Estimating the carbon footprint of the Galician fishing sector (NW Spain)

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About us

3.1. Product and process sustainability: Life Cycle Assessment and carbon footprint

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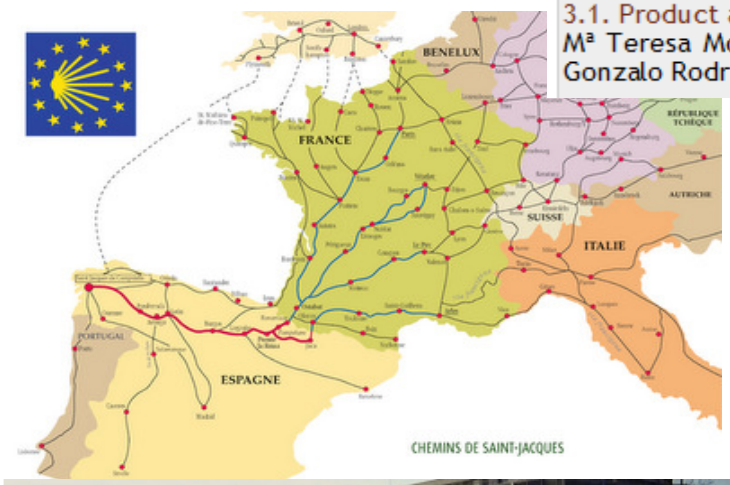


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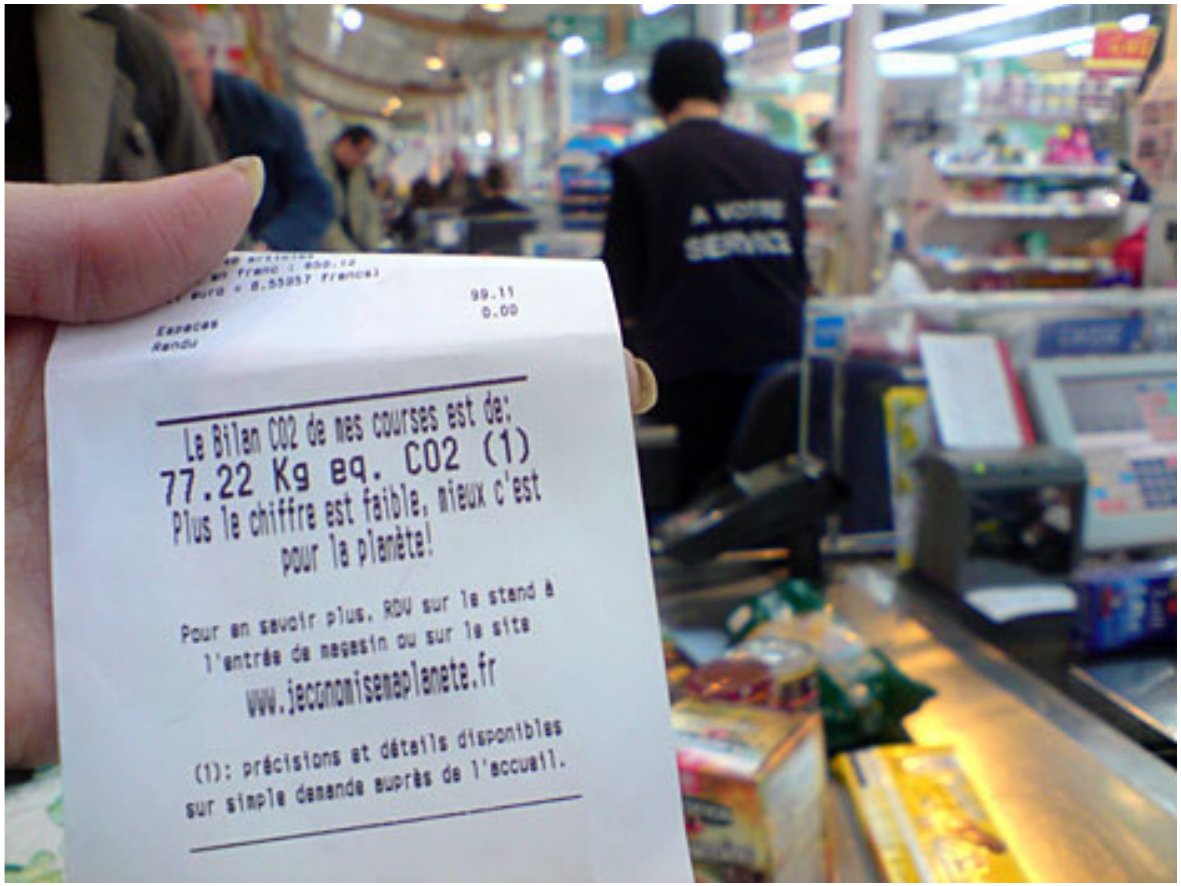
Introduction (1/2)

- Food production system = one of the major contributors to environmental impacts
- Increasing interest to report the environmental performance of food products.
- Assessment of the carbon footprint of the fishing sector (commercial fishing -coastal, offshore and deep-sea fisheries- and aquaculture -extensive and marine intensive farming practices) as a key subgroup of the food industry.
- LCA = suitable methodology to undertake the environmental assessment of seafood products. However, current trends in environmental communication have led to the development of CF as an independent methodological approach.

