

# Generating Global Environmental Change scenarios for the world's small pelagic fisheries and global fishmeal and oil markets

*Gorka Merino, Manuel Barange, Christian Mullan, Rob Holmes, Julia Blanchard, Simon Jennings and Lynda Rodwell*



*Climate Change Effects on Fish and Fisheries:  
Forecasting Impacts, Assessing Ecosystem Responses, and Evaluating Management Strategies*

*April 26-29, 2010, Sendai, Japan*

# Introduction

- Fishmeal and oil are global commodities that support the animal feeds and aquaculture industry worldwide due to their high protein content.



# Introduction

- Fishmeal and oil are global commodities that support the animal feeds and aquaculture industry worldwide due to their high protein content.
- They are produced mostly by reducing pelagic fish catches (e.g. anchovy, sardine, herring and sandeels).



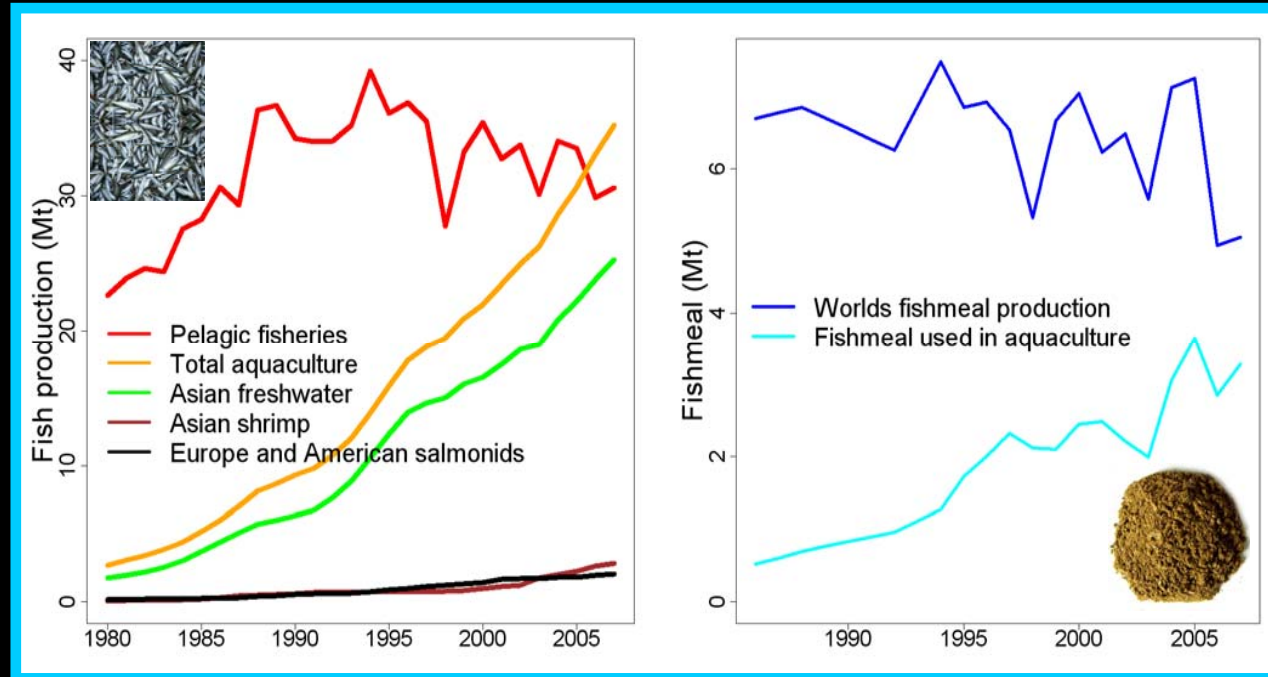
# Introduction

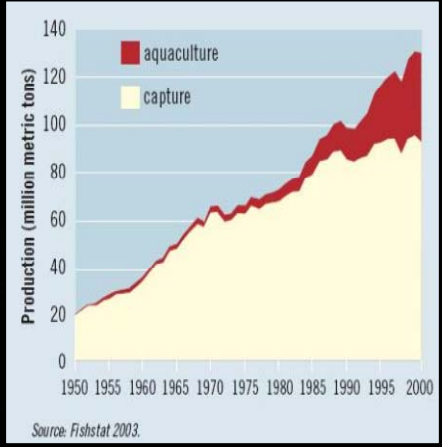
- Fishmeal and oil are global commodities that support the animal feeds and aquaculture industry worldwide due to their high protein content.
- They are produced mostly by reducing pelagic fish catches (e.g. anchovy, sardine, herring and sandeels).



