Extent Account

(Levels 0, 1 and 2)

Project: Advancing the SEEA
Experimental Ecosystem Accounting

United Nations
UNEP
Convention on Biological Diversity
NORWEGIAN MINISTRY OF FOREIGN AFFAIRS

Overview: The Extent Account

Learning objectives

1. Review of Level 0 (5m)

- **What** is it?
- **Why** do we need it?
- **What** does it look like?
- **Expertise** & **data** required

2. Level 1 (Compilers)

- Concepts (15m)
- Calculation exercise & check results (15m)

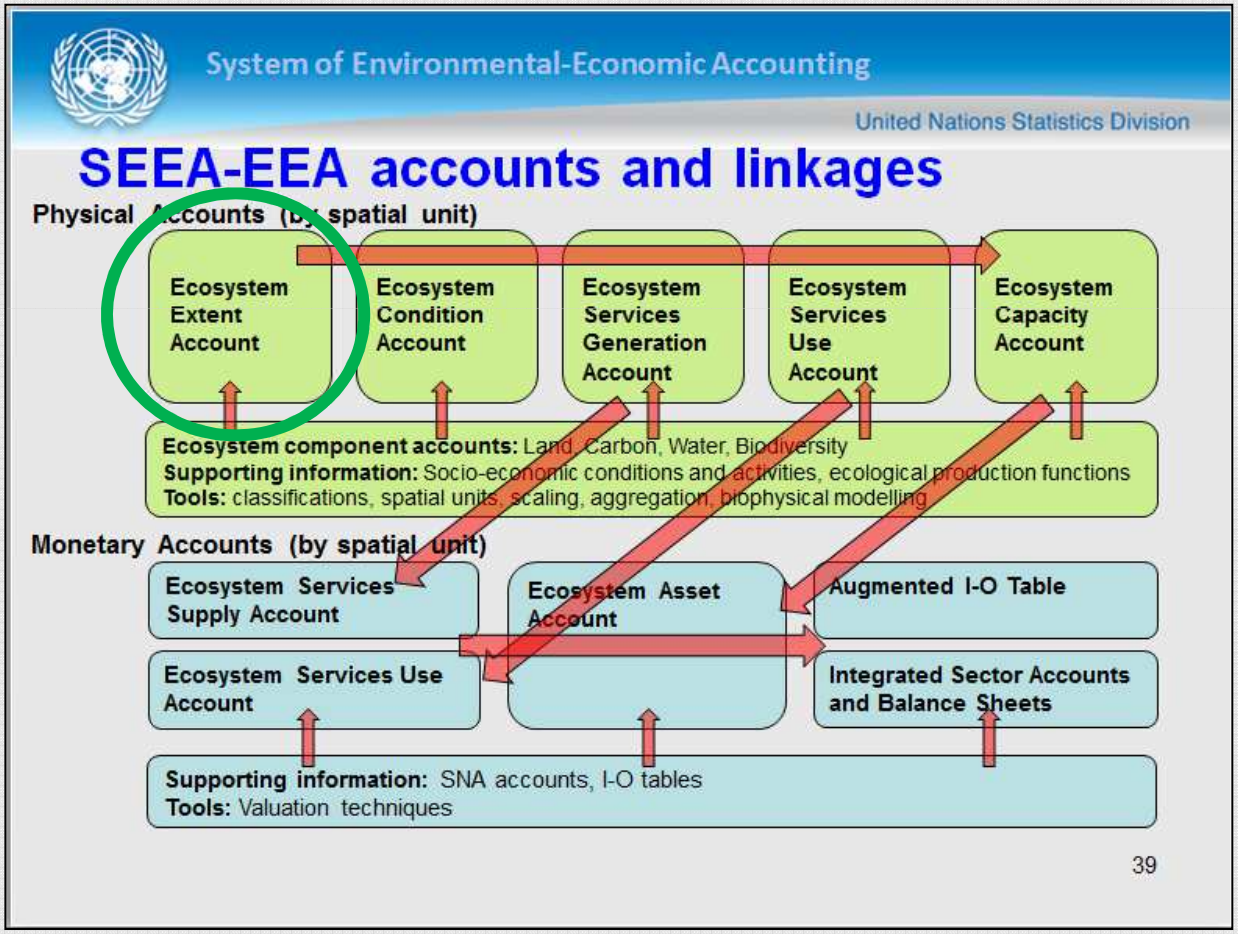
3. Level 2 (Data providers)

- Data options, examples & issues (15m)
- Group exercise & Discussion (30m)

SEEA-EEA Training Levels 1 and 2

- **Learning objectives**
  - Level 1:
    - Understand the basic concepts of The Extent Account
    - Learn the steps of compiling an Extent Account
  - Level 2
    - Understand the data options and sources
    - Understand the important conceptual issues
    - Be aware of how other countries have approached measuring Extent

Account 1: Extent



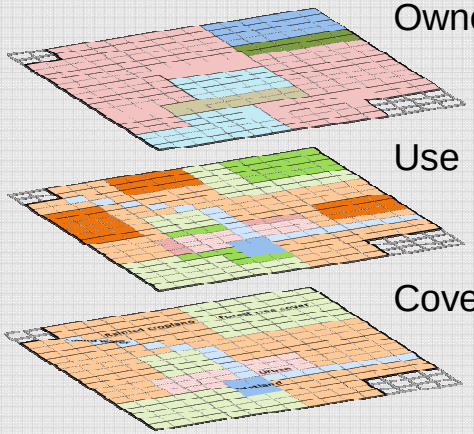
Level 0: Account 1: Extent

- **What?**
  - ***Ecosystem assets*** *are spatial areas containing a combination of biotic and abiotic components and other characteristics that function together* (SEEA-EEA Sections 2.31, 4.1)
  - **National** coverage of land cover, land use, ownership (terrestrial, freshwater, coastal and marine areas)
- **Why?**
  - Land management and conservation policies
  - Spatial foundation for other accounts
    → basis for allocating macro data to spatial units
  - Builds on SEEA-CF (land, forest, water)
  - Indicators:
    - Land cover change → where changes occurring
    - Land cover/use intensity → who owns it

Level 0: Account 1: Extent

- **What does an Extent Account look like?**

Maps



Tables

Cover	Urban and associated		Rainfed herbaceous cropland		Forest tree cover		Inland water bodies		Open wetlands	Total
Use	Infrastructure	Residential	Permananet crops	Maintenance	Forestry	Protected	Infrastructure	Aquaculture	Maintenance	
Ownership	Government	Private	Private	Private	Private	Government	Government	Private	Government	
Units	hectares									
Opening Stock										
Additions to Stock										
Managed expansion										
Natural expansion										
Reductions to stock										
Managed regression										
Natural regression										
Closing stock										

