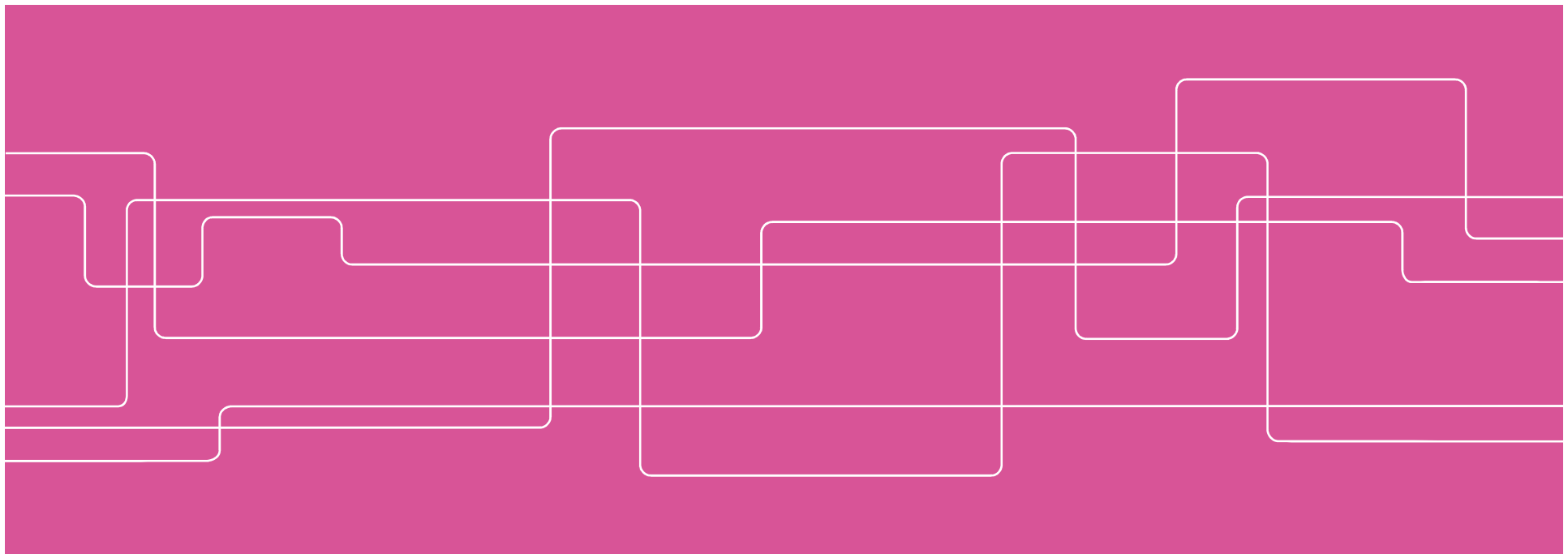




# PES and ecosystem service markets in the blue economy

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## My research questions

When are PES or ecosystem service markets

- Motivated
- Not motivated

...to support sustainable blue growth?

What types of designs may be suitable?

“Blue Growth is the long term strategy to support sustainable growth in the marine and maritime sectors as a whole.”

*European Commission / DG MARE*

**EC highlights sectors such as:**

- a. Aquaculture
- b. Coastal tourism
- c. Marine biotechnology
- d. Ocean energy
- e. Seabed mining



## What do I mean with PES and ES markets?

*"voluntary transaction between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services"*

Wunder (2015)

A way of getting paid for providing ES indirectly or directly

...and a way of having to be accountable for a negative impact on ES

# What creates and drives these "markets"

(Adapted from Cole et al., 2012)

## Regulatory compliance

Ex: Habitat banking  
(Similar to Co2 trade)

Dependent on  
regulation by the  
government

## Taxpayer financing/pigouvian

Ex: Most of the PES  
schemes around the  
world.

