European Network of
Freshwater Research Organisations

Aquatic Research and Social Sciences: EurAqua Group in Action on Ecosystem Services and Natural Capital

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EurAqua 25th Anniversary Event

11 June 2019, Brussels

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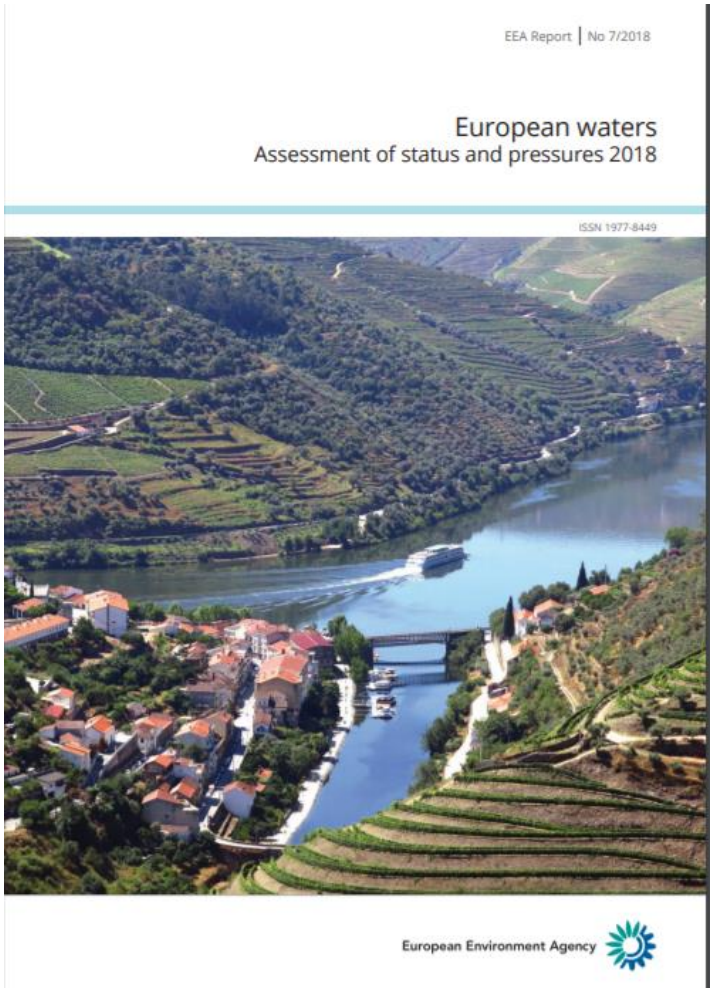
Why Ecosystem Services and Natural Capital?

"Managing water in a green economy means using water in a sustainable way
in all sectors
and ensuring that ecosystems
have both the quantity
and the quality of water
they need to function.
It also means fostering a more
integrated and ecosystem based
approach that involves all relevant
economic sectors."



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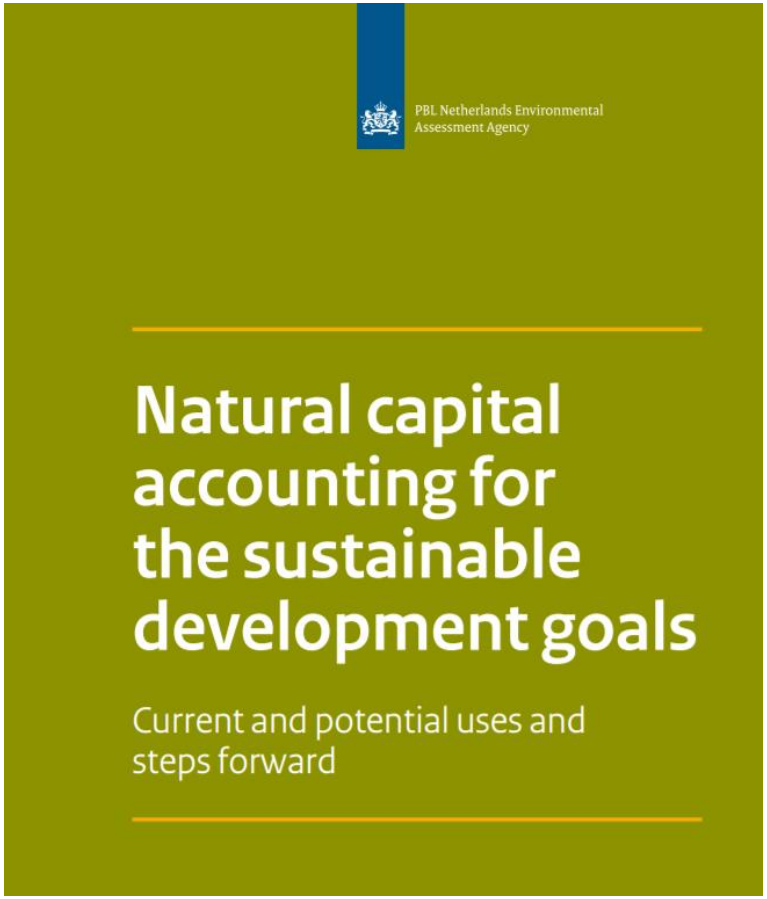
Why Ecosystem Services and Natural Capital?



