Maritime Spatial Planning and the Italian Blue Economy: Economic Impacts through a Multi-Regional Input-Output Approach

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Working Group on Methodology and Data Sources of the EU BEO Community of Practice, 3 June 2026

Study Context and Objective

National Biodiversity Future Center – NBFC

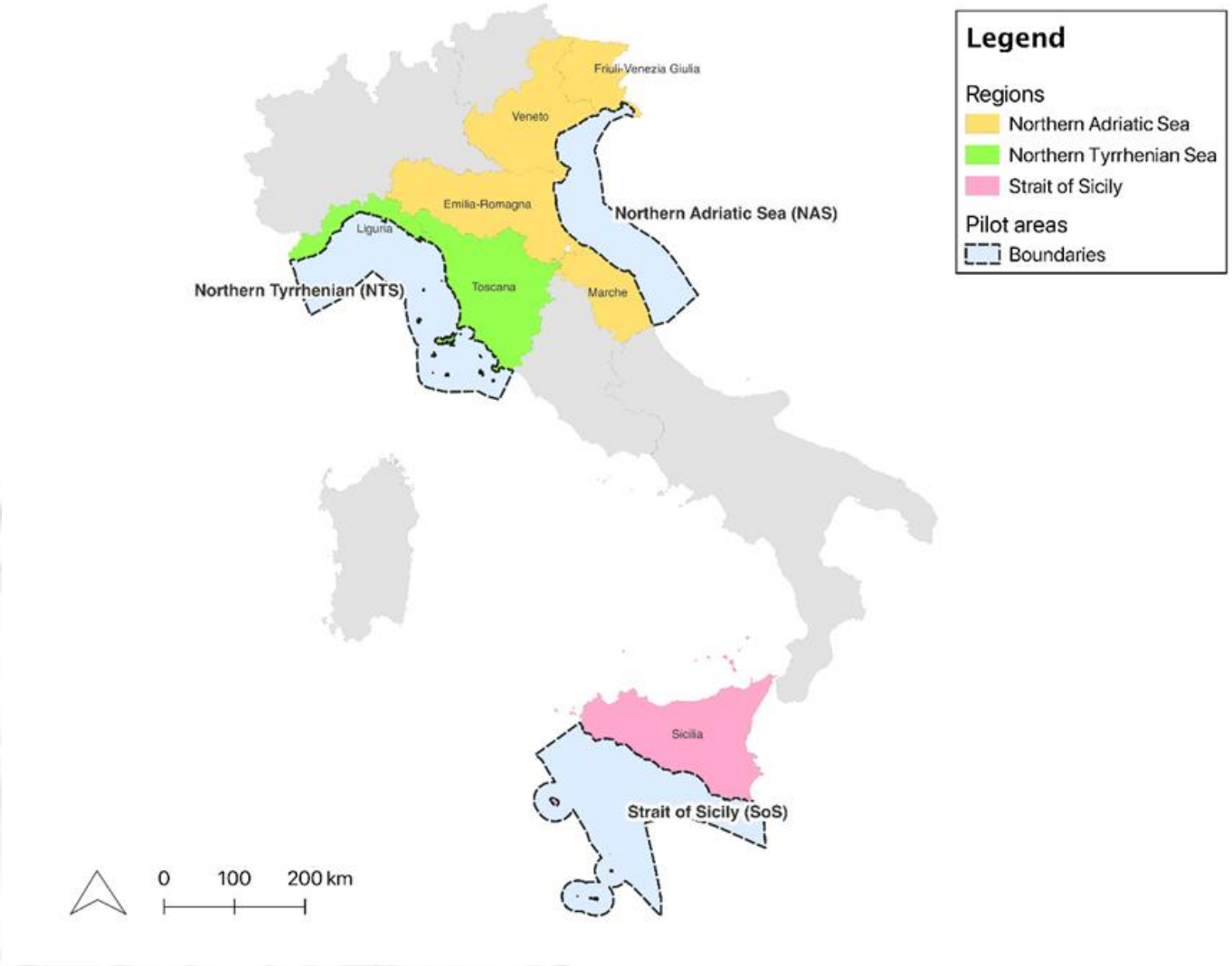
Next Generation EU Activity 4, Spoke 2

Biodiversity Mainstreaming in Maritime Spatial Planning (MSP4BIODIVERSITY)