(Similar to EU CAP)

Dependent on taxpayer  
funding

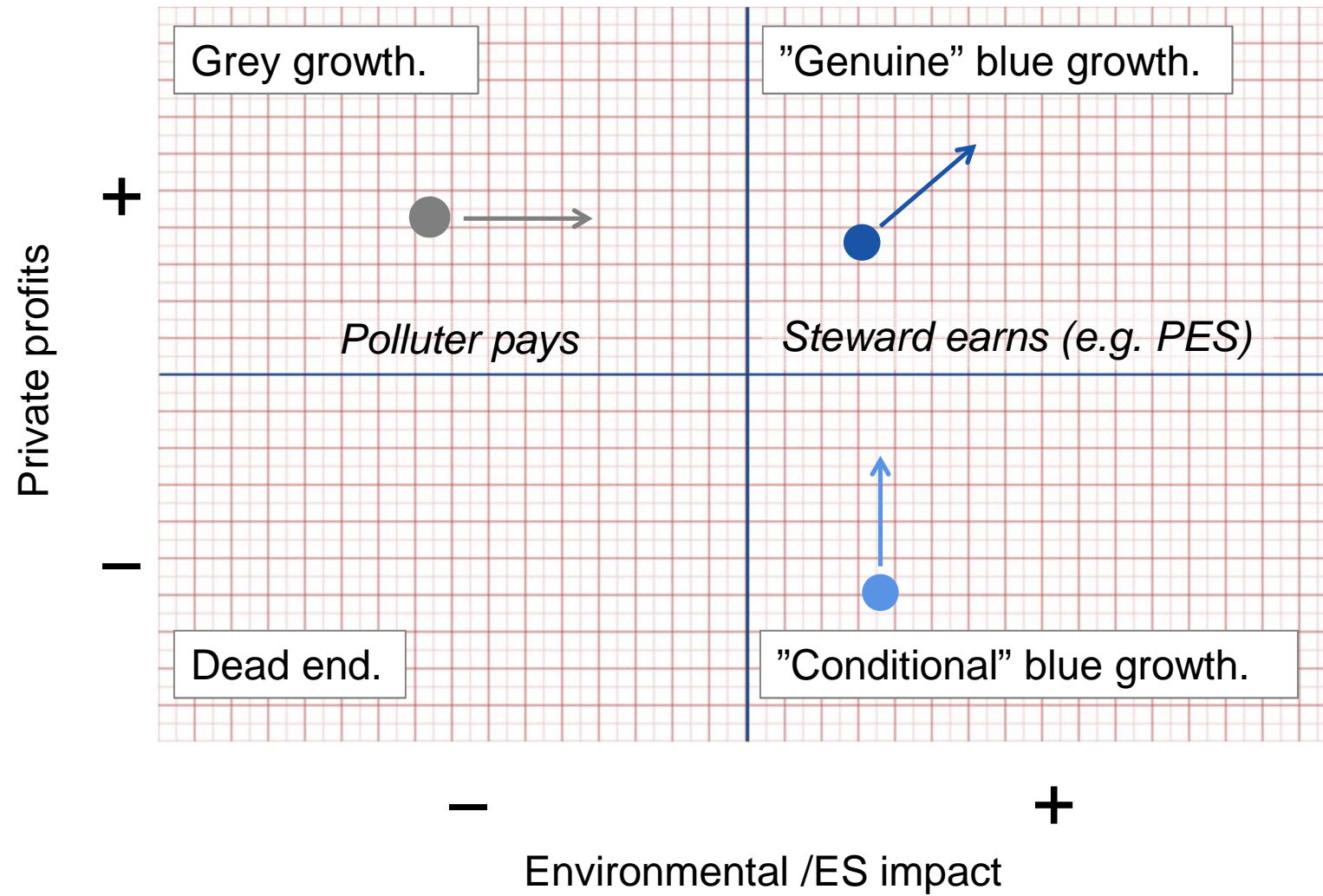
## Voluntariness/coasean

Ex: Market for drinking  
water in France /NGO  
funded PES/voluntary  
environmental  
compensation, etc.

