

GLORIA DRAFT

Overall conclusions

and recommendations



Programme for Afternoon Session

1. Recommendations on WWF/BV methods for vulnerability assessment
2. Conclusions and recommendations for activity sessions
 - i. identify major challenges caused by climate change facing coastal communities;
 - ii. identify options for adaptation to the climate challenges (that are valid and acceptable);
 - iii. recommendations for an action plan;
 - iv. make recommendations for priorities for future research.
3. Closing



blue ventures
discovery through research

Methods for assessing the vulnerability of traditional fisheries to climate change: Part of the Capacity for adaptation to Climate Change, Madagascar. WWF Project MG 935 |

What is Vulnerability

(from 'Methods for assessing the vulnerability of traditional fisheries to climate change' by WWF/BV)

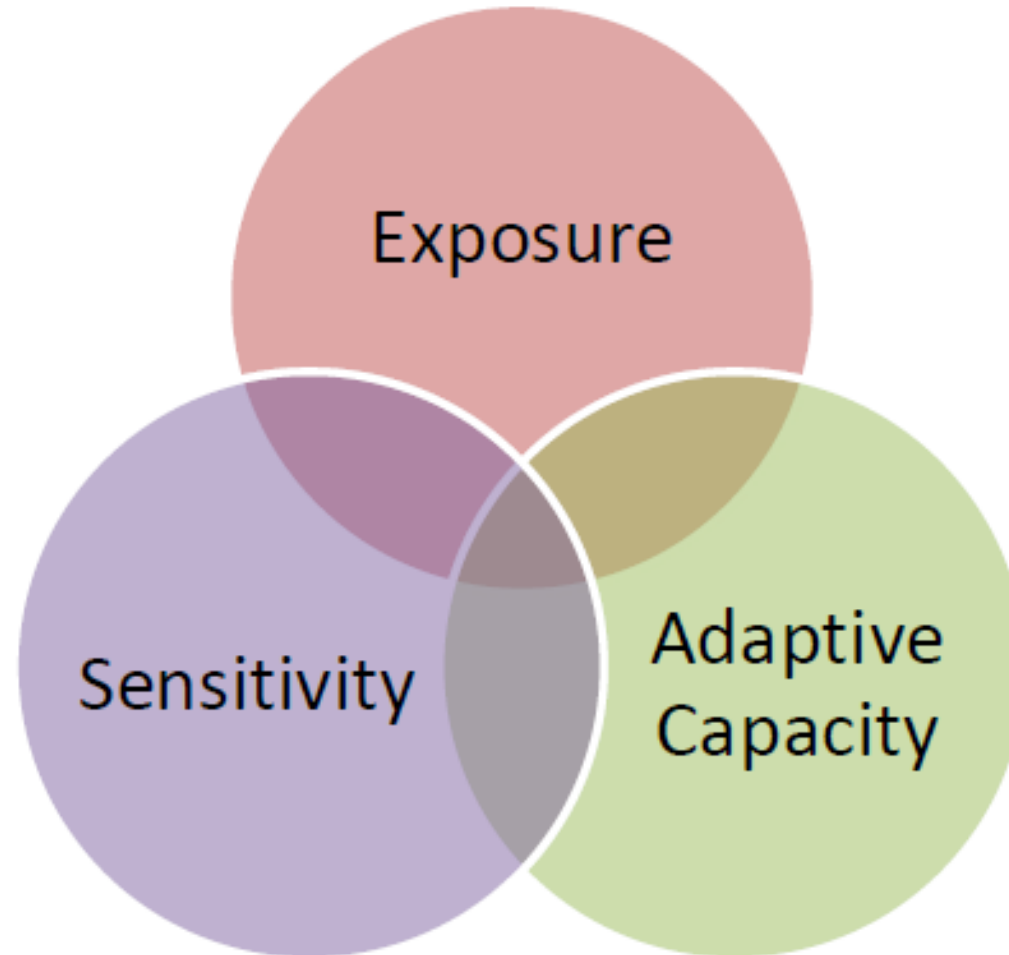
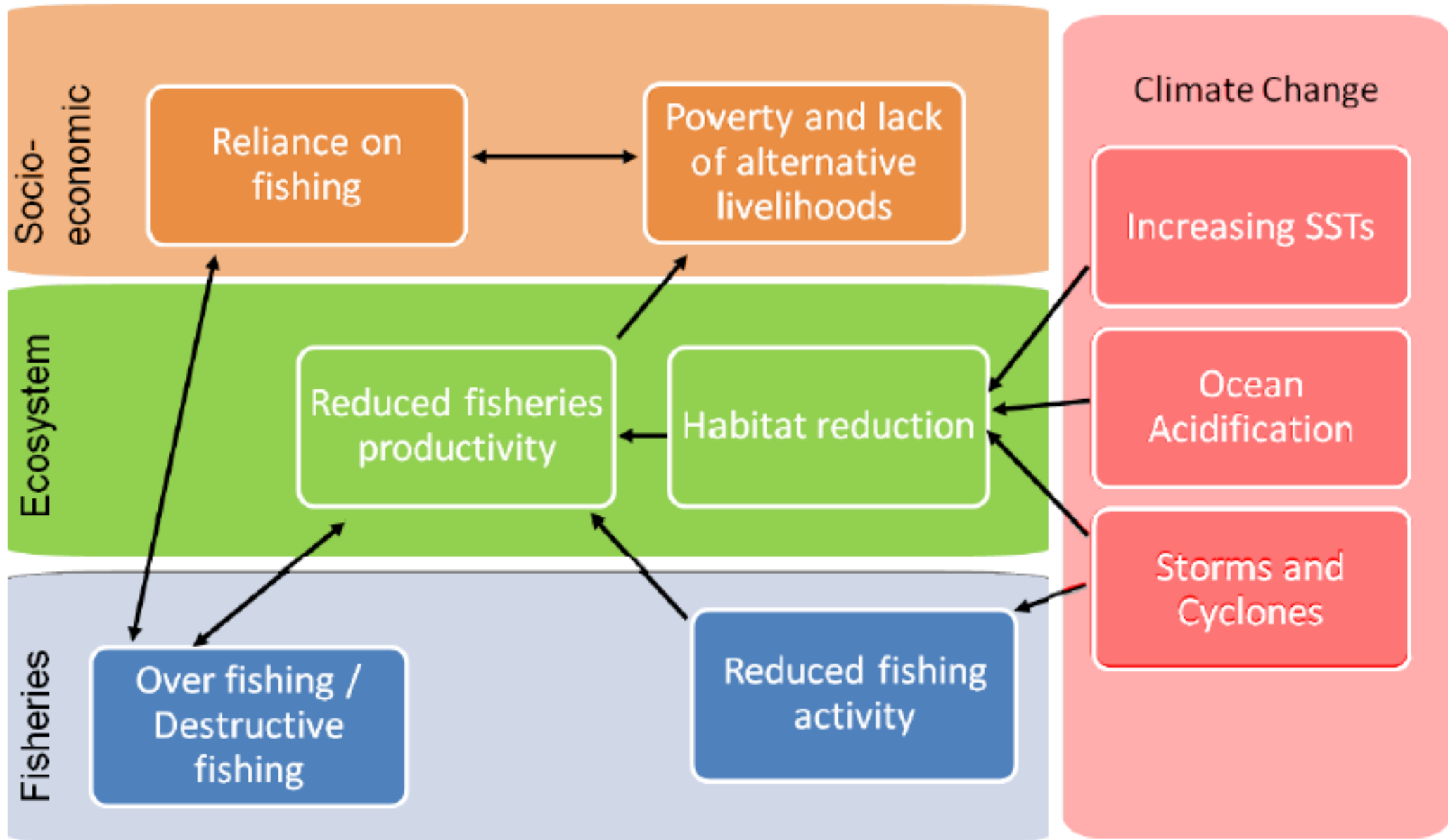