Spatial units
Classifications

Level 0: Account 1: Extent

- **What does an Extent Account look like?**
  - An integrated spatial (GIS) database that overlays:
    - Cover: forest, wetland, lake…
    - Use and intensity of use: agriculture, forestry, protected…
    - Ownership: business, private, government
  - Classified into Spatial units (e.g. BSU)
  - At high resolution (30m to 100m, maximum 500m) with national coverage
  - For two or more periods (change over time)
  - Based on comparable Classifications, Quality, Methods and Spatial units
  - Units: hectares
  - Records: opening stock, closing stock, additions, reductions

Level 0: Account 1: Extent

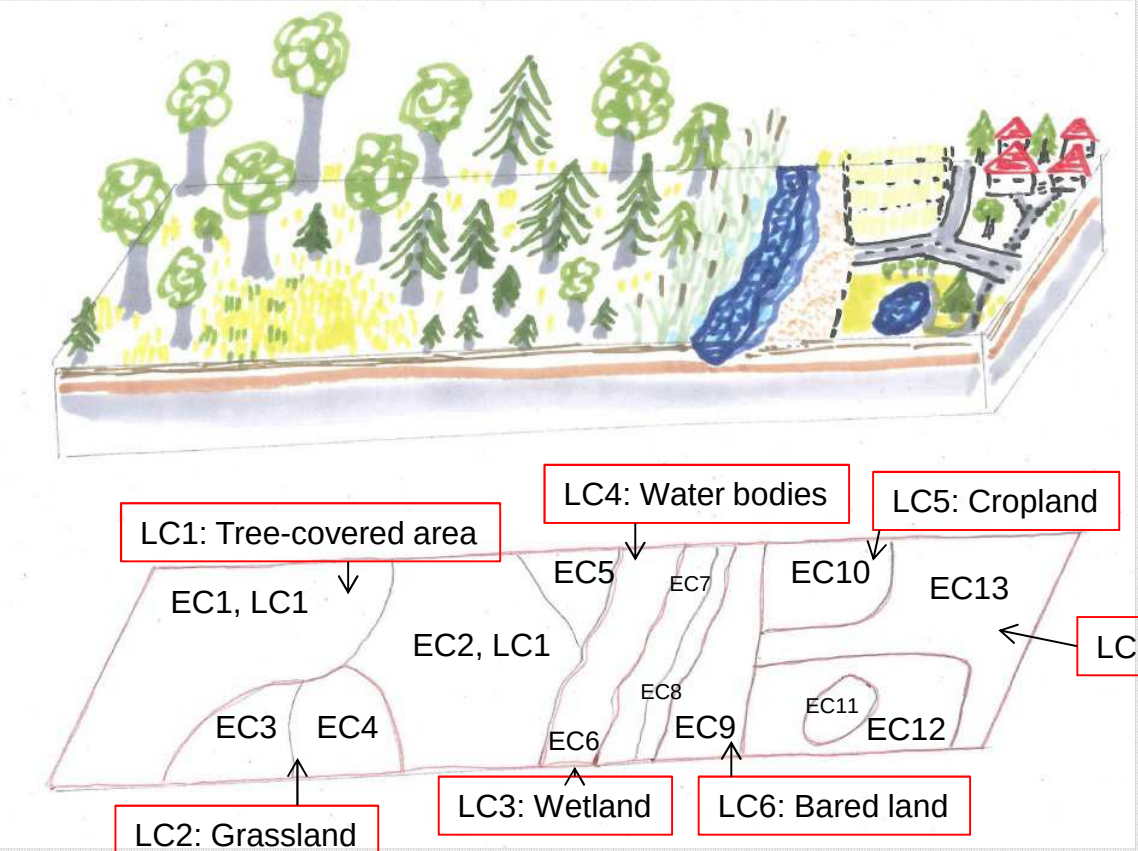
- **What do you need to compile an Extent Account?**
  - GIS platform: software, protocols, spatial units
  - Classifications: land cover, land use, ownership
  - National level data:
    - **Existing land cover** maps would be useful
    - Satellite land cover, aerial photography
    - Census: agriculture, population, settlements
    - Forest inventories
    - Hydrological, topographic (rivers, drainage areas, elevation, coastlines)
    - Cadastral (ownership, tax)
  - Expertise:
    - Land managers, ecologists, geographers (GIS, satellite imagery, integration)

Level 1: Account 1: Extent

- Concepts:
  - Typology of ecosystems and their coverage:
    Extent measures
  - Land cover, land use and land ownership:
    Classification nomenclatures in SEEA
  - Compiling extent accounts:
    Opening stocks
    - Reductions
    + Additions
    = Closing stock

Level 1: Account 1: Extent

- Typology of ecosystems and their coverage



Ecosystem = EC

Land cover = LC

Level 1: Account 1: Extent

- Land cover, land use and land ownership

Land cover classification (SEEA-CF, Table 5.12, p.178)

1 Artificial surfaces (incl. urban and assoc. 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 herb. veg., aquatic or reg. flooded
10 Sparsely natural vegetated areas
11 Terrestrial barren land
12 Permanent snow and glaciers
13 Inland water bodies
14 Coastal water bodies and intertidal areas

Land use classification (SEEA-CF, Table 5.11, p. 176)

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
2.1 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

Land ownership: by industry (e.g. agriculture, mining) or by sector (e.g. public or private)

Level 1: Account 1: Extent

- Compiling Extent Accounts (hectares)

	1 Artificial surfaces (including urban and	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,	10 Sparsely natural vegetated areas	11 Terrestrial barren land	12 Permanent snow and glaciers	13 Inland water bodies	14 Coastal water bodies and intertidal areas	TOTALS
Opening Stock of Resources	14859	193019	0	14	135772	16830	0	11	504	0	0	0	9859	0	370868
Additions to stock															
Managed expansion						3408									3408
Natural Expansion															0
Upward reappraisals						120									120
Total additions to stock															0
Reductions in stock															
Managed regression		3408													3408
Natural Regression															0
Downward reappraisals	112												8		120
Total reductions in stock															0
Closing stock	14747	189611	0	14	135772	20358	0	11	504	0	0	0	9851	0	370868

