Ecosystem Accounts Limburg

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Ecosystem Accounts Limburg

- Context and aims
- Maps
- Modelling ecosystem services
- Supply and use tables
- Take home messages

Context

The Netherlands: ecosystems under pressure

surface area	4.1 million ha
population	16.8 million
pop density	400 p/km^2
land use:	%
Agriculture	53
Water	15
Natural - semi natural	15
All other	17

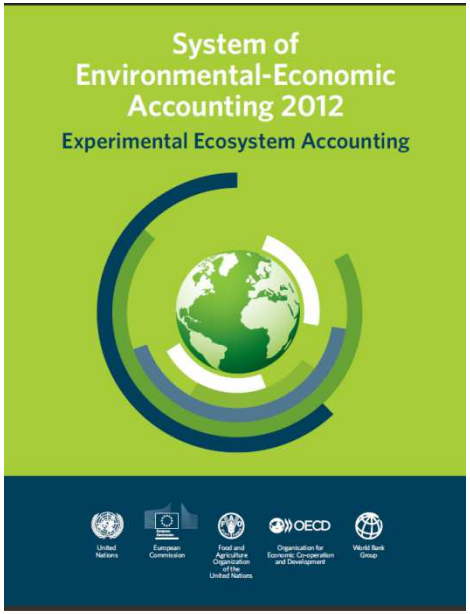
Project aims:

Pilot project on the application of the SEEA EEA approach for Limburg province: feasibility, relevance and recommendations for further work