Figure 5 Vulnerability is comprised of three components: Exposure, Sensitivity and Adaptive Capacity

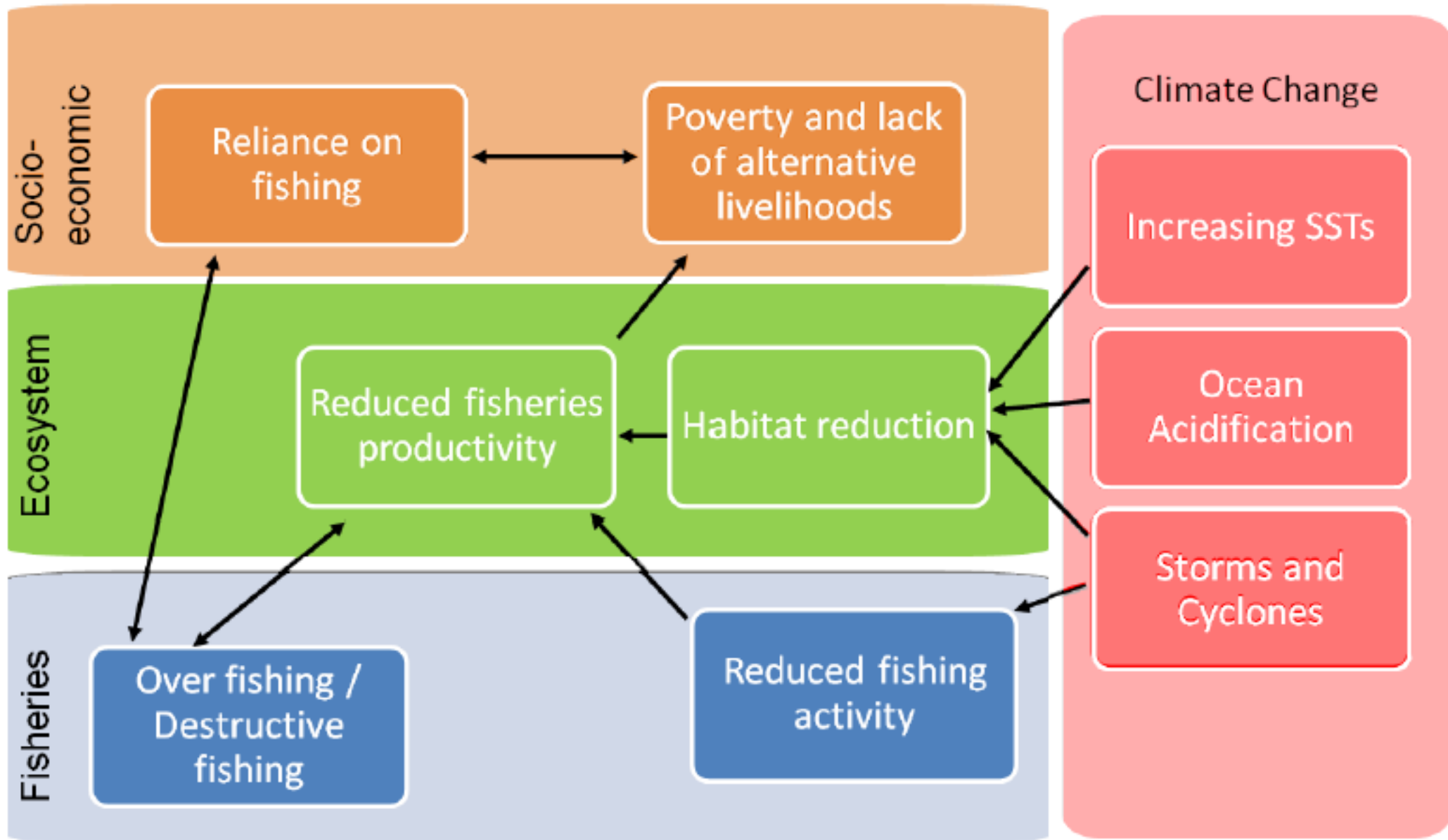
Climate change and vulnerability (WWF/BV)



Example of how the method is applied

	Indicator	Collection method	Valuation	Low (1)	Med(2)	High (3)	References
	F5. Diversity of fishing gears	Landings / Socmon	Number fishing methods (gears)/ fisher	>5 gears	3-5 gears	<3 gears	
	F6. Gear dependence	Landings / Socmon	Frequency of use	Even usage (1:1)	Preference but still employ other gears	Dominance of gear use	
Socio-economic	S1. Population density	Census/ Socmon	People/km ²	<200 people/km ²	200-500 people/km ²	>500 people/km ²	(Mamauag et al. 2011)
	S2. % Fishers	Socmon	% of total population	<35%	36-60%	>60%	(Cinner et al. 2012)
	S3. Engagement in other income generating activities	Socmon	Number alternative income sources	>1	1	0	
	S4. Reliance on fishing	Socmon	Rank importance of fishing	<30% rank fishing highest	<50% rank fishing highest	>50% rank fishing highest	

Climate change and vulnerability (WWF/BV)



Workshop Activities

- Activity 2: Climate change projections;
- Activity 3: Ecological sensitivity assessment;
- Activity 4: Key ecological assets – modelling;
- Activity 5 & 6: Vulnerability assessment, poverty and vulnerability, coping strategies and adaptation options;
- Activity 7+8: Assessing perceptions of change and participatory mapping;
- Activity 9: Education and outreach.