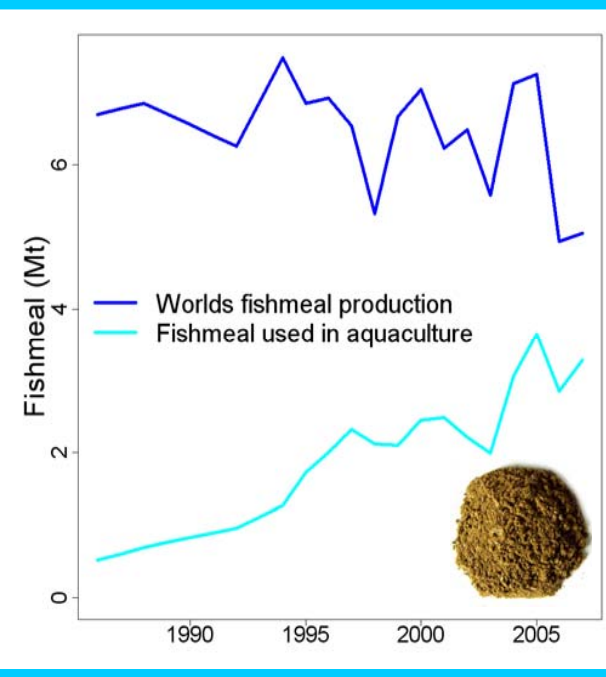
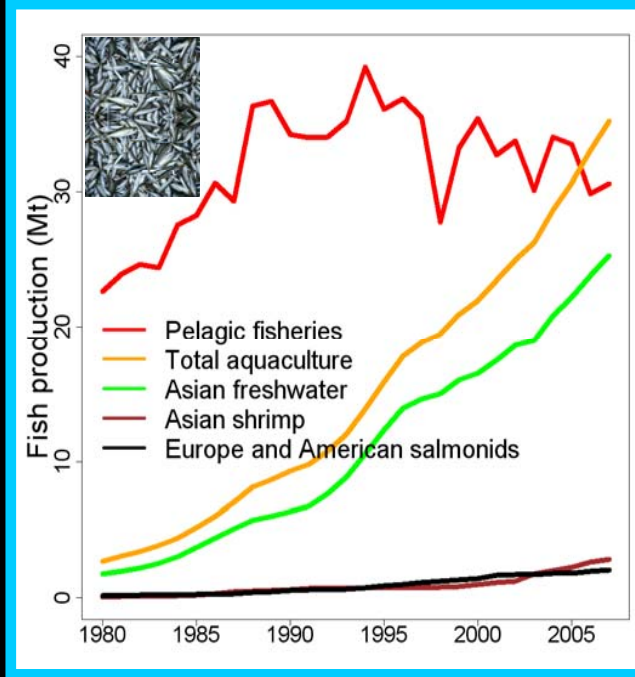
# Introduction

- Fishmeal and oil are global commodities that support the animal feeds and aquaculture industry worldwide due to their high protein content.
- It is produced mostly by reducing pelagic fish catches (e.g. anchovy, sardine, herring and sandeels).
- The dramatic increase in the aquaculture industry over the past two decades has raised concerns over the long term sustainability of global pelagic resources, highly affected by environmental variability too.





- The dramatic increase in the aquaculture industry over the past two decades has raised concerns over the long term sustainability of global pelagic resources, highly affected by environmental variability too.

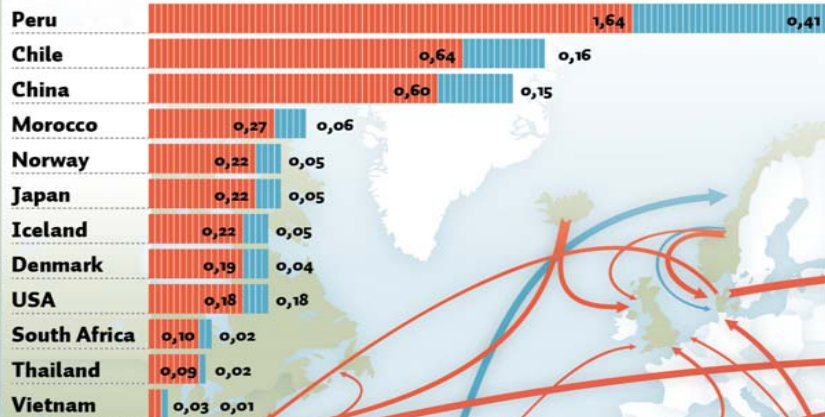


# Objectives:



Build GEC scenarios for small pelagic fish stocks, fisheries and fishmeal (oil) markets and aquaculture

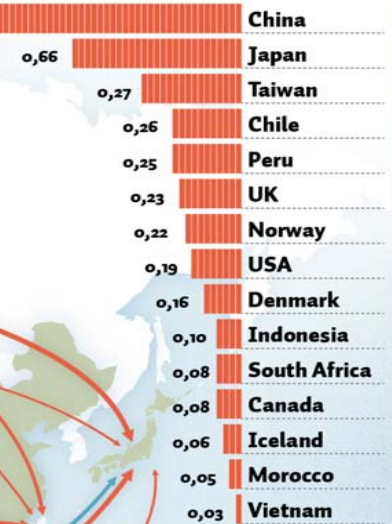
### FISHMEAL & OIL PRODUCERS (Mt)