Objective:

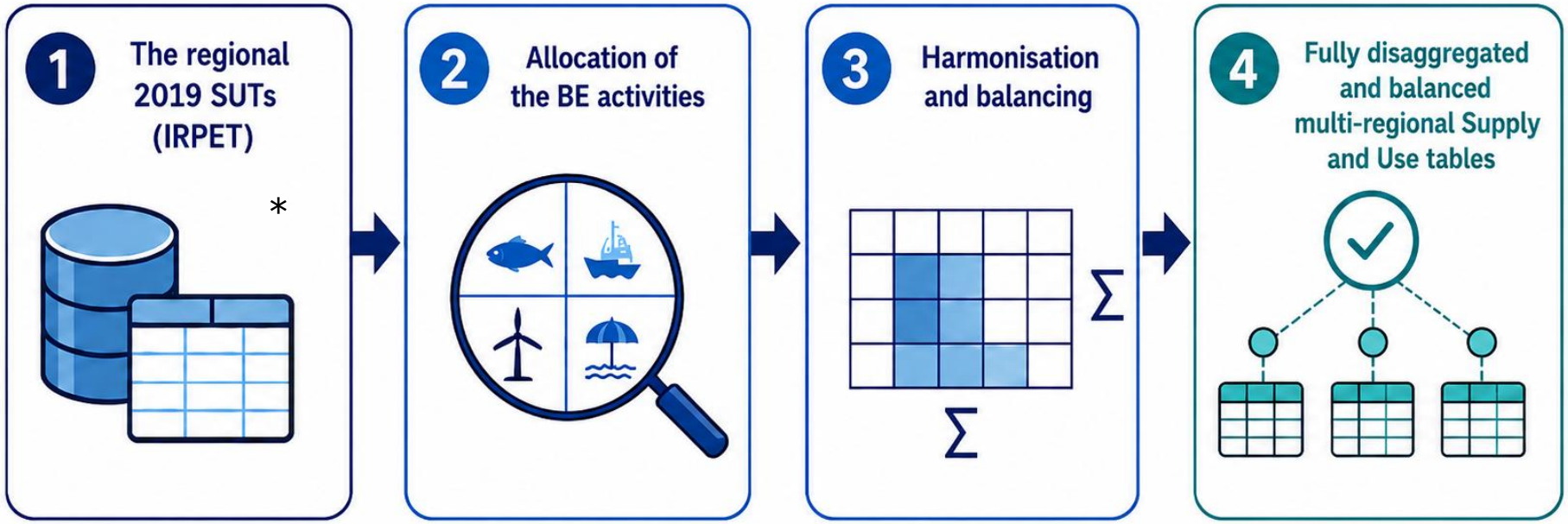
Assessing the socio-economic impacts of Italian Marine Spatial Planning across three pilot areas — Northern Adriatic Sea (NAS), Ligurian and Northern Tyrrhenian Sea (NTS), and Strait of Sicily (SoS) — under alternative management scenarios.

Study areas


Legend
Regions
Northern Adriatic Sea
Northern Tyrrhenian Sea
Strait of Sicily
Pilot areas
Boundaries
Friuli-Venezia Giulia
Veneto
Emilia-Romagna
Liguria
Toscana
Marche
Northern Adriatic Sea (NAS)
Northern Tyrrhenian (NTS)
Sicilia
Strait of Sicily (SoS)
0
100
200 km

Methodological Workflow

Construction of the Multi-Regional Blue Economy Supply and Use Framework



*Source: R. Paniccià (2024). *A methodology for building a multiregional Supply and Use Table for Italy: an updated and revised version*. IRPET Working paper 12/2024

