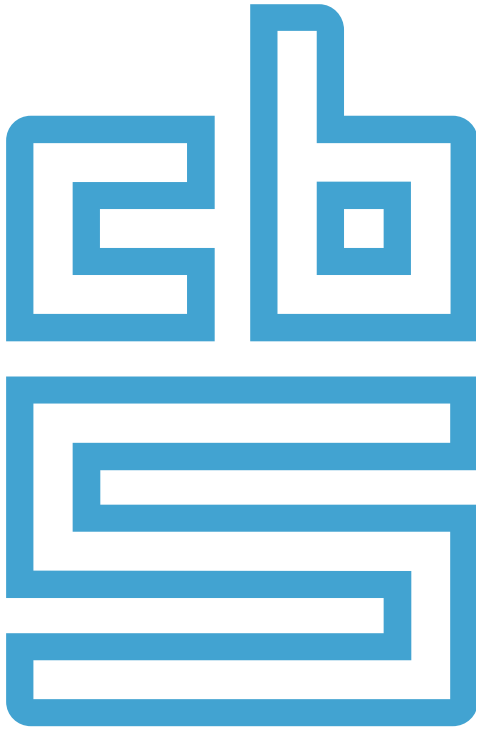

Experimental monetary ecosystem accounts in the Netherlands

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- Approaches to ecosystem service valuation
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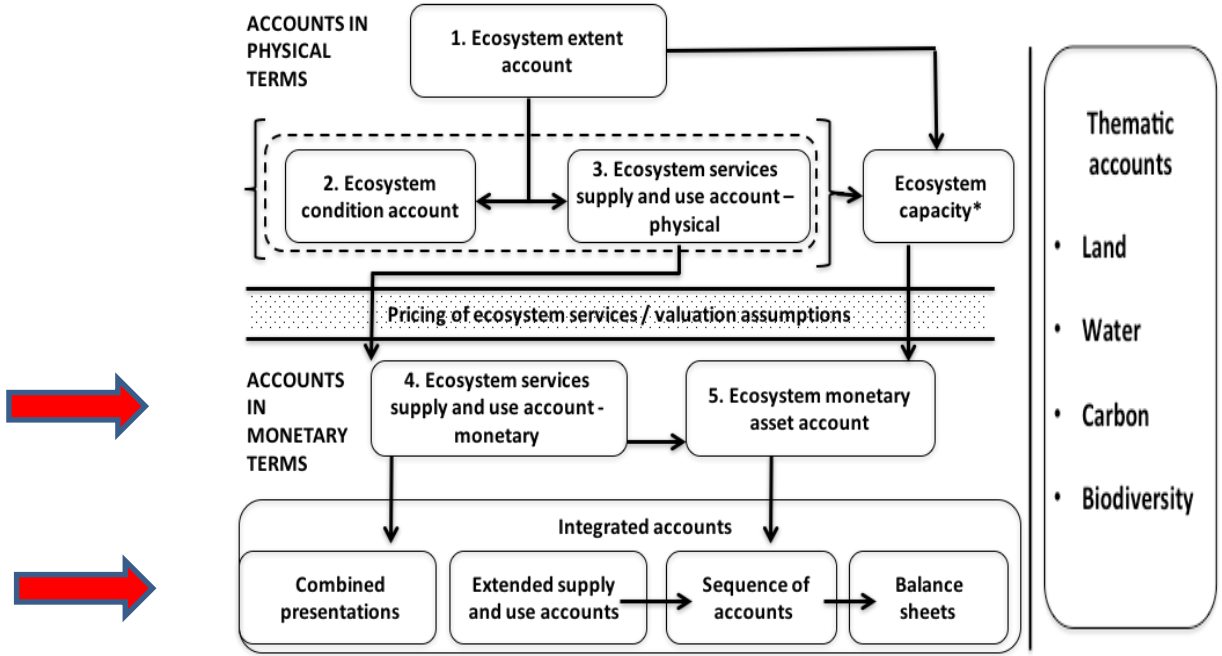
SEEA EEA accounting framework



Aim monetary ecosystem accounts

- The aim of this study is **to provide experimental monetary values for ecosystem services and ecosystem assets in the Netherlands**.