### FISH OIL CONSUMERS (Mt)

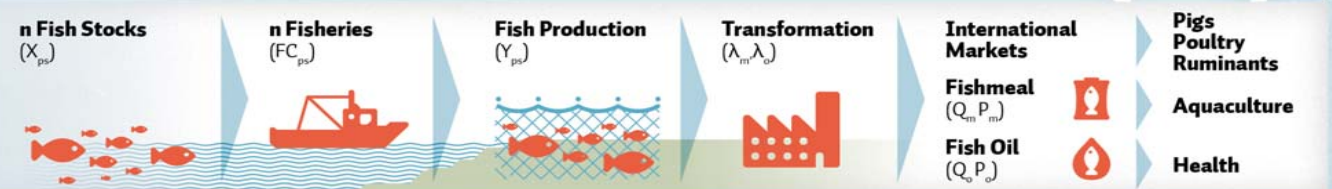


### FISH MEAL CONSUMERS (Mt)



Fishmeal flows  
Fish oil flows

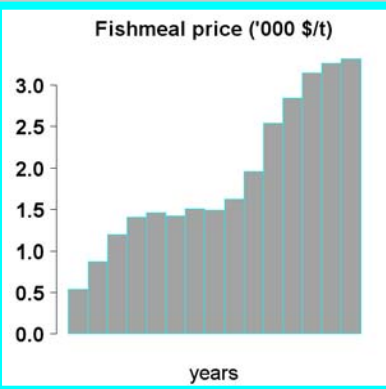
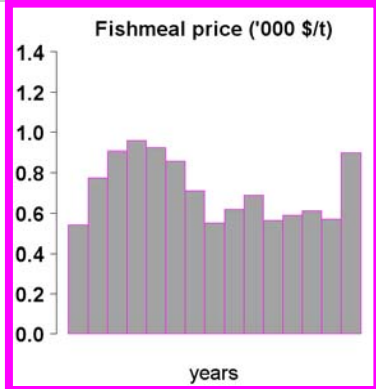
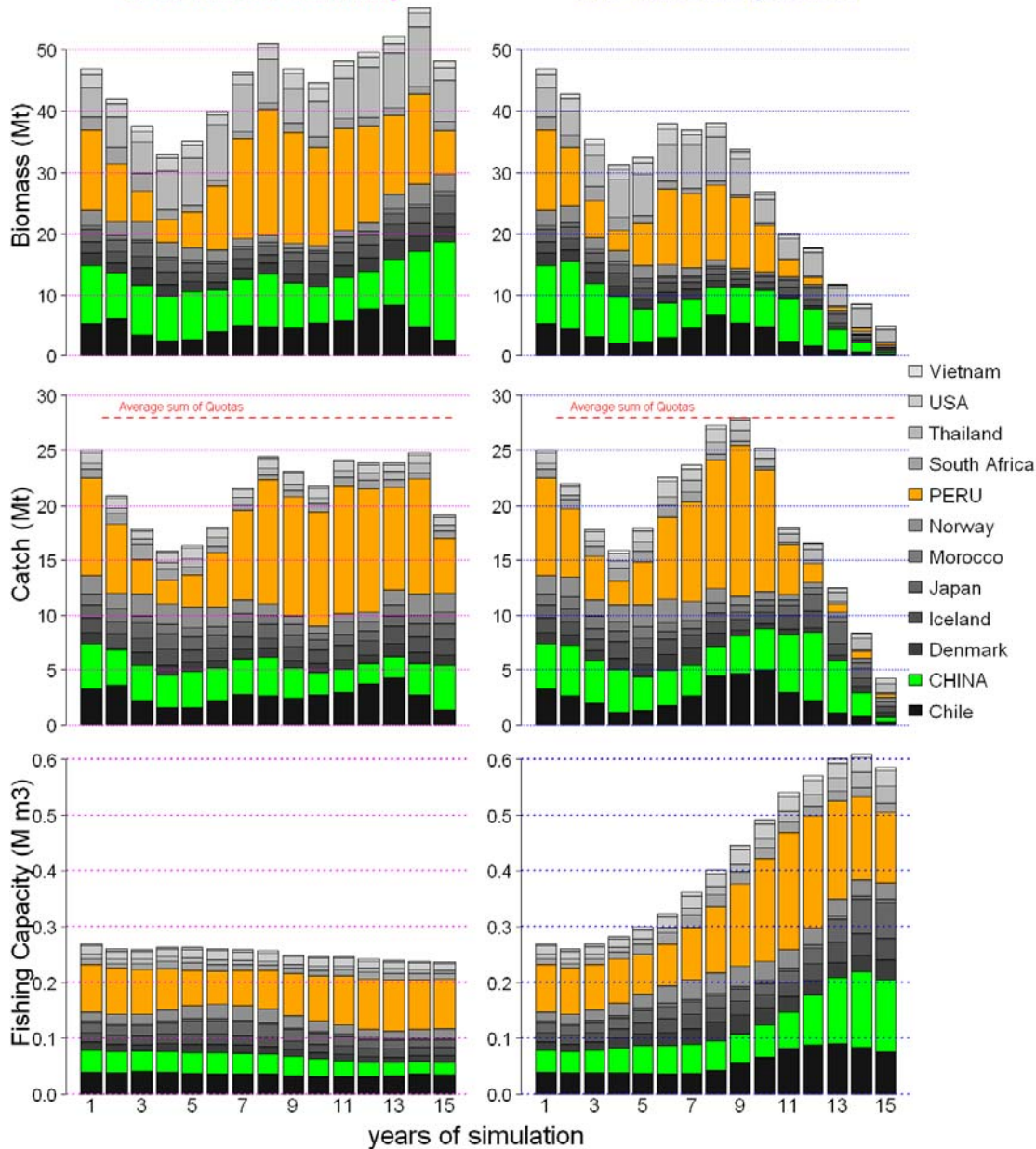
### STRUCTURE OF THE MODEL