Blue Economy Sectors, Classifications, and Data Sources

BE Sector	NACE Section	Products (CPA 2.1)	Data	Make and Supply Tables
 Fishing, Support Services to Fishing	A - Agriculture, forestry and fishing - 3.01	—	Italian DCF	Statistics Canada, 2019
 Aquaculture	A - Agriculture, forestry and fishing - 3.02	—	Italian DCF	Statistics Canada, 2019
 Sea and coastal passenger water transport	H - Water transportation - 50.1	—	FRAME SBS, Assoporti	ISTAT SUT, 2019
 Sea and coastal freight water transport	H - Water transportation - 50.2	—	FRAME SBS, Assoporti	ISTAT SUT, 2019
 Offshore wind energy	D - Electricity, Gas, Steam and Air Conditioning Supply - 35.11	—	Terna S.p.A.	—
 Coastal Tourism	—	H49 - Land transport services H50 - Water transport services H51 - Air transport services I - Accommodation and Food Service Activities N (77-82) - Other administrative activities R (90-93) - Creative, arts, entertainment and cultural services + sporting and amusement services G (47) - Retail trade services	FRAME SBS	ISTAT Tourism Satellite Accounts (TSA)

SUTs Disaggregation

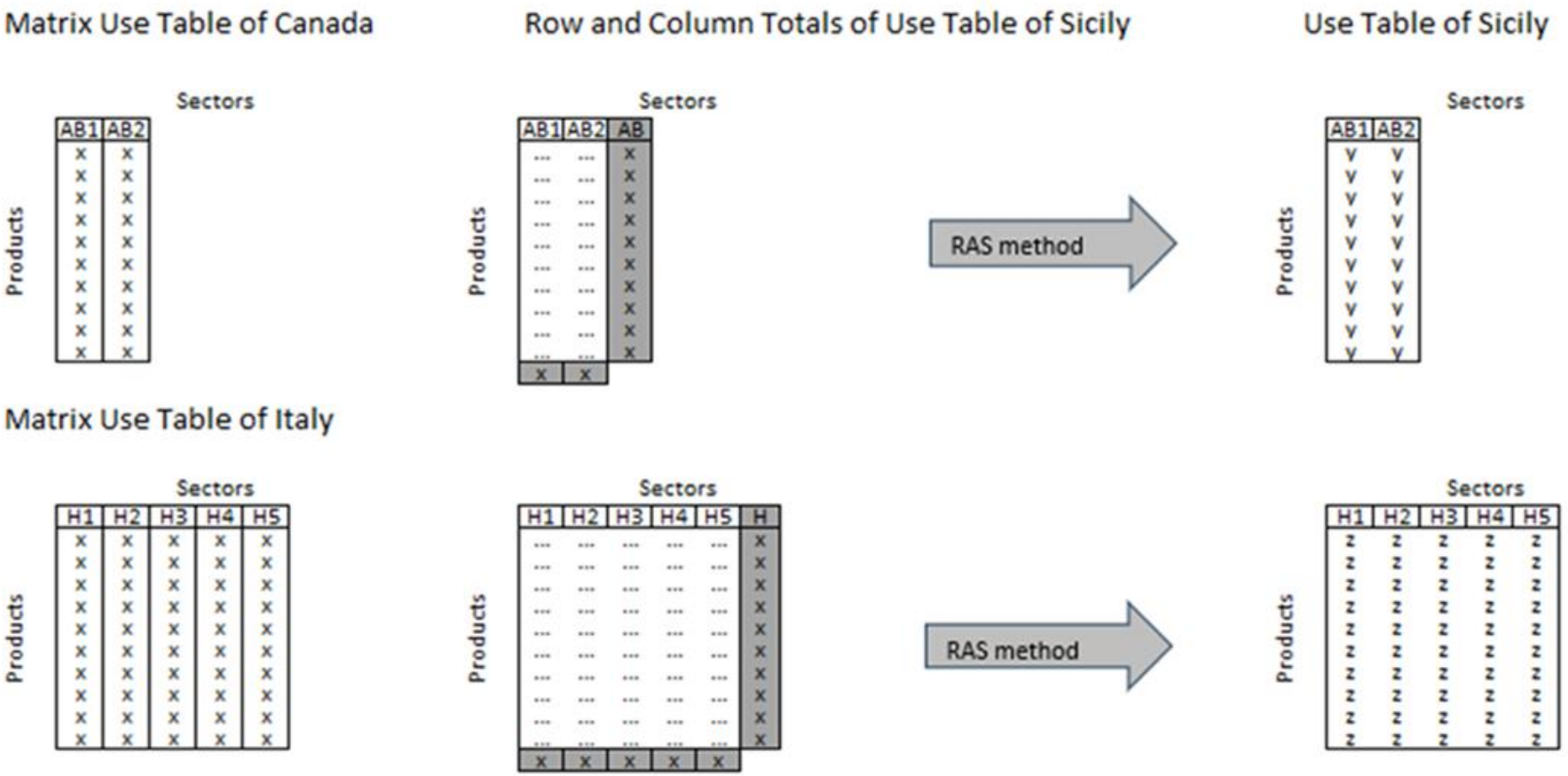
The restructuring of the SUTs was carried out through proportional disaggregation.

