

Using Ecosystem Accounting beyond GDP: applications to the Complementary Accounting Network (CAN) and Genuine Savings (GS)

Valentina Di Gennaro¹, Alice Bartolini², Silvia Ferrini^{1,2,3}, Robert Kerry Turner¹

1 University of East Anglia, Norwich, United Kingdom

2 University College of London, London, United Kingdom

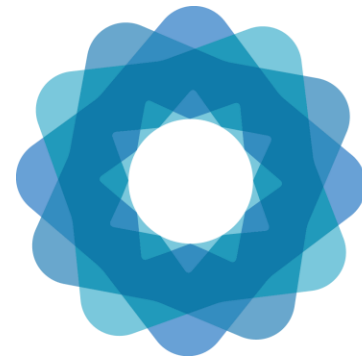
3 University of Siena, Siena, Italy



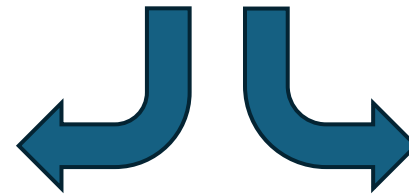
*Challenges in the Measurement of Nature in Official Statistics.
Workshop, Italian National Institute of Statistics (Istat)
Rome, Italy, 25–26 May 2026*



Using Ecosystem Accounting beyond GDP



System of
Environmental
Economic
Accounting



Genuine Savings (GS)

The Genuine Savings as your savings account



"pragmatic improvement from 'weak' towards 'stronger' sustainability indicators"
(Di Gennaro et al., 2025)

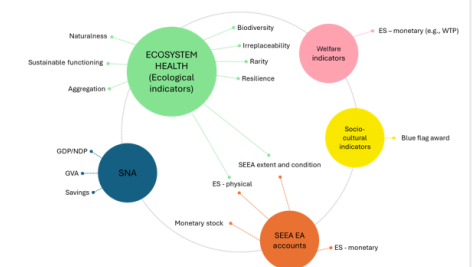
**Complementary
Accounting Network
(CAN)**

Complementary Accounting Network (CAN)

The CAN is a **network** framework, conceptualised as a set of interconnected accounting components (nodes) that link economic, ecological, and socio-cultural dimensions

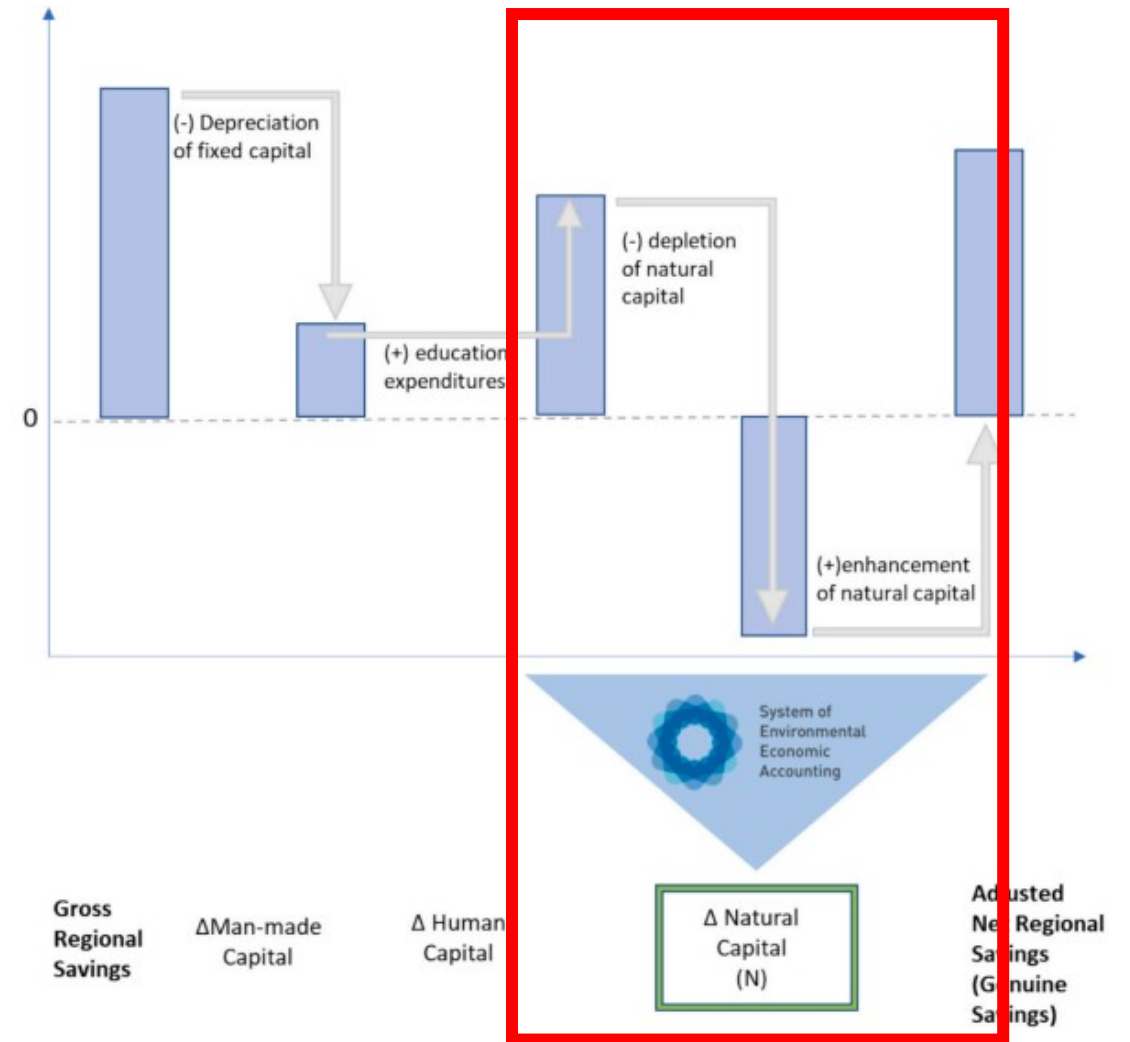
It should consist of a network of relevant nodes, each encompassing a set of **indicators** and metrics, but all consistently measured **over a same temporal period** and **spatial area**.

The CAN aims to set up the **dashboard**, which are the operational and visual tools, respectively, used to present the indicators corresponding to the different components.



Complementary Accounting Network (CAN) and information nodes

The Genuine Savings as your savings account



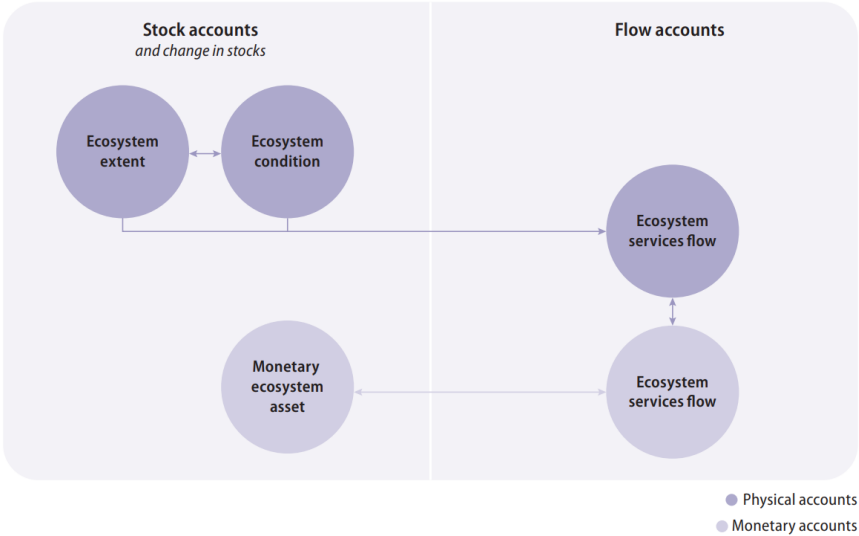
“pragmatic improvement from ‘weak’ towards ‘stronger’ sustainability indicators”
([Di Gennaro et al., 2025](#))

From Ecosystem Accounting to Genuine Savings (GS)