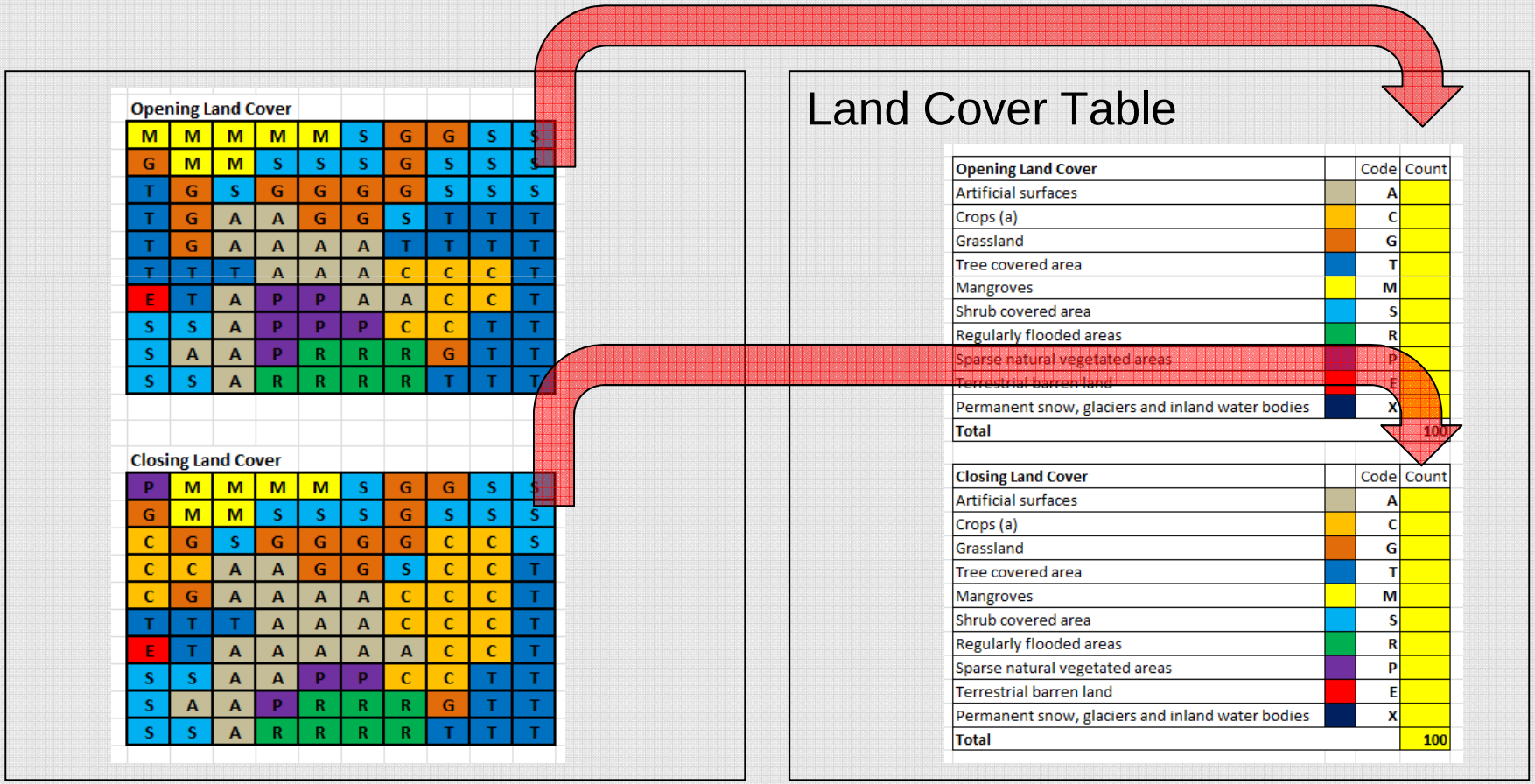
Source: UNSD, Special tabulation.

Level 1: Account 1: Extent

- Compilation Exercise (15 m)
  - Situation:
    - Land cover units defined for two periods (Opening and Closing)
    - Need to calculate:
      - Land Cover Opening and Closing stocks,
      - Land Cover Change per class (with additions and reductions)
      - Physical Account for Land Cover
  - Objective:
    1. Transfer Land Cover from map to table
    2. Calculate Land Cover Change Matrix
    3. Calculate Physical Account for Land Cover
    4. Verify your results

Level 1: Account 1: Extent

Exercise: Step 1 – Calculate Land Cover (see page 6)



Opening Land Cover

M	M	M	M	M	S	G	G	S	S
G	M	M	S	S	S	G	S	S	S
T	G	S	G	G	G	G	S	S	S
T	G	A	A	G	G	S	T	T	T
T	G	A	A	A	A	T	T	T	T
T	T	T	A	A	A	C	C	C	T
E	T	A	P	P	A	A	C	C	T
S	S	A	P	P	P	C	C	T	T
S	A	A	P	R	R	R	G	T	T
S	S	A	R	R	R	R	T	T	T

Closing Land Cover

P	M	M	M	M	S	G	G	S	S
G	M	M	S	S	S	G	S	S	S
C	G	S	G	G	G	G	C	C	S
C	C	A	A	G	G	S	C	C	T
C	G	A	A	A	A	C	C	C	T
T	T	T	A	A	A	C	C	C	T
E	T	A	A	A	A	A	C	C	T
S	S	A	A	P	P	C	C	T	T
S	A	A	P	R	R	R	G	T	T
S	S	A	R	R	R	R	T	T	T

Land Cover Table

Opening Land Cover		Code	Count
Artificial surfaces		A	
Crops (a)		C	
Grassland		G	
Tree covered area		T	
Mangroves		M	
Shrub covered area		S	
Regularly flooded areas		R	
Sparse natural vegetated areas		P	
Terrestrial barren land		E	
Permanent snow, glaciers and inland water bodies		X	
Total			100

Closing Land Cover		Code	Count
Artificial surfaces		A	
Crops (a)		C	
Grassland		G	
Tree covered area		T	
Mangroves		M	
Shrub covered area		S	
Regularly flooded areas		R	
Sparse natural vegetated areas		P	
Terrestrial barren land		E	
Permanent snow, glaciers and inland water bodies		X	
Total			100

Level 1: Account 1: Extent

Exercise: Step 2 – Calculate Land Cover Change (p. 7)

Land Cover Table

Opening Land Cover	Code	Count (ha)
Artificial surfaces	A	
Crops	C	
Grassland	G	
Tree covered area	T	
Mangroves	M	
Shrub covered area	S	
Regularly flooded areas	R	
Sparse natural vegetated areas	P	
Terrestrial barren land	E	
Permanent snow, glaciers and inland water bodies	X	
Total		**100**

Closing Land Cover	Code	Count (ha)
Artificial surfaces	A	
Crops	C	
Grassland	G	
Tree covered area	T	
Mangroves	M	
Shrub covered area	S	
Regularly flooded areas	R	
Sparse natural vegetated areas	P	
Terrestrial barren land	E	
Permanent snow, glaciers and inland water bodies	X	
Total		**100**

Land Cover Change Matrix

Table 1: Net Land Cover Change Matrix (hectares)

		Closing Land Cover										
		Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	**Opening**
Opening Land Cover	Code	**A**	**C**	**G**	**T**	**M**	**S**	**R**	**P**	**E**	**X**	
Artificial surfaces	**A**											
Crops	**C**											
Grassland	**G**											
Tree covered area	**T**											
Mangroves	**M**											
Shrub covered area	**S**											
Regularly flooded areas	**R**											
Sparse natural vegetated areas	**P**											
Terrestrial barren land	**E**											
Permanent snow, glaciers and inland water bodies	**X**											
Closing												

