The purpose of this brief review is to identify requirements for land accounts and related work and communicate these requirements to further strengthen a mutual understanding of land accounting and the development and use of input data from earth observation. This document also briefly summarizes current practices, particularly at the OECD and FAO, regarding compilation of underlying data and publication of land accounts statistics and related products. The ultimate objective is to incorporate land cover and land use accounting in the Global SEEA databases to be hosted at seea.org

I. Requirements for SEEA Land Accounts and related statistics

SEEA land accounts are one of five priority areas for developing global databases, as agreed by the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA).[1]

At the 14th Meeting of the UNCEEA, it was also agreed that dissemination of global databases should take the core tables and accounts, as put forth in the SEEA Technical Note, as the starting point for dissemination requirements (subject to review by the SEEA Technical Committee). This technical note implies the compilation of two types of accounts, globally: physical asset accounts for land cover and physical asset accounts for land use.

Minimum technical requirements, according to SEEA, are as follows:

Land cover	**Minimum requirements**
Product categories	Land cover classes according to the SEEA CF Interim Land Cover Classification: 1) Artificial surfaces (including urban and associated areas 2) Herbaceous crops 3) Woody crops 4) Multiple or layered crops 5) Grassland 6) Tree covered areas 7) Mangroves 8) Shrub covered areas 9) Shrubs and/or herbaceous vegetation, aquatic or regularly flooded 10) Sparsely natural vegetated areas 11) Terrestrial barren land 12) Permanent snow and glaciers 13) Inland water bodies 14) Coastal water bodies and inter-tidal areas
Spatial Coverage	Global: land and inland waters (excluding coastal waters), with sufficient quality to apply for national and local-scale stakeholders
Temporal Extent	Beginning with as early a period as possible to the current period, and maintained
Temporal Resolution	Annual
Delivery Mode	Interactive web-service

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[1] The other priority databases include air emission, energy, material flow and water accounts.

Other Requirements	• Global validation scheme with ideally spatially explicit uncertainty information and reporting of regional accuracy. • Free and open access • Transparent methodology, ensuring technical suitability of the product for future updates (and extensions) at regular intervals (annually) over the long-term. • Clarity and comprehensiveness of metadata, and facilitating future communication with non-expert users about appropriate uses of the product, its limitations and caveats.

Land use	Minimum requirements

Product categories	Land use classes according to the SEEA Land Use Classification:
	1 Land
	    1.1 Agriculture
	    1.2 Forestry
	    1.3 Land used for aquaculture
	    1.4 Use of built up and related areas
	    1.5 Land used for maintenance and restoration of environmental functions
	    1.6 Other uses of land n.e.c.
	    1.7 Land not in use
	2 Inland waters
	    2.1 Inland waters used for aquaculture or holding facilities
	    2.2 Inland waters used for maintenance and restoration of environmental functions
	    2.3 Other uses of inland waters n.e.c.
	    2.4 Inland waters not in use

Spatial Coverage	Global: land and inland water (including coastal water and EEZ), with sufficient quality to apply for national and local-scale stakeholders
Temporal Extent	Beginning with as early a period as possible to the current period, and maintained
Temporal Resolution	Annual
Delivery Mode	Interactive web-service
Other Requirements	• Global validation scheme with ideally spatially explicit uncertainty information and reporting of regional accuracy. • Free and open access • Transparent methodology, ensuring technical suitability of the product for future updates (and extensions) at regular intervals (annually) over the long-term. • Clarity and comprehensiveness of metadata, and facilitating future communication with non-expert users about appropriate uses of the product, its limitations and caveats.

User requirements

Previous assessments conducted by FAO, the OECD and the UN Statistics Division (UNSD) identified the following examples of applications and basic requirements for international compilation of land accounts, or related products, from the perspective of using the information to conduct policy-relevant analyses:

- Achieve the broadest possible geographic coverage.
- An essential methodological objective is achieving coherence across countries.
- Availability of historic time series to allow observing trends over an extended period, which is particularly important for (slow-moving) environmental variables.
- Availability of future updates at regular intervals (timeliness).
- Provide more fine-grained information at the regional and local levels, in addition to national-level aggregates.
- Ensure that calculation of the indicators is transparent, replicable over time and resource efficient.
- Applicable for thematic studies on the following:
  - Anthropogenic uses of land.
  - Land classes of high biodiversity value.
  - Land cover change as proxies for pressures on biodiversity and ecosystems.
  - Indicators on the environmental dimension of quality of life (e.g. population access to good-quality green space & blue space).
  - Analyses of pressures on biodiversity and ecosystems driven by anthropogenic land-cover changes.
  - Modelling of spatial patterns of land use and land use change (e.g. urban sprawl, urban transport systems, deforestation).

While these user requirements, in most cases, could be met using SEEA land accounts, the analyses in these studies also sometimes utilize statistics beyond the SEEA outputs or inputs. For example, OECD land cover and land use databases further incorporate more detailed data on anthropogenic uses of land (such as location of buildings or transportation networks) and additional information on land use or land cover qualities relevant for biodiversity assessment (e.g. concept of intact forest landscape).

II. Details of current initiatives at FAO and OECD:

FAOSTAT Agri-environmental indicators on land cover

- **Purpose/objectives**
  ,
  FAOSTAT Agri-environmental Indicators are intended primarily as an analysis tool and international reference. The statistics are aimed to support development of physical asset accounts for land cover. Land cover information is relevant for understanding the changing composition and condition of ecosystems, including agricultural and forest landscapes.