For each aggregate sector, subsector shares were estimated using revenue ratios derived from FRAME SBS and sector-specific datasets (Miller & Blair, 2009)

$$VA_{SUBi} = VA_{SEC}\left(\frac{Revenues_{SUBi}}{Revenues_{SEC}}\right) \qquad (7)$$

$$CI_{SUBi} = CI_{SEC}\left(\frac{Revenues_{SUBi}}{Revenues_{SEC}}\right) \qquad (8)$$

RAS process diagram for the USE table



Multi-regional SUT for Sicily and the Rest of Italy (SoS model)

			Sicily						Rest of Italy (RI)						Sicily	RI	Exports to Rest of the World	TOT
			Products			*Industries*			*Products*			*Industries*			Final demand	Final demand		
			Agr	Man	Ser	Agr	Man	Ser	Agr	Man	Ser	Agr	Man	Ser				
Sicily	*Products*	Agriculture	Sicilian *Make* matrix $\mathbf{V}^S$			u^S_{aa}	u^S_{am}	u^S_{as}	$e^{S,RI}_a$						f^S_a		$e^{S,RW}_a$	tu^S_a
		Manufacturing				u^S_{ma}	u^S_{mm}	u^S_{ms}		$e^{S,RI}_m$					f^S_m		$e^{S,RW}_m$	tu^S_m
		Services				u^S_{sa}	u^S_{sm}	u^S_{ss}			$e^{S,RI}_s$				f^S_s		$e^{S,RW}_s$	tu^S_s
	Industries	Agriculture	v^S_{aa}	v^S_{am}	v^S_{as}	Sicilian *Use* matrix $\mathbf{U}^S$												x^S_a
		Manufacturing	v^S_{ma}	v^S_{mm}	v^S_{ms}													x^S_m
		Services	v^S_{sa}	v^S_{sm}	v^S_{ss}													x^S_s
Rest of Italy (RI)	*Products*	Agriculture	$e^{RI,S}_a$						Rest of Italy's *Make* matrix $\mathbf{V}^{RI}$			u^{RI}_{aa}	u^{RI}_{am}	u^{RI}_{as}		f^{RI}_a	$e^{RI,RW}_a$	tu^{RI}_a
		Manufacturing		$e^{RI,S}_m$								u^{RI}_{ma}	u^{RI}_{mm}	u^{RI}_{ms}		f^{RI}_m	$e^{RI,RW}_m$	tu^{RI}_m
		Services			$e^{RI,S}_s$							u^{RI}_{sa}	u^{RI}_{sm}	u^{RI}_{ss}		f^{RI}_s	$e^{RI,RW}_s$	tu^{RI}_s
	Industries	Agriculture							v^{RI}_{aa}	v^{RI}_{am}	v^{RI}_{as}	Rest of Italy's *Use* matrix $\mathbf{U}^{RI}$						x^{RI}_a
		Manufacturing							v^{RI}_{ma}	v^{RI}_{mm}	v^{RI}_{ms}							x^{RI}_m
		Services							v^{RI}_{sa}	v^{RI}_{sm}	v^{RI}_{ss}							x^{RI}_s
Net taxes on products						nt^S_a	nt^S_m	nt^S_s				nt^{RI}_a	nt^{RI}_m	nt^{RI}_s	nt^S_f	nt^{RI}_f	nt^{RW}_g	Σ
Value Added	Net taxes on production					$va^S_{T,a}$	$va^S_{T,m}$	$va^S_{T,s}$				$va^{RI}_{T,a}$	$va^{RI}_{T,m}$	$va^{RI}_{T,s}$				Σ
	Employees' compensation					$va^S_{L,a}$	$va^S_{L,m}$	$va^S_{L,s}$				$va^{RI}_{L,a}$	$va^{RI}_{L,m}$	$va^{RI}_{L,s}$				Σ
	Gross operating surplus					$va^S_{K,a}$	$va^S_{K,m}$	$va^S_{K,s}$				$va^{RI}_{K,a}$	$va^{RI}_{K,m}$	$va^{RI}_{K,s}$				Σ
Imports from Rest of World (RW)			$e^{RW,S}_a$	$e^{RW,S}_m$	$e^{RW,S}_s$				$e^{RW,RI}_a$	$e^{RW,RI}_m$	$e^{RW,RI}_s$							Σ
TOT			ts^S_a	ts^S_m	ts^S_s	x^S_a	x^S_m	x^S_s	ts^{RI}_a	ts^{RI}_m	ts^{RI}_s	x^{RI}_a	x^{RI}_m	x^{RI}_s	tf^S	tf^{RI}	Σ	