Context: Limburg province

Context: Limburg province

Project aims

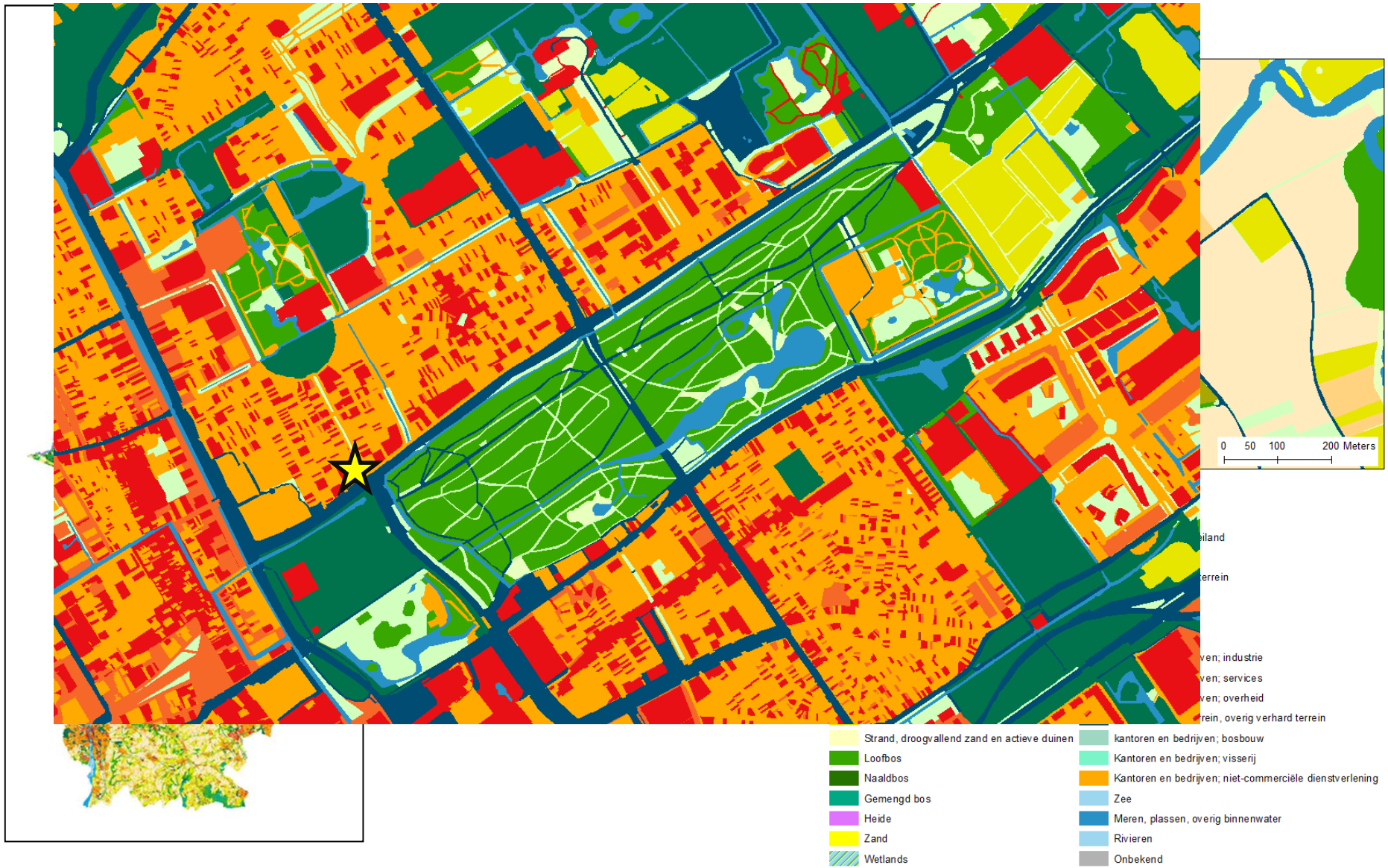


- Physical and Monetary Supply and Use tables
- 8 ESS: provisioning (crops, fodder, groundwater), regulating (PM10, Carbon seq.), cultural (hunting, bike rec., nature tourism)
- Condition table (prelim.)
- Content of accounts is geographically explicit:
  - Ecosystem Units Map
  - Economic Ownership (SBI) map
  - Maps for all ecosystems services, physical and monetary

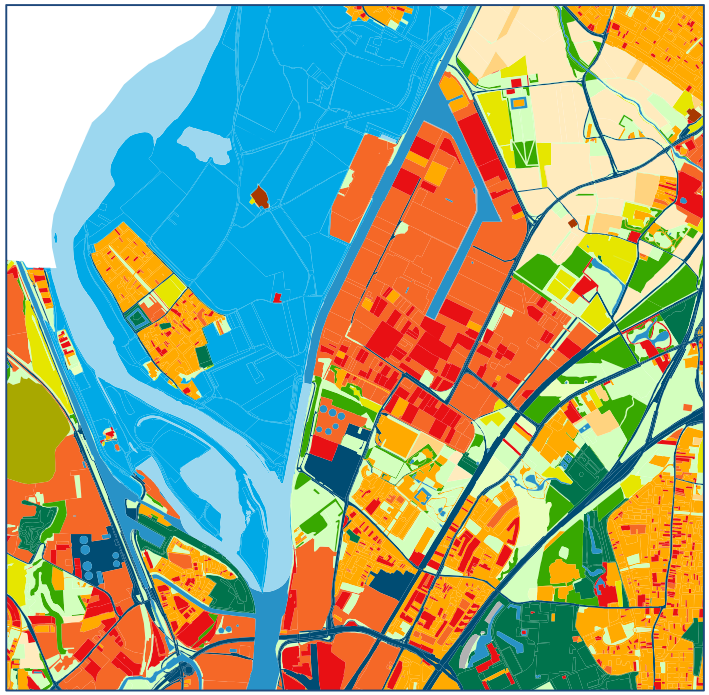
Ecosystem Units map

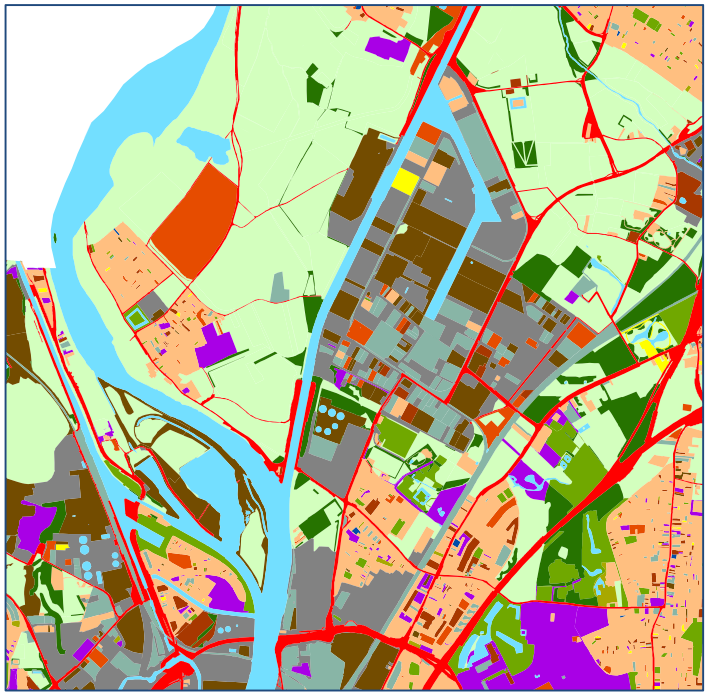
- Highly detailed polygon map w line elements >6m included
- Mixture of land use, economic ownership, specific regional features (mixed level-legend)
- 31 units, based on requirements for ES models → not the ideal map for ecologists, biologists etc.