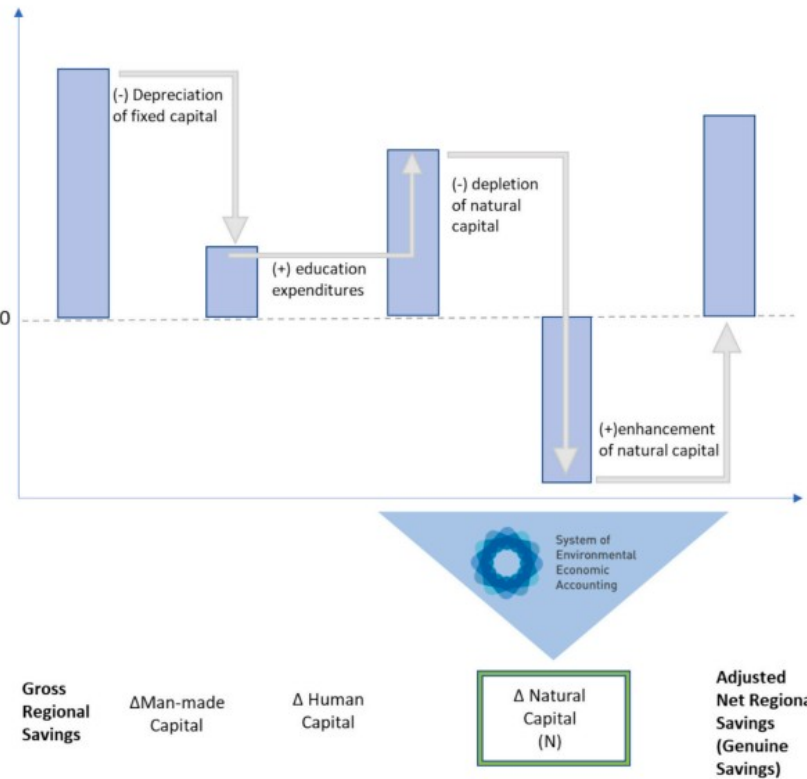
Posidonia oceanica

ECOSYSTEM ACCOUNTING



United Nations et al. (2024)

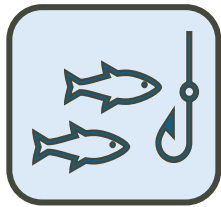
GENUINE SAVINGS



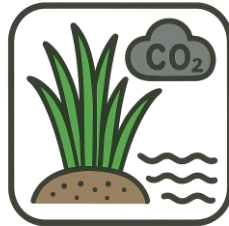
Di Gennaro et al. (2025)

Case study: *Posidonia oceanica* in Italy

Ecosystem Services



Fisheries provisioning



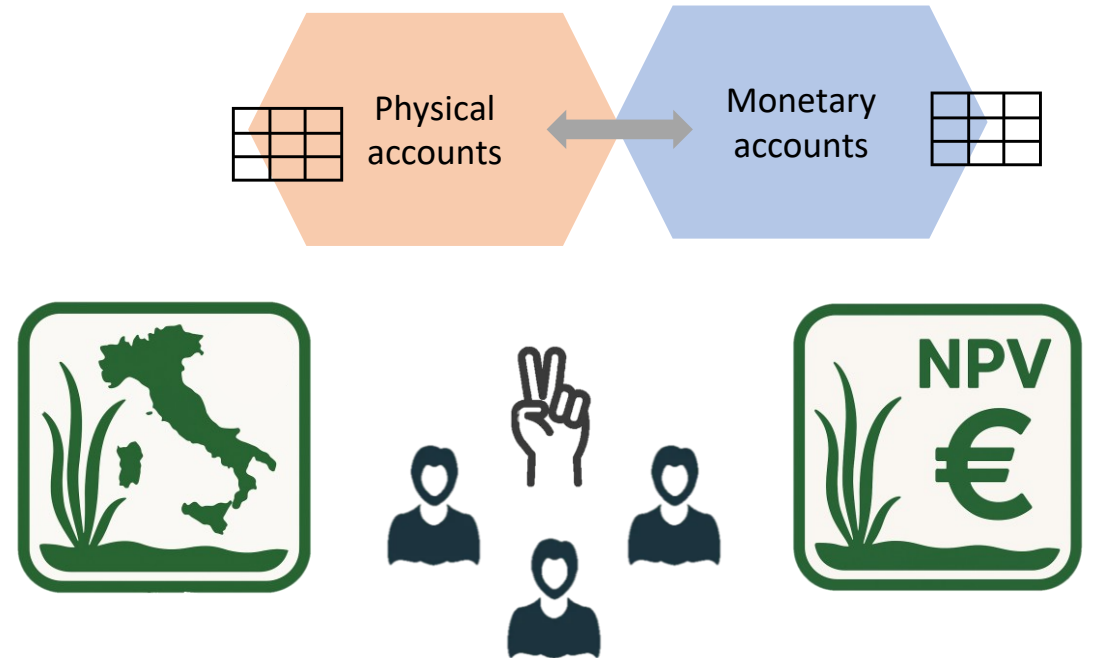
Carbon sequestration



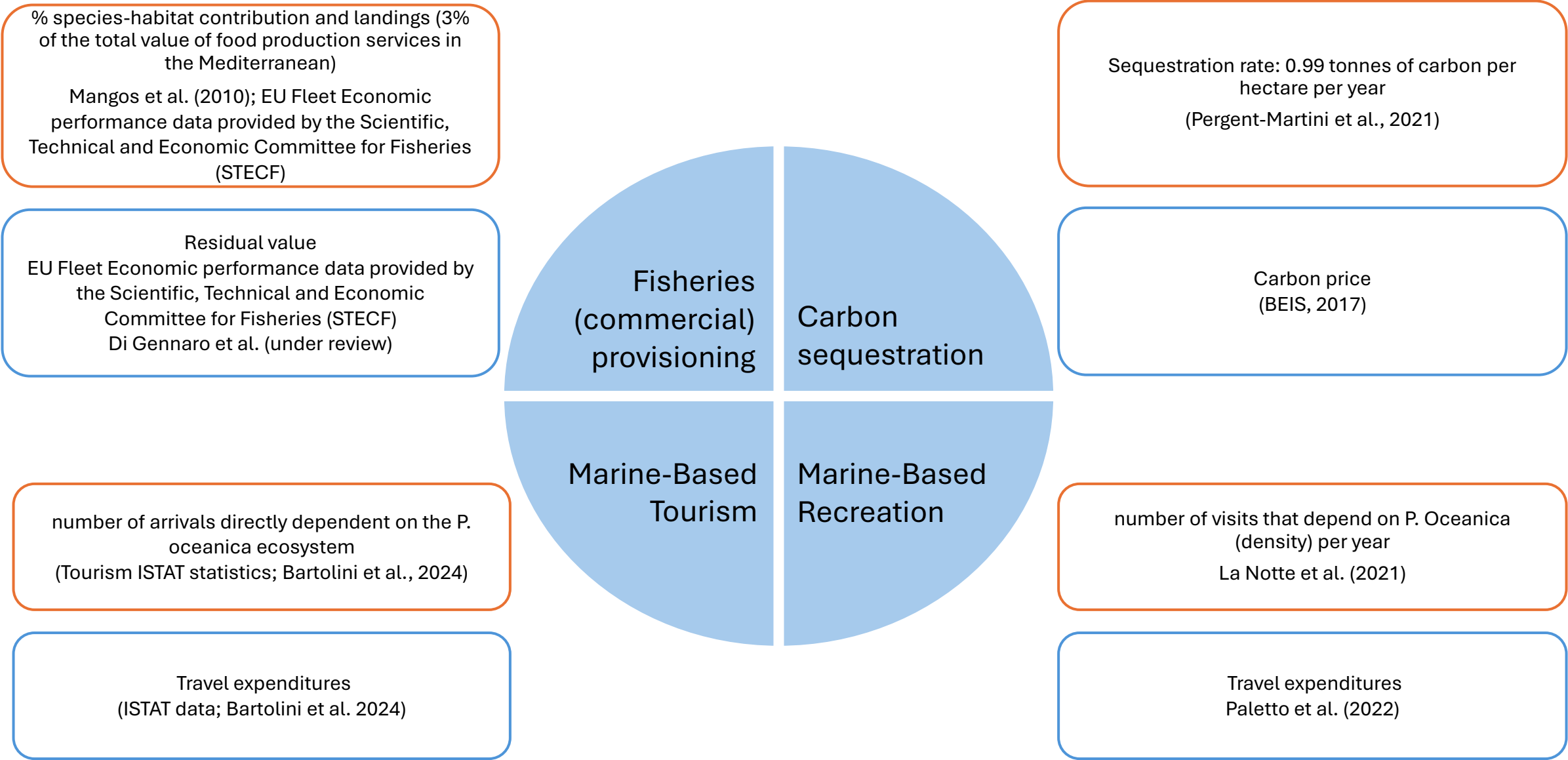
Marine-based recreation



Marine-based tourism



Methodological Approach



National Supply and Use Tables for ecosystem accounting (2020)