Note: Rows represent reductions in stock; columns represent deletions in stock

Record “No change” in diagonal
Rows = No change + Reductions
Columns = No change + Additions

Level 1: Account 1: Extent

Exercise: Step 3 – Calculate Physical Land Cover (p. 8)

Land Cover Change Matrix

Table 1: Net Land Cover Change Matrix (hectares)

		Closing Land Cover										
		Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	Opening
Opening Land Cover	Code	A	C	G	T	M	S	R	P	E	X	
Artificial surfaces	A											
Crops	C											
Grassland	G											
Tree covered area	T											
Mangroves	M											
Shrub covered area	S											
Regularly flooded areas	R											
Sparse natural vegetated areas	P											
Terrestrial barren land	E											
Permanent snow, glaciers and inland water bodies	X											
Closing												

Note: Rows represent reductions in stock; columns represent deletions in stock

Additions to (A) Artificial surfaces

Physical Land Cover Account

Table 2: Physical Account for Land Cover

	Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	**Total**
Opening Stock											
Additions to Stock											
Reductions in Stock											
Closing Stock											

Note: Reductions are sum of row, excluding areas that remained the same

Additions = Column total – no change
Reductions = Row total – no change

Level 1: Account 4: Extent

- Is everyone clear on the objectives?
- 30 minutes group work
- Please ask questions!
- Results:
  - Each group report:
    - Additions to Stock
    - Reductions in Stock
    - What were the largest sources of change?

Table 2: Physical Account for Land Cover

	Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	**Total**
Opening Stock											
Additions to Stock											
Reductions in Stock											
Closing Stock											

Note: Reductions are sum of row, excluding areas that remained the same

Level 1: Account 1: Extent

- The answers:

Land Cover Change Matrix

- Rows add to Opening
- Columns add to Closing

Table 1: Net Land Cover Change Matrix (hectares)

		Closing Land Cover										
		Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	**Opening**
Opening Land Cover	Code	**A**	**C**	**G**	**T**	**M**	**S**	**R**	**P**	**E**	**X**	
Artificial surfaces	**A**	16	0	0	0	0	0	0	0	0	0	**16**
Crops	**C**	0	7	0	0	0	0	0	0	0	0	**7**
Grassland	**G**	0	1	13	0	0	0	0	0	0	0	**14**
Tree covered area	**T**	0	8	0	15	0	0	0	0	0	0	**23**
Mangroves	**M**	0	0	0	0	6	0	0	1	0	0	**7**
Shrub covered area	**S**	0	2	0	0	0	17	0	0	0	0	**19**
Regularly flooded areas	**R**	0	0	0	0	0	0	7	0	0	0	**7**
Sparse natural vegetated areas	**P**	3	0	0	0	0	0	0	3	0	0	**6**
Terrestrial barren land	**E**	0	0	0	0	0	0	0	0	1	0	**1**
Permanent snow, glaciers and inland water bodies	**X**	0	0	0	0	0	0	0	0	0	0	**0**
Closing		**19**	**18**	**13**	**15**	**6**	**17**	**7**	**4**	**1**	**0**	**100**

Note: Rows represent reductions in stock; columns represent deletions in stock

Physical Account for Land Cover

- Additions to Stock = 3, 11, 0, 0, 0, 0, 0, 1, 0, 0
- Reductions in Stock = 0, 0, 1, 8, 1, 2, 0, 3, 0, 0

Table 2: Physical Account for Land Cover

	Artificial surfaces	Crops	Grassland	Tree covered area	Mangroves	Shrub covered area	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow, glaciers and inland water bodies	**Total**
Opening Stock	16	7	14	23	7	19	7	6	1	0	**100**
Additions to Stock	3	11	0	0	0	0	0	1	0	0	**15**
Reductions in Stock	0	0	1	8	1	2	0	3	0	0	**15**
Closing Stock	19	18	13	15	6	17	7	4	1	0	**100**

Note: Reductions are sum of row, excluding areas that remained the same

Level 2: Account 1: Extent

- **Learning objectives (Level 2)**
  - Understand the important conceptual issues:

    More detail (than Land Cover) may be needed

    Introduction to the FEU (Functional Ecosystem Unit)
  - Understand the data options and sources

    In relation to scale of analysis, pilot project objectives, available resources
  - Be aware of how other countries have approached measuring extent

    EU's MAES process, Canada's MEGS, Australian land accounts

Level 2: Account 1: Extent

- Functional ecosystem units, FEU
  - Are defined by the distinguishable structural elements of terrestrial and aquatic ecosystems
    - Terrestrial – plant community associations (or vegetation complexes), following Brown-Blanquet classification model
    - Aquatic – habitat or biotic communities (such as corals, mussel banks, kelp, reefs etc.)
  - Can be aggregated into Land Cover classes in a nested hierarchy

Level 2: Account 1: Extent

- Data Options for FEU mapping
  - Detailed mapping of habitats and vegetation complexes would be best completed through in-situ inventories (once a base map is completed, remote sensing can be easily applied to update it)
  - Very-high resolution remote sensing imagery (such as QuickBird and Ikonos) and aerial imagery can be applied to facilitate the process.
  - Intermediate solutions may be to produce detailed land cover and use maps (also combined), which are able to distinguish vegetation types at the level of community (e.g. with dominant species)
  - High- and medium- resolution imagery such as Landsat, SPOT, etc. would be suitable for the purpose

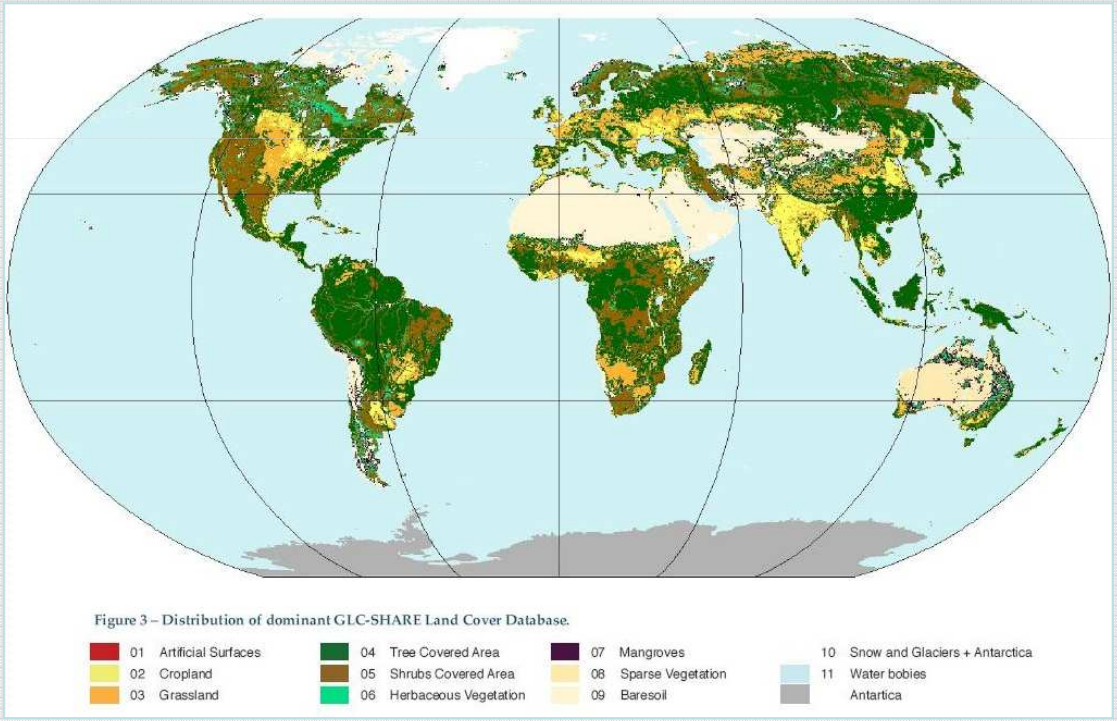
Andalucian Land cover (112 classes, level 5 of CORINE LC)