Ecosystem Units map



ISIC (economic user) map





Same map as EU, different legend: ISIC

- A Landbouw, bosbouw en visserij
- B-E Nijverheid (geen bouw) en energie
- F Bouwnijverheid
- G-I Handel, vervoer en horeca
- J Informatie en communicatie
- K Financiële dienstverlening
- L Verhuur en handel van onroerend goed
- M-N Zakelijke dienstverlening
- O-Q Overheid en zorg
- R-U Cultuur, recreatie, overige diensten
- Huishoudens
- Natuur
- Water
- Wegen
- Overig

Methods

- Biophysical models ecosystem services
  - Based on Remme et al. 2014 – Ecosystem Services
- Monetary valuation ecosystem services
  - Based on Remme et al. 2015 – Ecological Economics

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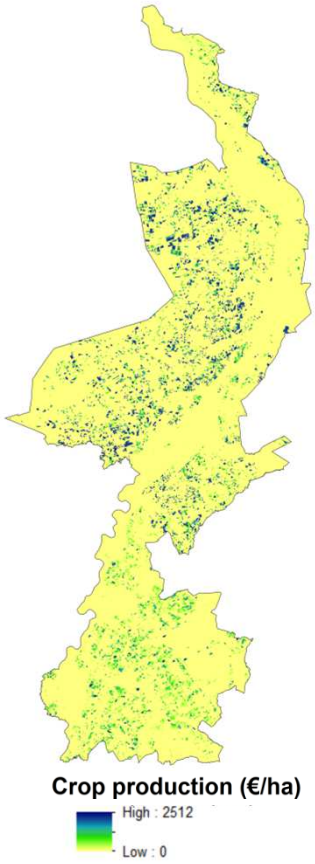
Monetary valuation

- Valuation methods aligned with National Accounts
  - Focus on producer surplus
  - Exclude consumer surplus

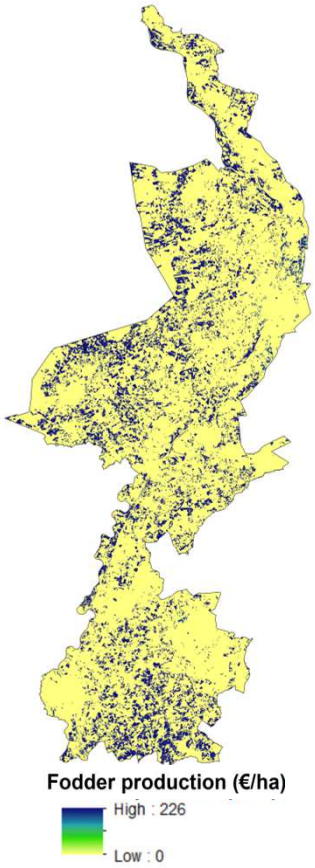
- Described in SEEA Experimental Ecosystem Accounting
  - Resource rent
  - Avoided damage costs
  - Replacement costs

