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COMMITTEE FOR INLAND FISHERIES AND AQUACULTURE OF AFRICA

Sixteenth Session

Maputo, Mozambique, 16-18 November 2010

CLIMATE CHANGE EFFECTS AND ADOPTION OF STRATEGIES FOR INLAND FISHERIES AND AQUACULTURE IN AFRICA

Assessing vulnerability of fishermen and fish farming communities

A fishing or fish farming community's vulnerability to climate change is a function of exposure, sensitivity and adaptive capacity:

- a) Exposure to climate change is the direct impact of climate change in the form of floods, storms, drought or changes in fish stocks on fishing communities. Exposure can be reduced through relocating to less exposed sites.
- b) Sensitivity is a composite of employment and economic dependence of the fisheries sector. For example, communities that live exclusively from fishing (including nutritional dependency) and/or from fish farming.
- c) Adaptive capacity is the ability of communities to adjust to climate change, ie. coping with the consequences and taking advantage of new opportunities that may arise. It includes elements such as levels of social and human capital and the appropriate governance structures (e.g. life expectancy, health, education, capable institutions, and size of the economy) (Allison *et al.* 2009a¹).

An analysis done by Allison *et al.* (2009b²) showed that among the 33 countries most vulnerable to climate induced changes in the fisheries sector, two thirds were African nations (Figure 1). The analysis, unfortunately, did not separate marine and inland fisheries, but from inspection it appears that several of the most vulnerable countries are either land locked (Niger, Malawi, Mali, Uganda, Zambia, and Zimbabwe) or known to be major producers of inland fish (D. R. Congo, and U. R. Tanzania). If we add the increasing inland aquaculture production in the region and its potential for food security, livelihood and development, other countries that are relying more and more on this sector such as Nigeria, and Ghana could be added to the list.

It is however fundamental to increase our understanding and ability to assess (for example at the watershed level); exposure, sensitivity and adaptive capacity in order to define vulnerability for inland fish production in Africa. Such knowledge will enhance our ability to target adaptation. For example developing risk maps for different climate change related threats.

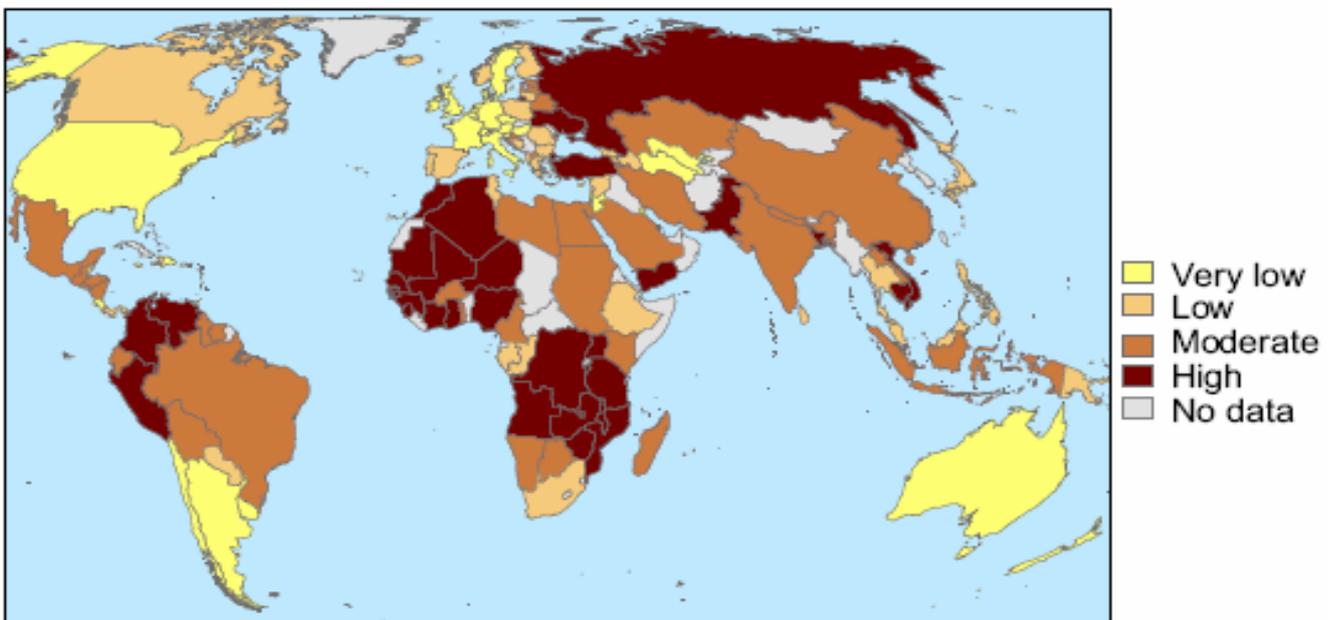


Figure 1. Vulnerability of national economies of potential climate change impacts on fisheries (which integrates exposure, sensitivity and adaptive capacity) under IPCC scenario B2 (local development, lower emissions). Source: Allison *et al.*, (2009b)