  →Ecosystems make an economic contribution.

  →Monetary valuation helps to make that contribution visible and comparable to other economic variables.

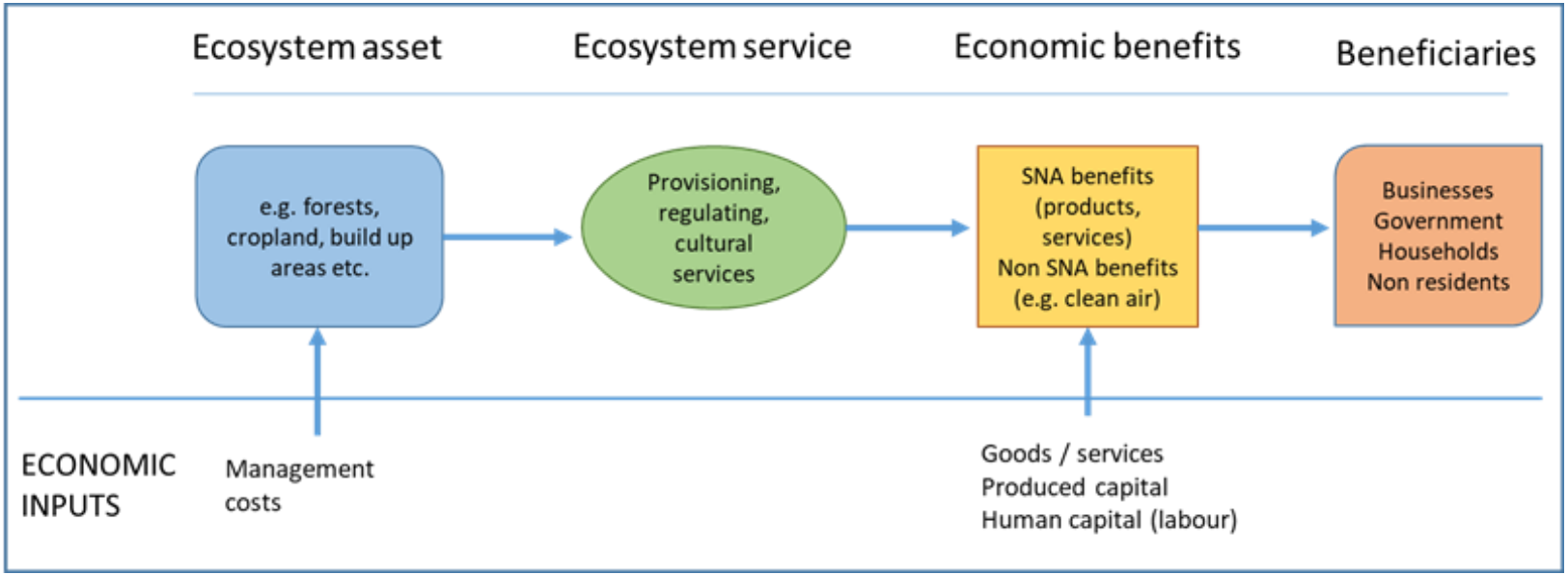
  →(Change of) economic value gives a signal of the scarcity and quality of ecosystems

- It is **not** the purpose of this report to provide statistical information on all aspects of value nor do the results present the ‘true’ value of nature.

Focus

1. **Only estimate the *economic value* of the contribution of ecosystems to *human benefits***. Non-economic values (e.g. the cultural value of a landscape) and so-called 'non-human' benefits (e.g. ecosystems as habitats for animals) have been excluded in this report.
2. **Values to *final ecosystem services*** – produced by ecosystems and used in production activities (e.g. crops, timber) or consumption activities (e.g. avoided health damage of air filtration).
3. **Actual use of ecosystem services** rather than the capacity of ecosystems. This is consistent with the concept of actual transactions as recorded in the SNA.
4. We use valuation techniques that are **consistent with the principles of the System of National Accounting**. This implies that we calculate exchange values for ecosystem services rather than so-called welfare values.