Resource rent

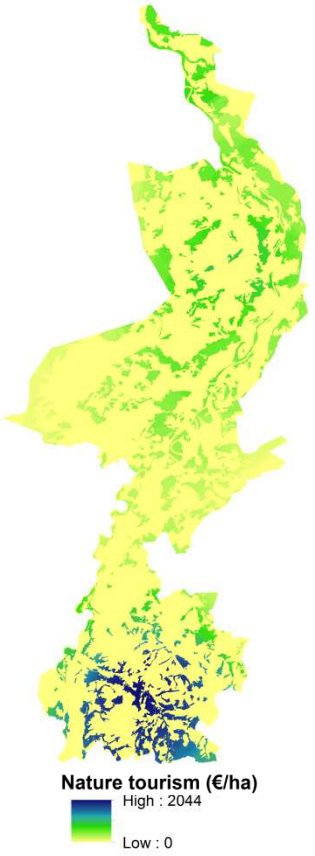
Crop production



Fodder production

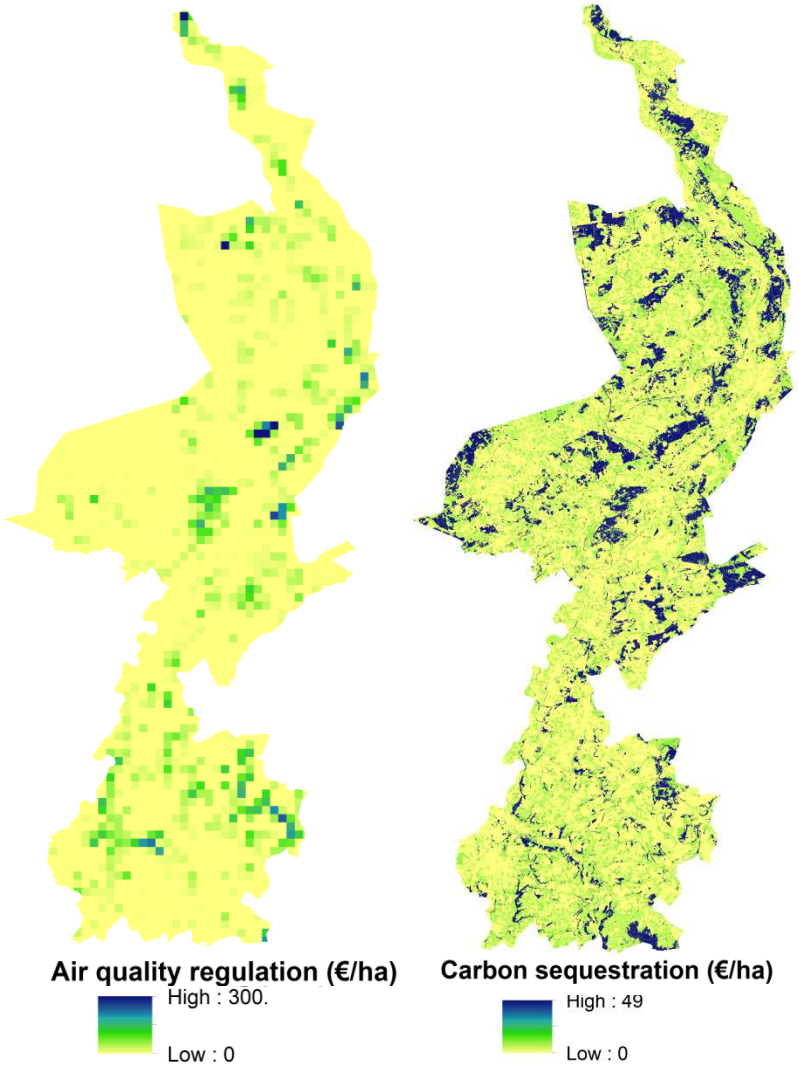


Nature tourism



Avoided damage costs

- Carbon sequestration
- PM10 filtration
  - Avoided increased concentration
  - Avoided medical costs



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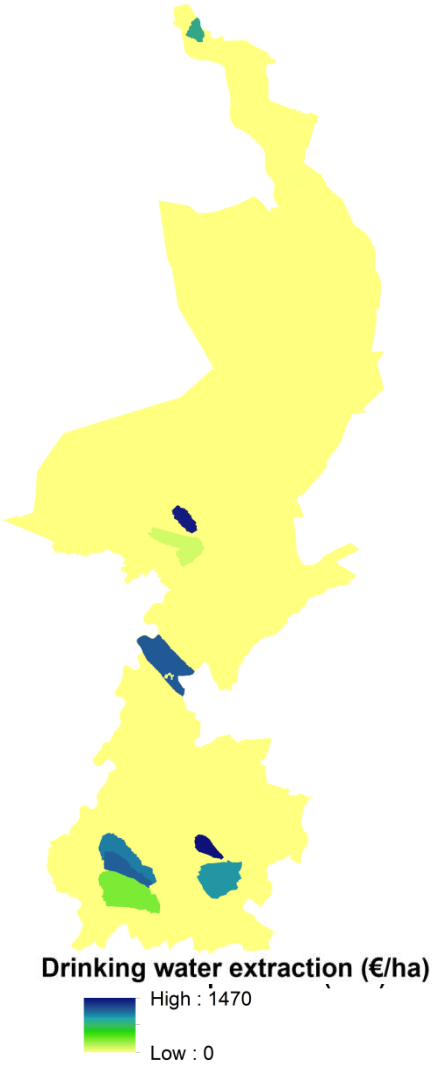
Replacement costs