Introduction (2/2)

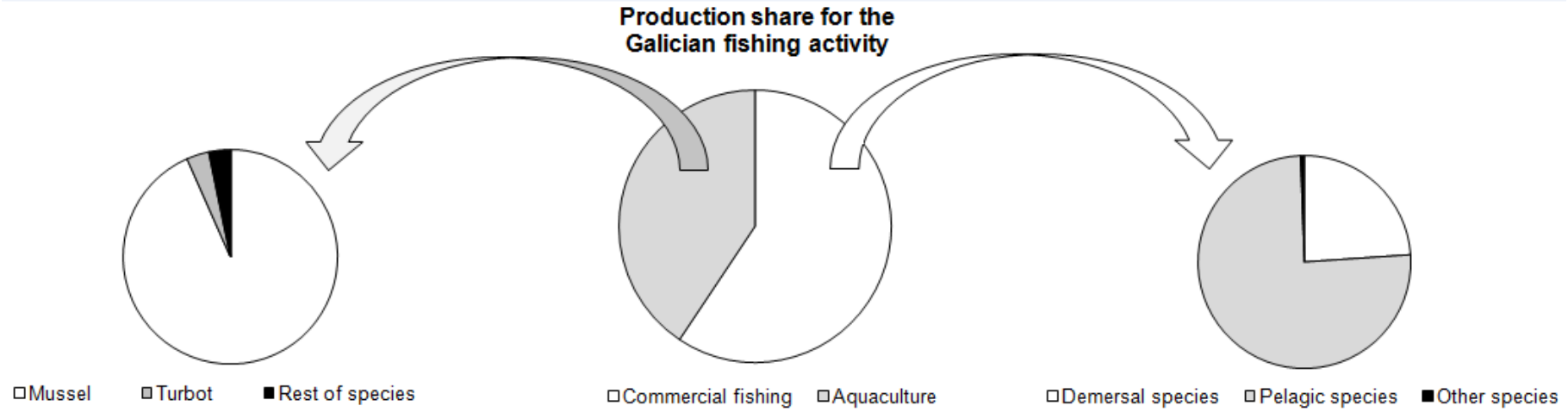


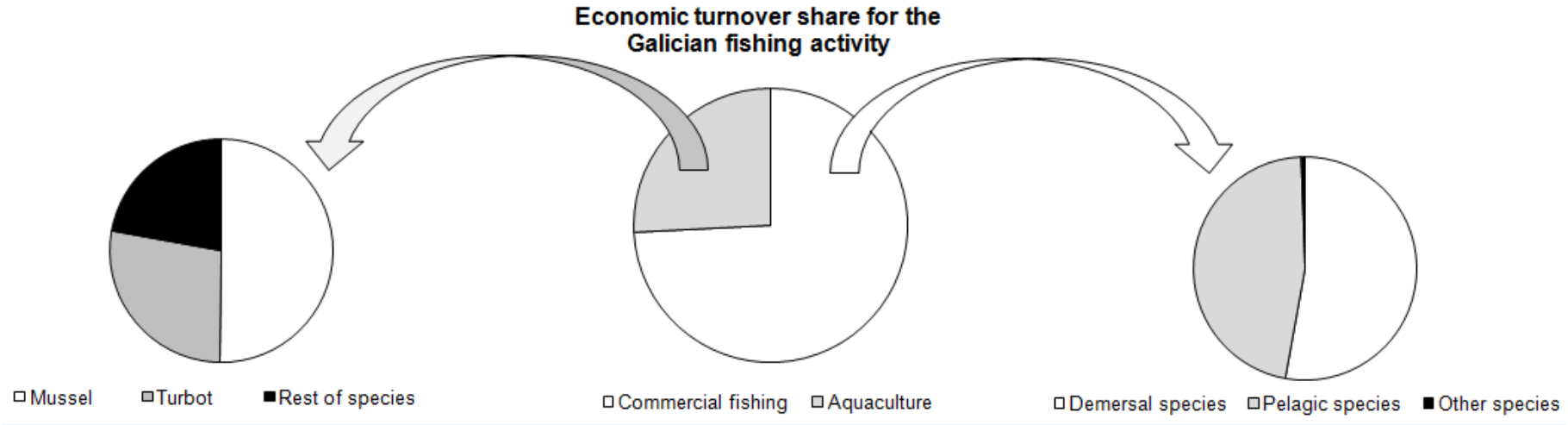
Carbon footprinting has a much broader appeal than LCA. . . . In [carbon footprinting], things are kept simple, and a carbon footprint is easy to calculate online . . . and the calculated value can easily be grasped. . .