http://www.juntadeandalucia.es/medioambiente/site/rediam/menuitem.04dc44281e5d53cf8ca78ca731525ea0/?vgnextoid=e77f21895d55a210VgnVCM1000001325e50aRCRD&vgnextchannel=784efa937370f210VgnVCM1000001325e50aRCRD&vgnextfmt=rediam&lr=lang_es#subapartadob77f21895d55a210VgnVCM1000001325e50a____

Level 2: Account 1: Extent

- Global land cover datasets

FAO Global Land Cover-SHARE



The FAO product Global Land Cover-SHARE (year 2014 Beta-Release 1.0) is constructed using the best quality national and international data sources.

11 land cover classes were harmonized and reclassified according to the SEEA-CF land cover classification

http://www.glcn.org/databases/lc_glcshare_en.jsp

Level 2: Account 1: Extent

- Global land cover datasets

MODIS Land Cover

Modis Land Cover is a set of annual products based on NASA's MODIS imagery, and available at 500m x 500m spatial resolution. The product name is 'Land Cover Type Yearly L3' (version 51 is the latest)

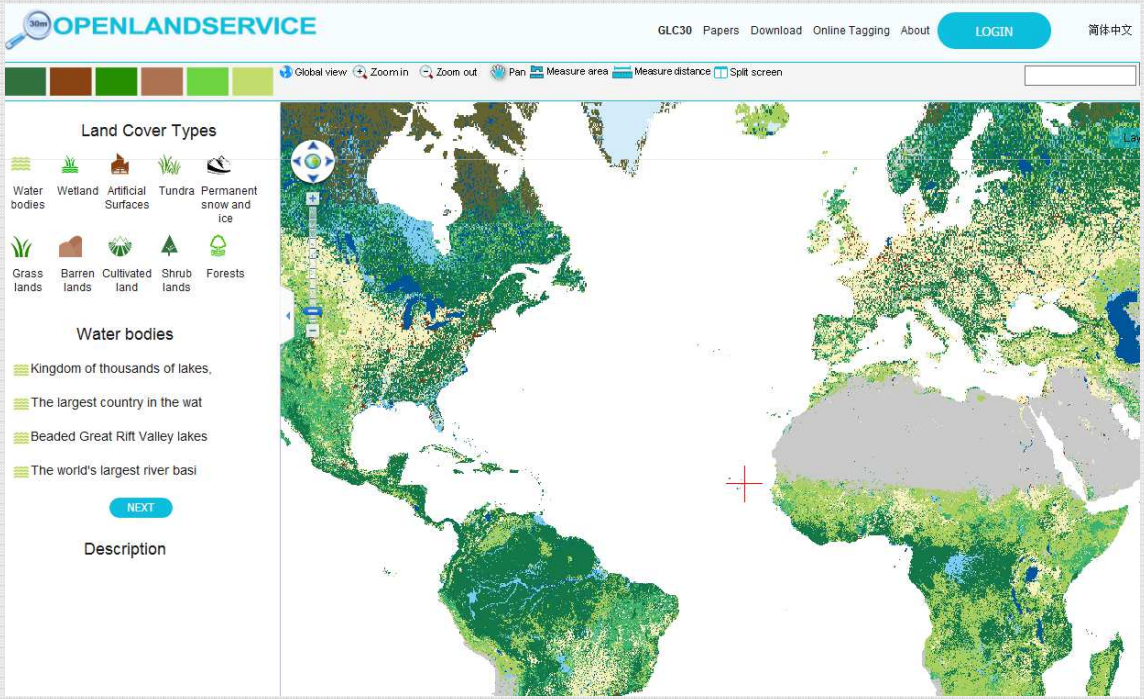
Land Cover Type 1: IGBP global vegetation classification scheme
Land Cover Type 2: University of Maryland (UMD) scheme
Land Cover Type 3: MODIS-derived LAI/fPAR scheme
Land Cover Type 4: MODIS-derived Net Primary Production (NPP) scheme
Land Cover Type 5: Plant Functional Type (PFT) scheme

All spatial data downloaded from http://reverb.echo.nasa.gov/

Level 2: Account 1: Extent

- Global land cover datasets

GlobeLand30 (new product)

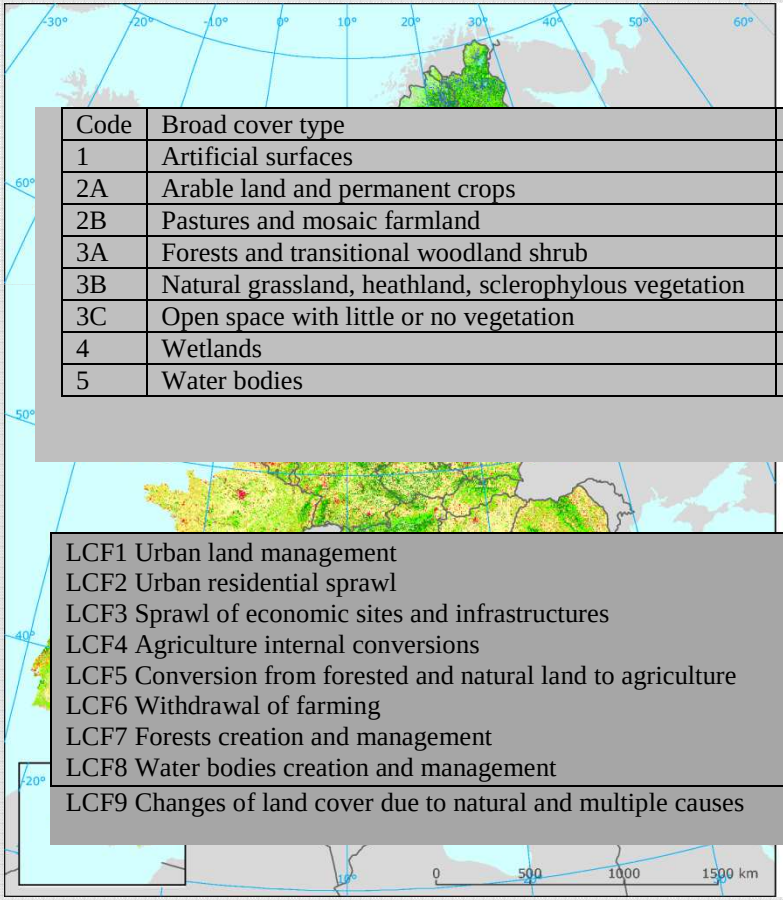


Very high resolution global land cover maps were produced by China, known as GlobeLand30, for years 2000 and 2010, with 10 classes and 30 m resolution, based on the freely available imagery from NASA's Landsat satellite instruments.