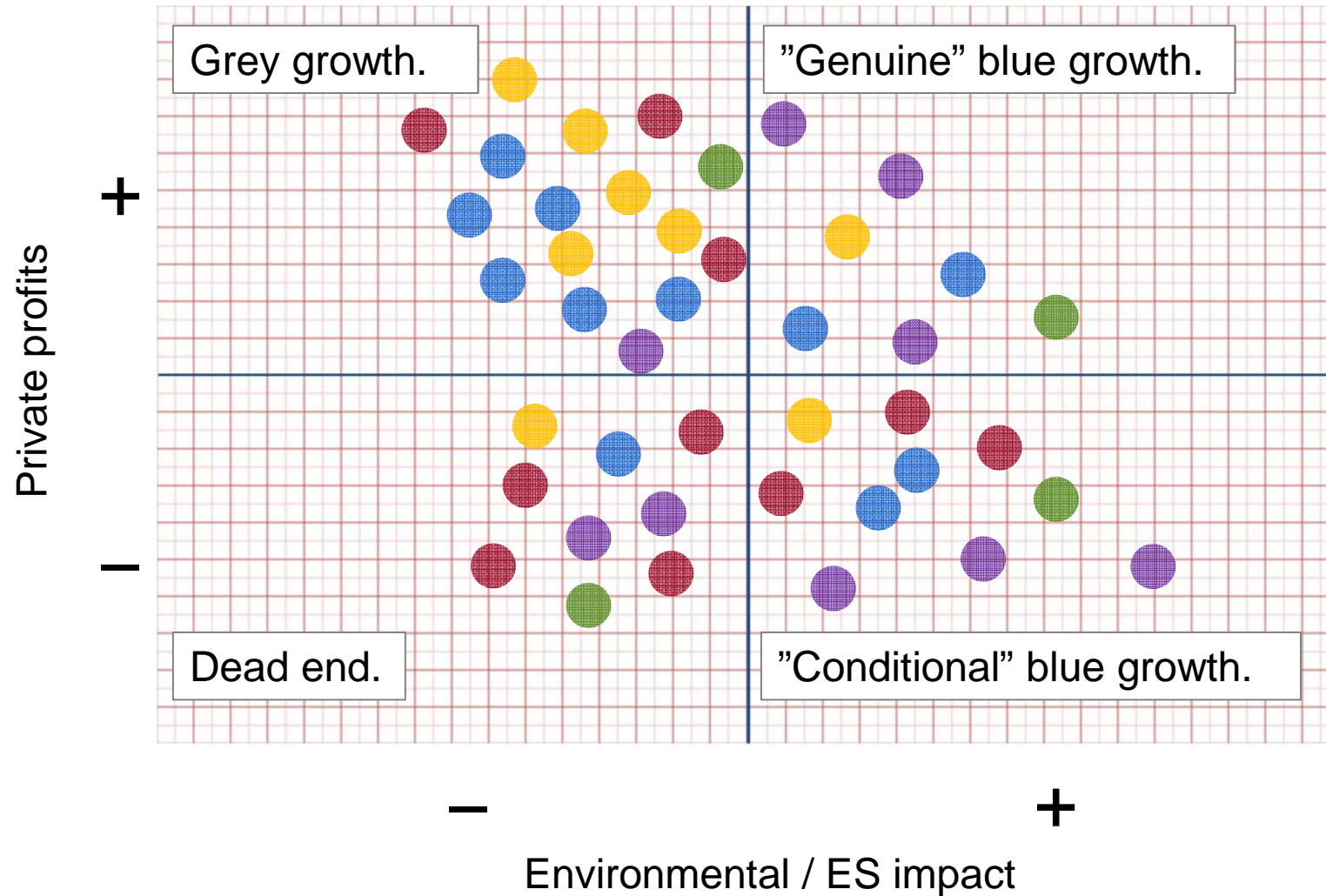
Dependent on that an  
ecosystem service  
provides a private  
profit

Or "charity"