- SDG 6 – protection and restoration of water related ecosystems
- SDG 15 – sustainable use of freshwater ecosystems and their services, promoting the integration of ecosystem and biodiversity values into national and loccal planning

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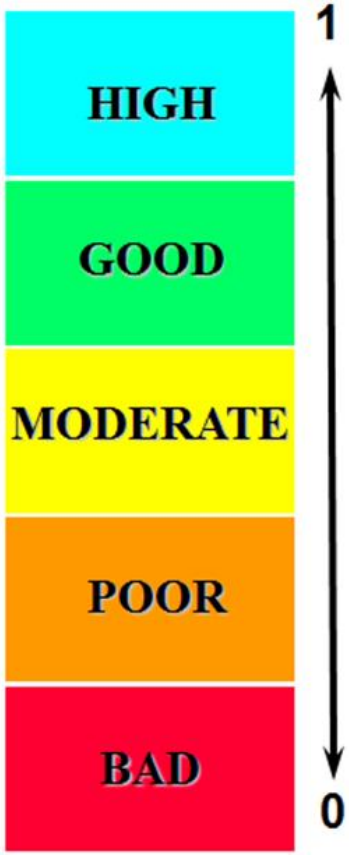
"WFD has delivered a great increase in knowledge…

Challenge now is to use that knowledge more effectively…

Effective solutions need a systemic approach…

Laurence Carvalho – EurAqua 25th Anniversary Event



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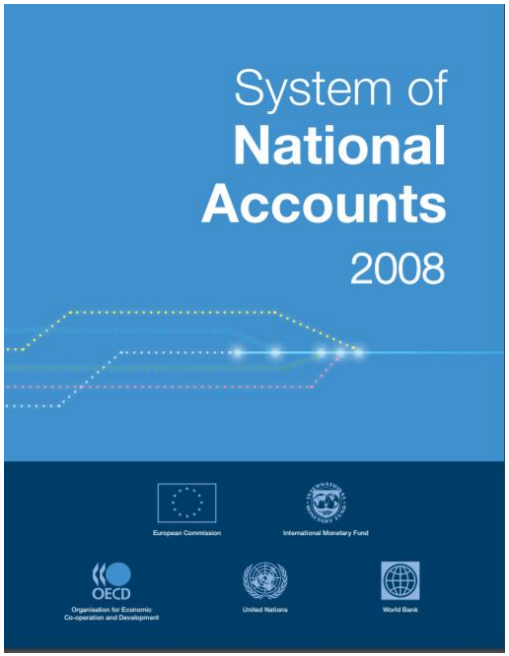
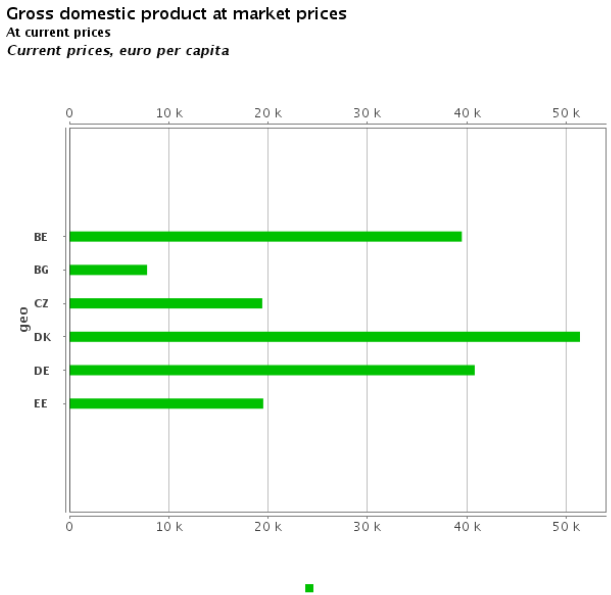
Systems of integrated information