- Costs for replacing ecosystem service with most viable alternative
- Drinking water production from ground water
- Alternative: surface water
  - higher purification costs
  - comparison between drinking water production companies



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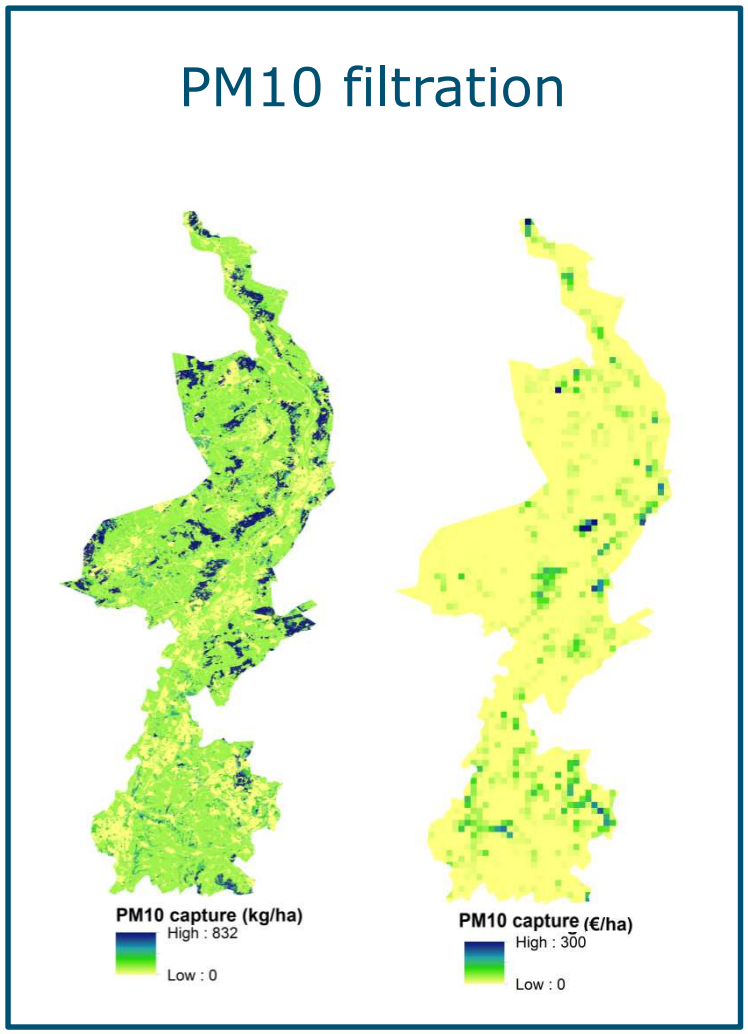
Biophysical vs. monetary maps



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Ecosystem contribution to economy

Ecosystem service	Total revenue (million €)	ES contribution (million €)
Crop production	386	37.9
Fodder production	86	7.6
Drinking water production	104	11.6
PM10 filtration	-	2.3
Carbon sequestration	-	2.0
Nature tourism	248	41.8
Hunting	-	2.2

Physical Supply (summ.)

Physical supply, totals

Ecosystem services	Ecosystem Units	1 Non-perennial plants	2 Perennial plants	4 Meadows (for grazing)	5 Hedgerows	21 Deciduous forest	22 Coniferous forest	23 Mixed forest	24 Heath land	26 Fresh water wetlands	27 Natural grassland	28 Public green space	31 River flood basin	Totals
	extent (ha)	53.600	8.100	27.100	2.900	11.400	7.100	10.400	2.100	900	3.100	4.800	14.100	**220.900**
Crops	tonnes/yr	1.427.300	65.000	-	-	-	-	-	-	-	-	-	-	**1.492.400**
Fodder	tonnes/yr	140.800	4.700	328.700	-	-	-	-	-	-	-	-	66.900	**541.100**
Meat (from game)	kg/yr	11.500	1.500	5.900	800	2.500	1.700	2.900	600	200	800	900	2.400	**36.800**
Ground water (drinking water only)	in 1000 m3/yr	9.000	1.400	4.200	500	1.900	100	500	100	-	700	400	1.300	**27.000**
capture of PM10	tonnes/yr	400	100	200	-									
Carbon sequestration	tonnes C/yr	-	2.400	4.900	500									
Recreation (cycling)	1000s of bike trips/yr	1.800	300	1.000	100									
Nature tourism	# tourists/yr	94.000	22.000	136.800	57.000									

