

Are our Oceans responding to Climate Change?

The Case for Marine Aquaculture



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Presentation Outline

- Climate change impacts on aquaculture
- Mitigation case studies of Abagold and HIK abalone farmers
- Potential areas of future research

Findings from desktop literature review

- Limited studies exist on climate change impacts on marine aquaculture
- Climate change drivers and responses for three South African marine bio-geographical areas are known
- Global climate drivers and impacts on aquaculture culture systems and operations are known

Climate drivers and responses for three South African bio-geographical marine areas

DRIVERS	RESPONSE	SUB-TROPICAL		WARM TEMP		COOL TEMP
		KwaZulu-Natal	Wild Coast	Eastern Cape	Southern Cape	Western Cape
Ocean circulation	Current speed	+	+	+	+-	+-
	Current position	?	?	?	?	
	Upwelling	+	+	+	+	+
Precipitation	Runoff	+	+	+	+-	-
	Mouth closure	-	-	-	+-	+
	Salinity	-	-	-	+-	+
	Nutrients fluxes	+	+	+	+-	-
	Floods & sediment	+	+	+	+-	-
	Droughts	+	+	+	+	+
	Flushing pollutants	+	+	+	+-	-
Sea level rise	Salinity	+	+	+	+	+
	Increased tidal prism	+	+	+	+	+
	Mouth closure	-	-	-	-	-
Rising temperatures	Species range extensions	+	+	+-	+-	-
	Community composition	-	-	-	+	+
Acidification	Calcifying organisms	-	-	-	-	-
Coastal storms	Mouth closure	+	+	+	+	+
	Overwash	+	+	+	+	+
	Marine sediment	+	+	+	+	+

dark shading = high intensity response;
medium shading = medium intensity response;
light shading = low intensity response.

Department of Environmental Affairs (2013)

Relative expected changes to the Southern African coastal ocean by 2050

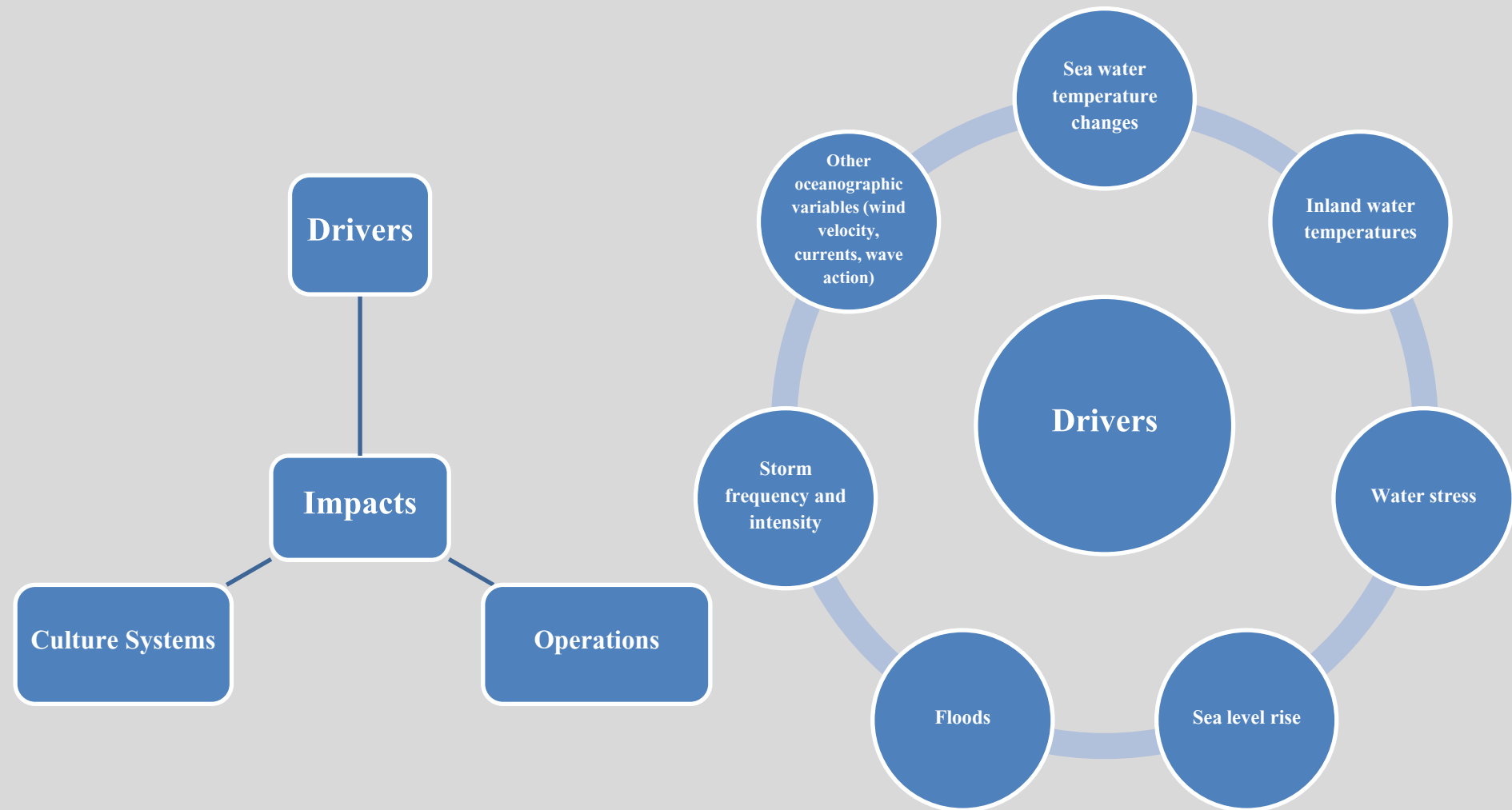
	SST	Upwelling	Current strength	Rainfall	pH	Sea level
Tropical and sub-tropical west coast	↑			↓	↓	↑
Warm-temperate west coast	↑			↑	↓	↑
Cool-temperate west coast	↓	↑		↓	↓	↑
Warm-temperate south coast	↓	↑	↑		↓	↑
Sub-tropical and tropical east coast	↑		↑	↑	↓	↑