Ecosystem Services	Physical Supply	Monetary Value (€)	% of Total	Main Beneficiary
Marine Recreation	31.4 million visits	277,723,914	87.3%	Households
Carbon sequestration	722,652 tonnes CO2	32,519,355	10.2%	Society
Marine Tourism	306,579 arrivals	4,721,328	1.5%	Tourism Sector
Fisheries provisioning	3,903 tonnes	3,103,172	1.0%	Primary Sector

Adjusted Genuine Savings for marine ecosystem

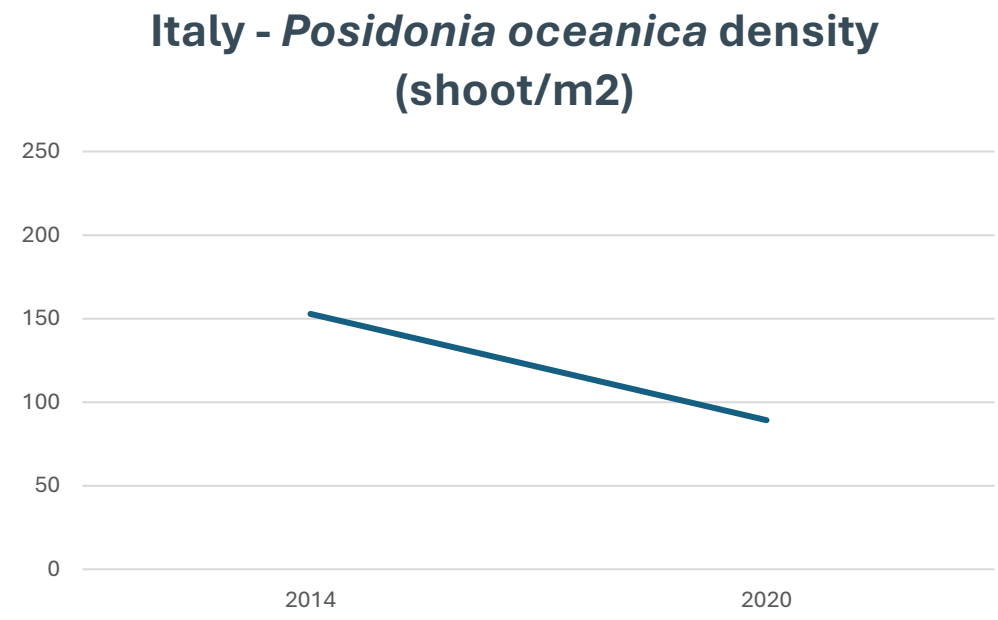
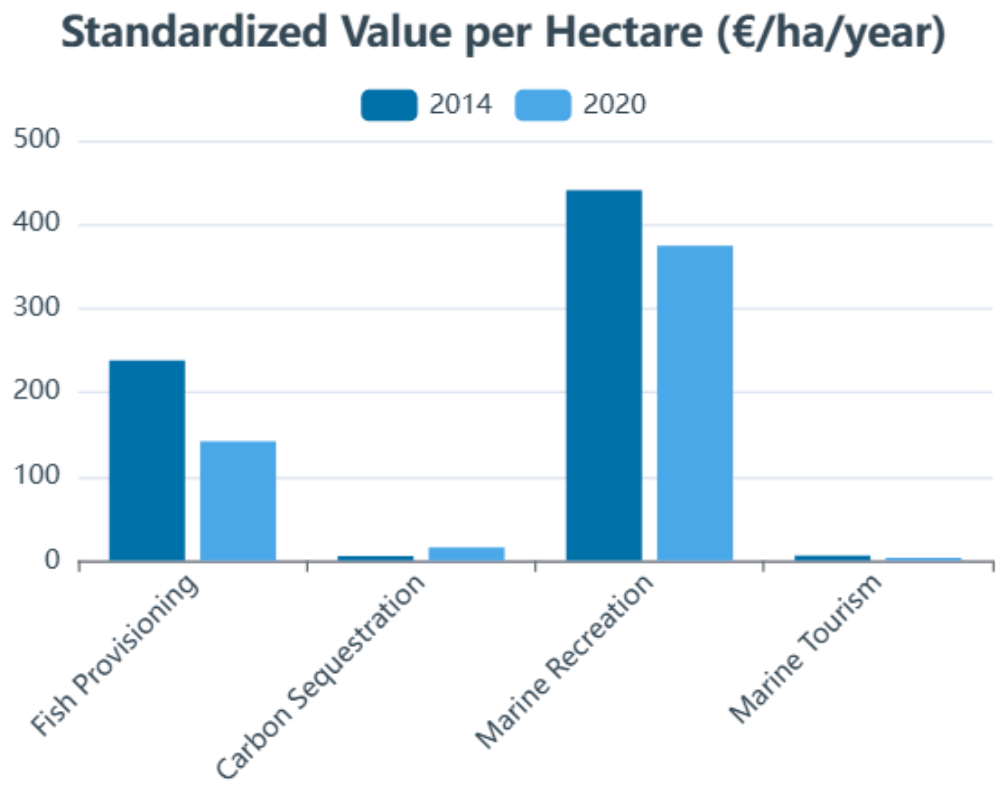
Ecosystem services	Physical accounts	Monetary accounts
ES 1 fish provisioning	Over time (2013-2021)	Over time (2013-2021)
ES 2 carbon sequestration	fixed	Over time (carbon price)
ES 3 marine-based recreation	2 years (2014, 2020)	2 years (2014, 2020)
ES 4 marine based tourism	Over time (2014-2021)	2 years (2019, 2021)

Ecosystem services (€/ha year)	2013	2014	2015	2016	2017	2018	2019	2020	2021
ES 1 fish provision	228	238	266	274	355	344	179	142	164
ES 2 carbon sequestration		5.50	6.25	5.70	5.54	14.28	15.10	15.84	24.90
ES 3 marine-based recreation		441						375	
ES 4 marine-based tourism		5.85	6.24	6.50	6.98	7.42	7.61	3.47	5.11