Physical Supply per Hectare

Ecosystem services	Ecosystem Units	Non-perennial plants	Perennial plants	Meadows (for grazing)									
Crops	tonnes/ha/yr	26,63	8,02	-									
Fodder	tonnes/ha/yr	2,63	0,58	12,13									
Meat (from game)	kg/ha/yr	0,21	0,19	0,22	0,28	0,22	0,24	0,28	0,29	0,22	0,26	0,19	0,17
Ground water (drinking water only)	1000m3/ha/yr	0,17	0,17	0,15	0,17	0,17	0,01	0,05	0,05	-	0,23	0,08	0,09
capture of PM10	tonnes/ha/yr	0,01	0,01	0,01	-	0,03	0,06	0,05	-	-	-	0,02	0,01
Carbon sequestration	tonnesC/ha/yr	-	0,30	0,18	0,17	1,45	1,45	1,45	0,19	0,22	0,19	0,25	0,20
Recreation (cycling)	1000s of bike trips/ha/yr	0,03	0,04	0,04	0,03	0,05	0,03	0,04	-	-	0,03	0,04	0,04
Nature tourism	#tourists/ha/yr	1,75	2,72	5,05	19,66	14,06	13,21	14,17	10,81	12,89	17,87	2,46	6,70

Monetary Supply (summ.)

		Non-perennial plants	Meadows (for grazing)	Hedgerows	Deciduous forest	Coniferous forest	Mixed forest	Heath land	Fresh water wetlands	Natural grassland	Public green space	Other unpaved terrain	River flood basin	Totals
extent	ha	**53.629**	**27.066**	**2.940**	**11.414**	**7.091**	**10.437**	**2.149**	**936**	**3.121**	**4.761**	**22.591**	**14.126**	**220.922**
Crops	€	35.303.100	-	-	-	-	-	-	-	-	-	-	-	**37.908.400**
Fodder	€	1.960.900	4.587.100	-	-	-	-	-	-	-	-	-	942.300	**7.556.200**
Meat (from game)	€	817.700	223.400	-	186.800	192.700	261.100	35.600	12.700	32.900	14.700	211.200	136.000	**2.249.400**
Ground water	€	3.861.200	1.802.300	193.900	824.200	63.500	218.700	57.300	11.200	295.700	192.600	1.041.100	545.700	**11.602.800**
Capture of PM10	€	301.200	173.700	30.400	200.200	185.700	200.700	27.200	2.400	46.700	78.100	258.200	85.900	**2.275.900**
Carbon sequestration	€	300	165.700	13.000	562.500	350.300	515.000	13.200	6.400	19.300	40.500	139.000	95.600	**2.006.100**
Nature tourism	€	4.410.000	6.349.100	2.357.700	6.930.100	3.162.500	5.443.100	917.000	392.800	2.488.900	525.900	2.870.600	3.162.100	**41.816.200**
Recreation (cycling)	€	NA												**NA**
	€	**46.654.400**	**13.301.400**	**2.600.000**	**8.703.800**	**3.954.700**	**6.638.800**	**1.050.400**	**425.400**	**2.883.500**	**951.700**	**4.520.200**	**4.967.500**	**105.415.000**
value per ha	€/ha	**870**	**491**	**884**	**763**	**558**	**636**	**489**	**454**	**924**	**200**	**200**	**352**	**477**
value per ha (incl. Amenity)*	€/ha	**870**	**491**	**884**	**1.193**	**988**	**1.066**	**489**	**454**	**924**	**688**	**220**	**352**	**553**

Monetary use

Ecosystem services	Ecosystem Units	Economic Users (ISIC Sections) A	B-D	E	F-H	I,R	Rest	Export	Household cons	Government cons.	Investments	Inventories	Env (global goods)
Crops	tonnes/yr	37.908.400											
Fodder	tonnes/yr	7.556.200											
Meat (from game)	kg/yr								2.249.400				
Ground water (drinking water only)	in 1000 m3/yr			11.602.800									
Capture of PM10	tonnes/yr								2.275.900				
Carbon sequestration	tonnes C/yr												2.006.100
Recreation (cycling)	1000s of bike trips/yr								na				
Nature tourism	# tourists/yr					41.816.200							

Take home messages

- Ecosystem accounting is feasible in the Netherlands
- Ecosystem accounting is in demand

- Challenges:
  - monetary valuation; much more experimentation needed,
  - problems of scale: to what scale are models reliable?
  - International comparisons; how to compare a service like hunting or firewood collecting (cultural service/provisioning service?)