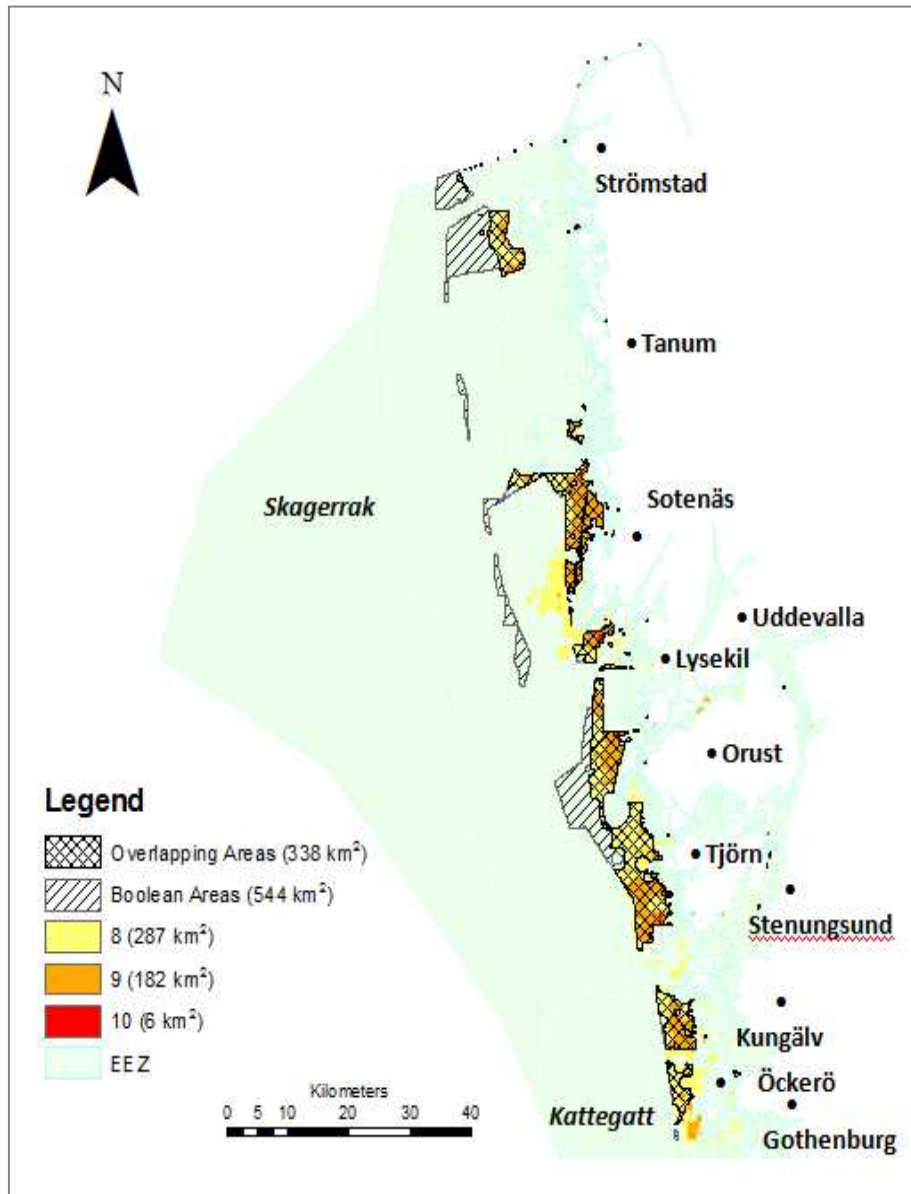
# Types of maritime industries



# Types of maritime industries



- |   |  |
|---|--|
| <span style="color: blue;">●</span> Aquaculture           | <span style="color: purple;">●</span> Ocean energy |
| <span style="color: yellow;">●</span> Coastal tourism     | <span style="color: red;">●</span> Seabed mining   |
| <span style="color: green;">●</span> Marine biotechnology |  |



Suitable locations for algae cultivation along the Swedish west coast (340 km<sup>2</sup>)

What are the positive and negative ES impacts?



# Impacted ecosystem services from algae cultivation

(Hasselström et al., in prep)

	Ecosystem service	Affected?
Supporting	S1. Biogeochemical cycling	Attractive habitat for fish and small mobile species. Provides a surface for non-mobile species. Anchoring devices provide habitat for lobster and crabs.
	S2. Primary production	
	S3. Food web dynamics	
	S4. Biodiversity	
	S5. Habitat	
	S6. Resilience	
Regulating	R1. Climate and atmospheric regulation	Temporary C storage
	R2. Sediment retention	No.
	R3. Regulation of eutrophication	N&P uptake.
	R4. Biological regulation	No.
	R5. Regulation of toxic substances	Maybe.
Provisioning	P1. Food	Production by cultivation.
	P2. Raw material	Production by cultivation.
	P3. Genetic resources	No.
	P4. Chemical resources	Production by cultivation.
	P5. Ornamental resources	No.
	P6. Energy (from biomass only)	Production by cultivation.
Cultural	C1. Recreation	Negatively.
	C2. Aesthetic values	Negatively.
	C3. Science & education	No.
	C4. Cultural heritage	No.
	C5. Inspiration	No.
	C6. Natural heritage	Negatively.

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	S5. Habitat	
	S6. Resilience	
Regulating	R1. Climate and atmospheric regulation	Temporary C storage
	R2. Sediment retention	No
	R3. Regulation of eutrophication	N&P uptake. <i>Large benefits!</i>
	R4. Biological regulation	No.
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# Algae cultivation and nutrient regulation... Some possible market designs.

## Regulatory compliance

**Establishing cap & trade system for nutrients?**

(as investigated by e.g. Swedish EPA, 2009 and Swedish EPA, 2012)

Challenging design  
Location matters  
Legal issues  
Tradition matters

## Taxpayer financing/pigouvian

**Government pays seafarmers**

(ex. for mussels: Lindahl & Kollberg (2008); Zandersen et al. (2009) )

Expensive for tax payers!  
Will payment be sufficient incentive?