¹ Allison, E.H. ; Beveridge, M.C.M. ; van Brakel, M. 2009. Climate change, small-scale fisheries and smallholder aquaculture. p. 73-87 In: M Culberg (ed.) Fish, Trade and Development. Royal Swedish Academy of Agriculture and Forestry, Stockholm

² Allison E, Perry A, Badjeck M.-C., Adger, W.N., Brown, K., Conway, D., Halls, A.S., Pilling, G.M., Reynolds, J.D. , Andrew, N.L. and Dulvy, N.K. 2009. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish and Fisheries* **10**: 173–196.

Possible pathways for adaptation and mitigation

Adaptation to climate change occurs when we are able to reduce vulnerability. This includes reactive or anticipatory actions by individuals or public institutions. These range from abandoning fisheries and aquaculture altogether for alternative occupations, to developing insurance and warning systems and changing operations. Governance of fisheries and aquaculture affects the range of adaptation options available and will need the flexibility to account for changes in culture growing conditions, stock distribution, and abundance.

Reduced rainfall as predicted for the region, combined with population growth is for example likely to reduce the possibility and increase the cost of aquaculture production in freshwaters. For countries with access to the sea, it would be a possibility to move to mariculture although this creates other challenges such as competition for coastal marine space.

Adaptation and mitigation is necessary both within the fishery/aquaculture sector and in those external sectors that use or have impacts on inland water resources. One route is to make fishery management decisions to reduce impact or adapt an alternative way is to organize the social system so that it can respond and adapt (*Satia in preparation*).

The ecosystem approach to fisheries and to aquaculture are holistic strategies for managing capture fisheries and aquaculture that integrate their ecological, socio-economic, and institutional dimensions. Such strategies consider elements of maximum sustainable fishing capacity and ecosystem carrying capacity for aquaculture; they also consider the risk elements and precaution in the decision making and planning of fisheries and aquaculture activities in the short, medium, and long term. Governance aimed towards equitable and sustainable fisheries and aquaculture, accepting inherent uncertainty, and based on an ecosystem approach, as currently advocated, is necessary to maintain and improve the adaptive capacity of fisheries and aquaculture. In addition, fisheries and aquaculture management that conserves genetic diversity will enable aquatic species to retain the genetic resources needed to adapt to new or changing selective pressures brought on by climate change.

Some adaptation measures for other sectors such as the construction of reservoirs for irrigation, hydropower generation and domestic water supply have negative consequences for both biodiversity and fish production, but these habitats also provide opportunities to establish new fisheries for species that do well in reservoirs. However, an adjustment period will be required to get people's accept of species that are not traditionally consumed. Reservoirs also provide an important opportunity for cage aquaculture but the appropriate dissemination of information, training and initial investment are needed in order to use such opportunity.

Participants in inland fisheries have adopted flexible, adaptable and mobile livelihoods as an adaptation to an unstable production environment; as a result, fishers are normally engaged in various mixes of farming, trading, wage-labour, self-employment in addition to fishing. The contribution from each livelihood component varies considerably between seasons and may differ significantly between years. Thus, in spite of the uncertainties inland fisheries may still offer an economically attractive occupation at high production periods, and provide cash and animal protein to the wider rural community. Unfortunately, development strategies are usually directed towards individual sectors (sometimes at the cost of others) and tend to favour specialisation rather than diversity leading not only to inequities across the population but also significantly reduces resilience.

Biodiversity is essential for ecosystems' ability to respond to environmental changes. In a changing climate maintaining aquatic biodiversity is therefore essential for ecosystem resilience. Climate change mitigation measures in sectors using the aquatic ecosystem must be carefully planned and use an ecosystem approach with a system-wide impact assessment.

Availability of fish for food can be improved by making better use of the production. This means reducing post-harvest losses and increasing the percentage of use for direct human consumption. Traditional processing methods such as smoking may become unavailable due to lack of fuel wood if forests get flooded, and transportation may require more time if roads are washed out or flooded. In addition, changes in rainfall and higher relative humidity may affect the quality of dried fish.

Policy and legal issues will need to be developed. Regional market and trading mechanisms also would be more important in linking and buffering supply variability and maintaining sectoral value and investment.

The management of transboundary resources (such as fish and water) will pose new challenges in a changing environment, will require strengthening of existing bilateral and regional cooperation and collaboration, and associated frameworks.

There are 59 international river basins in Africa of which 19 (*i.e.* 32 percent) have one or more agreements (UNEP 2002³) that focus primarily on the allocation of water for irrigation, flood protection, navigation or hydropower generation and not on fishery resources. Nevertheless, most of the agreements have a mandate in environmental matters, which could be extended to include fisheries.