"…economic data to be compiled and presented in a format that is designed for purposes of economic analysis, decision-taking and policymaking"

GDP
Gross Domestic Product



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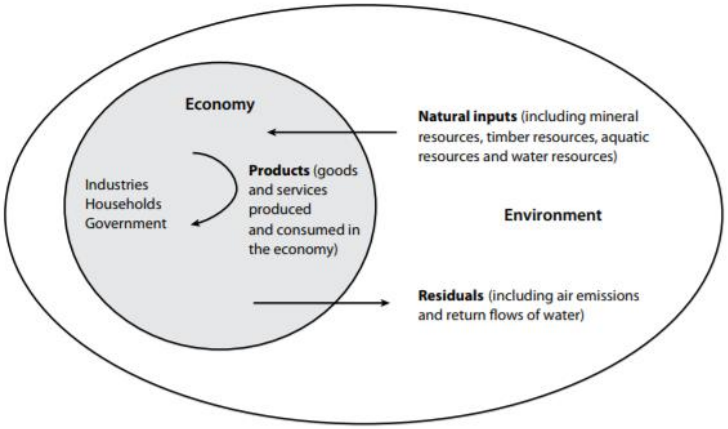
Source of Data Eurostat
Last update: 06.06.2019
Date of extraction: 10 Jun 2019 10:21:16 CEST
Hyperlink to the graph: https://ec.europa.eu/eurostat/eurostat/tgm./drawGraph.do&init=1&plugin=1&language=en&pcode=tec00001&toolbox=legend

Systems of integrated information

"…international statistical standard that describes the interactions between the economy and the environment"

Figure 2.1
Physical flows of natural inputs, products and residuals



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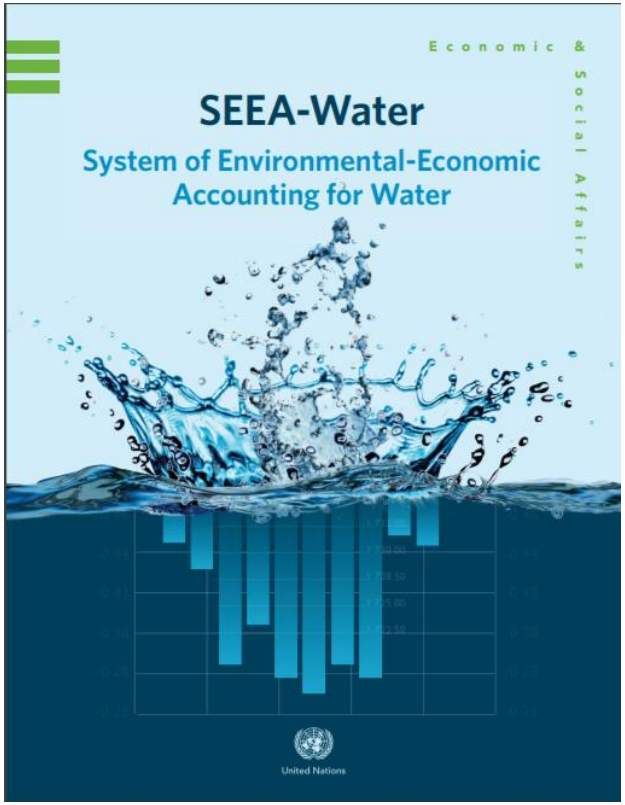
Systems of integrated information



"…organizing hydrological and economic information in a coherent and consistent manner…

…enable the analysis of interactions between water and the economy"