SOURCE: Weidema et al. (2008). *Carbon Footprint: a Catalyst for LCA?* Journal of Industrial Ecology

Case study (1/2)

- Galicia (NW Spain) is the main Spanish region regarding fishing. This activity is a key economic sector that provides 10% of the regional GDP.





Case study (2/2)

- BOTTOM-UP approach: CF of a selection of species targeted by the Galician fishing activity

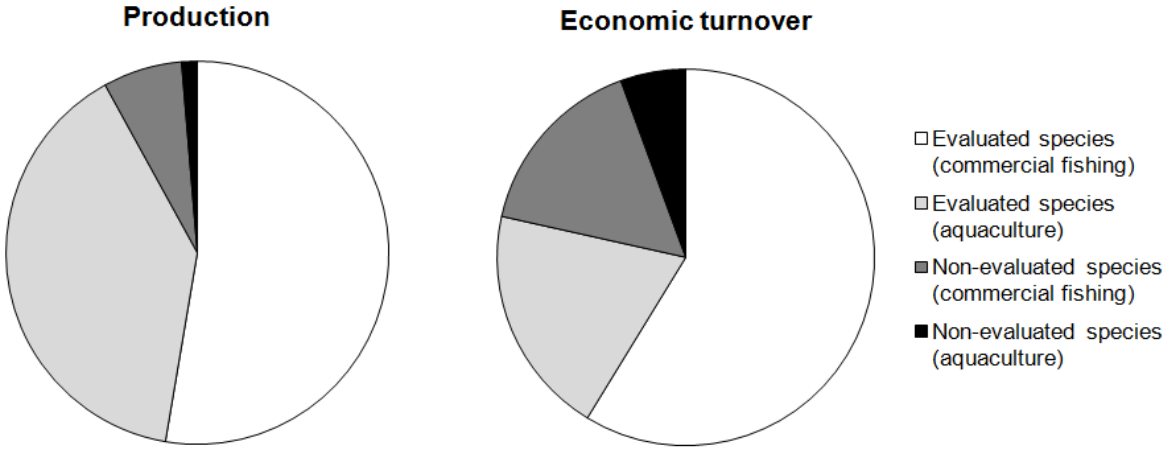
✓ Coastal fishing: horse mackerel (TR&PS), Atlantic mackerel (TR&PS), blue whiting (TR), hake (TR), European pilchard (PS) and chub mackerel (PS).

✓ Offshore fishing: hake (LL&TR); megrim, anglerfish and Norway lobster (TR); conger eel, Atlantic pomfret, common ling, rock fish and fork beard (LL); all from Northern Stock. Porbeagle, mako shark, bigeye tuna, blue shark and swordfish (LL in the Azores).

✓ Deep-sea fishing: skipjack and yellowfin tuna (PS in the Indian, Atlantic and Pacific Oceans).

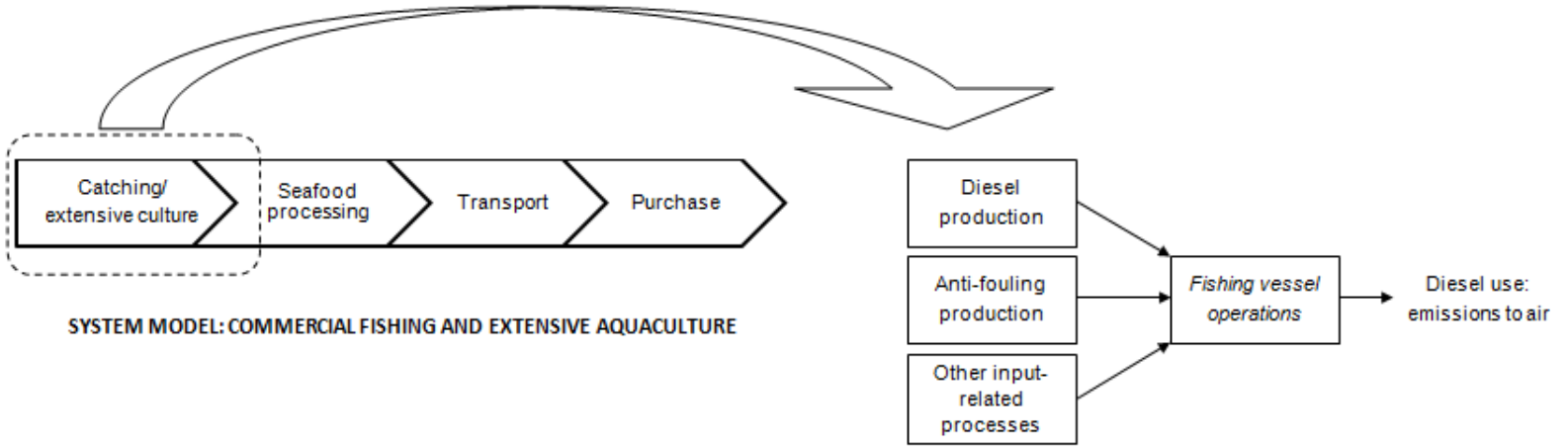
✓ Ext. aquaculture: mussels cultured in traditional rafts

