

Vulnerability, Adaptive Capacity and Resilience in marine and coastal social-ecological systems

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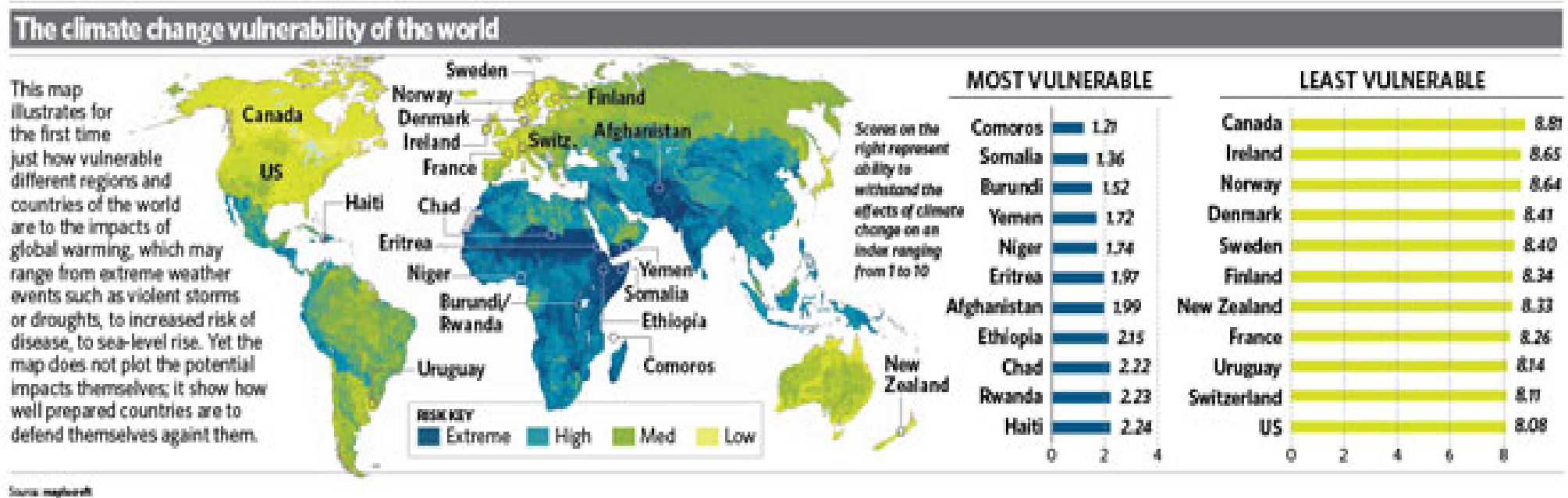


Vulnerability, resilience and adaptive capacity at multiple scales

- What insights do we get from working at different scales and across scales?
- How can we understand the interactions between multiple stressors?
- Assessing vulnerability and global, regional and household scales
- Insights from a resilience perspective; a focus on adaptive capacity

“Why Canada is the best haven from climate change”

THE INDEPENDENT, Friday 4 July 2008



Climate Change Risk Report analysis of 168 countries

Vulnerability is examined across six different sectors – the economy; natural resources and ecosystems; poverty, development and health; agriculture; population, settlement and infrastructure; and institutions, governance and social capital.

Index developed on the scale of one to 10, with one being the most vulnerable, and 10 the most secure. Comoros score is 1.21; Canada's score is 8.81.

8 of the 10 most vulnerable nations are in Africa; only 5 non-African countries and in the top 20

Assessing Vulnerability

VULNERABILITY (V) = Potential impact (PI) – Adaptive capacity (AC)