Source: F. Andreottola, S. Badiglio, S. Capasso, M. Gambino, L. Guadalupi, M. Pettena, V. Pipitone, D.A.L. Quagliarotti, L. Seta (2026). *Assessing the blue economy for the Maritime Spatial Planning: evidence from Sicily.* Journal of Policy Modeling,107067,ISSN 0161-8938,https://doi.org/10.1016/j.jpolmod.2026.107067.

The three multi-regional Supply-and-Use models

	Northern Adriatic Sea (NAS)	Ligurian and Northern Tyrrhenian Sea (NTS)	Strait of Sicily (SoS)
Featured NUTS 2 regions	Friuli Venezia Giulia, Veneto, Emilia Romagna, Marche, Rest of Italy	Liguria, Tuscany, Rest of Italy	Sicily, Rest of Italy
Number of sectors in each region	49	49	49
Number of products in each region	54	54	54

Model Equations Used for Scenario Analysis

$$\begin{pmatrix} \mathbf{q}^S \\ \mathbf{x}^S \\ \mathbf{q}^{RI} \\ \mathbf{x}^{RI} \end{pmatrix} = \left[\mathbf{I} - \begin{pmatrix} \mathbf{0} & \mathbf{T}^S \cdot \mathbf{B}^S & \mathbf{0} & \mathbf{M}^{S,RI} \cdot \mathbf{B}^{RI} \\ \mathbf{D}^S & \mathbf{0} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{M}^{RI,S} \cdot \mathbf{B}^S & \mathbf{0} & \mathbf{T}^{RI} \cdot \mathbf{B}^{RI} \\ \mathbf{0} & \mathbf{0} & \mathbf{D}^{RI} & \mathbf{0} \end{pmatrix} \right]^{-1} \cdot \begin{pmatrix} \mathbf{T}^S \cdot \mathbf{f}^S + \mathbf{M}^{S,RI} \cdot \mathbf{f}^{RI} \\ \mathbf{0} \\ \mathbf{T}^{RI} \cdot \mathbf{f}^{RI} + \mathbf{M}^{RI,S} \cdot \mathbf{f}^S \\ \mathbf{0} \end{pmatrix} \quad (1)$$

shock to Sicilian final demand $\boldsymbol{f}^{*S}$

$$\begin{pmatrix} \mathbf{q}^S \\ \mathbf{x}^S \\ \mathbf{q}^{RI} \\ \mathbf{x}^{RI} \end{pmatrix} = \left[\mathbf{I} - \begin{pmatrix} \mathbf{0} & \mathbf{T}^S \cdot \mathbf{B}^S & \mathbf{0} & \mathbf{M}^{S,RI} \cdot \mathbf{B}^{RI} \\ \mathbf{D}^S & \mathbf{0} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{M}^{RI,S} \cdot \mathbf{B}^S & \mathbf{0} & \mathbf{T}^{RI} \cdot \mathbf{B}^{RI} \\ \mathbf{0} & \mathbf{0} & \mathbf{D}^{RI} & \mathbf{0} \end{pmatrix} \right]^{-1} \cdot \begin{pmatrix} \mathbf{T}^S \cdot \mathbf{f}^{*S} \\ \mathbf{0} \\ \mathbf{M}^{RI,S} \cdot \mathbf{f}^{*S} \\ \mathbf{0} \end{pmatrix} \quad (2a)$$