✓ Marine int. aquaculture: turbot

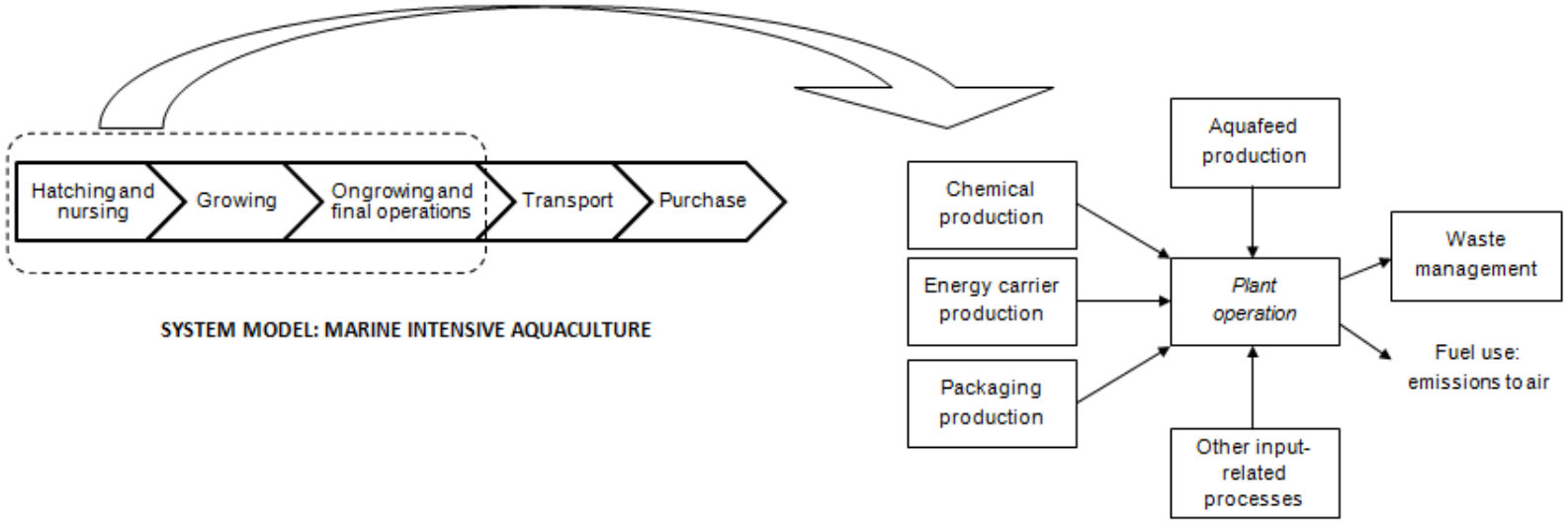


Materials & Methods (1/2)

- PAS 2050 used as the reference document for methodological guidance
- B2B approach considered: from capture/culture to landing in Galician ports



SYSTEM MODEL: COMMERCIAL FISHING AND EXTENSIVE AQUACULTURE



SYSTEM MODEL: MARINE INTENSIVE AQUACULTURE

Materials & Methods (2/2)

PRIMARY DATA

Questionnaire-based data collection (reference year = 2008).

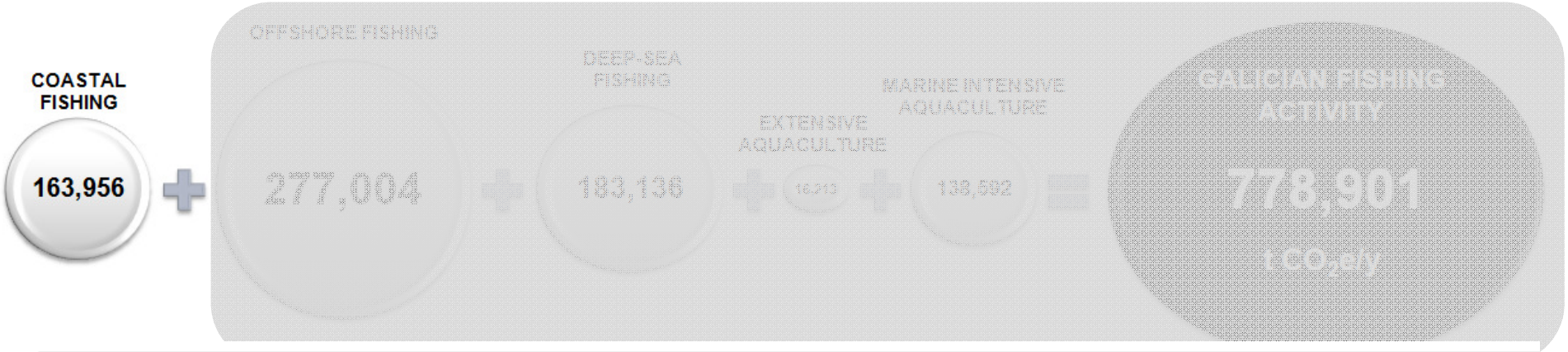
Direct interview with skippers and technicians.