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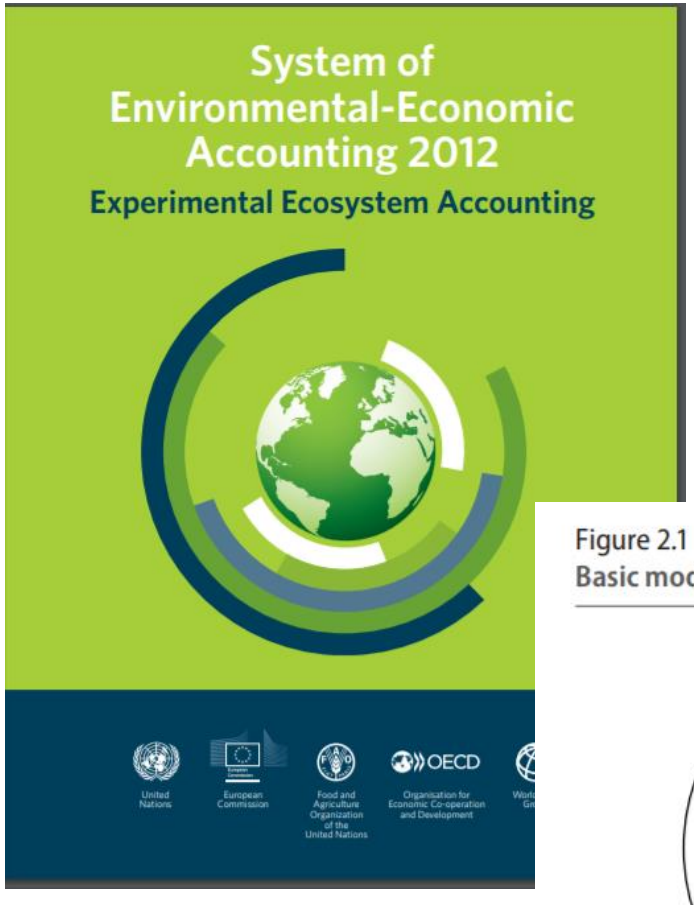
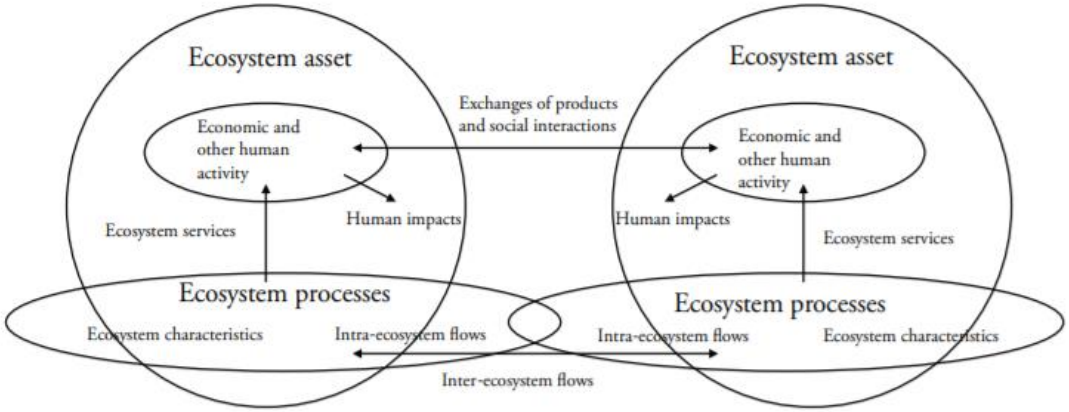
Systems of integrated information



"..starts from the perspective of ecosystems…
…integrating biophysical data, tracking changes in ecosystems and linking those changes to economic and other human activity"

Figure 2.1
Basic model of ecosystem stocks and flows



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Water ecosystem services

REGULATING SERVICES

- Carbon storage and sequestration
- Climate regulation: global, regional and local
- Erosion regulation
- Water flow and flood regulation
- Water purification and waste treatment

CULTURAL SERVICES

- Cultural identity, heritage, and sense of place
- Existence of ecosystems
- Recreation and tourism
- Spirituality and religion
- Well-being: psychological and physical

SUPPORTING SERVICES

- Food web maintenance
- Genetic resources
- Habitat and biodiversity
- Nutrient cycling
- Predator/prey relationships and ecosystem resilience
- Primary productivity