Potential funding sources for adaptation in inland fisheries and aquaculture

There are some funding mechanisms for climate change adaptation at the national level and regional level. Some of these mechanisms include the Least Developed Countries Fund (LDCF)⁴ and Special Climate Change Fund (SCCF) under the GEF. These are administered by the United Nations Framework Climate Change Convention, UNFCCC-GEF. The LDCF is based on National Adaptation Programmes for Adaptation (NAPAs), which are a country led process to identify national adaptation priorities in LDC countries.

Unfortunately, the fisheries and aquaculture sectors do not make up a significant part of the priority profiles in NAPAs. In order to change this situation and access funding under GEF LDCF fisheries and aquaculture adaptation priorities need to be integrated into the NAPAs (through revision) at national level. Once this is done, or if fisheries and aquaculture priorities already exist in the NAPAs, then the national authorities need to do identify a GEF implementing partner (FAO is one of the ten) and together develop the PIF for submission to GEF. A project Preparation Grant (PPG) is available if required to support formulation.

Under LDCF, regional and transboundary climate change adaptation issues can be addressed. The way to do this is to ensure the issues are in the NAPAs and projects of respective participating countries. Regional cooperation is important on many adaptation issues that cannot be dealt with by any one country alone. Actions to develop national and regional programmes under LDCF could include discussions with national LDCF focal points, national consultations to identify and prioritise climate change adaptation priorities for the sector and regional consultations to identify and address transboundary issues and learn lessons from other countries and partners.

Other donors are also giving more focus to climate change assistance such as the European Space Agency (ESA) (TIGER programme), McArthur Foundation etc.

What can CIFAA do?

Based on the information briefly reviewed in this document there is no doubt that climate change is going to have an impact on aquatic ecosystems in inland water in Africa and will consequently also significantly affect inland fisheries and rural livelihoods in many parts of the continent.

Although climate models provide us with some guidance, it is not possible to say with certainty who will be most affected, but there is a strong need to prepare for the situation by improving the understanding of patterns of vulnerability in order to develop and prioritize adaptation interventions. Climate change is already on the international agenda, but there is a need to include fisheries and especially inland fisheries in these programmes, and African nations need to participate in relevant fora.

More and better data are needed from all over Africa, and African nations should collaborate in gathering information, doing research and there should be mechanisms for sharing information. In situations where data already exist they should be analyzed and made available for research. Action plans should also be coordinated to have the best effect.

Inland fisheries are only one part of people's livelihood even where it is most important, and climate change hits entire societies, not just individual sectors. Any attempt to increase adaptability and lower vulnerability must necessarily look beyond the fisheries sector and be multidisciplinary in nature.

CIFAA is well placed to request that the agencies and agreements for the 19 international river basins in Africa address their environmental mandate, including inland fisheries and aquaculture. Specific requests could be made to examine potential impacts, adaptation and mitigation to climate change.

³ UNEP 2002: *Atlas of International Freshwater Agreements*. United Nations Environment Programme, Oregon State University, Food and Agriculture Organization of the United Nations.

⁴ http://unfccc.int/cooperation_support/least_developed_countries_portal/ldc_fund/items/4723.php

Potential actions regarding impacts and adaptation

- Facilitate the understanding of fisheries and aquaculture vulnerability to climate change and strengthening adaptive capacity to ensure food and livelihood security
 - Identifying fish production systems most likely to be impacted at the watershed level (transboundary), e.g. producing risk maps?
 - Documenting adaptive frameworks, mechanisms and best practices
 - Creating awareness, outreach and develop capacity-building
- Facilitate the integration of climate change adaptation and disaster risk reduction planning to increase resilience in fishing and aquaculture communities
- Facilitate the implementation the ecosystem approach to fisheries and aquaculture (EAF/EAA) as a means of climate proofing the fish production sector
- Promoting the sector's involvement in climate change funding at the regional and national levels (e.g. NAPAs, Least Developed Countries Fund for climate change adaptation and Special Climate Change Fund).

The CIFAA members are invited to review the paper and discuss and advise upon the following:

- i) Whether there is a need for a CIFAA climate change strategy in inland fisheries and aquaculture?
- ii) If a strategy is needed what should be the next steps in elaborating and finalising the strategy, when and by whom?
- iii) It is proposed that CIFAA identify three to five indicator fisheries or ecosystems that should be monitored. These should be critical areas that may be expected to suffer the impacts of climate change before other areas, or that are especially important and should be prepared for climate change.
- iv) How experiences and data of relevance to climate change and fisheries can be better shared and made use of at the regional level;
- v) Which other partners (including donors) should be approached, and what projects should be prioritized?