- ✓ Coastal species: 30 coastal purse seiners and 24 coastal trawlers.
- ✓ Offshore species: 12 long liners and 9 trawlers from the Northern Stock fleet and 5 vessels from the Azores long lining fleet.
- ✓ Deep-sea fishing: 9 purse seiners.
- ✓ Mussel culture: 22 auxiliary vessels in charge of 80 rafts.
- ✓ Turbot production: Environmental statements of several Galician plants.

SECONDARY DATA

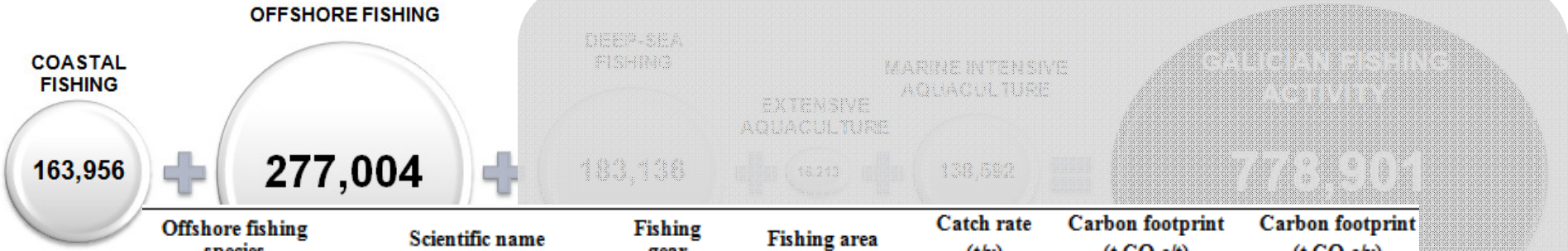
- ✓ Ecoinvent database

Results (1/5)



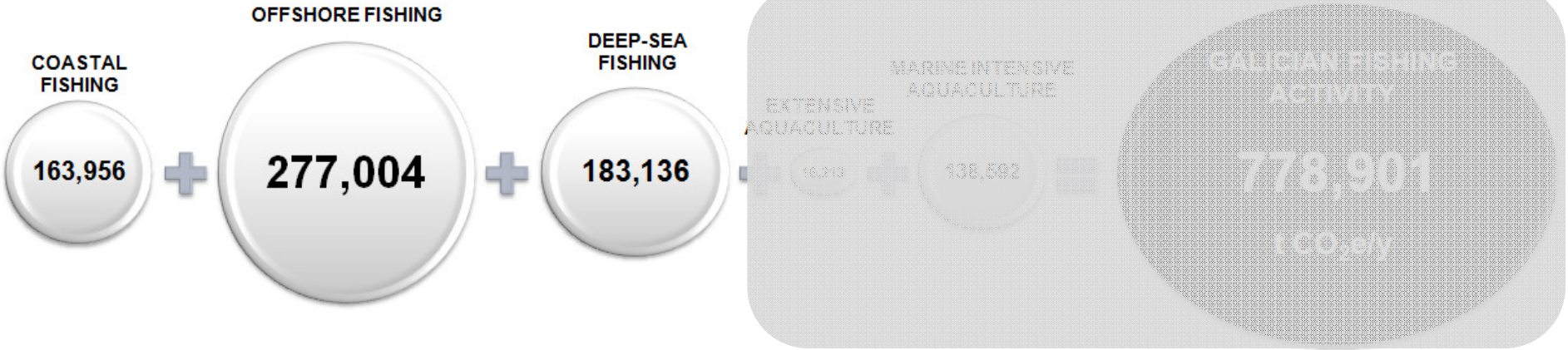
Coastal fishing species	Scientific name	Fishing gear	Catch rate (t/y)	Carbon footprint (t CO_2e/t)	Carbon footprint (t CO_2e/y)
European pilchard	*Sardina pilchardus*	Seining	15,021.77	0.74	11,071.04
Atlantic horse mackerel	*Trachurus trachurus*	Trawling	12,898.27	1.18	15,207.07
Atlantic horse mackerel	*Trachurus trachurus*	Seining	11,245.78	0.93	10,447.33
Atlantic mackerel	*Scomber scombrus*	Trawling	9,795.15	0.55	7,093.06
Atlantic mackerel	*Scomber scombrus*	Seining	6,284.06	0.58	3,632.19
Hake	*Merluccius merluccius*	Trawling	11,094.46	3.99	58,776.01
Blue whiting	*Micromestimius poutassou*	Trawling	12,838.09	0.96	16,258.15
Chub mackerel	*Scomber japonicus*	Seining	8,810.94	0.74	6,511.28
Other species	-	Trawling	2,975.22	1.85	5,502.67
Other species	-	Seining	1,791.05	0.74	1,323.59
Other species	-	Artisanal and trolling	18,881.47	1.49	28,133.38
TOTAL	-	-	111,636.25	-	**163,955.77**