a) El Niño and recruitment variability

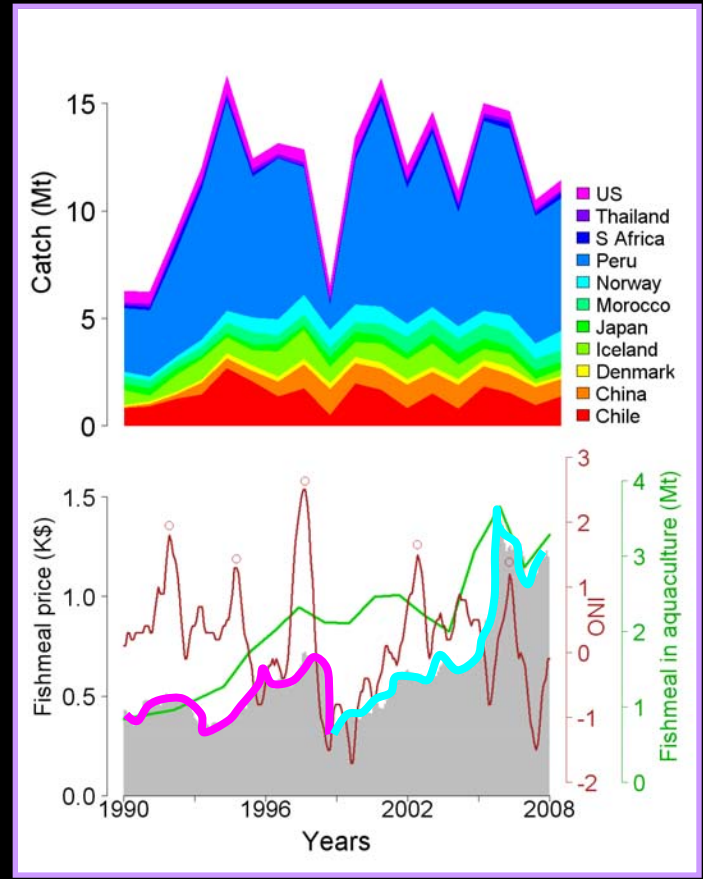
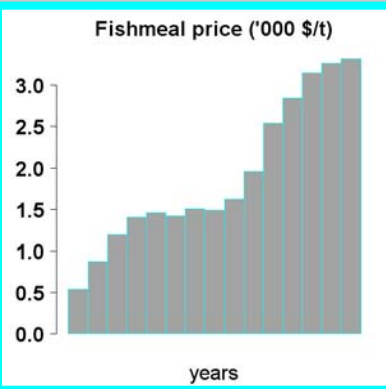
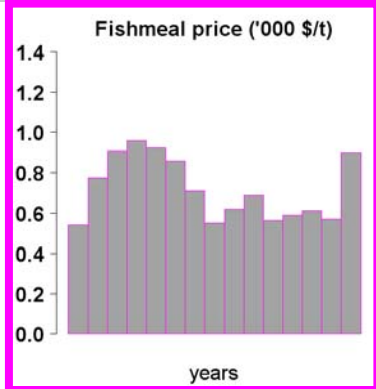
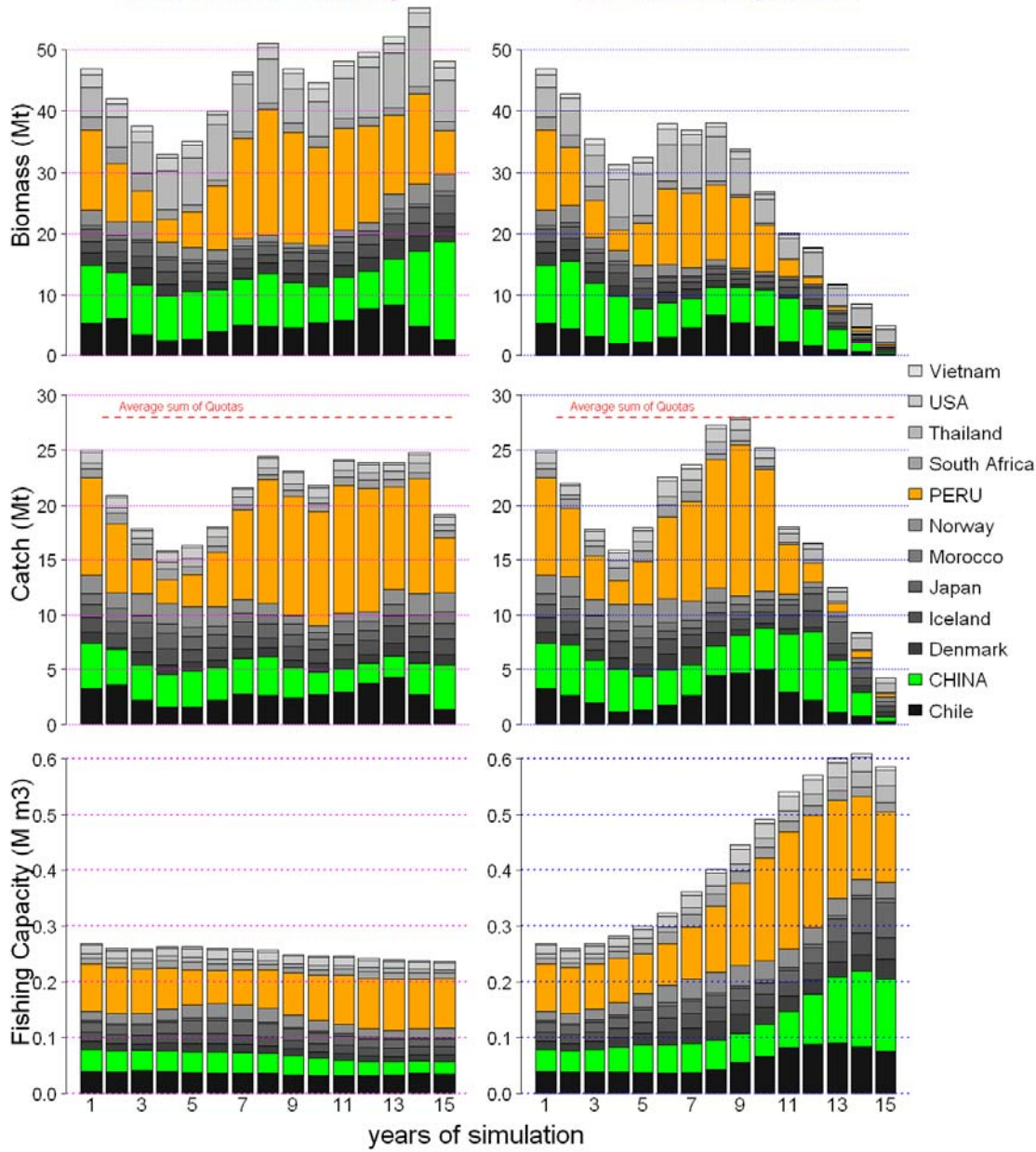
b) El Niño, recruitment variability and market expansion