PROVISIONING SERVICES

- Aquatic organisms for food and medicines
- Fresh water for human consumption and use
- Power generation and transport
- Raw materials for human use

Source: https://www.norden.org/fi/node/34487

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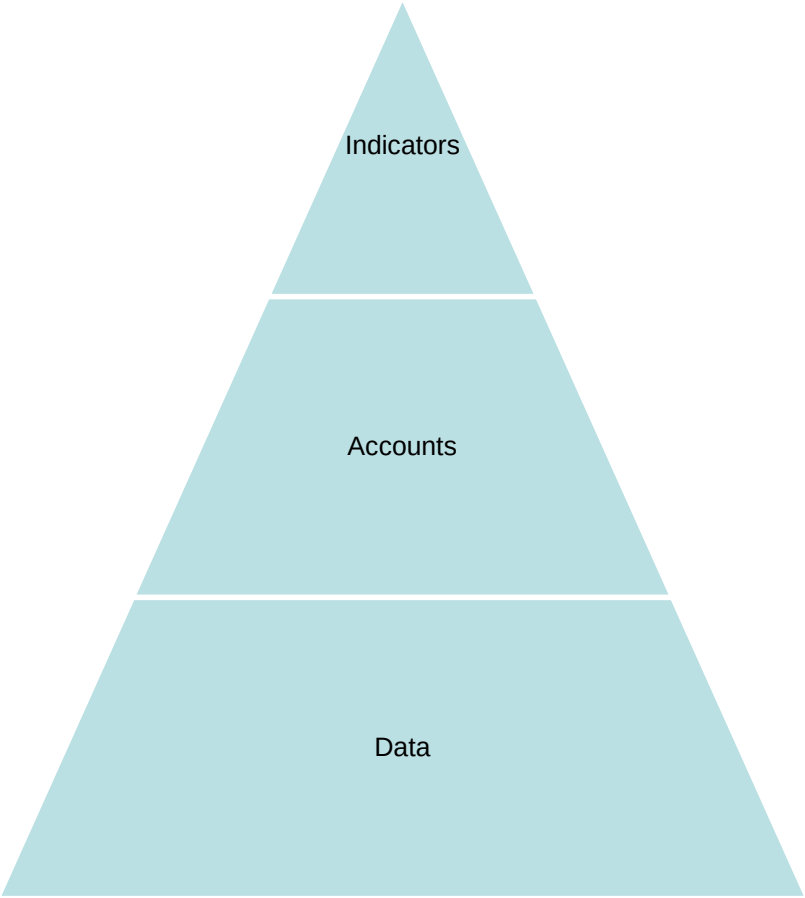
Systems of integrated information

- Resources
  - Water
- Ecosystems
  - Lakes, rivers
- Physical accounts
- Monetary accounts



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Science of the Total Environment 657 (2019) 517–534

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Linking biodiversity to ecosystem services supply: Patterns across aquatic ecosystems

Heliana Teixeira [a,*], Ana I. Lillebø [a], Fiona Culhane [b], Leonie Robinson [b], Daniel Trauner [c], Florian Borgwardt [c], Mathias Kuemmerlen [d], Ana Barbosa [e], Hugh McDonald [f], Andrea Funk [c], Tim O'Higgins [g], Jan Tjalling Van der Wal [h], Gerjan Piet [h], Thomas Hein [c,i], Juan Arévalo-Torres [e], Alejandro Iglesias-Campos [e], Julian Barbière [e], António J.A. Nogueira [a]

Received: 24 April 2017 | Accepted: 7 November 2017

DOI: 10.1111/1365-2664.13045

REVIEW

Journal of Applied Ecology

A review of riverine ecosystem service quantification: Research gaps and recommendations

Dalal E. L. Hanna[1] | Stephanie A. Tomscha[2] | Camille Ouellet Dallaire[3] | Elena M. Bennett[4]

GROUNDWATER–SURFACE-WATER INTERACTIONS

Groundwater ecosystem services: a review

Christian Griebler[1,2] and Maria Avramov[1,3]

Ecosystem Services 23 (2017) 18–29

Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

Physical and monetary ecosystem service accounts for Europe: A case study for in-stream nitrogen retention