Key components for monetary valuation in SEEA EEA



Approaches to ecosystem service valuation

Approach 1: Exchange values

1a Exchange values incorporated in GDP (as defined in the SNA)

→ *Contributing to production activities*

→ *Contributing to consumption activities*

1b Exchange values not incorporated in GDP (as defined in the SNA)

Approach 2: Welfare values

→ Not SNA consistent, but useful for other applications

Approach 3: GVA approach

→ Gross value added generated by economic activities that directly depend upon natural capital

Approach	Method	Exchange values			Welfare values	GVA/NVA approach
		Exchange values incorporated in GDP of the SNA		Exchange values not incorporated in GDP of the SNA		
		Contribution to production activities	Contribution to consumption activities			
Market-based	resource rent method	X				
	rent prices	X				
	user costs	X				
	payments for ecosystem services	X				
	production function method	X				
	GVA/NVA method					X
Cost-based	replacement costs			X		
	avoided damage costs			X		
	social cost of carbon			X		
Revealed preference	consumer expenditure (including travel costs)		X			
	hedonic pricing	X				
Stated preference	contingent valuation				X	
	choice modelling				X	

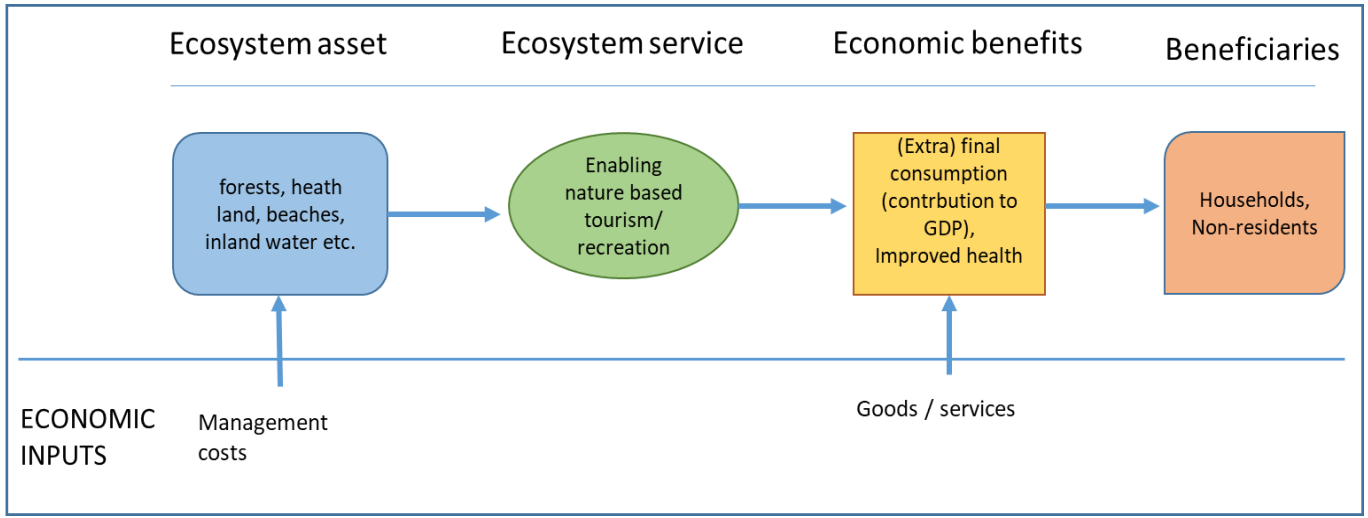
Most appropriate methods for estimating

Class	Ecosystem service	Exchange values			Welfare values	GVA/NVA approach
		Exchange values incorporated in GDP of the SNA				
		Contribution to production activities	Contribution to consumption activities	Exchange values not incorporated in GDP of the SNA		
Provisioning ecosystem services	crop production	resource rent rent prices user costs				GVA
	fodder production	resource rent rent prices user costs				GVA
	timber production	resource rent rent prices				GVA
Regulating ecosystem services	air filtration			avoided damage		
	carbon sequestration			avoided damage		
	water filtration			replacement costs		
	pollination			avoided damage		
Cultural ecosystem services	nature recreation		household expenditure			
	nature tourism	resource rent	household expenditure			
	amenity services	hedonic pricing				