Tricky

Sticky

Adjusted Genuine Savings for marine ecosystem



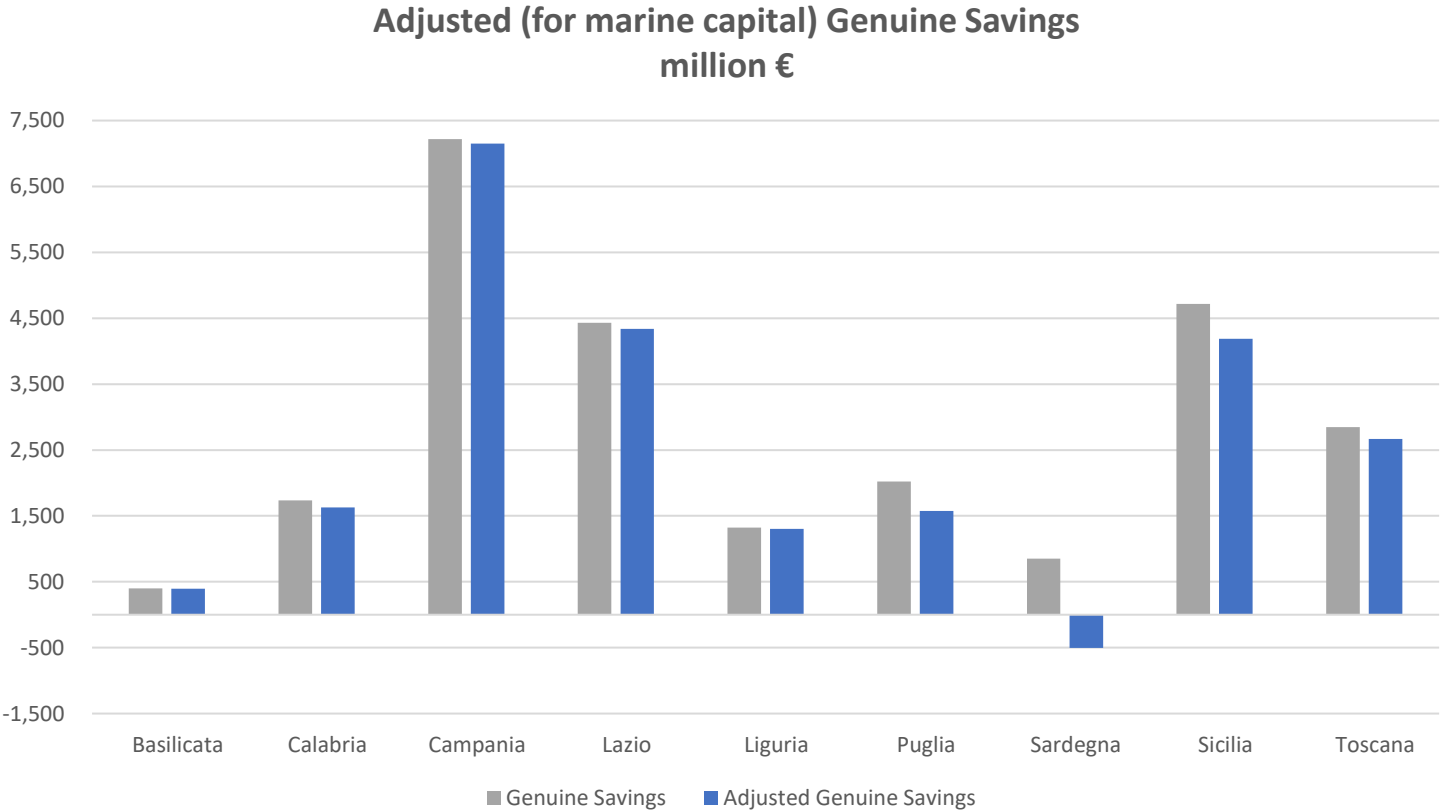
Bartolini et al. (2024)

Adjusted Genuine Savings for marine ecosystem

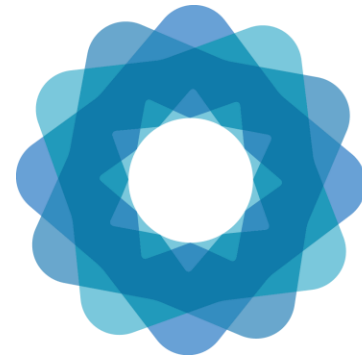
$$N_t(EA) = \sum_{i=1}^{i=S} \sum_{j=t}^{j=t+T} \frac{ES_t^{ij}(EA_t)}{(1+r)^{(j-t)}}$$

$$GS_t = k_t \frac{dK_t}{dt} + \mu_t \frac{dH_t}{dt} + \lambda_t \frac{dN_t}{dt}$$

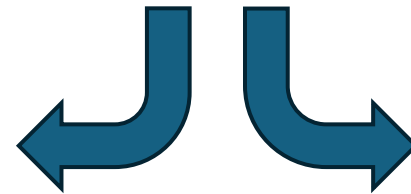
where ES_t^{ij} is the value of ecosystem service i in year j as expected in period t generated by a specific ecosystem asset EA_t , S is the total number of ecosystem services, r is the discount rate, and T is the lifetime of the asset (UN United Nations, 2021b).



Using Ecosystem Accounting beyond GDP

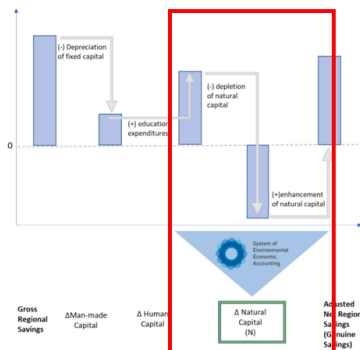
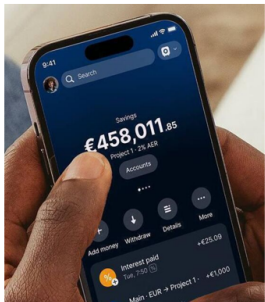


System of
Environmental
Economic
Accounting



Genuine Savings

The Genuine Savings as your savings account



“pragmatic improvement from ‘weak’ towards ‘stronger’ sustainability indicators”

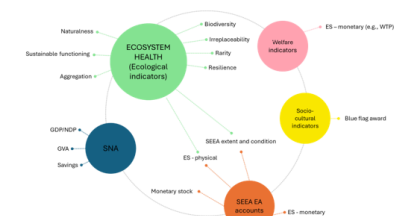
**Complementary
Accounting Network
(CAN)**

Complementary Accounting Network (CAN)

The CAN is a **network** framework, conceptualised as a set of interconnected accounting components (nodes) that link economic, ecological, and socio-cultural dimensions

It should consist of a network of relevant nodes, each encompassing a set of **indicators** and metrics, but all consistently measured **over a same temporal period and spatial area**.

The CAN aims to set up the **dashboard**, which are the operational and visual tools, respectively, used to present the indicators corresponding to the different components.



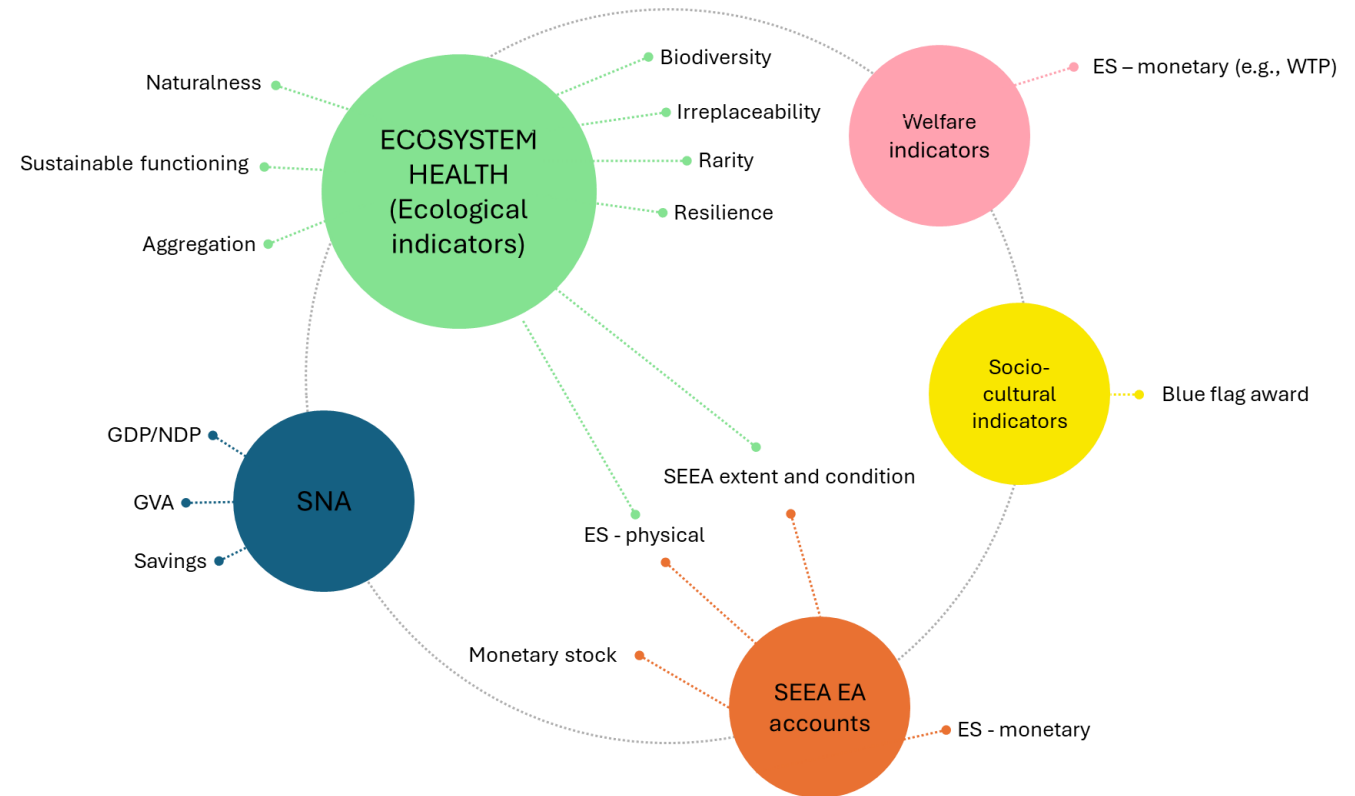
Complementary Accounting Network (CAN) and information nodes
Turner et al. (2026)

Complementary Accounting Network (CAN)

The CAN is a **network** framework, conceptualised as a set of interconnected accounting components (nodes) that link economic, ecological, and socio-cultural dimensions

It should consist of a network of relevant nodes, each encompassing a set of **indicators** and metrics, but all consistently measured **over a same temporal period** and **spatial area**.