Alessandra La Notte[a,*], Joachim Maes[a], Silvana Dalmazzone[b], Neville D. Crossman[c], Bruna Grizzetti[a], Giovanni Bidoglio[a]

Journal of Environmental Management 223 (2018) 964–974

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Research article

Sustainability assessment and causality nexus through ecosystem service accounting: The case of water purification in Europe

Alessandra La Notte[a,*], Silvana Dalmazzone[b]

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Arctic Freshwater Natural Capital in the Nordic Countries

Nordic Council of Ministers

Policy brief

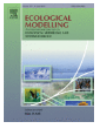
Arctic Freshwater Capital in the Nordic Countries

Natural Capital Accounting

ELSEVIER

Ecological Modelling

Volume 377, 10 June 2018, Pages 51-65



Bridging the gap between ecosystem service indicators and ecosystem accounting in Finland

Tin-Yu Lai [a], Jani Salminen [b], Jukka-Pekka Jäppinen [c], Saija Koljonen [d], Laura Mononen [c, e], Emmi Nieminen [f], Petteri Vihervaara [c], Soile Oinonen [f]

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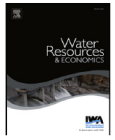
Water Resources and Economics

journal homepage: www.elsevier.com/locate/wre



Improving data quality, applicability and transparency of national water accounts – A case study for Finland

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ARTICLE INFO

Keywords:
Water accounting
Fresh water
Ground water
SEEA-Water
Input-output modeling
Water resources

ABSTRACT

This paper introduces a novel procedure for the compilation of highly disaggregated water accounts by using Finland as a case example. The procedure is based on combining the use of existing standard economic statistics and other registers and databases with a dataset on water supply and use collected in the present study. As an outcome, water supply and use accounts are presented for 195 industries in the Finnish economy in 2010. The water accounts presented are based primarily on actual water supply and use rates and distinguish between various raw water sources and uses: groundwater, fresh surface, brackish water self abstracted for own use, and

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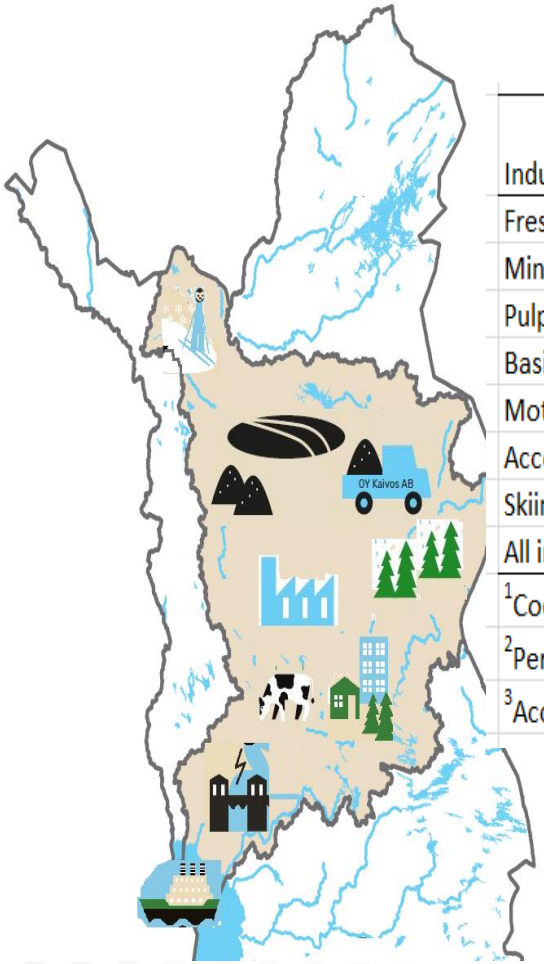
Outcomes of the CAPITAL-project: National water accounts for 195 sectors of the Finnish economy & advances in data quality protocols