Results (2/5)



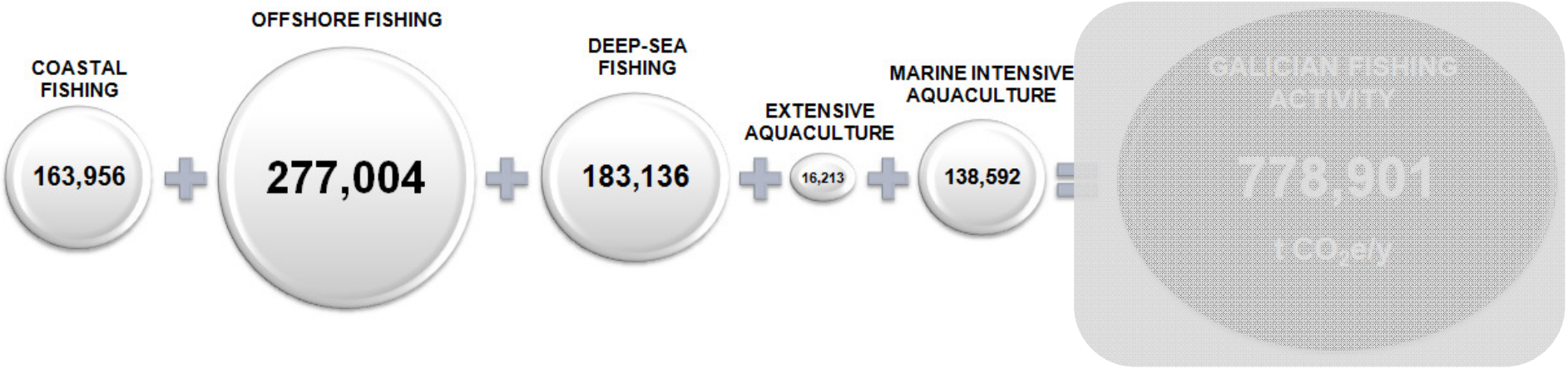
Offshore fishing species	Scientific name	Fishing gear	Fishing area	Catch rate (t/y)	Carbon footprint (t CO_2e/t)	Carbon footprint (t CO_2e/y)
Hake	*Merluccius merluccius*	Lining	Northern Stock	9,770.07	5.70	55,689.40
Hake	*Merluccius merluccius*	Trawling	Northern Stock	5,555.15	6.26	34,775.25
Megrim	*Lepidorhombus spp.*	Trawling	Northern Stock	6,437.19	7.57	48,729.56
Anglerfish	*Lophius budegassa*	Trawling	Northern Stock	4,281.62	9.38	40,161.58
Norway lobster	*Nephrops norvegicus*	Trawling	Northern Stock	694.54	25.50	17,710.72
Conger eel	*Conger conger*	Lining	Northern Stock	2,049.88	3.07	6,293.12
Atlantic pomfret	*Brama brama*	Lining	Northern Stock	3,583.27	2.76	9,889.83
Common ling	*Molva molva*	Lining	Northern Stock	778.28	2.47	1,922.35
Rock fish	*Helicolenus dactylopterus*	Lining	Northern Stock	1,181.62	5.49	6,487.09
Fork beard	*Phycis spp.*	Lining	Northern Stock	1,342.17	4.94	6,630.31
Bigeye tuna	*Thunnus obesus*	Lining	Azores	126.67	13.30	1,684.71
Splendid alfonsino	*Beryx splendens*	Lining	Northern Stock	80.30	2.76	221.63
Mako shark	*Isurus oxyrinchus*	Lining	Azores	181.34	5.87	1,064.44
Porbeagle	*Lamna nasus*	Lining	Azores	479.55	5.87	2,814.97
Swordfish	*Xiphias gladius*	Lining	Azores	782.29	9.27	7,251.87
Blue shark	*Prionace glauca*	Lining	Azores	1,806.60	2.19	3,956.46
Common cuttlefish	*Sepia officinalis*	Trawling	Mauritania	166.76	3.57	595.32
Common octopus	*Octopus vulgaris*	Varied	Mauritania	809.92	4.11	3,328.79
Lesser-flying squid	*Todaropsis eblanae*	Varied	Mauritania	932.29	3.86	3,598.65
Other species	-	Varied	Varied	7,933.65	3.05	24,197.64
TOTAL	-	-	-	48,973.17	-	**277,003.68**

Results (3/5)