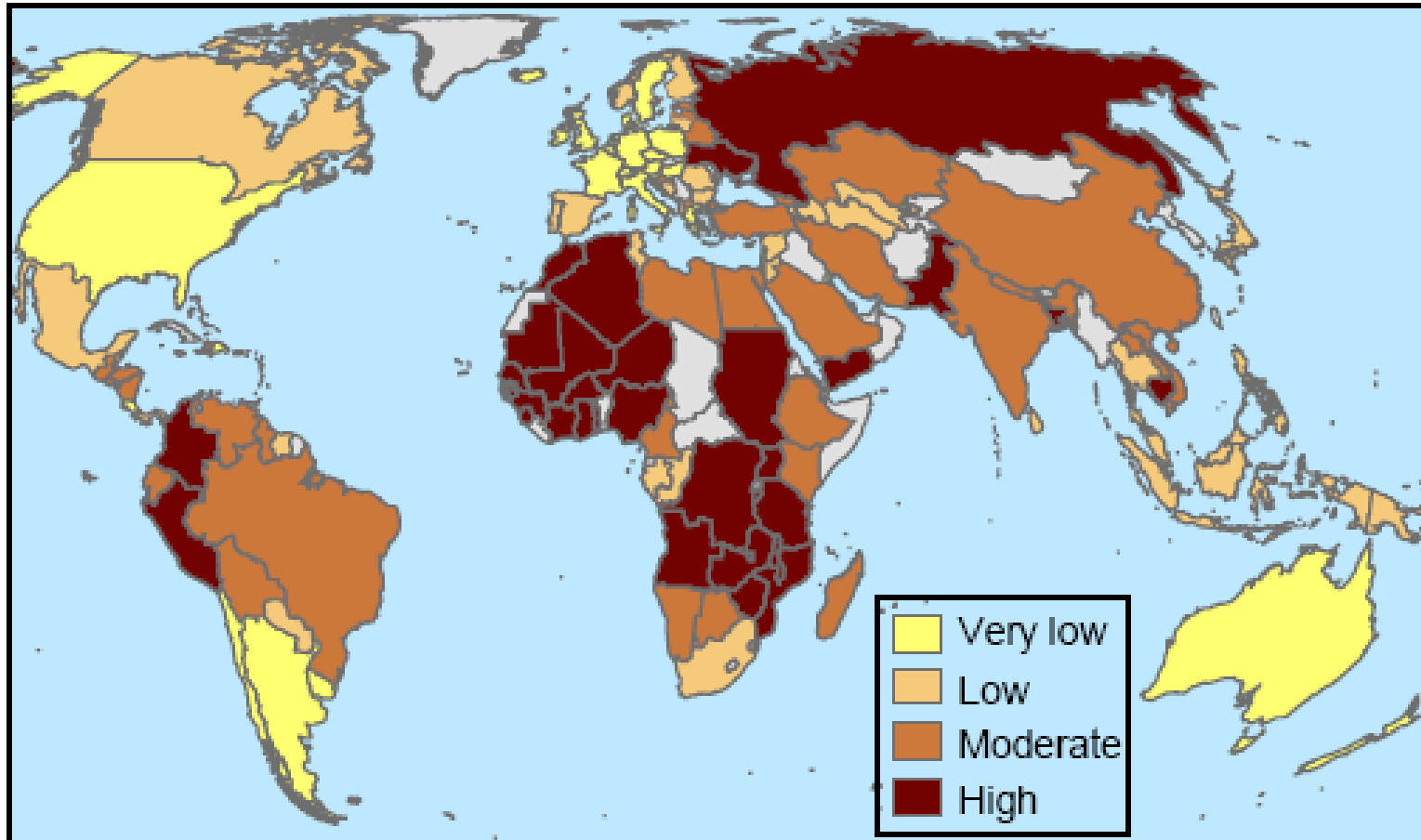
PI = Exposure (E) + Sensitivity or dependence (D)

Exposure: The nature and degree to which a system experiences environmental or socio-political stress

Sensitivity: The extent to which a human or natural system can absorb the impacts without suffering long-term harm or some significant state change

Adaptive capacity the preconditions necessary to enable adaptation to take place, where *adaptation* is a process or activity undertaken in order to alleviate the adverse impacts of environmental stresses or take advantages of new opportunities