NACE	INDUSTRY	OUTPUT VALUE (mill. €)	EMPLOYMENT (1000 persons)	TOTAL WATER USE (mill m^3)
101	MEAT PRODUCTS	2 480,0	7,4	6,07
102	FISH PRODUCTS	251,0	1,2	0,21
103	FRUIT AND VEGETABLE PRODUCTS	463,0	2,1	0,96
104	OILS AND FATS	197,0	0,2	0,71
105	DAIRY PRODUCTS	2 449,0	5,4	15,77
106	GRAIN MILL AND STARCH PRODUCTS	282,0	0,6	0,31
107	BAKERIES & FARINACEOUS PRODUCTS	1 037,0	9,2	0,83
108	OTHER FOOD PRODUCTS	1 528,0	5,4	7,48
109	ANIMAL FOOD PRODUCTS	547,0	1,0	0,24
11	BEWERAGES	1 153,0	3,8	6,79
13	TEXTILES	513,0	4,9	2,25
14	WEARING APPAREL	533,0	5,0	0,64
15	LEATHER PRODUCTS	191,0	2,5	0,46
161	TIMBER & SAWMILLING	2 859,0	8,2	0,53
162	WOOD PRODUCTS	2 639,0	17,3	6,97
171	PULP, PAPER & CARDBOARD	12 626,0	18,9	1060,77
172	PAPER AND CARDBOARD PRODUCTS	848,0	4,1	18,33

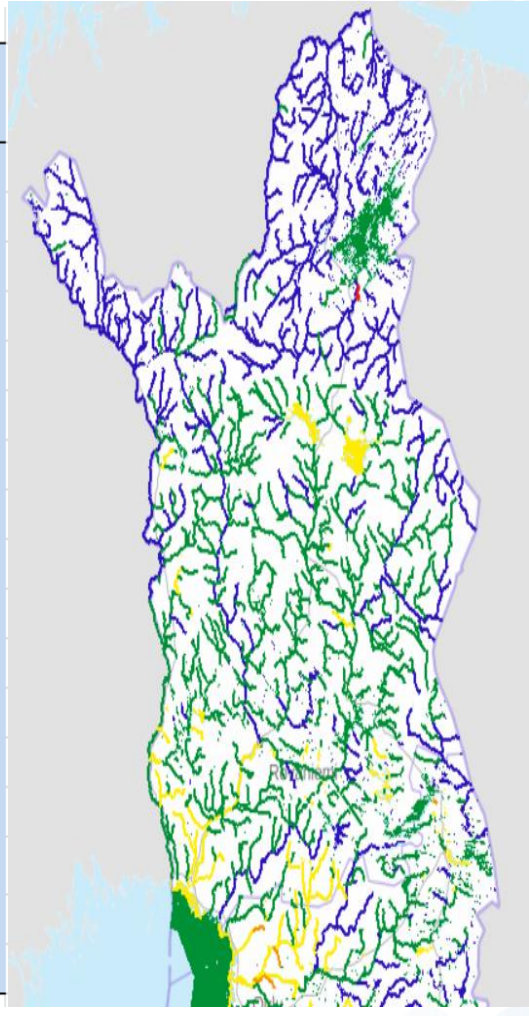
Outcomes of the CAPITAL-project: Water flow accounts from the economy to the environment & water emission accounting – comparisons with water quality data



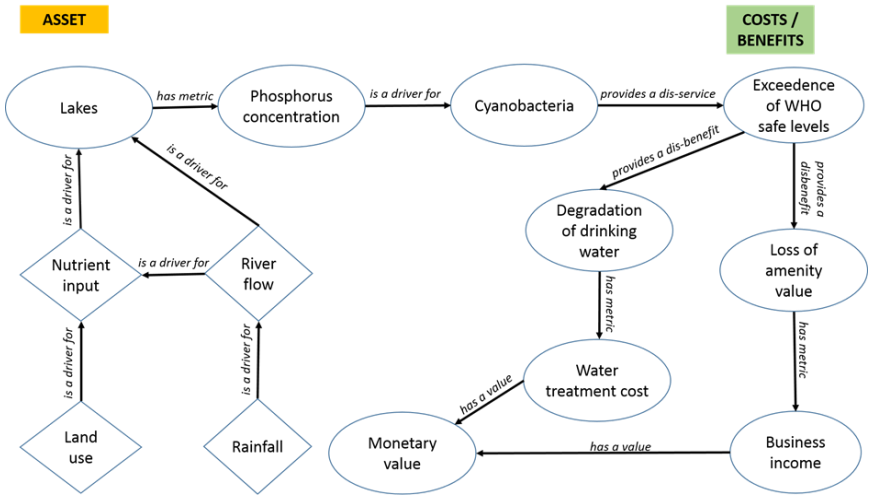
Industry
Freshwater aquacul
Mining of ore metal
Pulp, paper and pap
Basic iron, steel and
Motor vehicles
Accommodation
Skiing centres
All industries
[1]Code used in the st
[2]Percent of the tota
[3]According to Salmi