Conclusions and recommendations: major challenges caused by climate change facing coastal communities;

Activity 2

1. Rising temperatures intensify coral reefs bleaching
2. Rising temperature affecting small scale fish movement (fish is escaping heatwaves)
3. Concern about potential shift in upwelling which supports valuable fisheries and ecosystem communities
4. Rising temperatures increase harmful algal blooms (need alerts with advise for e.g. not eating shark liver and sardines heads when T increases a threshold)
5. Sea level rise exacerbating coastal erosion
6. Sedimentation at the coral reefs potentially caused by intensification of cyclones, heavy precipitation and land run-off , increased wave activity, changes in ocean currents
7. “Confused fishermen” – changing climate affecting local weather patterns making local knowledge less reliable and reducing number of fishing days
8. Spread of diseases affecting marine species through changing connectivity or changing climate “upstream” (white spot affecting shrimps and arriving 6 months after being observed in Mozambique)

Conclusions and recommendations: major challenges caused by climate change facing coastal communities;

Activity 3

- Talked about variety of methods to assess species sensitivity
- Now need to decide on approach & region for current study
- How to expand assessments into other regions
- How to integrate biological assessment with other components

Conclusions and recommendations: major challenges caused by climate change facing coastal communities

Activity 4

- Ensure management is successful in maximising potential increases in octopus production and building resilience eg by protecting reef
- CC-related impacts eg bleaching, damage to coral structure due to cyclones makes it even more important to minimise any human-related damage (eg via fishing methods) to protect ecosystem, leading to benefits from fisheries
- Changes in rainfall can affect the distribution, availability and possibly productivity of some species
- Changes in the start of dry/wet season can influence catch rates (availability) and prices paid for product
- Changes in trade winds make some fishing activities more difficult (eg prawn fishing) and hence a switch to other resources (eg crabs) which can lead to overexploitation and conflicts
- If rainfall increases and hence runoff increases, poor land management practices can exacerbate problems in the marine environment eg because of increased sediments, which could also cause problems for visual predators
- Increased runoff can also lead to increased pollution which negatively affects marine systems, and especially sensitive mangrove systems
- Major challenge is the cumulative impact of different stressors and hence with the knowledge that CC will increasingly negatively impact some systems, it is urgent to implement improved legislation and protection measures for marine ecosystems

Conclusions and recommendations: major challenges caused by climate change facing coastal communities;

Activity 5+6

Supply chains

- Strong relationship between price increases and increased effort - management controls
- on-land activities (erosion) affecting mangroves (e.g. affecting crab)
- Supply chain interruptions from climate events (e.g. cyclones)

Conclusions and recommendations: major challenges caused by climate change facing coastal communities;

Activity 5+6

Wellbeing

- Changing fish species composition and in number
 - Through coral bleaching, changes in temperature etc...
 - This has an effect on elders and their traditional knowledge on where and how to fish
 - Can lead to less sustainable/traditional fishing approaches/techniques
- Migration of fishers to other areas
 - Reduction in number of fish in many areas will lead to fishers to migrate to more fertile areas
 - Will have a negative repercussion on family life as in many cases, women and children will be left behind.
- Move from farming to fishing
 - Increasing fishing pressure
 - Increasing conflict
 - Increasing use of destructive fishing practices by non traditional fishers

Conclusions and recommendations: major challenges caused by climate change facing coastal communities;

Activity 7+8

- (possibly) greater rainfall variability
- (possibly) changes in distribution of important fish species, but impacts are more likely to be caused by overexploitation and habitat destruction.
- Changes in wind patterns and strength
- Coral bleaching
- Shifts in social and gender roles with disadvantages to women and children

Conclusions and recommendations: identify options for adaptation to the climate challenges (that are valid and acceptable)

Activity 2

See our recommendations for actions and priorities for future research. In the area of climate change projections these are the adaptation actions.

Activity 3

Assessment not designed to lead directly to adaptation options but rather highlight priority species for consideration

Conclusions and recommendations: identify options for adaptation to the climate challenges (that are valid and acceptable)

Activity 4

- Explore alternative fishing methods that reduce negative impact on coral structure when harvesting resources eg traps for octopus
- Explore types of traps eg lighter design that doesn't need a boat to set (and thus doesn't exclude women who could use in shallower regions)
- Explore sustainable aquaculture solutions as well as improved feeds with low environmental footprint

Conclusions and recommendations: identify options for adaptation to the climate challenges (that are valid and acceptable)

Activity 5+6

Supply chains

- Quality assurance in the supply chain (maximise gains)
- Distribution channels robust to climate impacts

Well-being

- Food storage (if extreme weather events increase in future)
- Cellars
- Smoking fish
- Improving agriculture (if drought or decreasing fish)
- Drought resistant species
- Goats rather than chickens (less expensive to keep)