Selected ecosystem services

- Provisioning
  - **Crop production**
  - **Fodder production**
  - **Timber production**
- Regulating
  - **Air filtration**
  - **Carbon sequestration in biomass**
  - **Pollination**
  - **Water filtration**
- Cultural
  - **Nature recreation (hiking)**
  - **Nature tourism**
  - **Amenity service**

Nature tourism and recreation



Definition of the ecosystem service and benefits for nature-based tourism: defined as **an input to consumption activities**

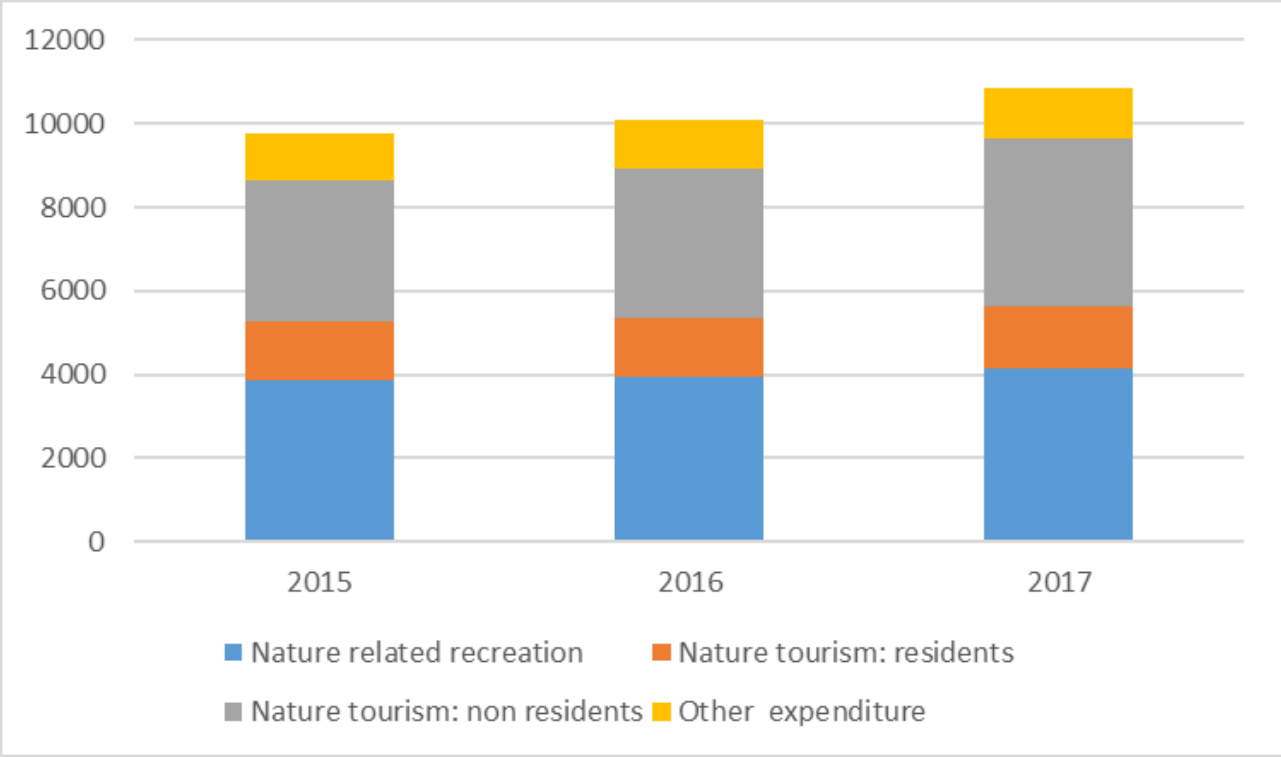
Methods: *Consumer expenditure*

- **Total consumer expenditure related to nature tourism/recreation** was taken as an approximation for the related ecosystem service.
- Consumer expenditure was determined separately for a) nature recreation, b) nature tourism by residents and c) nature tourism by non-residents.