exogenous change in Sicilian sectoral output $\widetilde{\boldsymbol{x}^S}$

$$\begin{pmatrix} \mathbf{q}^S \\ \mathbf{x}^S \\ \mathbf{q}^{RI} \\ \mathbf{x}^{RI} \end{pmatrix} = \left[\mathbf{I} - \begin{pmatrix} \mathbf{0} & \mathbf{T}^S \cdot \mathbf{B}^S & \mathbf{0} & \mathbf{M}^{S,RI} \cdot \mathbf{B}^{RI} \\ \mathbf{D}^S & \mathbf{0} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{M}^{RI,S} \cdot \mathbf{B}^S & \mathbf{0} & \mathbf{T}^{RI} \cdot \mathbf{B}^{RI} \\ \mathbf{0} & \mathbf{0} & \mathbf{D}^{RI} & \mathbf{0} \end{pmatrix} \right]^{-1} \cdot \begin{pmatrix} \mathbf{0} \\ \tilde{\mathbf{x}}^S \\ \mathbf{0} \\ \mathbf{0} \end{pmatrix} \quad (2b)$$

Gross Value Added (GVA) multipliers

v^S is the vector of value-added coefficients

$$v^S = va^S \cdot \widehat{x^{S^{-1}}} \quad (3)$$

va^S is the vector of sectoral value added

$$va^S = v^S \cdot \widehat{x^S} \quad (4)$$

$\widehat{\boldsymbol{x}}^S$ is the diagonal matrix of sectoral gross output derived from the 2019 SUT

m_{GVA}^S is the Sicilian GVA multiplier associated with an exogenous change in Sicilian final demand $\boldsymbol{f}^{*S}$

$$m_{GVA}^S = \frac{\boldsymbol{va}^S \cdot 1}{1' \cdot \boldsymbol{f}^{*S}} \quad (5)$$

where 1 is a 49x1 vector of ones and 1′ is its transpose

If the shock is applied to output, $\widetilde{\boldsymbol{x}^S}$

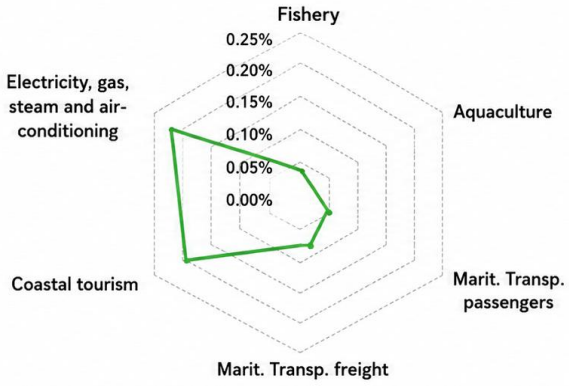
$$m_{GVA}^S = \frac{\boldsymbol{va}^S \cdot 1}{1' \cdot \widetilde{\boldsymbol{x}^S}} \quad (6)$$

Empirical Results (1): GVA Multipliers by BE Sector and Pilot Area

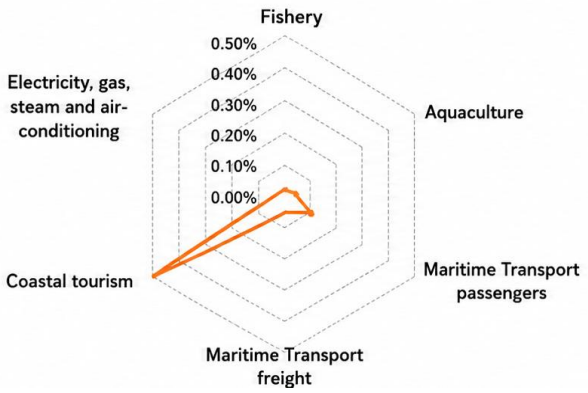
	Fishery	Aquaculture	Coastal Transport Passengers	Coastal Transport Freight	Coastal Tourism	Electricity, gas, steam and air-conditioning
SoS	0.58	0.62	0.66	0.66	0.71	0.58
NAS	0.62	0.66	0.59	0.58	0.71	0.62
NTS	0.63	0.69	0.51	0.53	0.71	0.72