Vulnerability of national economies to climate impacts on fisheries

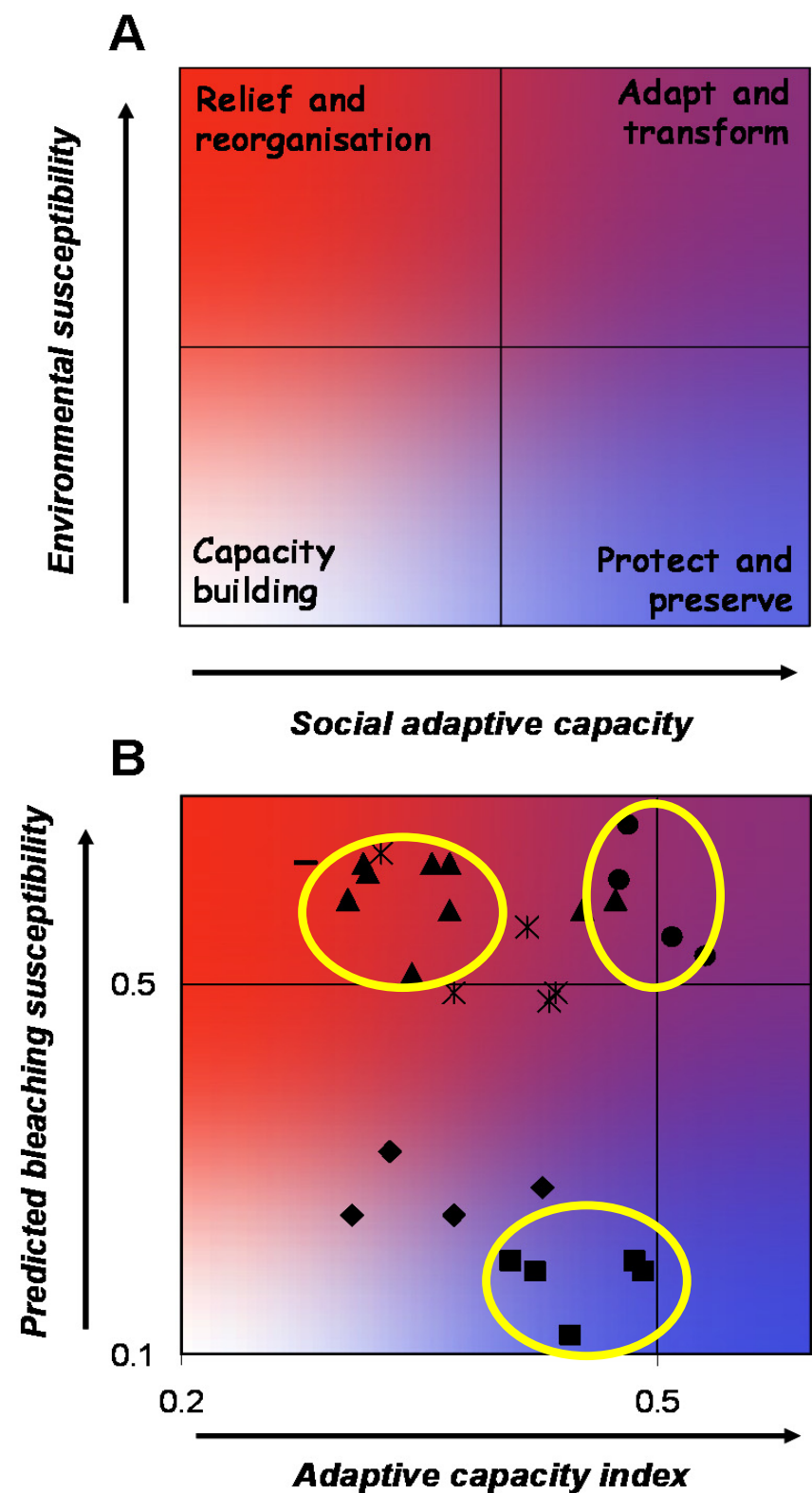


At a regional scale: Vulnerability to coral bleaching in the Western Indian Ocean