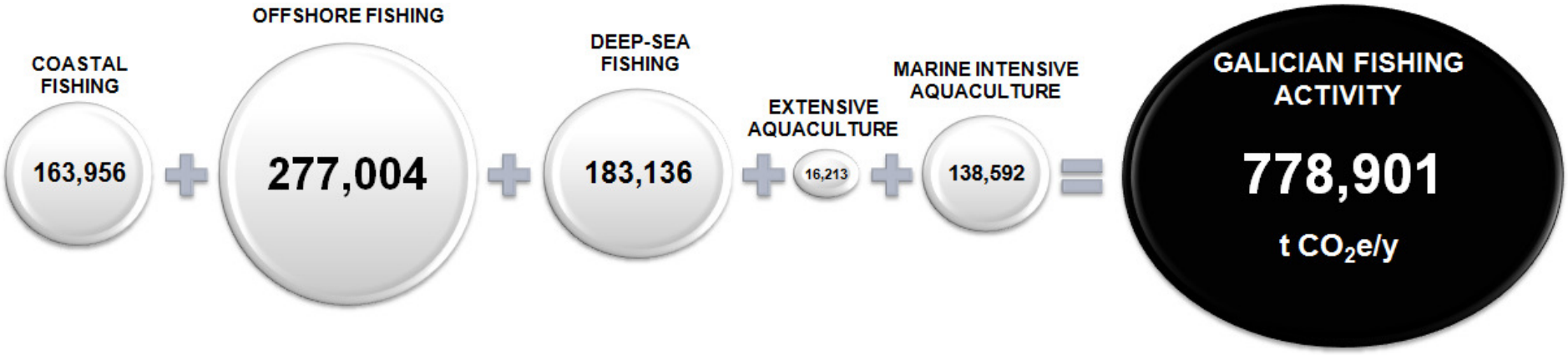
Deep-sea fishing species	Fishing gear	Ocean	Catch rate (t/y)	Carbon footprint (t CO_2e/t)	Carbon footprint (t CO_2e/y)
Tuna	Seining	Atlantic	38,037.79	1.41	53,481.13
Tuna	Seining	Indian	70,800.08	1.21	85,314.09
Tuna	Seining	Pacific	26,067.76	1.70	44,341.25
TOTAL	-	-	134,905.62	-	**183,136.47**

Results (4/5)

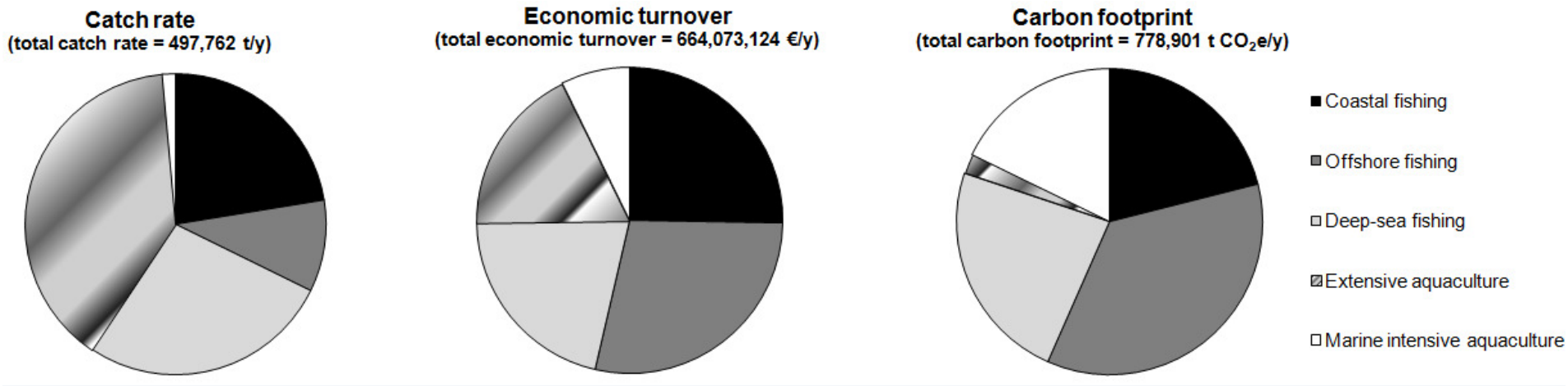


	Production rate (t/y)	Carbon footprint (t CO_2 e/t)	Carbon footprint (t CO_2 e/y)
Extensive Aquaculture	195,103	0.08	16,213
Instensive Aquaculture	7,144	19.4	138,592

Results (5/5)