- Data was obtained from Dutch tourism and recreation statistics which are based on survey data.
- Only expenditure related to outdoor activities were selected.

Expenditure on nature related recreational activities, 2015, million euro

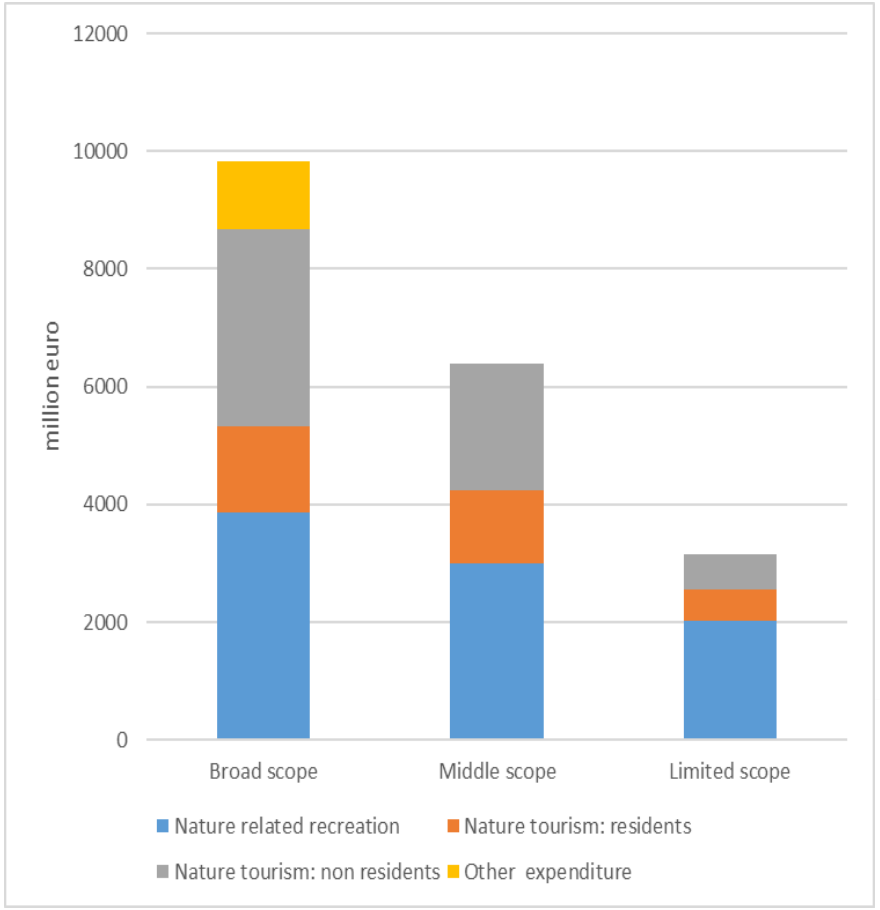
	Admission fees, etc.	Travel costs	Food drinks etc.	Other	Total
Hiking	30,8	506,6	176,2	30,8	744,4
Cycling	25,1	65,7	185,5	25,1	301,4
Other outdoor receration	87,8	821,5	333,2	300,5	1543,0
Water sports	80,3	78,5	34,2	122,0	315,0
Outdoor sports	119,1	196,9	152,0	501,5	969,5
Total	343,2	1669,1	881,1	980,0	3873,4

Total consumer expenditure on nature-related tourism and recreation



Nature related expenditure for tourism and recreation activities calculated according to three scenarios