Thank you!

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Project Participants:

Lars Hein and Roy Remme (Wageningen University)

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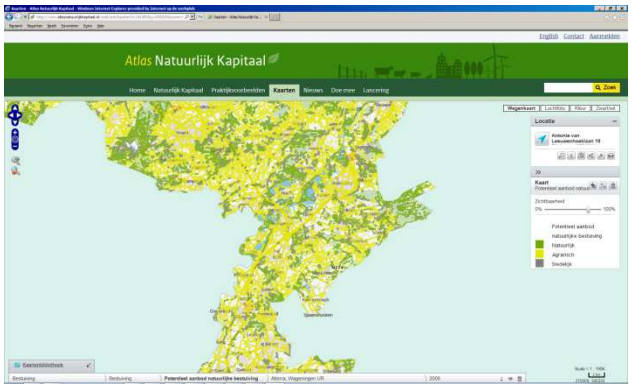
With contributions from RIVM and PBL

Concept, Supply en Use



Ecosystem service map

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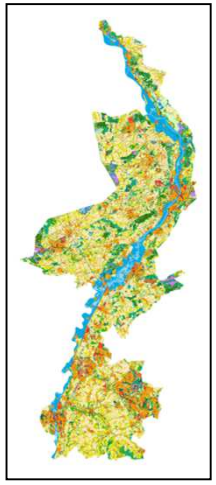


= Supply per EU

or

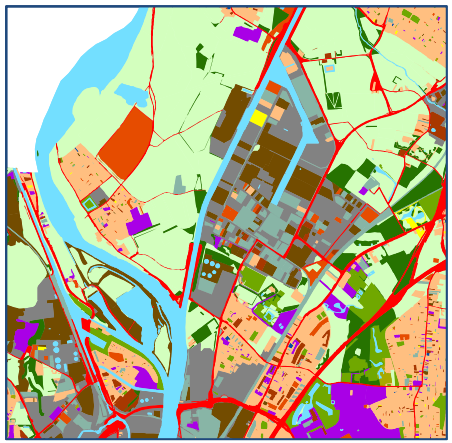
ES model based directly on EU map

= Supply per EU

Concept, Supply en Use

Model of Ecosystem service (map)

x



Economic Users map

= Use per EU

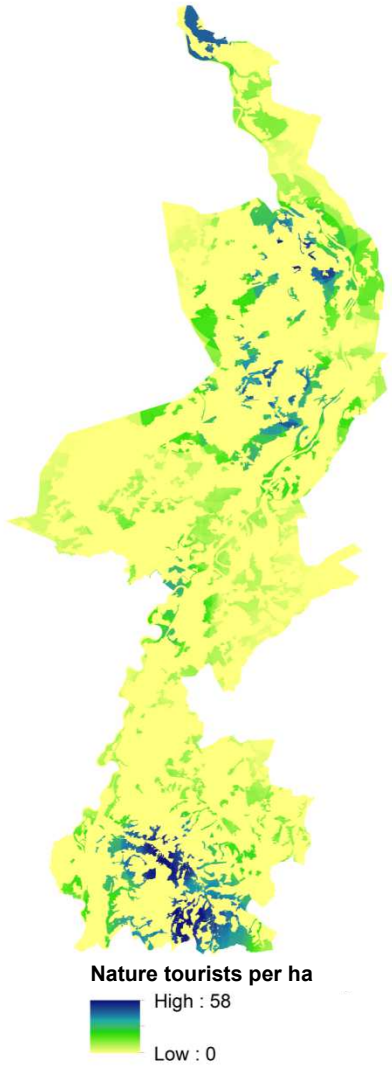
or

Conceptual assignment to ISIC sections

Biophysical ecosystem service models

- Example: Nature tourism

- Accommodation locations
- Surrounding nature areas
- Statistics
    - Capacity
    - Occupancy



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