- **Input data**

  V.1: MODIS Global Land Cover v. 6, an output of NASA/USGS based on the MODIS satellite progamme
  V 2: ESA CCI Land Cover, European Space Agency (ESA) Climate Change Initiative (CCI) Land Cover progamme, based on Sentinel satellites, developed in coordination with UNFCC

- **Objects (units of observation)**

  Global coverage using the FAO Global Administrative Unit Layer (GAUL National level – reference year 2014).

- **Time periods available**

  V.1: 2001-2017
  V.2: 1992-2017

- **Classification**

  FAO uses the 22 global CCI-LC classes to generate statistics for 12 out of 14 SEEA land cover categories (omitted categories are multiple or layered crops category and coastal water bodies and intertidal areas).

- **Methodological review/vetting**

  Overall accuracy is not assessed.

- **Output**

  Annual statistics per country: http://www.fao.org/faostat/en/#data/LC

OECD environment statistics: land cover & land cover change

- **Purpose/objectives**
  - Country reviews (Environmental Performance Reviews, Economic Surveys)
  - Indicator reports (Environment at a Glance, Regions and Cities at a Glance, Green Growth Indicators, How's Life)
  - Cross-country policy analyses
  - Input to the OECD Green Growth headline indicators (in this case: indicator on land cover change)
  - Contributes to monitoring SDG 15.3.1 and the UNCCD-LDN Target, and SDG goals 11 and 6

- **Input data**
  - ESA CCI Land Cover, European Space Agency (ESA) Climate Change Initiative (CCI) Land Cover programme, based on Sentinel satellites, developed in coordination with UNFCCC
  - EU Joint-Research Centre Global Human Settlements Layer (GHSL)
  - Joint Research Centre and Pekel et al. Global Surface Water map
  - Potapov et al. Intact Forest Landscapes map
  - Other global single-class and multi-class products are of interest, subject to review by OECD member countries.

- **Objects (units of observation)**

  OECD Territorial Classification for subnational units in OECD countries and FAO Global Administrative Unit Layer (GAUL National level – reference year 2014).; OECD-EU Joint Research Centre Functional Urban Areas (global coverage)

- **Time periods available**

Land cover: 1992, 2004, 2015, 2018*
Built-up areas: 1990, 2000, 2014
Surface water: 1984, 2015
Intact Forest Landscapes: 2000, 2013, 2016
*public version to be released in coming weeks

- **Classification**

  OECD work does not specifically target alignment with any fixed classification system. Given the paucity of good-quality global datasets, preference has so far been given to finding a pragmatic way to meet user needs, e.g. track changes from the more natural to the more anthropogenic land cover. The CCI Land Cover based summaries use the nine IPCC land cover categories mapped by the dataset authors (artificial surfaces, tree cover, grassland, cropland, wetland, shrubland, sparse vegetation, bare land and water). However, this could easily evolve responding to changing internal and external demand.

- **Methodological review/vetting**

  OECD indicator methodologies and selection of underlying data sources have been developed in close consultation with member countries, and have been vetted by the OECD Environment Policy Committee (EPOC). The land cover change indicator, as a green growth headline indicator, was also consulted with the Committee on Statistics and Statistical Policy (CSSP) and the Working Party 1 on Macroeconomic and Structural Policy of the Economic Policy Committee (EPC-WP1).[2]

- **Output**
    - Annual tabulation of land cover by country and subnational regions & functional urban areas
    - Land cover change conversion matrix by country and subnational regions
    - Built-up area & built-up area change by country and subnational regions
    - Surface water & surface water change
    - Intact forest landscapes
      http://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER
      http://oe.cd/land-cover

- **Future Developments**

  The suite of input sources and output indicators will be progressively extended as new datasets become available and are reviewed by the relevant OECD bodies (e.g. Working Party on Environmental Information, WPEI). 2018 land cover results will be released on the website in the coming weeks.

III. Recap & Next Steps

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[2] https://doi.org/10.1787/72a9e331-en

- Currently there are 2 relevant databases with global coverage (FAO and OECD)
- There are limitations (applicable for both products) in the available input data for land cover accounting, for example for matching all classes in the SEEA classification (input data is constantly improving, but for the moment both FAO and OECD use ESA CCI land cover as the best currently available input)
- Special attention is required regarding level of accuracy for change assessment to avoid misleading results. Change detection using global datasets is between very different land cover types (e.g. forest to bare land changes) whereas more discrete changes (e.g. changes in forest canopy cover) are not. Therefore, the dataset (at this time) only supports the reporting of land cover changes between rather aggregated thematic classes.
- The SEEA land cover and land use global database compilation methodology should undergo a technical review and endorsement by international experts, including the UNCEEA
- Development of land accounts for the global SEEA databases should proceed pragmatically, leveraging the iterative improvements in the underlying data sources and science of earth observation to ensure that the best possible inputs are being used for accuracy and alignment of requirements for SEEA land accounts as described above.
- The global database should include, as completely as feasible, the variables and terminology from the SEEA Technical Note for physical asset accounts for land cover and land use.
- There will likely be a need to continue to maintain related parallel land cover and land use statistics, e.g. at the OECD and elsewhere, in order to meet some of the users' analytical requirements (e.g. for various calculations used in studies of biodiversity loss, anthropogenic use of land, water resources and risks, characterisation of urban areas etc.)