The CAN aims to set up the **dashboard**, which are the operational and visual tools, respectively, used to present the indicators corresponding to the different components.



Complementary Accounting Network (CAN) and information nodes

Turner et al. (2026)

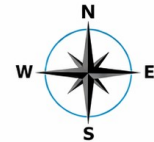
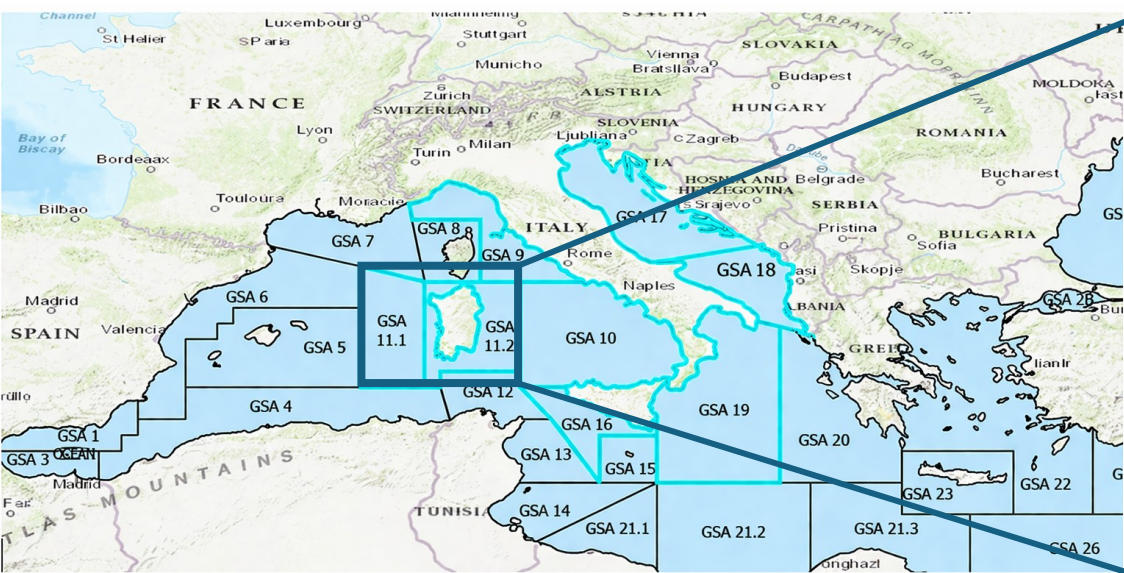
Complementary Accounting Network (CAN) for marine and coastal resources

Spatial scale:

- Italy
- Sardinia island
- Gulf of Oristano

Temporal scale:

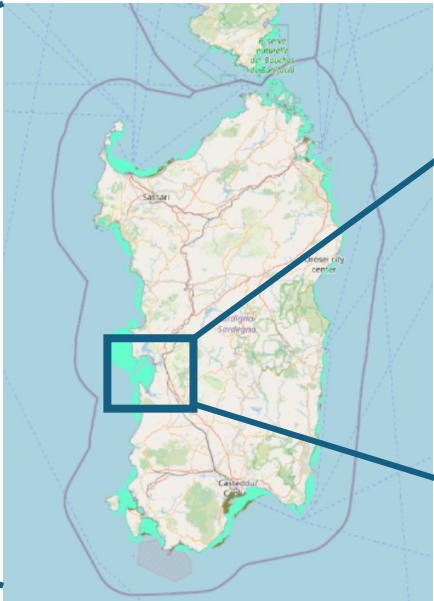
- Opening year: 2014
- Closing year: 2020



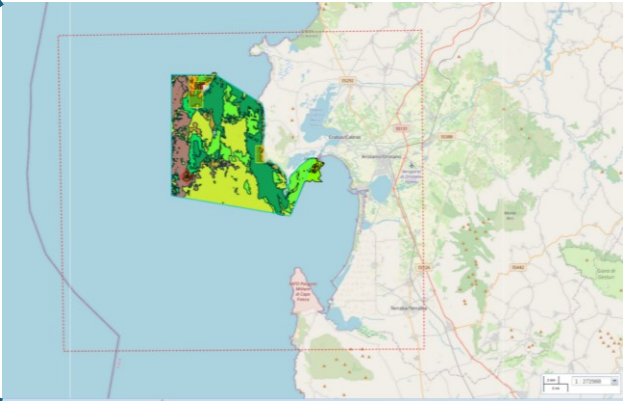
- GSA 9** Ligurian Sea and North Tyrrhenian Sea
- GSA 10** Southern and Central Tyrrhenian Sea
- GSA 11** Sardinia
- (11.1, 11.2)**

- GSA 17** Northern Adriatic
- GSA 18** Southern Adriatic Sea
- GSA 19** Western Ionian Sea
- GSA 16** Southern Sicily

Italy



Sardinia



Gulf of Oristano

CAN matrix and indicators

MONETARY	
<div>SNA INDICATORS (national/regional)</div> <div><ul style="list-style-type: none">• GDP</div>	<div>EXTENDED SNA/ SEEA-EA (national/regional)</div> <div><ul style="list-style-type: none">• Ecosystem Services/Monetary Accounts• Extended Genuine Savings</div>
<div>CULTURAL INDICATORS (national/regional)</div> <div><ul style="list-style-type: none">• Blue Flag award</div>	<div>ECOLOGICAL INDICATORS (national/regional)</div> <div><ul style="list-style-type: none">• SEEA EA/Physical Accounts• Sea turtle nests</div>