## Voluntariness/coasean

**e.g. voluntary offsetting s.a. "Nutritrade" project.**

Or

**Market signaling / eco labeling?**

Too small potential?



## Use of product vs. system boundaries

Many positive indirect effects

Product may replace e.g. fossil fuel, other food/fodder production, etc.

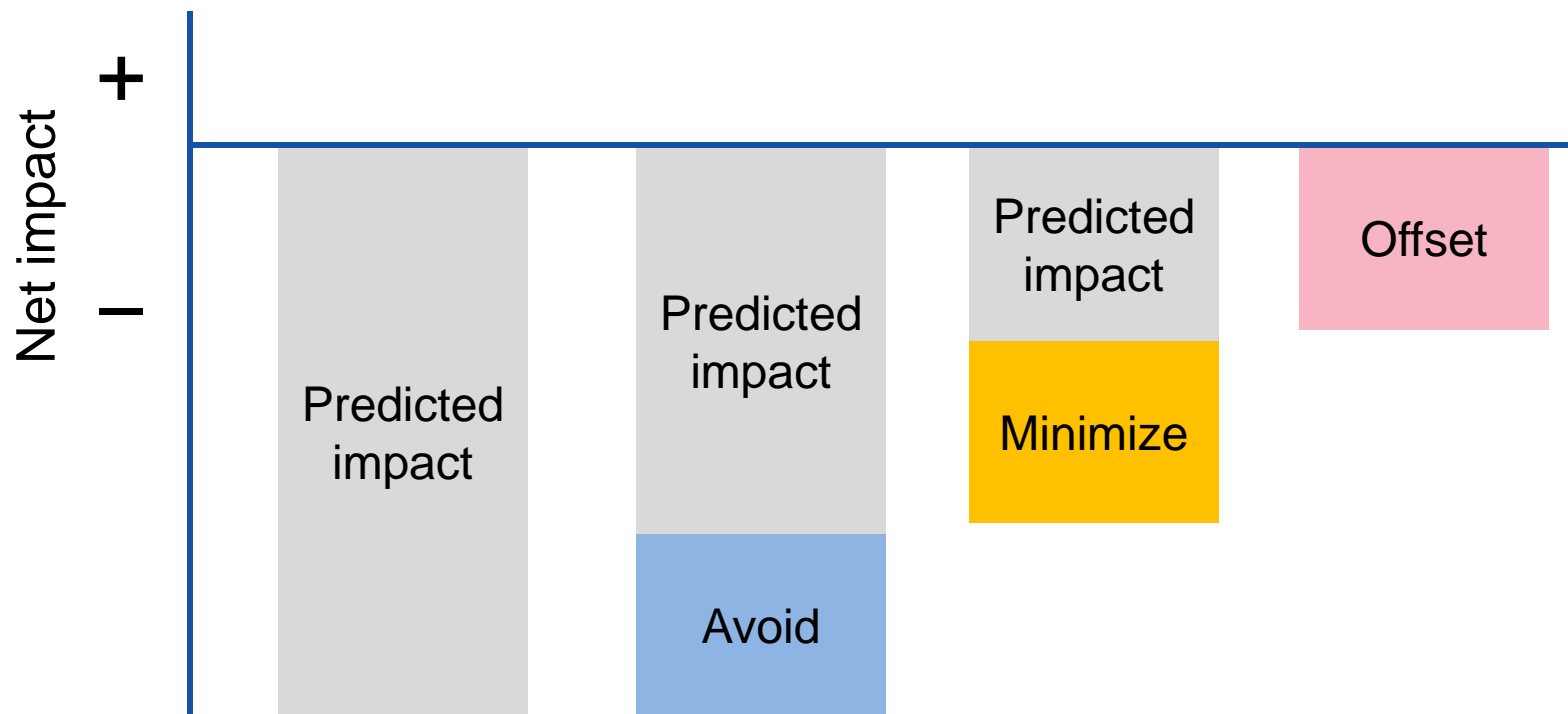
Should this indirect "positive impact" be priced on the algae market?

(Many economists would say no.)