http://www.globallandcover.com/GLC30Download/index.aspx

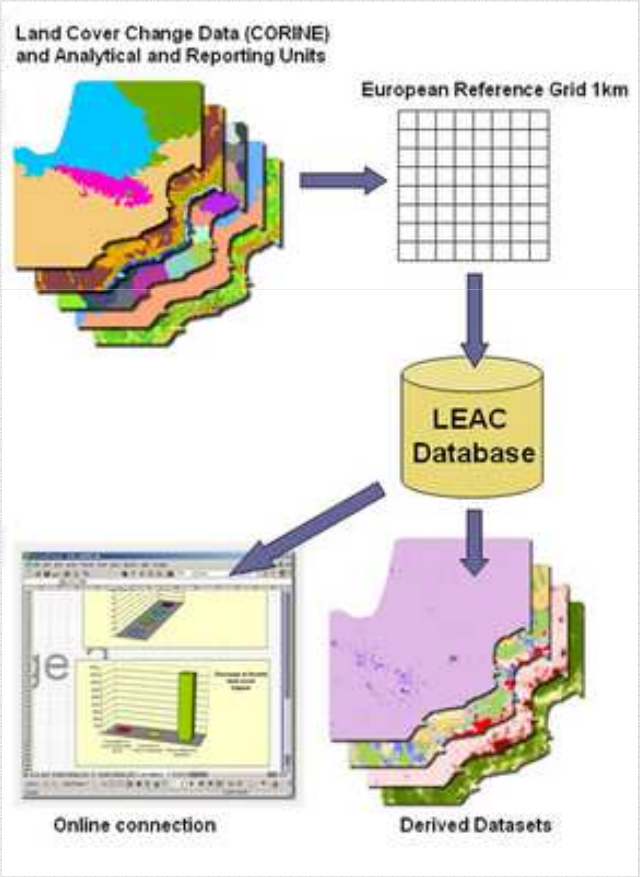
Level 2: Account 1: Extent

EU Land accounts:



Code	Broad cover type	Aggregated CLC classes by Code
1	Artificial surfaces	CLC 1
2A	Arable land and permanent crops	CLC 2.1+2.2+2.4.1
2B	Pastures and mosaic farmland	CLC 2.3+2.4.2+2.4.3+2.4.4
3A	Forests and transitional woodland shrub	CLC 3.1+3.2.4
3B	Natural grassland, heathland, sclerophylous vegetation	CLC 3.2.1+3.2.2+3.2.3
3C	Open space with little or no vegetation	CLC 3.3
4	Wetlands	CLC 4
5	Water bodies	CLC 5

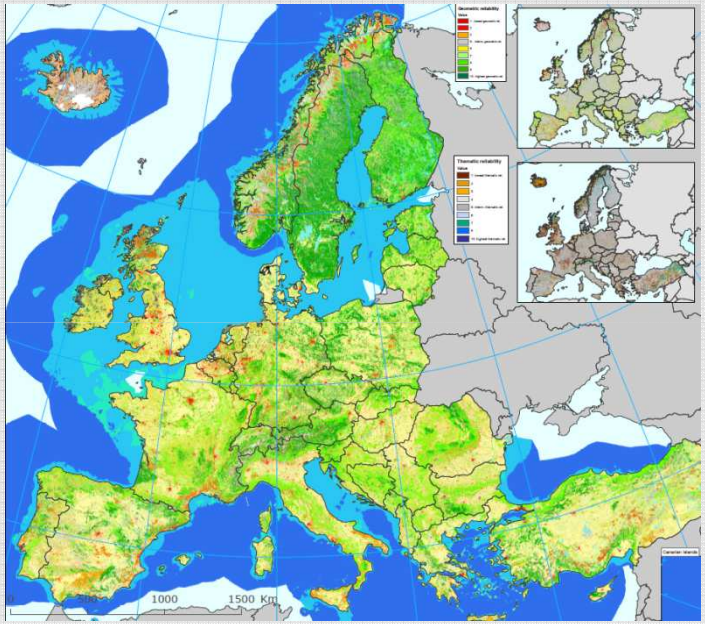
LCF1 Urban land management
LCF2 Urban residential sprawl
LCF3 Sprawl of economic sites and infrastructures
LCF4 Agriculture internal conversions
LCF5 Conversion from forested and natural land to agriculture
LCF6 Withdrawal of farming
LCF7 Forests creation and management
LCF8 Water bodies creation and management
LCF9 Changes of land cover due to natural and multiple causes



http://www.eea.europa.eu/themes/landuse/interactive/land-and-ecosystem-accounting-leac