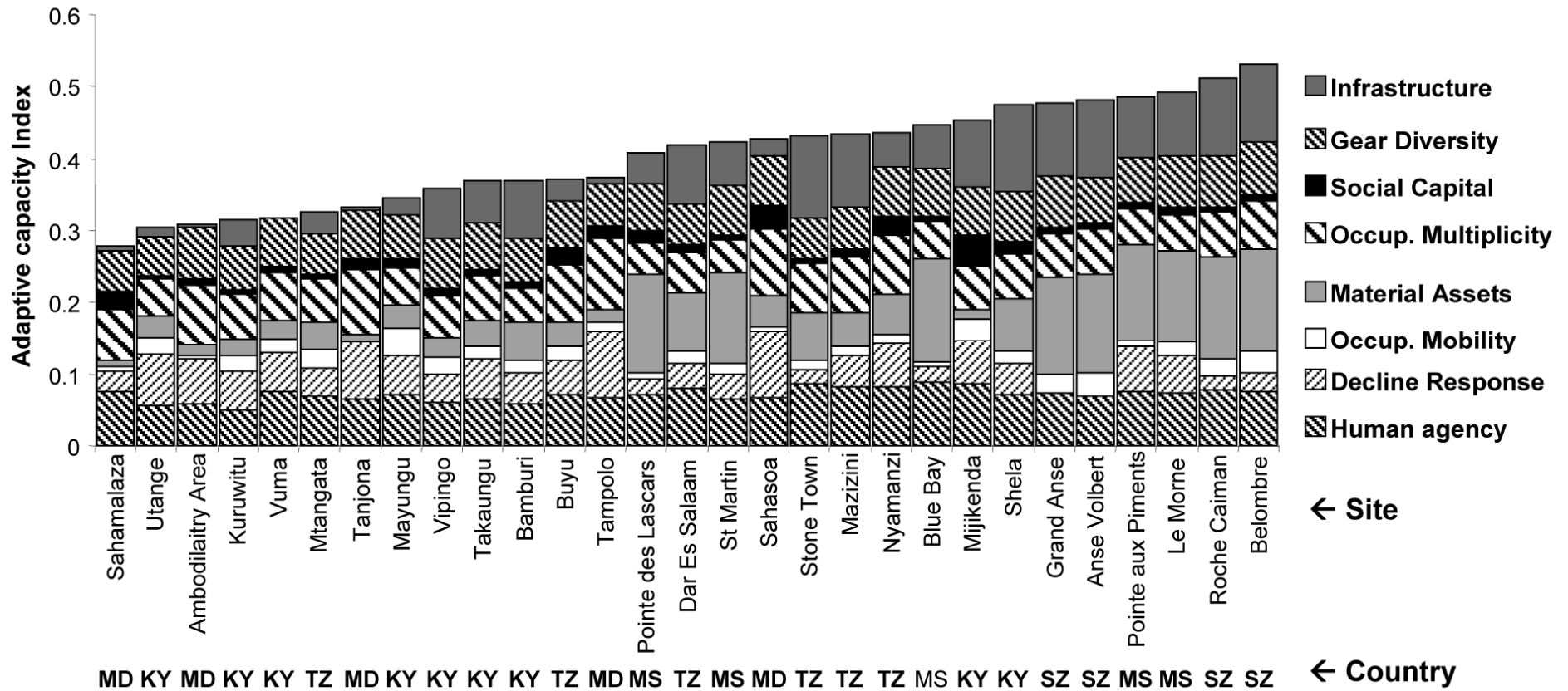
	Area of coral reef (km ²)	No take area (NTA) (km ²)	NTA as % of reef area
Madagascar	2230	10.4	0.5%
Mauritius	870	8.5	0.9%
Seychelles	1690	255	15%
Kenya	630	54.3	8.6%
Tanzania	3580	66	1.9%

The sustainability of this protection strategy under climate change scenarios is questionable

- Seychelles
- ▲ Kenya
- W. Madagascar
- * Tanzania
- ◆ E. Madagascar
- Mauritius



Household analysis of Adaptive Capacity



Components of Adaptive Capacity

AC will depend on:

- Recognition of the need to adapt
- Belief that adaptation is possible and desirable
- Willingness to undertake adaptation
- Availability of resources necessary for implementation of adaptation measures
- Ability to deploy resources in an appropriate way
- External constraints, barriers and enablers to implementation