How environmental and economic drivers can interact?

**a) El Niño and recruitment variability**

**b) El Niño, recruitment variability and market expansion**



# Long-term (A1B) GEC Scenarios

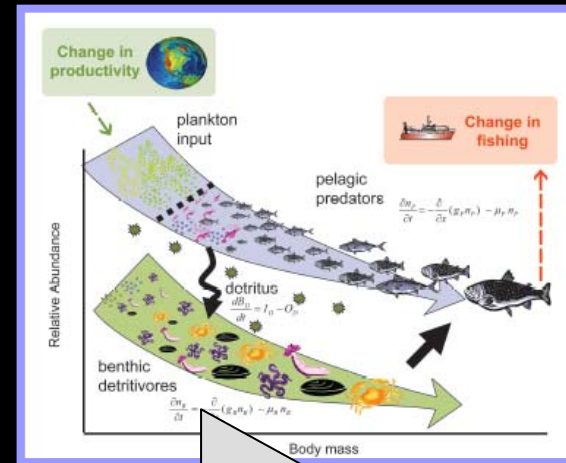
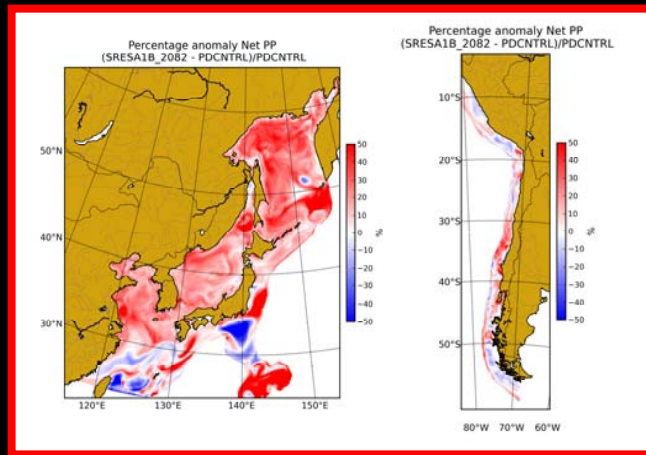