# Negative impacts

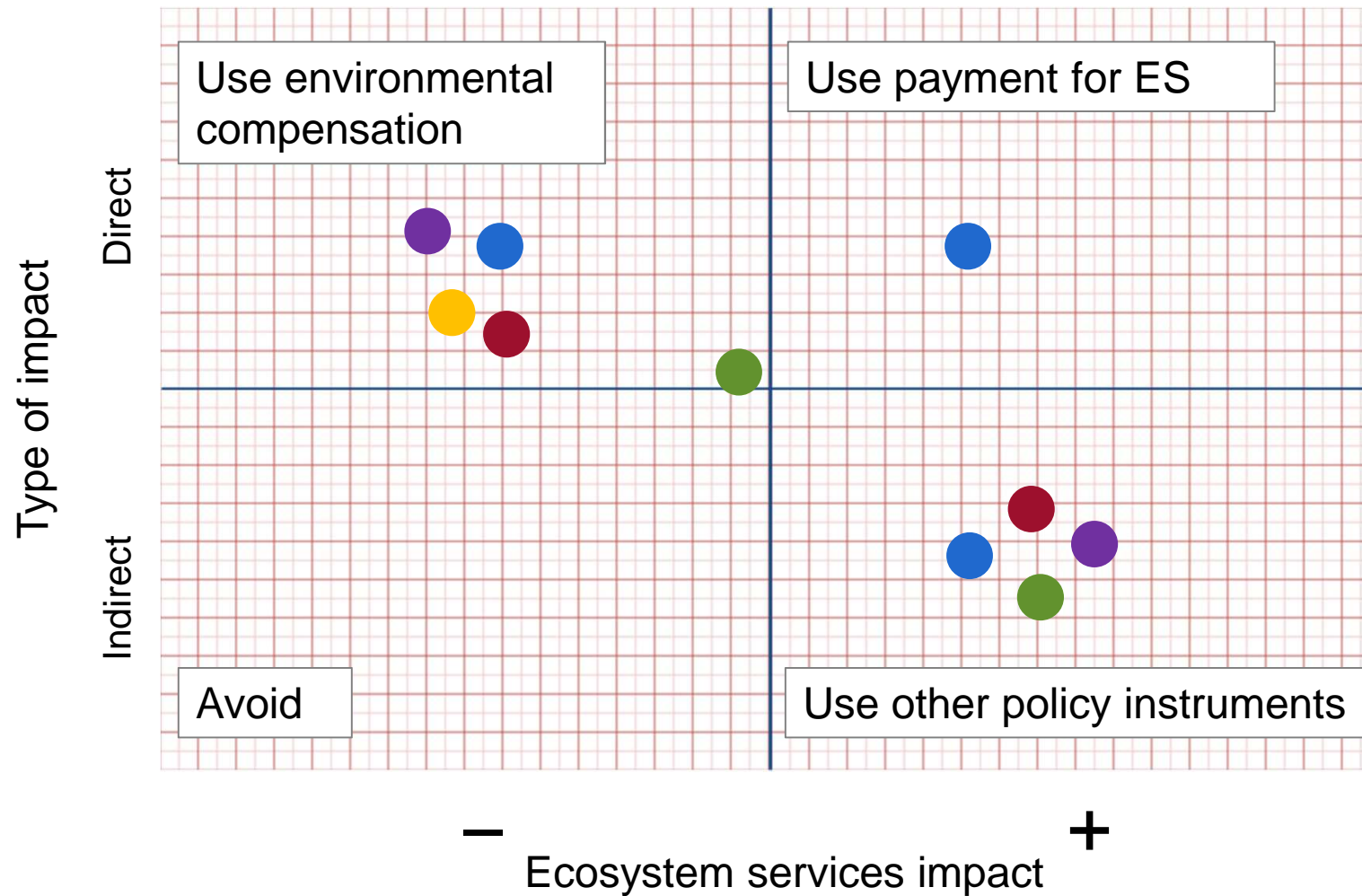
EU no net loss objective (of biodiversity and ecosystem services).

- Suggests use of the mitigation hierarchy (BBOP, 2012)
- And potentially compensation through habitat banking



Adapted from Enetjärn et al., 2015

# Type of impacts to ES/environment and consequences for policy



- Aquaculture
- Coastal tourism
- Marine biotechnology
- Ocean energy
- Seabed mining



## Conclusions

- Industries pointed out by commission for Blue Growth are not inherently (environmentally) sustainable.
- Aquaculture is only industry with clear direct positive impacts to ES?
- All industries likely to have local negative impacts to ES.
  - Environmental compensation markets and trade between actors/sectors may be an option.
- Many industries and products are "more sustainable than substitutes". This suggests more overarching pricing policies, not ES markets. (?)