Level 2: Account 1: Extent

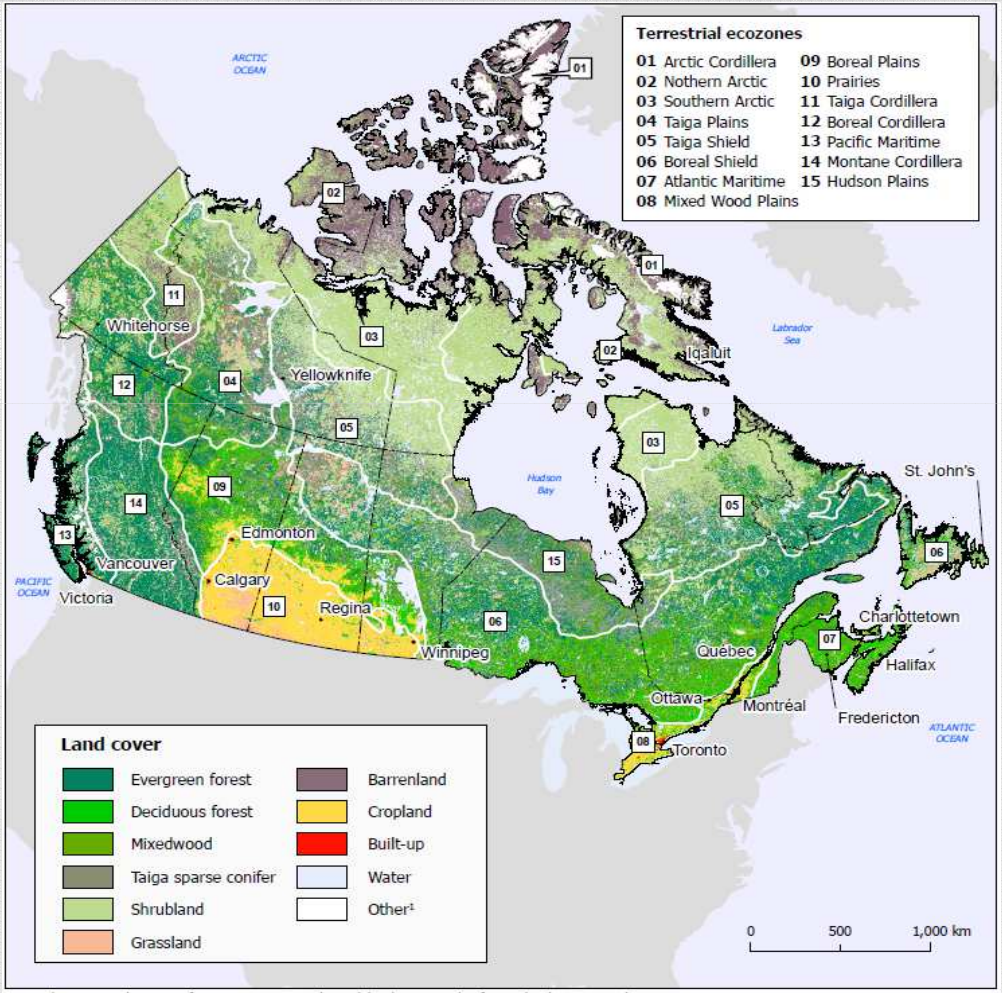
EU (MAES) Ecosystem types:



Source: European Environment Agency
spatial resolution: * 100*100 m
data sources:
* CLC 2006, HRL sealing 2006, JRC-Forest 2006, OSM 2013
* CLC 2000 (Greece)
* EU-DEM
* ESDB, Art. 17 (2006), pot. nat. vegetation ((c) BfN),
* env- strata (Metzger)
* HANTS-MODIS (Alterra, GISAT)
crosswalk
* CLC-EUNIS crosswalk
* method: ETC-SIA (c) 2013

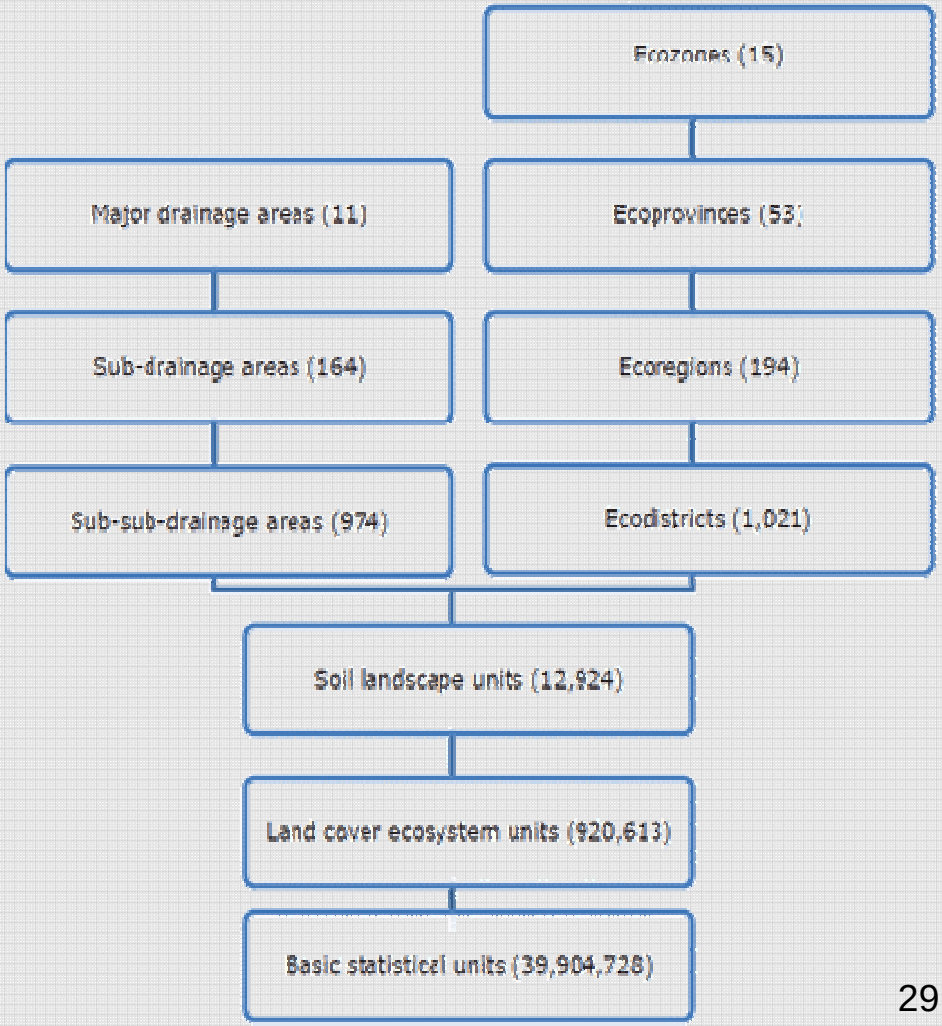
Level 2: Account 1: Extent

- Statistics Canada (Measuring Ecosystem Goods and Services – MEGS)
- Based Extent Account on existing National Ecological Classification
- Further sub-divided Ecodistricts and Soil Landscape Units to LCEUs (See Spatial Units)
- Using MODIS (at 250m resolution), hydrology, topography, roads…



Level 2: Account 1: Extent

- Statistics Canada
  MEGS Spatial Infrastructure
- Developed a hierarchy of spatial units that was consistent with the SEEA-EEA classification



Level 2: Account 1: Extent

- Australia's Land Accounts
- Based on MODIS 250m Land Cover, aggregating 25 classes to seven categories

Australian Dynamic Land Cover	AEEA presentation
Built Up Areas	Built Up Areas
Rainfed Cropping Rainfed Pasture	Rainfed cropping and pasture
Alpine Grasses - Open Hummock Grasses - Open Sedges - Open Tussock Grasses - Open Hummock Grasses - Sparse Tussock Grasses - Sparse	Grasses and Sedges
Trees - Closed Trees - Open Trees - Scattered Trees - Sparse	Trees
Irrigated Cropping Irrigated Pasture	Irrigated cropping and pasture
Shrubs - Closed Shrubs - Open Chenopod Shrubs - Open Shrubs - Scattered Shrubs - Sparse Chenopod Shrubs - Sparse	Shrubs
Extraction Sites Inland Water bodies Salt Lakes Wetlands	Other

Level 2: Account 1: Extent

- Concepts group Exercise (15m) (Groups of 3-5)

1. What national data and classifications for Ecosystem Extent are already available for your country?
2. If there are no national classifications, what data could you use to create an Ecosystem Extent Account?
3. Report your results

Level 2: Account 1: Extent

- Concepts group Exercise (15m)

- Group reports:
  - National **data and classifications** for Ecosystem Extent already available for your country
  - Alternative sources of data for Ecosystem Extent Accounts?
- Discussion
  - Who would need to participate in creating a pilot Ecosystem Extent Account?