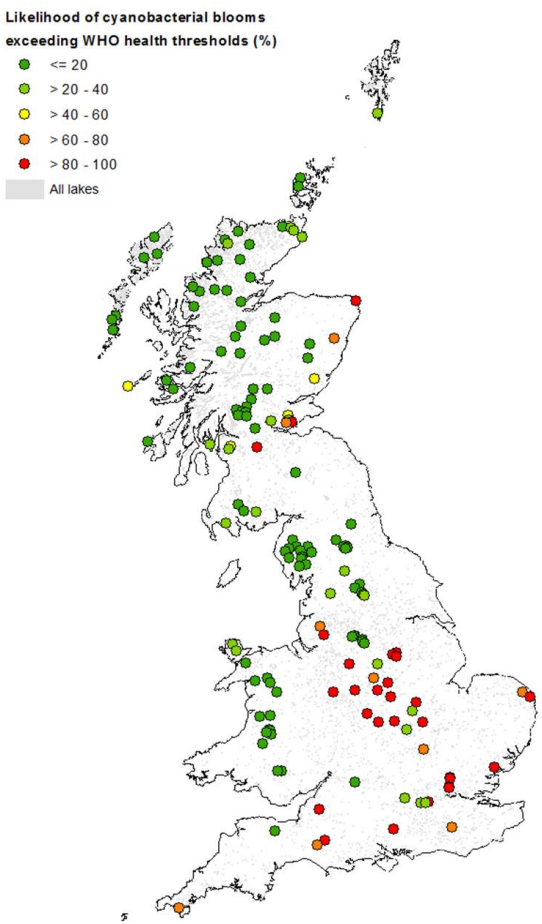
Wastewater emissions from mining industry in Finland

Parameter	Average (kg)	Standard deviation (kg)	Reporting mines (n)
As	39	51	17
Ca	1 508 621	1 551 872	5
Cd	0,5	0,6	8
Cl	1 176 704	546 972	4
Co	30	14	3
Cr	7	9	8
Cu	16	17	12
Fe	3 785	5 366	18
Hg	0,7	0,8	3
Na	1 409 877	1 261 984	4
Ni	177	155	18
N-tot	19 422	21 234	20
Pb	0,6	0,8	10
P-tot	134	128	15
SO_4^{2-}	5 040 252	4 995 021	16
Susp. solids	11 885	16 422	24
Zn	324	294	11



Recreational value of GB lakes





Suitability of WFD lakes for providing drinking water and recreation assessed based on their phosphorus concentrations.

Map shows the modelled likelihood of cyanobacterial blooms exceeding World Health Organisation (WHO) health thresholds at each site.

Results demonstrate that WFD monitoring data can be used to underpin ES assessment using relevant modelling approaches.

Examples of key evidence used:

- May et al. (2019) *Limnetica* 38: 489-501
- Carvalho et al. (2013) *J. Appl. Ecology* 50: 3165-323
- OECD (1982) *Eutrophication of waters. Monitoring, assessment and control*. OECD, Paris. 156 pp.
- WHO (2003) *Guidelines for Safe Recreational Water Environments*. World Health Organisation, Geneva.
- Pretty, J.N. et al. (2003) *Environmental Science and Technology* 37: 201–208.
- UK Lakes Portal. https://eip.ceh.ac.uk/apps/lakes/

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NATURAL ENVIRONMENT RESEARCH COUNCIL

http://nora.nerc.ac.uk/id/eprint/519669/

Future challenges

- WFD Disproportionate costs - a new way to assess the water status and the conservation management actions (DNAquanet COST Action)
- Linking biodiversity to ecosystem services
- Monetary and non-monetary valuation of the ecosystem services
- Developing evidence based models that enable us to transform existing (or new) monitoring data into data suitable for ecosystem service and natural capital assessments
- Enhance collaboration between aquatic researchers and social scientists

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