported as part of their normal ET (forest, freshwater)
- Use or intensity characteristic sub-classes like Commercial, industrial, high, medium, low density have very little to do with the ecosystem asset/condition/service or value. This type of information is useful to define the overall boundary of the urban area, but apart from that they are not very useful. A single urban boundary with natural ecosystem types and built-up areas identified within is most useful. Important to include urban natural capital--assets like ‘city river’ or a ‘town beach.’ Classify as much as possible according to the non-urban ecosystem types, then depending on data quality, each 0.05 ha of grassland (e.g. sports pitches and roadside lines of trees) can be assessed the main benefits they provide. If required more urban ecosystem category sub-classes could be used, which can be driven by function (e.g. areas of trees/blue for cooling, areas of trees for air pollutant removal and noise mitigation, accessibility for recreation and physical health, other features of importance for urban decision makers (e.g., green roofs and walls). Urban is a management boundary, not an ecosystem type. Categories in the urban class reflect the management regime - Category ‘managed urban green space, works well for areas like parks that don’t fit neatly into other ET categories.

D. Scale issues

Did they have specific comments on the scale or size of urban ecosystem assets that should be identified in a set of ecosystem accounts for urban areas?

- Country-specific, national needs and realities important to take into account
- A clear distinction between units of observation and units of aggregation would seem a part of the answer to questions b, c and d.
- There can be orders of magnitude difference in the extent of urban green assets between national level accounts and specific urban accounts using more detailed urban specific data sets.
- Compared to rural areas, small ecosystem areas in urban areas are more likely to have a very high value, so it is worth the effort to go to a finer spatial scale. So a forest inventory is inadequate for looking at the benefit of trees in urban areas). Scale to capture is an efficiency question of costs of the finer scale v.s. value of services understood.
- UN habitat suggests open spaces < 200 ha surrounded by buildings is the upper threshold for urban spaces. Possibly useful for defining when something goes in the ecosystem typology. And at the other end high resolution is necessary for urban areas, ideally 10m or less resolution.
- Depending on the scope, urban areas require a different scale of application, which makes it complex to include in the same framework as the others. Might be appropriate to have urban accounts possible as an individual section for specific treatment, such that there is overall coherence in the ecosystems for extent, condition and services, and then where desired and possible there is a zoom in on the urban areas of greatest interest, prioritized according to national criteria. to think of them as an individual section
- No cap to detail that could be included.
- Resolution should be, if possible and depending on context of policy application, fine grained enough to capture linear structures such as hedgerows, open water channels as well as point structures such as trees. In addition to grid cells, cadastral parcels are an important building block for basic spatial units, in order to combine ecosystem info with ownership and accessibility info and should be explicitly mentioned. The data infrastructure should include cadastral parcels.
- Urban areas are price rich. Should be accommodated at scales of 1:4000 or larger
- <u>Where data exists</u>, subgrid green/blue elements and relevant characteristics (e.g. tree health status, channel water quality) can be added as condition indicators
- Urban ecosystem should be looked at from a functional perspective. In our functional accounts (accessibility of green areas) even the lines of the width of 1 meter are considered green areas.

Other comments

- Definition of ecosystem asset—that they be continuous and that they have all the biotic/abiotic components to function—is problematic in urban areas. Very fragmented areas can still act as an asset (e.g., street trees and pocket parks in cities) but small fragments of habitat may not have all the components to function.
- The definition of ecosystem assets does not allow for human-determined/dominated ecosystems (e.g., urban, cropland). If we would like to ensure internal consistency, it should be adjusted.
- The benefit measurement characteristics of urban ecosystems need to be more strongly represented in the paper. The value of actual ecosystems is fairly minor, but the aesthetic, mental well-being and physical well-being aspects are fairly high.
- How do urban ecosystem accounts in paper 1.2 interact with the categories in 1.1. Are they a subset, or a separate concept to the core spatial unit idea? Does it correspond to the built environment/urban category? In either case, clarification between how the urban ecosystems link with the broader classification and spatial units would be helpful. [**Author comment** – yes – idea behind section 4.2 & 5.1 in paper 1.2 was that it would provide details for disaggregation of a high-level built/urban environment or ecosystem type into hierarchical sub-classes].
- The definition of "Urban/built-up type and sub-classes" in Option 1 is not clear. Is this intended to classify the artificial surfaces? Later it further subdivides into build-up, roads and green/blue, for which the green/blue may overlap with the "natural and semi-natural types". [**Author comment:** see above]
- The paper on urban ecosystems, despite presenting practical examples (Canada, UK and Oslo), does not provide sufficient elements for applicability in other regions and situations.
- The units issue keeps recurring and we are not sure if there is a substantial issue or if it is a matter of terminology /semantics. A key will be to allow flexibility is the delimitation of units and in particular to have alternative output areas and recognise that input data will come from a variety of sources, not all of which will be at fine levels of spatial reference.