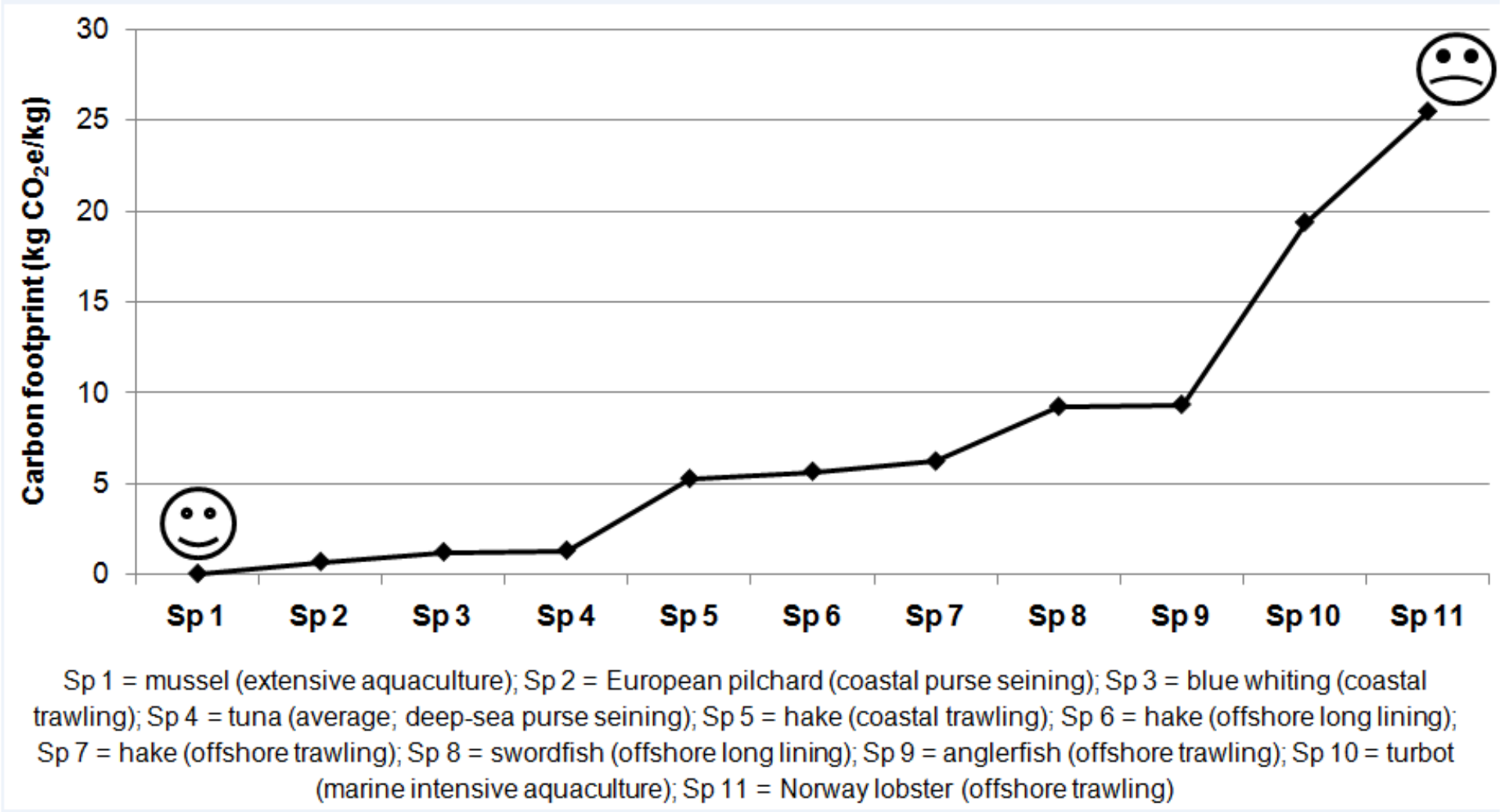

COASTAL FISHING
163,956
OFFSHORE FISHING
277,004
DEEP-SEA FISHING
183,136
EXTENSIVE AQUACULTURE
16,213
MARINE INTENSIVE AQUACULTURE
138,592
GALICIAN FISHING ACTIVITY
778,901
t CO_2e/y

Discussion (1/3)



- Prioritization of opportunities to reduce GHG emissions lead to focus efforts mainly on **offshore fishing** and **marine intensive aquaculture**.
- CF studies for individual species identified:
  - Diesel production and use as key element.
  - Electricity demand as key element for intensive aquaculture.

Discussion (2/3)



Sp 1 = mussel (extensive aquaculture); Sp 2 = European pilchard (coastal purse seining); Sp 3 = blue whiting (coastal trawling); Sp 4 = tuna (average; deep-sea purse seining); Sp 5 = hake (coastal trawling); Sp 6 = hake (offshore long lining); Sp 7 = hake (offshore trawling); Sp 8 = swordfish (offshore long lining); Sp 9 = anglerfish (offshore trawling); Sp 10 = turbot (marine intensive aquaculture); Sp 11 = Norway lobster (offshore trawling)

Discussion (3/3)

- Methodological choices affecting CF calculations:
  - Exclusion of capital goods.
  - Allocation procedure: economic.

Conclusions

- Bottom-up approach provided for sectorial analysis, enhancing chain transparency and accountability.
- Climate change mitigation opportunities were identified in the different fishing subsectors.
- By reporting individual CF this study provides useful environmental information for the entire seafood supply chain.

Thank you very much for your attention

D. Iribarren, I. Vázquez-Rowe, A. Hospido, M.T. Moreira, G. Feijoo (2010): Estimation of the carbon footprint of the Galician fishing activity (NW Spain), Sci TotalEnviron 408 (22): 5284-5294.