NON-MONETARY

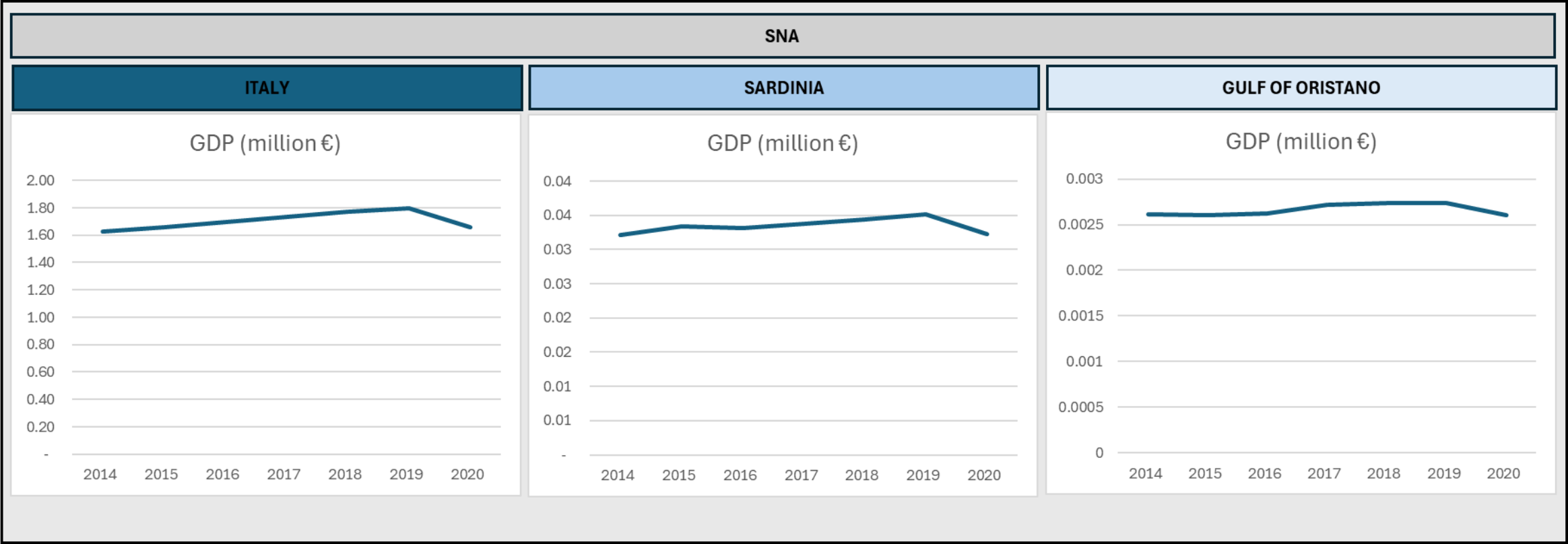
CAN matrix

List of indicators used for the CAN

Indicator	Unit	Category	year	Italy	Sardinia	Gulf of Oristano
GDP	€	SNA	2014-2020	✓	✓	✓
Fish provisioning ES	€	EXTENDED SNA/SEEA	2014, 2020	✓	✓	✓
Carbon sequestration ES	€	EXTENDED SNA/SEEA	2014, 2020	✓	✓	✓
Marine-based recreation ES	€	EXTENDED SNA/SEEA	2014, 2020	✓	✓	✓
Marine-based tourism ES	€	EXTENDED SNA/SEEA	2014, 2020	✓	✓	✓
<i>P. oceanica</i> density	shoot/m2	ECOLOGICAL INDICATORS	2014, 2020	✓	✓	✓
Loggerhead sea turtle (Caretta caretta) nest	#	ECOLOGICAL INDICATORS	2021, 2023, 2024	✓	✓	✗
Blu Flags	#	SOCIO-CULTURAL INDICATORS	2014-2020	✓	✓	✓
Place experience	#	SOCIO-CULTURAL INDICATORS	2024	✗	✗	✓