1) **Limited scope:** travel costs, admissions fees
2) **Middle scope:** travel costs, admissions fees, accommodation costs, other costs
3) **Broad scope:** travel costs, admissions fees, accommodation costs, other costs, food and drinks, other related expenditure (mainly consumer durables)



Supply table

	million euro	Agriculture	Dunes and beaches	Forest	Heath land and inland dunes	Wetlands	(semi)natural grassland	Public green space	Other unpaved terrain	River flood basin and salt marshes	Built up terrain	Water	Other	TOTAL	
Provisio-ning services	Crop production	415	0	0	0	0	0	0	1	0	0	0	0	415	
	Fodder production	849	0	0	0	0	0	0	2	21	0	0	0	872	
	Timber production	0	2	41	0	0	0	0	0	0	0	0	0	44	
	Drinking water	34	0	41	8	1	2	3	14	3	18	1	0	125	
Regulating services	Carbon sequestration	35	5	102	1	2	2	3	11	10	1	0	0	171	
	Pollination	136	0	73	5	6	15	11	70	36	7	2	0	359	
	Air filtration	10	1	6	0	0	1	2	5	0	15	2	0	42	
Cultural services	Nature recreation	910	329	949	135	78	75	547	532	58	26	235	1	3873	
	Nature tourism	2489	1791	602	100	52	97	113	463	115	6	116	0	5946	
	Amenity service	84	167	231	24	9	23	204	33	13	18	207	0	1014	
TOTAL		4962	2295	2044	275	147	215	884	1130	256	91	563	1	12863	

Use table

	million euro	A - Agriculture, forestry and fishing	B,C - Mining and manufacturing	D - Electricity	E - Water supply	F-H - Contruction, wholesale and transportation	I,R - Accommodation and food service, culture, sports and recreation	Export	Households	Government	Investments	Inventories	TOTAL
Provisio-ning services	Crop production	415											415
	Fodder production	872											872
	Timber production	44											44
Regulating services	Water filtration				125								125
	Carbon sequestration									171			171
	Pollination	359											359
Cultural services	Air filtration								42				42
	Nature recreation								3873				3873
	Nature tourism							3341	2605				5946
	Amenity service								1014				1014
TOTAL		1690	0	0	125	0	0	3341	7535	171	0	0	12862

Method asset valuation

We have used a **net present value approach** to convert the estimated flow of ecosystem services into an estimate of the associated asset value.

Assumptions:

- The *future flow* of income for each ecosystem services is assumed *constant* and equal to the flow observed most recently.
- The discount rate equals *3 percent*, unless the ecosystem asset is thought to become scarcer and there are limited substitution possibilities, in which case a discount rate of 2 percent is used.
- The asset life is *100 years* for all ecosystem assets.

Asset account (2015)

	million euro	Agriculture	Dunes and beaches	Forest	Heath land and inland dunes	Wetlands	(semi)natural grassland	Public green space	Other unpaved terrain	River flood basin and salt marshes	Built up terrain	Water	Other	TOTAL
Opening stock		159400	76300	66700	8600	4700	7100	28400	37500	8800	2600	17800	0	417800
	Additions to stock													
	Reductions to stock													
	Revaluations													
Closing stock														435200