Conclusions and recommendations: identify options for adaptation to the climate challenges (that are valid and acceptable)

Activity 7+8

- Increasing food security through diversification of food sources (goats, arid environmental-friendly cultures)
- Diversification of other small scale enterprises (manufacturing, tourism, trade)
- Rotation-based sea tenure regimes (temporal closures)
- Seafood preservation techniques/ innovation/ value addition (cellars, smoking rooms for fish)

General

- Better knowledge on growth rates and recruitment to better inform the timing of closures
- Vulnerability assessments standard / compulsory where coastal development takes place
- Extend the results where there is evidence of successful local management and upscale these successes
- Increase the adaptive capacity of women through aquaculture options (algae and sea cucumber)

Conclusions and recommendations: for an Action Plan;

Activity 2

- Extend coral bleaching alerts and monitoring of their impacts (Obura, CORDIO) making sure that spatial diversity is covered (North vs South). Link this to thermal tolerance of the key species
- When setting up or analysing MPA take into account advective connectivity and footprints (what is upstream?). Consider MPAs as a network rather than an isolated entity. Chose location which are most resilient for the future change including alien species coming with changing currents and changing conditions upstream. Consider “downstream seeding” impact of MPAs.
- Use the power of Madagascar as a developing nation and request international climate change modelling and satellite observation networks to address issues of this region (because they will do this if YOU demand it!)
- Capacity building: global models are becoming better with regional projections. Build capacity in analysis of available models, interpretation of their results, and assessment of value/reliability for the Madagascar region
- Capacity building: linking local observations with global satellite data will help to extend coverage of localised observations for Madagascar-wide environmental monitoring in the real time to short term.

Conclusions and recommendations: for an Action Plan;

Activity 3

- Identify people interested in being involved
 - Decisions – which species to include etc
 - Review - expert opinion
 - Co-author and helping to write up work

Activity 4

- Collect and analyse data (eg catch and effort) for as many resources as possible
- Use conceptual and other models to help identify important data gaps and needs
- Develop some general guidelines for building conceptual models as a tool to synthesize information and use as a framework for discussing adaptation options
- Review opportunities for value adding, also as a mechanism for compensating for reduced catches

Conclusions and recommendations: for an Action Plan;

Activity 5+6

Supply chains

- Deepen understanding of catches and distribution channels in Madagascar for more species

Well-being

- Put in place mechanisms to train non traditional fishers in sustainable fishing practices and techniques
- Encourage discussion and positive relationships between farmers and fishers for efficient transfer of information and increase likelihood of future collective action

Conclusions and recommendations: for an Action Plan;

Activity 7+8

- Develop legal tools at local government level (sea tenure)
- Where non-existent or eroded, build or reinvigorate local management measures and institutional governance systems

Conclusions and recommendations: Priorities for Research

Activity 2

- Establish thermal tolerance of the key species
- Initiate Western Indian Ocean regional analysis of high resolution global models output.
- Initiate model intercomparison for the area (use the power of Madagascar as a developing nation and request international climate modelling collaborations to address the needs of this region)
- Establish key regional features (using satellite data) model must be able to reproduce to be treated as acceptable (e.g. upwelling areas, main currents)
- Consider that setting up regional models might not be a wise use of resources. Using high resolution global models at this stage promise faster and more reliable results

Activity 3

- Possibly formally review different approaches/methodology for biological/ecological sensitivity and make recommendations on an integrated/common methodology to use throughout Madagascar?

Conclusions and recommendations: Priorities for Research

Activity 4

- Further develop toolbox of modelling approaches (conceptual, qualitative, quantitative) as a tool for supporting integrated decision making
- Monitor changes in the marine ecosystem and dependent communities to severe and extreme environmental events to inform on expected responses under climate change
- Use conceptual or other models to holistically consider all linkages in a system from the physical variables through the ecosystem and along the supply chain to facilitate exploring the full range of potential management levers and adaptive solutions
- Collect data on key resources harvested and especially to establish total amounts removed

Activity 5+6

Supply chains

- Ensure new research is integrated with existing local studies (e.g. in NE by CI and other organisations – WWF)
- Investigation of supply chains for fisheries not yet assessed and gain Madagascar wide logistics assessment

Conclusions and recommendations: Priorities for Research

Activity 7+8

- Integration of the community mapping with other spatial outputs from the other GLORIA activities
- Look into historical / traditional fishery management methods and governance
- Mapping of existing resources and territories
- Build partnerships for future joint research based on pilot studies, with local Malagasy scientists