CAN matrix – cell 1

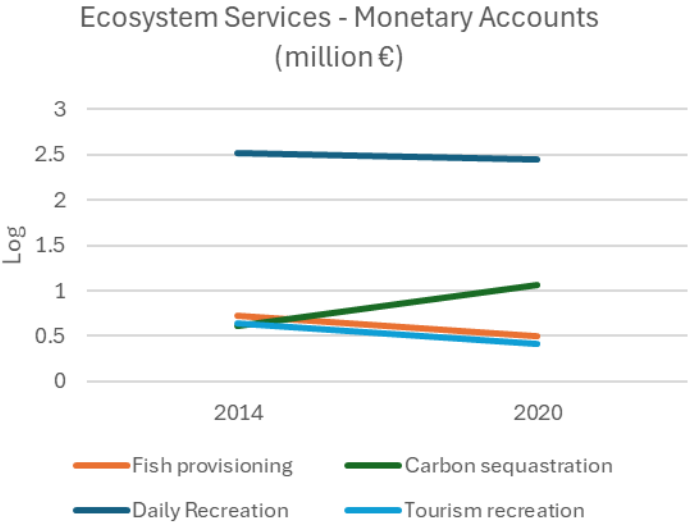
MONETARY



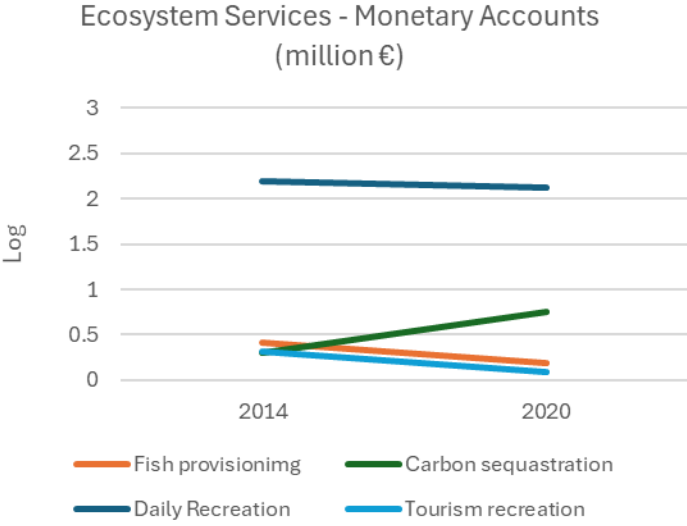
CAN matrix – cell 2

EXTENDED SNA/SEEA EA

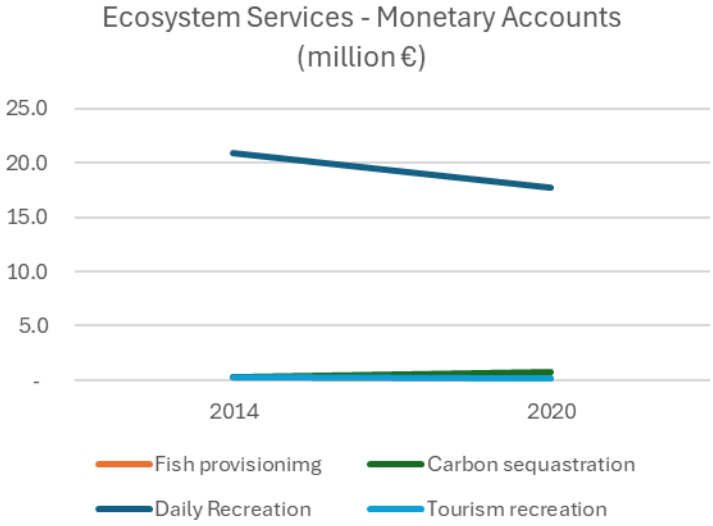
ITALY



SARDINIA

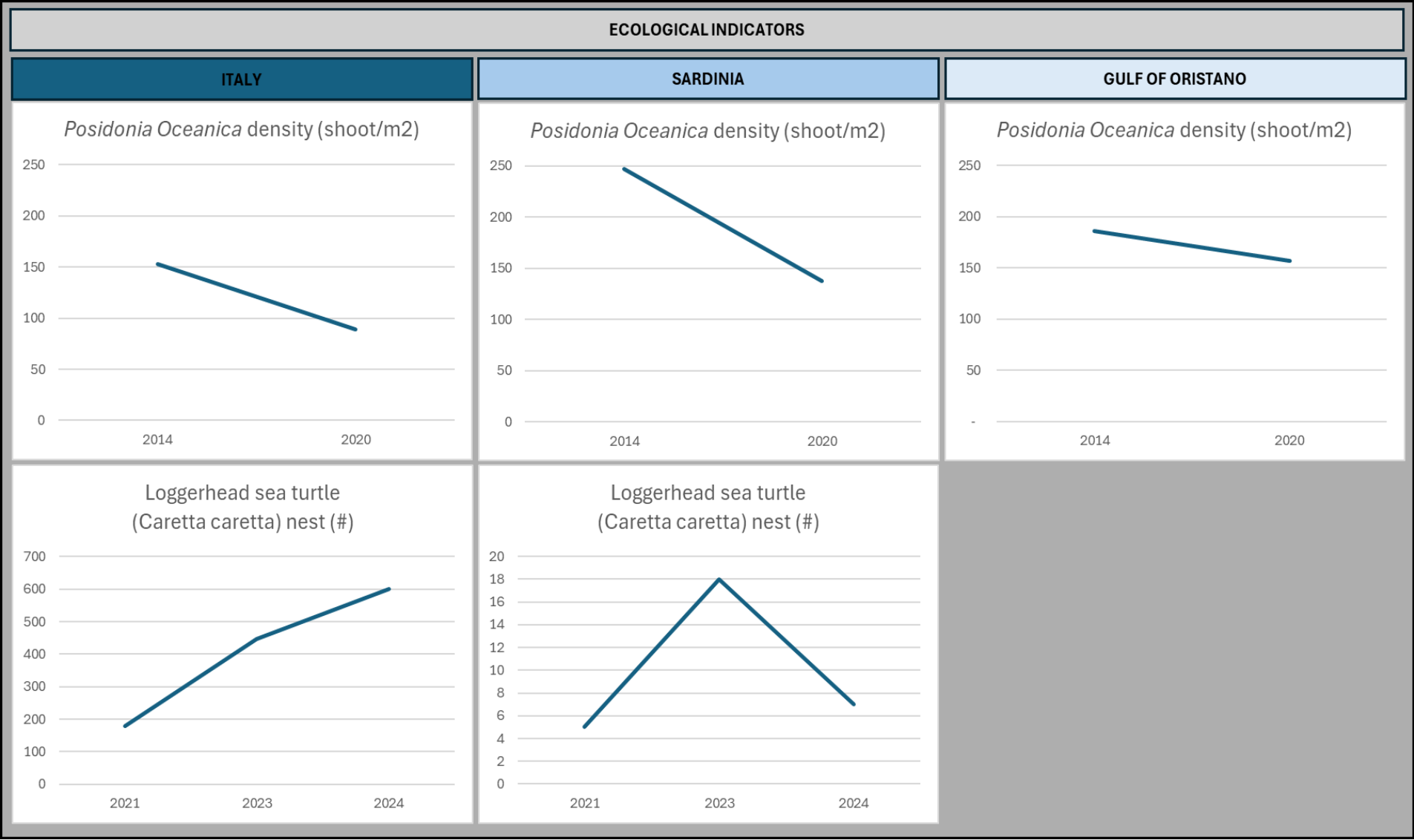


GULF OF ORISTANO



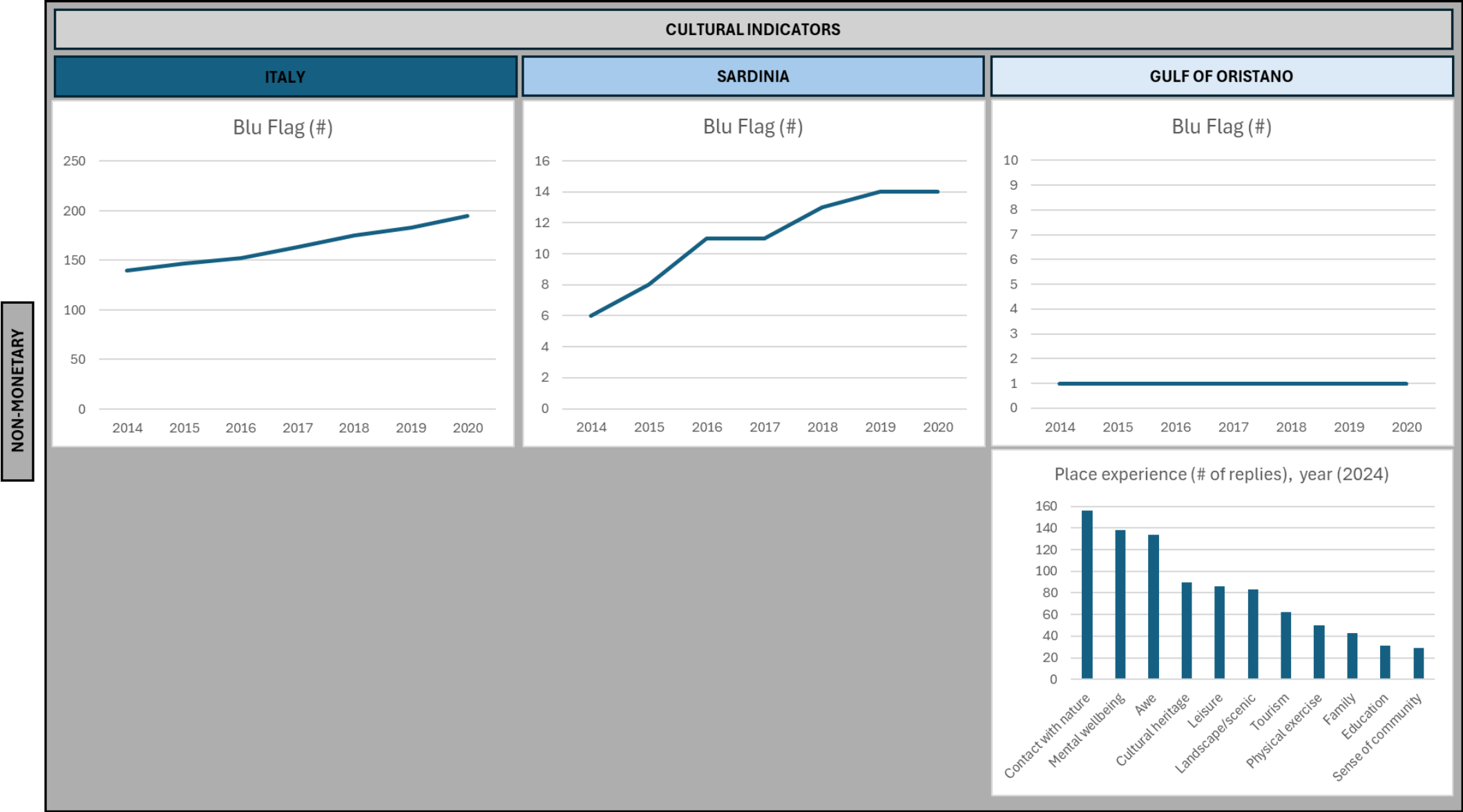
MONETARY

CAN matrix – cell 3

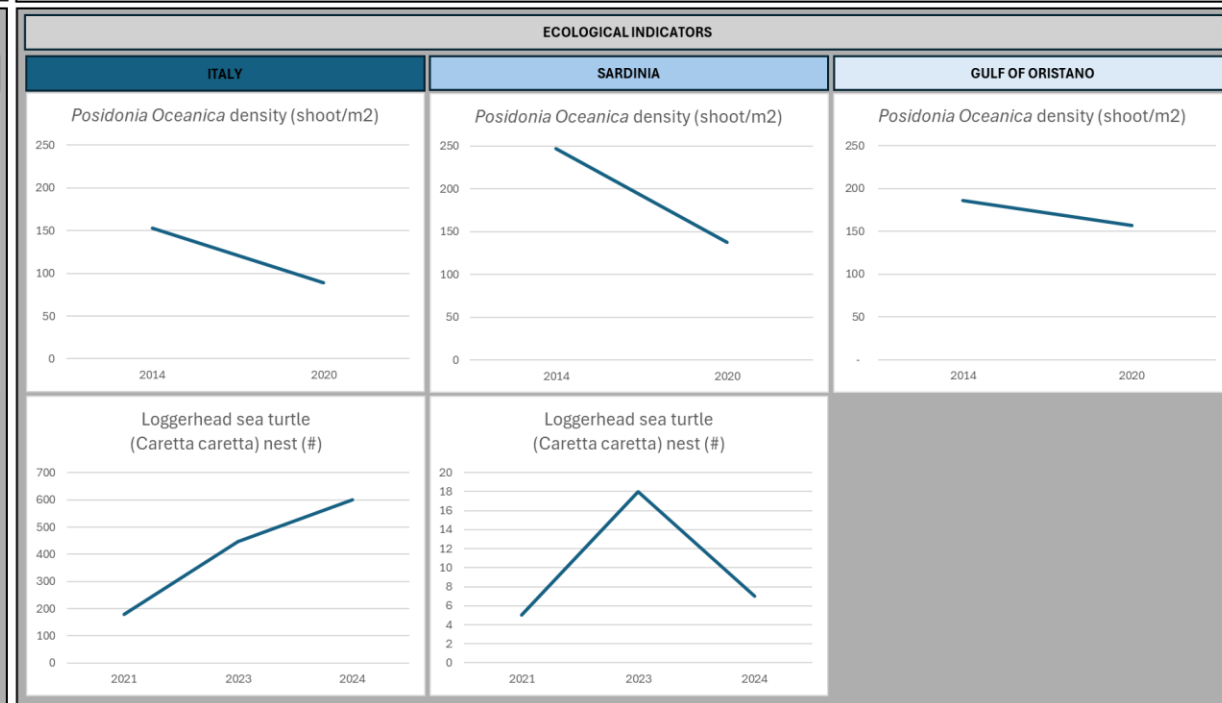
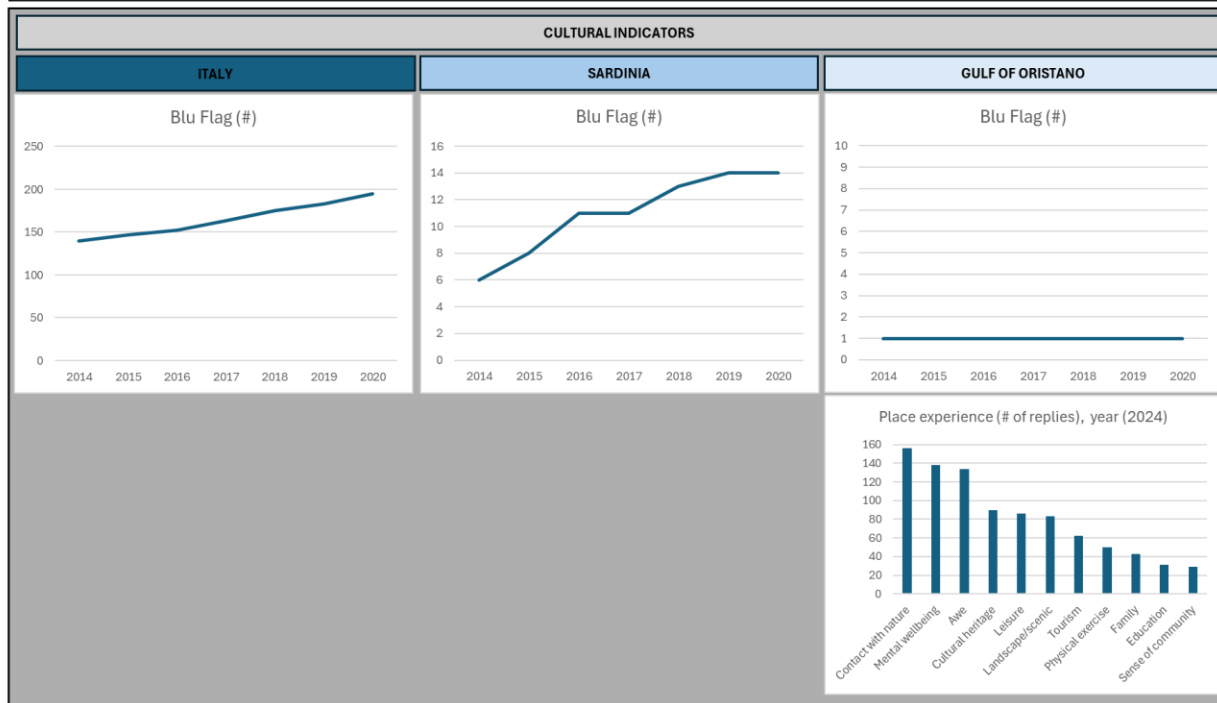
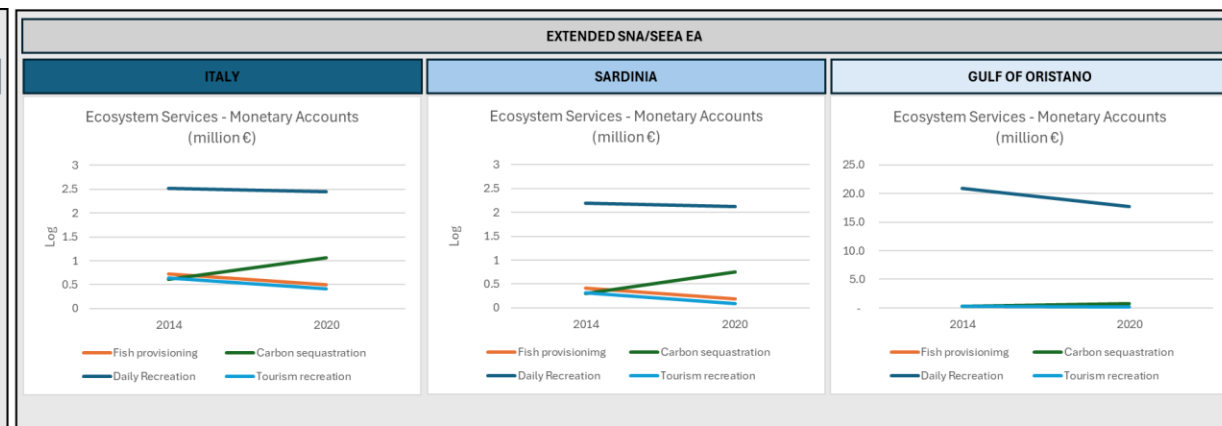
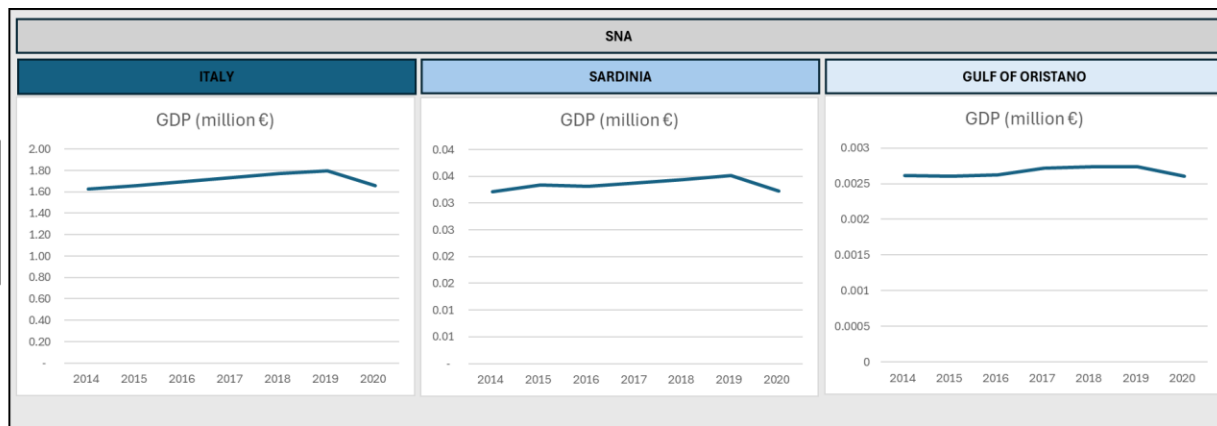


NON-MONETARY

CAN matrix – cell 4



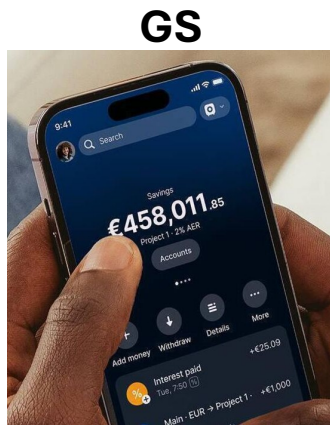
CAN dashboard – full matrix



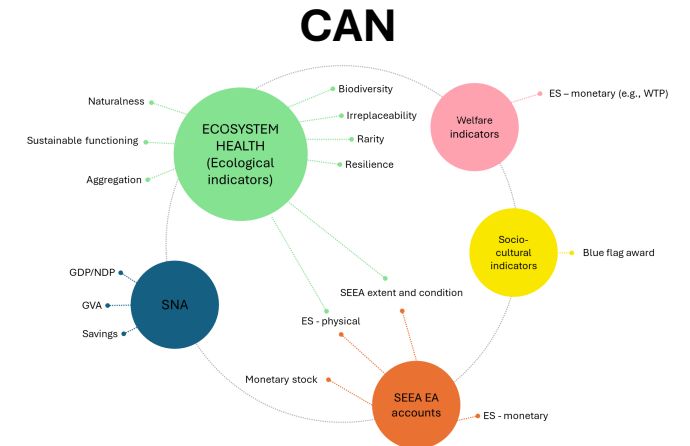
Conclusion

Ecosystem accounting contribute to

- Move 'weak' towards 'stronger' sustainability indicators as Genuine Savings (GS)
- holistic approach to capturing nature–economy interactions as the Complementary Accounting Network (CAN)



System of
Environmental
Economic
Accounting



Future work is needed for the *systematic implementation of ecosystem accounting* and harmonization of data and indicators across spatial and temporal scales in order to support meaningful sustainability assessments and better inform policy decisions at local, regional, and national levels

Thanks for your attention!

v.di-gennaro@uea.ac.uk