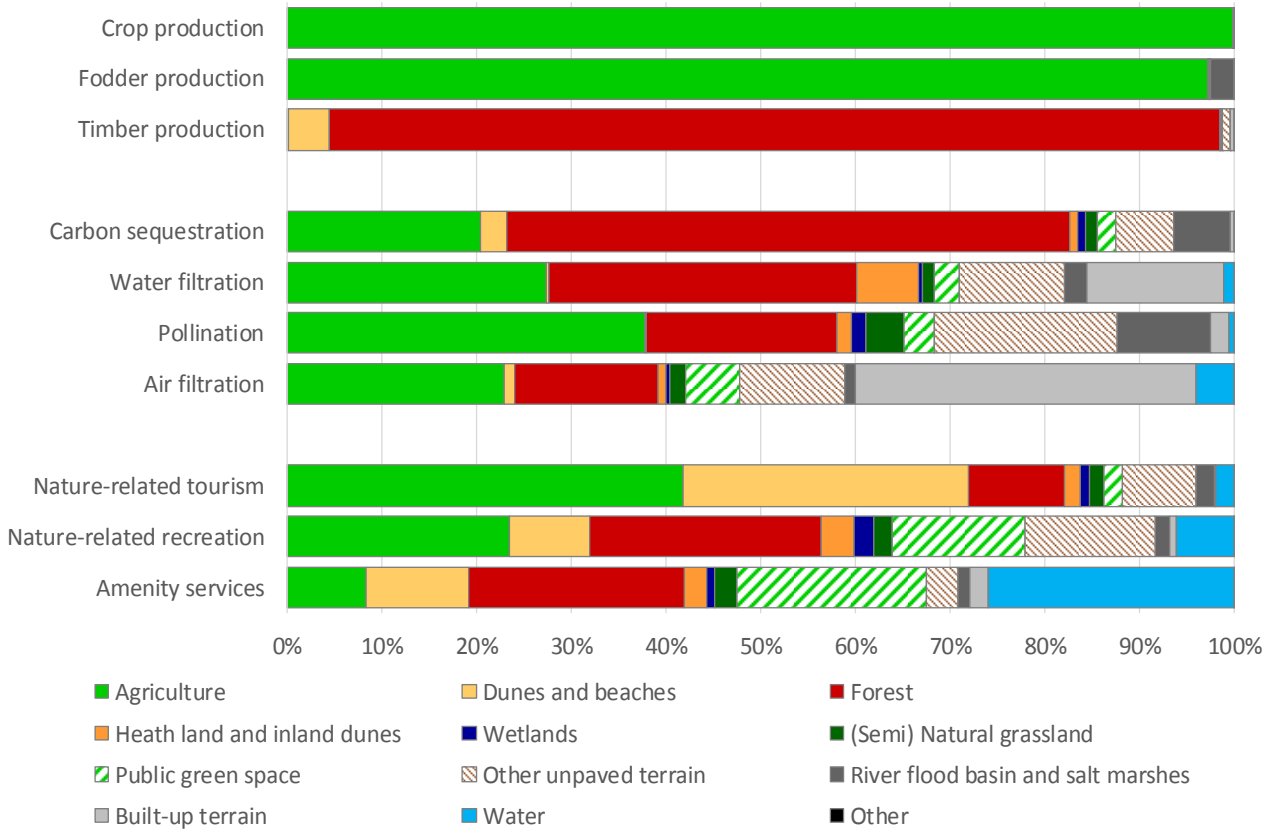
Overall results

Class	Ecosystem service	Flow of ecosystem services	Asset value
Provisioning services	Crop production	415	13125
	Fodder/ grass production	872	27569
	Timber production	44	1381
Regulating services	Drinking water	125	5384
	Carbon sequestration	171	7391
	Pollination	359	15470
	Air filtration	42	1823
Cultural services	Nature recreation	3873	122394
	Nature tourism	5946	187880
	Amenity service	1014	31687
Total		12862	414104