Level 2: Account 1: Extent

- Discussion and questions
- Take home points
  - Land Cover data, classified by the recommended SEEA-EEA classification is a useful starting point for creating Ecosystem Extent Accounts
  - Data need to be national and consistent
  - Alternatives exist to create more “optimal” units (such as the FEU, based on ecological classifications
    - These can fit into the SEEA-EEA Land Cover classification
  - Global for Land Cover may be used if there is no national alternative

Level 2: Account 1: Extent

- References

- EUROPEAN ENVIRONMENTAL AGENCY (EEA) (2006): Land accounts for Europe 1990–2000. Towards integrated land and ecosystem accounting. EEA report 11/2006, 107p, Copenhagen. (Authors: R. Haines-Young and Jean-Louis Weber)
- STATISTICS CANADA, 2013. Human Activity and the Environment: Measuring Ecosystem Goods and Services 2013. 16-201-XWE. Ottawa: Government of Canada
- AUSTRALIAN BUREAU OF STATISTICS, 2013. Land Account: Queensland, Experimental Estimates, 2013

- Further Information
  - SEEA Experimental Ecosystem Accounting (2012)
  - SEEA-EEA Technical Guidance (forthcoming)
    - Detailed supporting document on “Land inputs for ecosystem accounting” by UNSD

http://unstats.un.org/unsd/envaccounting/workshops/eea_forum_2015/lod.asp

Evaluation of the training module

- Please complete the evaluation form for this module
- For this module
  - What did you learn that you could apply in your work?
  - Was the presentation clear and informative?
  - Was it too simple? Too complex?
  - Was there anything you did not understand?
  - What additions or deletions would you suggest (recognizing that the unit is intended for a general audience)?
  - Do you have any suggestions as to how the SEEA-EEA may be improved (concepts, principles) in this area?

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NORWEGIAN MINISTRY OF CLIMATE AND ENVIRONMENT

UNEP
United Nations Environment Programme

United Nations

Convention on Biological Diversity

https://lpdaac.usgs.gov/products/modis_products_table/mcd12q1

Class	IGBP (Type 1)	UMD (Type 2)	LAI/fPAR (Type 3)	NPP (Type 4)
0	Water	Water	Water	Water
1	Evergreen Needleleaf forest	Evergreen Needleleaf forest	Grasses/Cereal crops	Evergreen Needleleaf vegetation
2	Evergreen Broadleaf forest	Evergreen Broadleaf forest	Shrubs	Evergreen Broadleaf vegetation
3	Deciduous Needleleaf forest	Deciduous Needleleaf forest	Broadleaf crops	Deciduous Needleleaf vegetation
4	Deciduous Broadleaf forest	Deciduous Broadleaf forest	Savanna	Deciduous Broadleaf vegetation
5	Mixed forest	Mixed forest	Evergreen Broadleaf forest	Annual Broadleaf vegetation
6	Closed shrublands	Closed shrublands	Deciduous Broadleaf forest	Annual grass vegetation
7	Open shrublands	Open shrublands	Evergreen Needleleaf forest	Non-vegetated land
8	Woody savannas	Woody savannas	Deciduous Needleleaf forest	Urban
9	Savannas	Savannas	Non-vegetated	
10	Grasslands	Grasslands	Urban	
11	Permanent wetlands			
12	Croplands	Croplands		
13	Urban and built-up	Urban and built-up		
14	Cropland/Natural vegetation mosaic			
15	Snow and ice			
16	Barren or sparsely vegetated	Barren or sparsely		

Class	PFT (Type 5)
0	Water
1	Evergreen Needleleaf trees
2	Evergreen Broadleaf trees
3	Deciduous Needleleaf trees
4	Deciduous Broadleaf trees
5	Shrub
6	Grass
7	Cereal crops
8	Broad-leaf crops
9	Urban and built-up
10	Snow and ice
11	Barren or sparse vegetation
254	Unclassified
255	Fill Value

Level 1	Level 2	Level 3
1. Artificial surfaces	1.1 Urban fabric	1.1.1 Continuous urban fabric
		1.1.2 Discontinuous urban fabric
	1.2 Industrial, commercial and transport units	1.2.1 Industrial or commercial units
		1.2.2 Road and rail networks and associated land
		1.2.3 Port areas
		1.2.4 Airports
	1.3 Mine, dump and construction sites	1.3.1 Mineral extraction sites
		1.3.2 Dump sites
		1.3.3 Construction sites
	1.4 Artificial, non-agricultural vegetated areas	1.4.1 Green urban areas
		1.4.2 Sport and leisure facilities
2. Agricultural areas	2.1 Arable land	2.1.1 Non-irrigated arable land
		2.1.2 Permanently irrigated land
		2.1.3 Rice fields
	2.2 Permanent crops	2.2.1 Vineyards
		2.2.2 Fruit trees and berry plantations
		2.2.3 Olive groves
	2.3 Pastures	2.3.1 Pastures
	2.4 Heterogeneous agricultural areas	2.4.1 Annual crops associated with permanent crops
		2.4.2 Complex cultivation patterns
		2.4.3 Land principally occupied by agriculture with significant areas of natural vegetation
		2.4.4 Agro-forestry areas
3. Forests and semi-natural areas	3.1 Forests	3.1.1 Broad-leaved forest
		3.1.2 Coniferous forest
		3.1.3 Mixed forest
	3.2 Shrub and/or herbaceous vegetation associations	3.2.1 Natural grassland
		3.2.2 Moors and heathland
		3.2.3 Sclerophyllous vegetation
		3.2.4 Transitional woodland scrub
	3.3 Open spaces with little or no vegetation	3.3.1 Beaches, dunes, sand plains
		3.3.2 Bare rock
		3.3.3 Sparsely vegetated areas
		3.3.4 Burnt areas
		3.3.5 Glaciers and perpetual snow
4. Wetlands	4.1 Inland wetlands	4.1.1 Inland marshes
		4.1.2 Peat bogs
	4.2 Coastal wetlands	4.2.1 Salt marshes
		4.2.2 Salines
		4.2.3 Intertidal flats
5. Water bodies	5.1 Continental waters	5.1.1 Water courses
		5.1.2 Water bodies
	5.2 Marine waters	5.2.1 Coastal lagoons
		5.2.2 Estuaries
		5.2.3 Sea and ocean