Some indicators

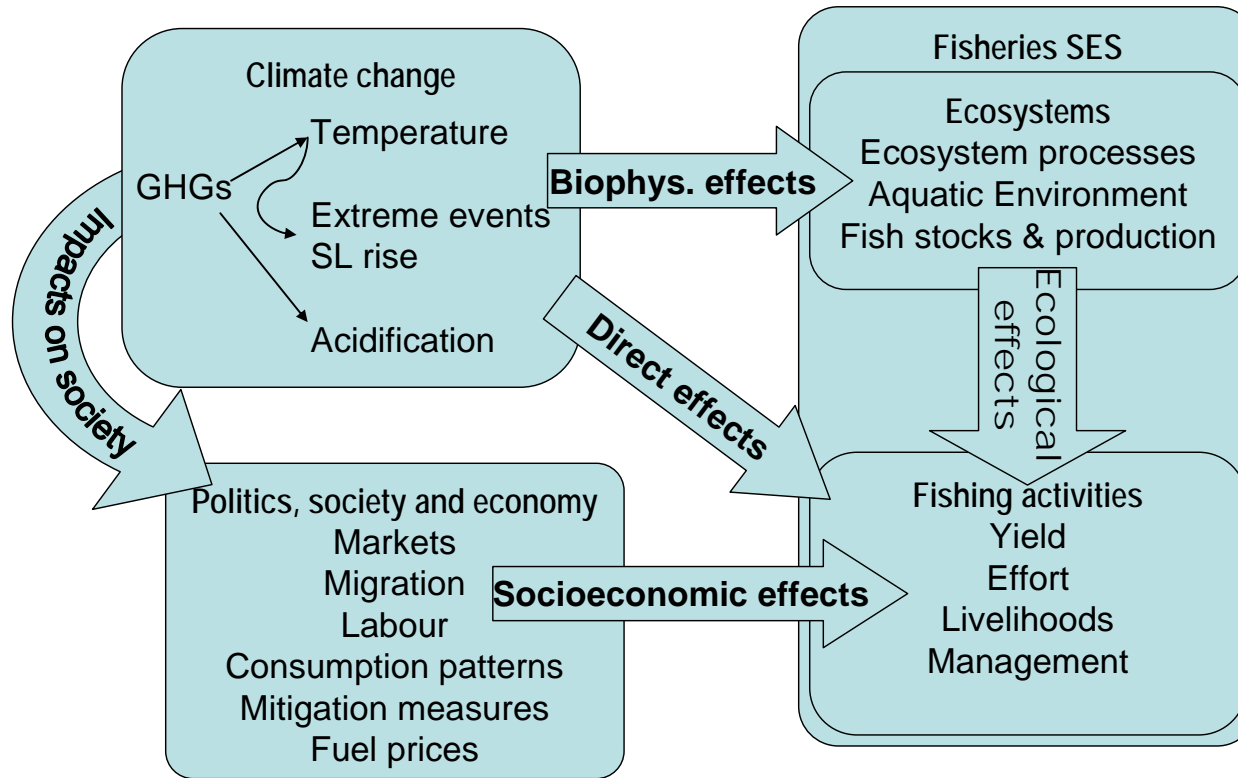
- *Infrastructure*
- *Gear diversity*
- *Social capital*
- *Occupational multiplicity*
- *Occupational mobility*
- *Material assets*
- *Change anticipation*
- *Recognition of causality*

Not necessarily the same as poverty.....

What do we learn from analysis at different scales?