Empirical Results (2): Percentage Changes in GVA from a 5% Exogenous Shock to BE Sectors

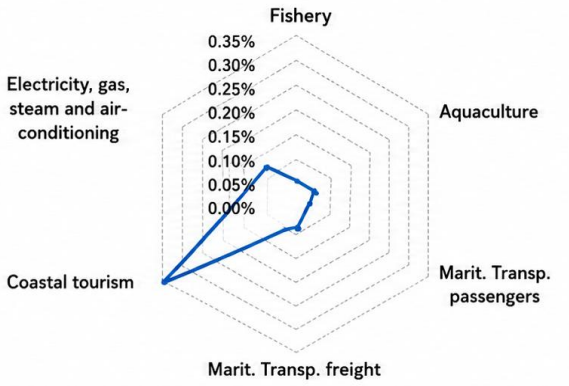
SoS model
Sicily



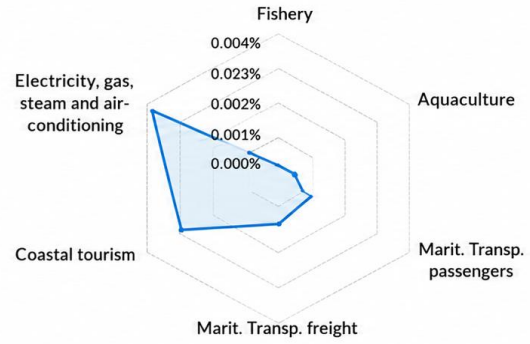
NTS model
Liguria & Tuscany



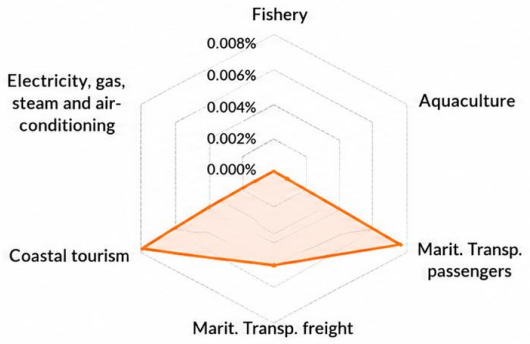
NAS model
Friuli-Venezia Giulia, Veneto, Emilia-Romagna, Marche



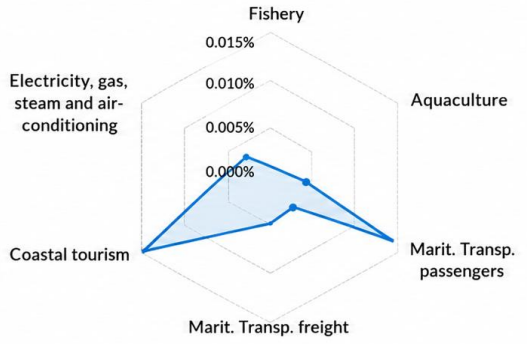
Rest of Italy



Rest of Italy



Rest of Italy



Concluding Remarks

1. Key Takeaway

MSP impacts are place-specific and depend on regional production structures and the ability of territories to retain value added.

2. Policy Implication

Place-based MSP strategies are needed, as different coastal economies respond differently to maritime planning interventions.

3. Limitations

Static Input–Output framework (fixed coefficients, constant returns to scale, constant prices).

4. Future Research

1) Assess spatial trade-offs among maritime activities.
2) Develop coastal-unit regionalised I-O tables.
3) Integrate environmental and ecological indicators.

Thank you for your attention.

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Any questions?