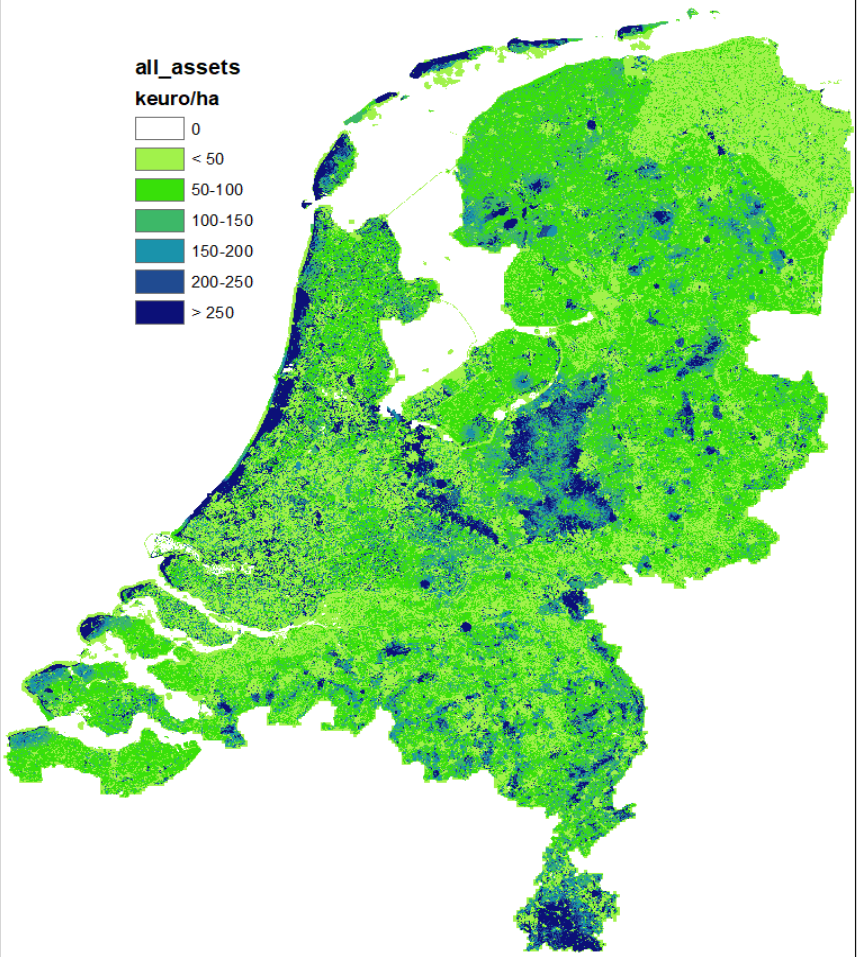
Value of ecosystem services per ecosystem (2015)

	Provisioning services	Regulating services	Cultural services	Total	Share in total value
	mln euro	*mln euro*	*mln euro*	*mln euro*	*%*
Agriculture	1264	219	3483	4966	38,4%
Dunes and beaches	2	94	2228	2324	18,0%
Forest	41	212	1781	2035	15,7%
Heath land and inland dunes	0	9	259	268	2,1%
Fresh water wetlands	0	7	139	146	1,1%
(Semi) Natural grassland	0	21	195	217	1,7%
Public green space	0	27	864	891	6,9%
Other unpaved terrain	3	113	1029	1145	8,8%
River flood basin and salt marshes	21	54	185	260	2,0%
Built-up terrain	0	23	50	74	0,6%
Water	0	6	617	623	4,8%
Other	0	0	1	1	0,0%
TOTAL	1332	784	10833	12949	100,0%

Allocation to ecosysteemtypes



Asset value map



Conclusions

- The **general conclusion** of this study is that it is feasible to compile monetary accounts for ecosystems on a national scale using several different statistical data sources.
- However, **important challenges** remain, particularly with regard to refinement of the assumptions made in applying the different valuation methods, the allocation of the values to ecosystem types, enhancing the scope of the ecosystem services, and communication of the results.

Questions for the London Group

1. We distinguish **three approaches** to value ecosystem services. Is this a useful way to describe the general approach to ecosystem service valuation ?
2. We argue that it important to **distinguish between exchange values that are already included in GDP and that are not**. Do you agree with this ?
3. A key finding with regard to methodology is that in most cases **the resource rent method is inadequate** to value ecosystem services. Do you agree ?
4. Do you agree that the **expenditure method** is an adequate method to value **nature based tourism and recreation**? What would be the most appropriate scope with regard to expenditure to use ?
5. We use some **assumptions to calculate values of ecosystem assets** (a constant future flow of income, discount rate, asset life). Are these the right assumptions ?