Red = large change, yellow = small change, green = no change

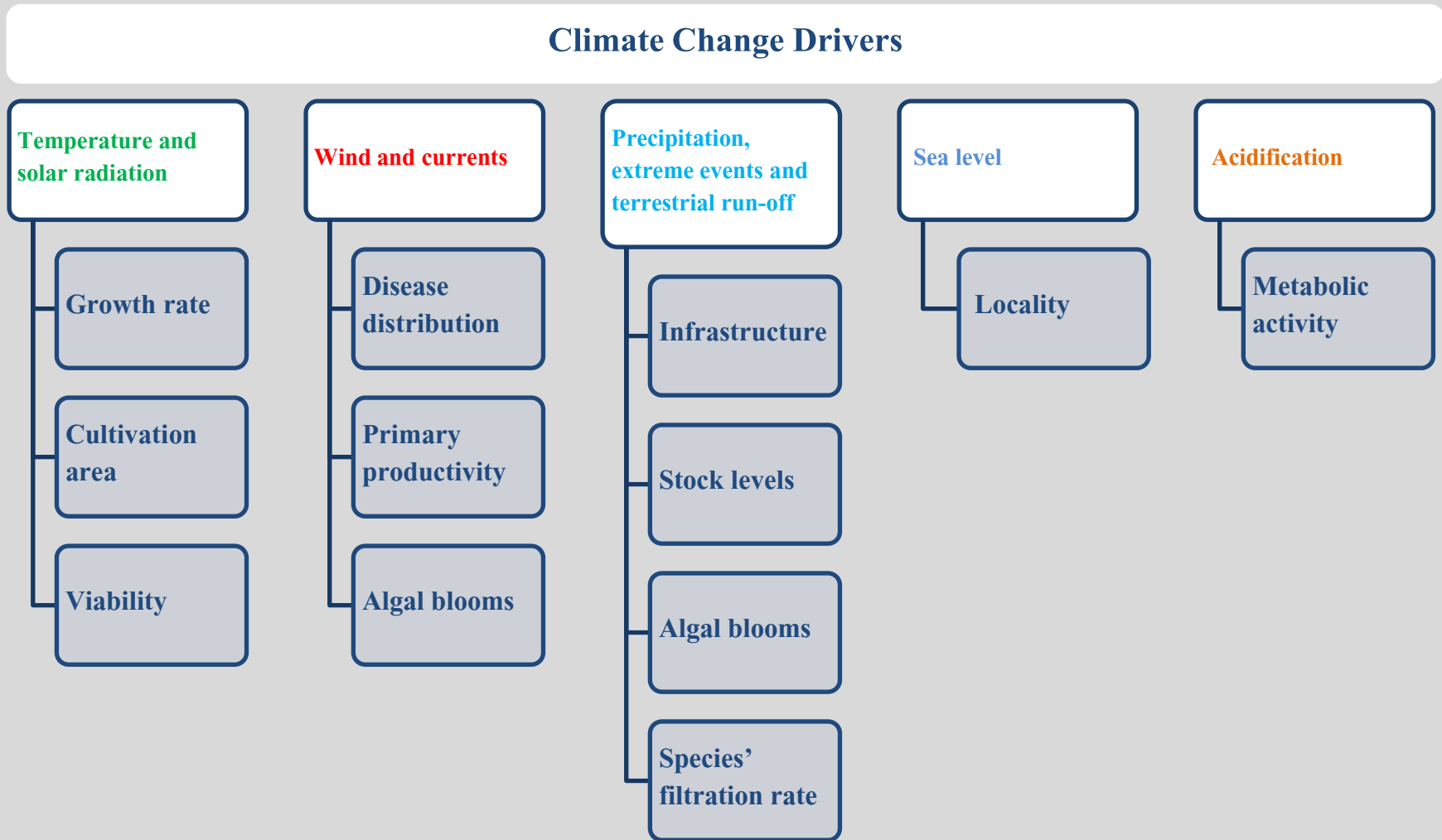
Pots and Gotz (2015)

Findings from desktop literature review

Global climate change drivers and impacts on marine aquaculture culture systems and operations



Climate change impacts on aquaculture operations from climate drivers



Rationale for case study focus on climate change mitigation

- **Climate change is not a key consideration for business decisions in marine aquaculture**
- **Energy production cost and security of energy supply is critical to deliver on high quality products**
- **Renewable energy has been implemented and being explored by marine aquaculture companies**



Key findings from case study

- ✓ Water pumping is highest contributor to energy use
- ✓ Short term risk mitigating action is diesel generator and renewable energy for long term risk mitigation
- ✓ Challenges to renewable energy implementation is local expertise, finance and regulatory aspects





ABAGOLD™

Climate change mitigation case studies

Potential areas of future research

Assess aquaculture potential under future climate scenarios

- Understanding of impacts of climate drivers on marine aquaculture species and biodiversity for single drivers and interaction between drivers

Integrate change in climate drivers in existing and future marine aquaculture breeding research

- Need for empirical quantitative estimates of magnitude and direction of change of climate drivers

Socio-economic impacts of future climate scenarios

- Trade off between adaption costs to move or alter culture systems versus protection against extreme events
- Future potential of marine aquaculture may have significant impacts on local economic development

Thank you for listening
Questions?



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