- No simple cause and effect relationships

Direct and indirect impacts of CC on fisheries



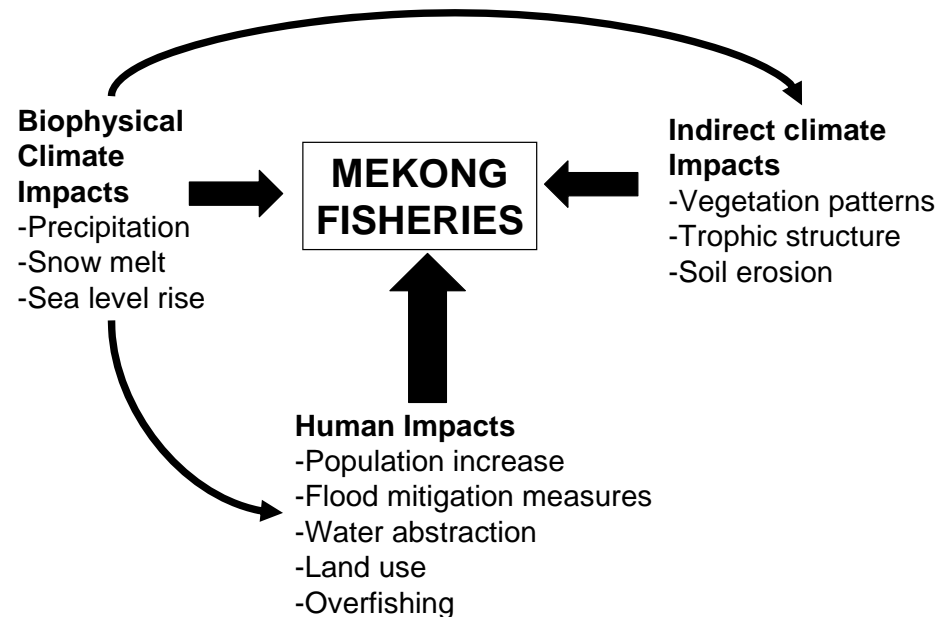
<p>Ecological impacts (covered in paper 1)</p> <ul style="list-style-type: none"> Change in yield Change in species distribution Increased variability of catches 	<p>Direct impacts</p> <ul style="list-style-type: none"> Damaged infrastructure Damaged gears Increased danger at sea Loss/gain of navigation routes 	<p>Socioeconomic impacts</p> <ul style="list-style-type: none"> Influx of migrant fishers Increasing fuel costs Reduced health due to disease Relative profitability of other sectors Resources available for management Reduced security Funds for adaptation
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What do we learn from analysis at different scales?

- No simple cause and effect relationships
- Climate change interacts with other stressors

Multiple impacts on Mekong delta fisheries

The lower Mekong delta supports over 1000 fish species, a capture fishery of 1.5 million tonnes and fishery-based livelihoods for 40 million people. These fisheries are threatened by a number of climate-mediated processes including changing precipitation, snow melt, rising sea level, which have impacts on various aspects of ecology of the delta as well as on human settlements.



In addition to these interacting climate impacts, the overwhelming impacts on fisheries in the delta are from human activities including overfishing, land use changes, and hydrological disruptions. Future increased flooding may have the potential to increase fishery yields but planned flood mitigation measures to protect agriculture may in fact result in reduced flooding and reduced fisheries productivity.

Daw et al., 2008 and Easterling et al., 1997

What do we learn from analysis at different scales?

- No simple cause and effect relationships
- Climate change interacts with other stressors
- Cross national analysis is problematic: data and compatibility issues *but* an important focus of policy
- Lack of precise data on impacts
 - a Resilience approach

What does a Resilience approach highlight?

- Expect change, manage for change - focus on adaptive management
- Expect the unexpected – uncertainty and surprise as features
- Different types of change; slow and fast changes and the interactions between them
- Crises as providing windows of opportunity
- Thresholds – ecological and social
- Cross scale issues – polycentric institutions, panarchy
- Interactions with other stressors – climate change, livelihoods, health, markets, migration and settlement

... a focus on Adaptive Capacity

- Vulnerability and resilience as socially constructed, contested and highly socially differentiated – at all scales and *across* scales
- Adaptive capacity provides key insights into *sources* of resilience and vulnerability
- Helps to distinguish between coping and adaptation

Expanding Resilience and Adaptive Capacity

- Resilience of what, for what?
- Who gains and who loses from a Resilience approach?
- Self efficacy and empowerment as key aspects of Adaptive Capacity



How should we respond to climate change risks in Orkney?

“Generally people here don’t see weather or the movement of the sea as a problem. Its something to accommodate – accept and work around” *local councilor, Stromness*

“Orkney may need to become more self-sufficient in many food products to reduce dependence on the importation of stocks” *fisher, Stromness*

“Orcadians should think ahead to alleviate prospective problems and need to start planning now” *librarian, Kirkwall*



Narratives of Resilience and Resistance

- Narratives matter – they help us to understand how different social actors conceptualise and strategise
- Narratives of resilience closely related to resistance
- Need to understand power and politics



In summary..

....the benefits of bifocals



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