Markets to Ecosystems

Climate to Ecosystems and Markets

**Step 1:** Annual PP at each EEZ of the 12 top fishmeal and oil producers for SRESA1B (2050) and (2080)

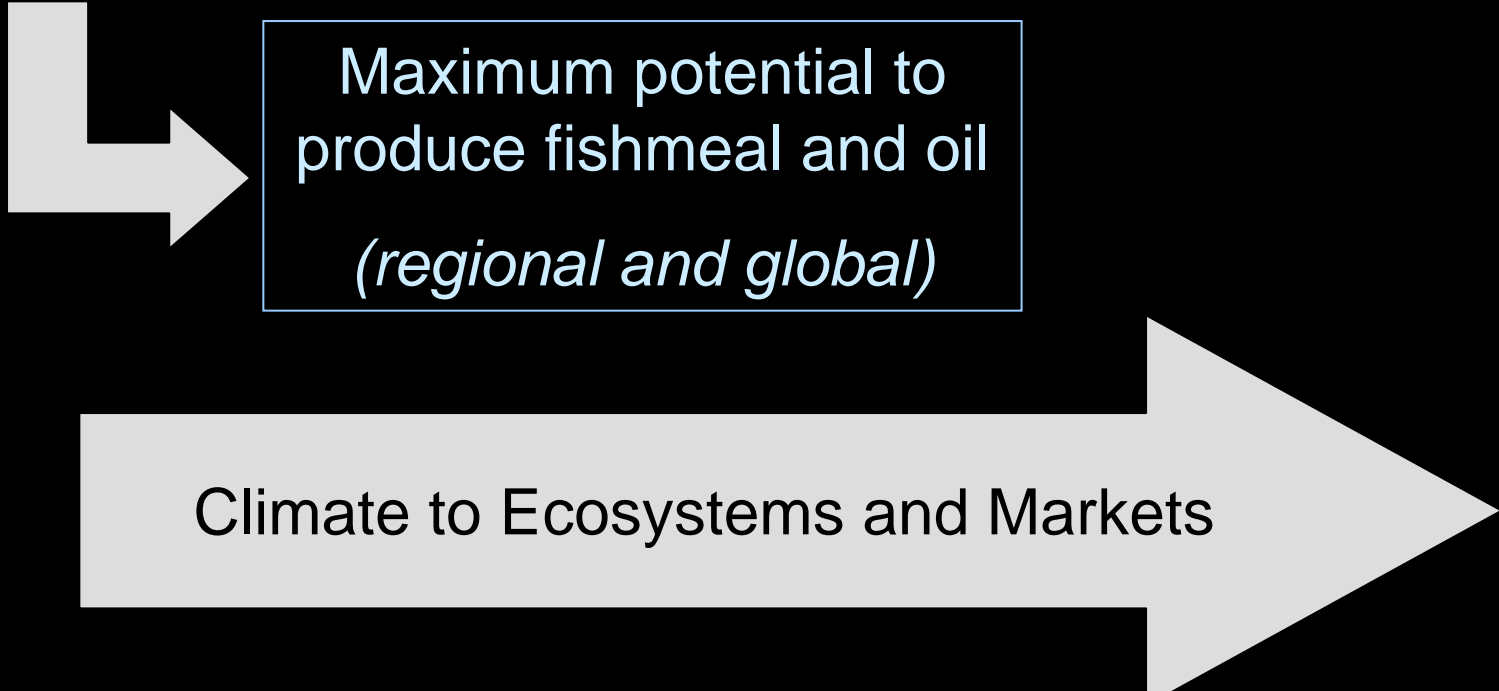
**Step 2:** Annual *maximum sustainable yield* potential for species of size (5-20 cm) for idem



Climate to Ecosystems and Markets

**Step 1:** Annual PP at each EEZ of the 12 top fishmeal and oil producers for SRESA1B (2050) and (2080)

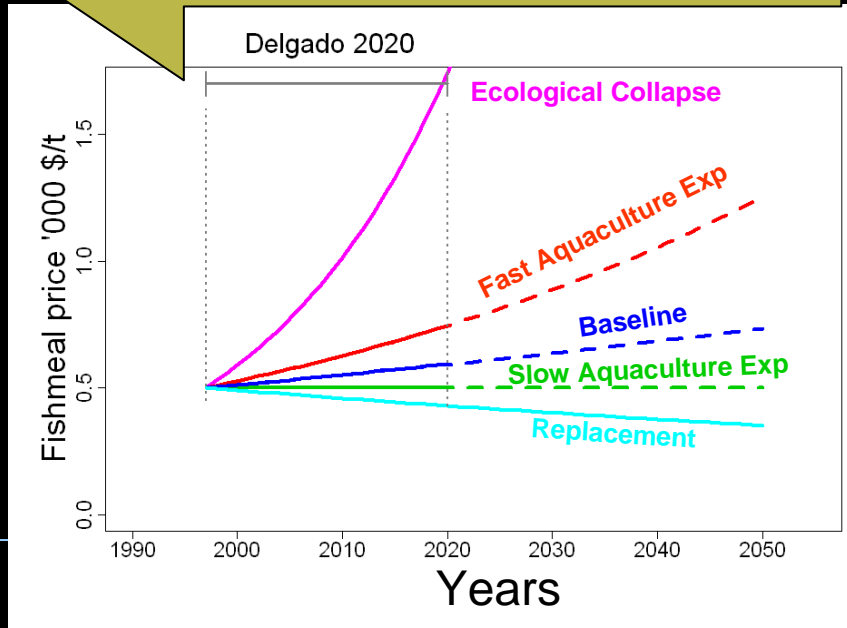
**Step 2:** Annual *maximum sustainable yield* potential for species of size (5-20 cm) for idem



Maximum potential to  
produce fishmeal and oil  
*(regional and global)*

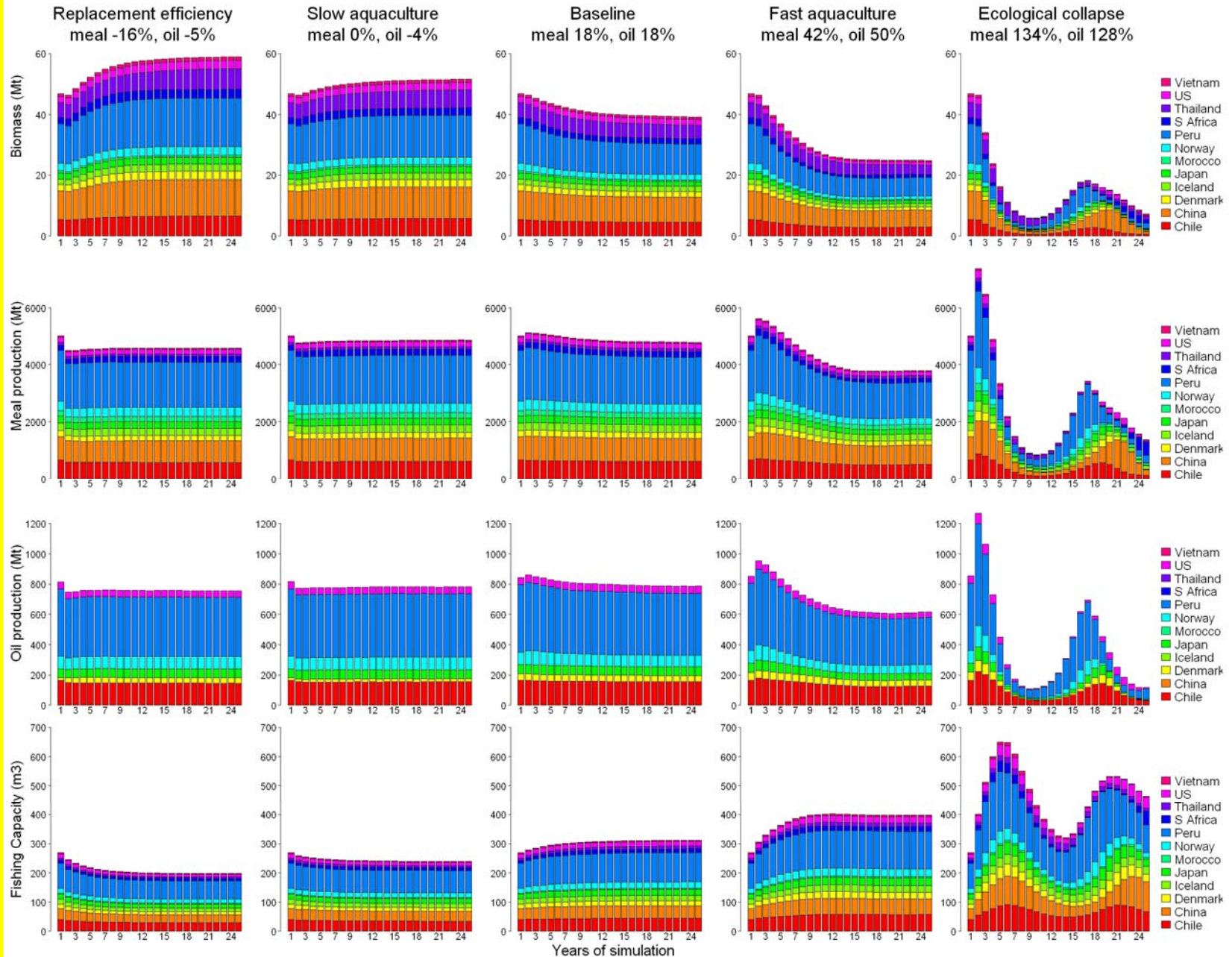
Climate to Ecosystems and Markets

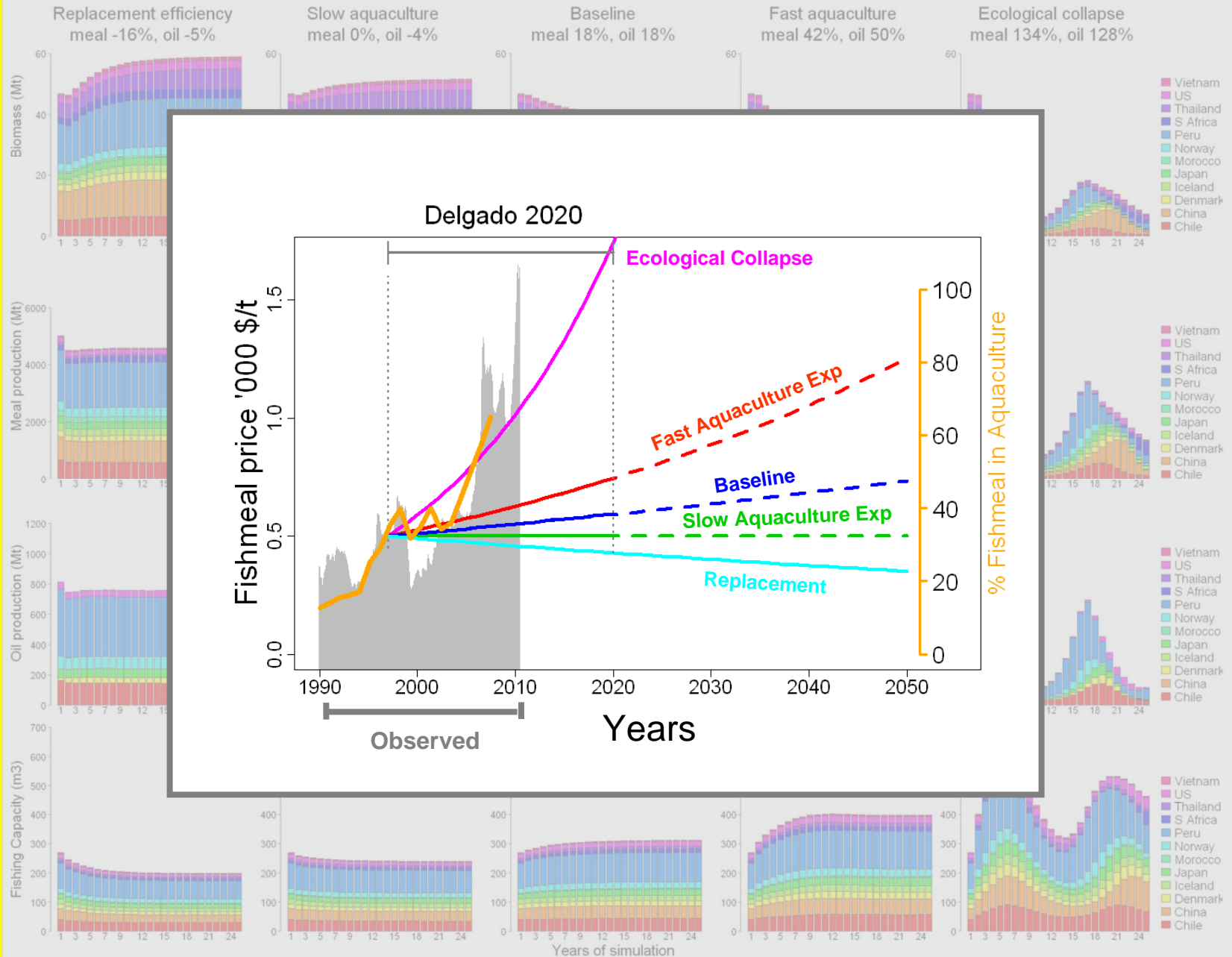
# Markets to Ecosystems



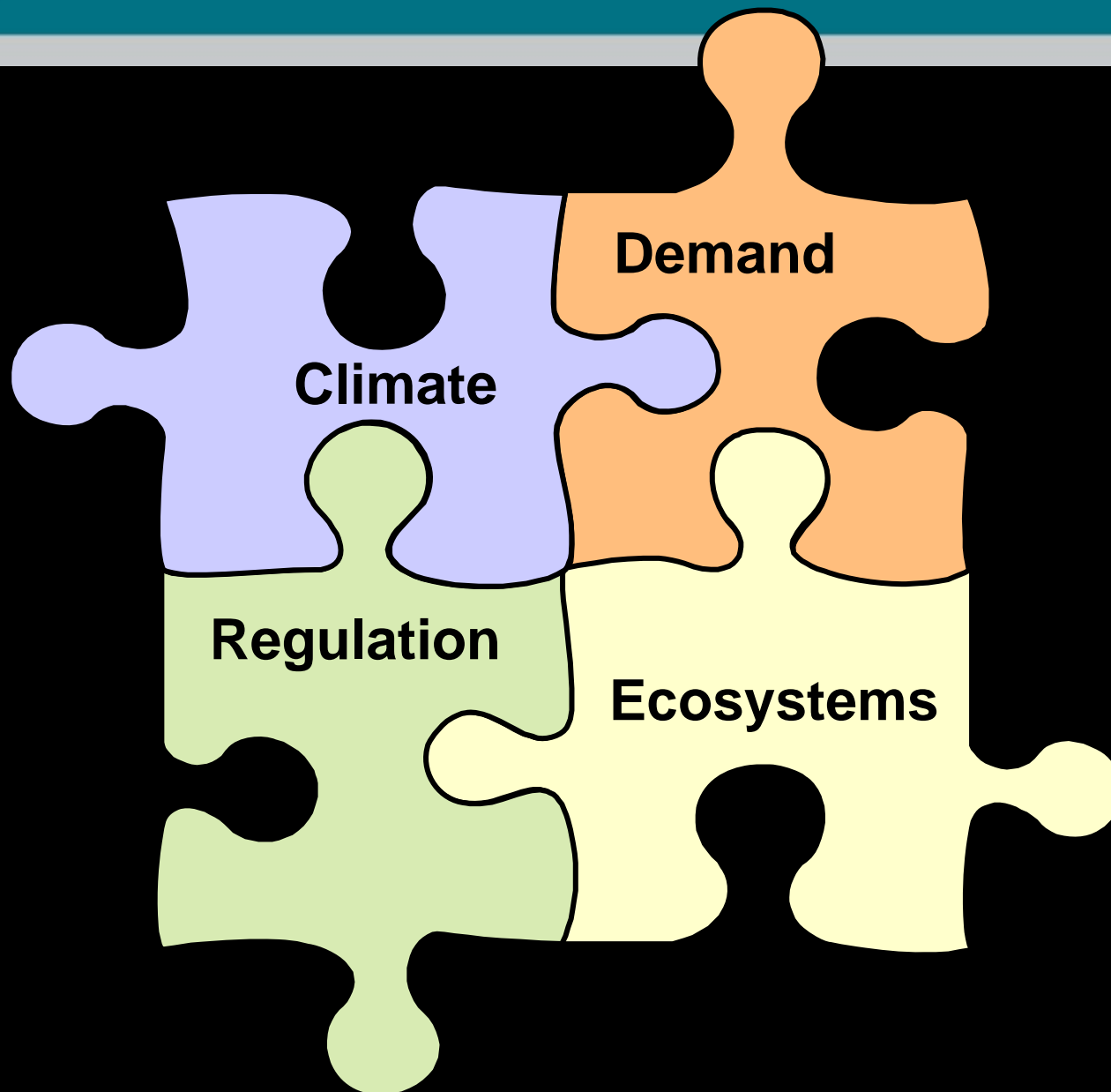
Maximum potential to produce fishmeal and oil  
*(regional and global)*

# Climate to Ecosystems and Markets









# Acknowledgements



どうもありがとう。

Visit [www.pml-globalpelagic.org.uk](http://www.pml-globalpelagic.org.uk)