A place at the table?

NICHOLAS DULVY AND EDWARD ALLISON

An oft-forgotten source of food security and livelihoods, fisheries must be included in ongoing discussions of how the world's most vulnerable can adapt to climate change.

It is well recognized that the world's most vulnerable nations will bear the brunt of escalating greenhouse gas emissions, primarily through reduced food and water availability. But while agriculture and freshwater resources have been central in climate policy discussions, the effects of climate change on fisheries resources — and the implications for health and livelihoods in the developing world — have been largely ignored. Whatever the details of a global climate treaty, it must aid adaptation to climate change as well as minimize its impacts. Here we ask that aquatic production systems and the people dependent on them are appropriately included in climate adaptation measures considered for coastal zones, water resources management, agriculture, food security and rural development. We put forward a series of policy and research priorities that will enable the fisheries sector to adapt to change as well as contribute to mitigation measures.

INCREASING UNCERTAINTY

Currently, one-third of the world's 6 billion people rely on fish and other aquatic products for at least one-fifth of their annual protein intake, and catches by subsistence and artisanal fisheries make up more than half of the essential protein and mineral intake for over 400 million people in the poorest countries in Africa and south Asia[1]. Fisheries and aquaculture directly employ over 36 million people worldwide, 98 per cent of whom are in developing countries. Taking into account ancillary occupations and their dependents, there are approximately 520 million fisheries-dependent people. Fisheries and aquaculture also support global trade worth over 78 billion dollars in 2008 (ref. 1).

The physical, biological and ecological impacts of climate change in aquatic ecosystems are becoming increasingly apparent. Coral reefs are bleaching and their associated fisheries collapsing rapidly. Commercially exploited fishes are moving northward and into deeper waters at rapid rates, invading polar seas, and withdrawing from subpolar seas, semi-enclosed seas and the tropics[2]. Climate change may affect fisheries, and their contribution to local livelihoods, national economies and global trade-flows, through both direct and indirect pathways. Always an unpredictable way to make a living, fishing may increasingly become a lottery as fish migration routes and spawning and feeding grounds change from those that fishers have learnt to harvest. In addition, the growing frequency and severity of extreme events such as floods and hurricanes will increase the vulnerability of fishing communities through disasters that damage infrastructure and threaten human health[3]. The future consequences for global fisheries are uncertain, however, and subject to ongoing analysis. But what is certain is that there will be winners and losers, and we can bet the losers will be those who don't have much already.

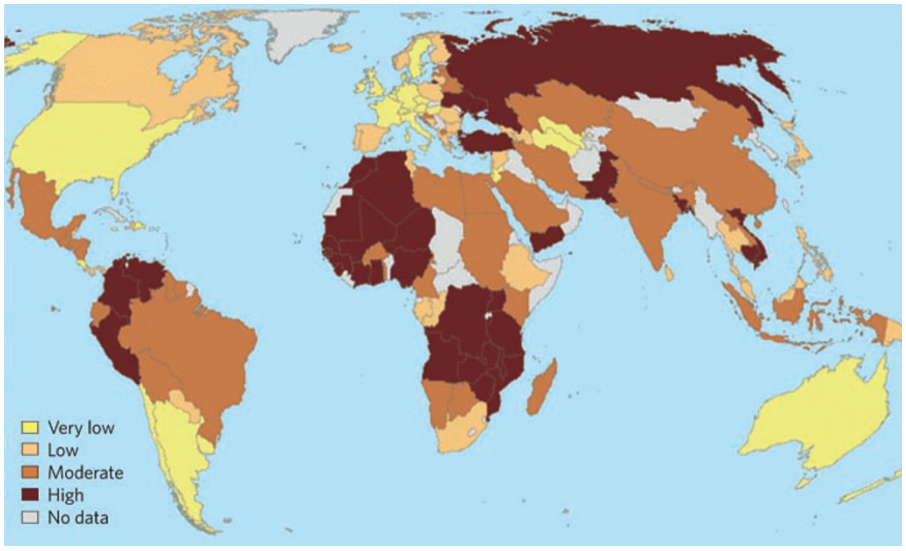

Figure 1 Unequal vulnerability. The vulnerability of national economies to potential climate change impacts on fisheries was calculated on the basis of exposure, sensitivity and adaptive capacity, assuming slowly increasing global emissions (scenario B2 of the Intergovernmental Panel on Climate Change). Colours represent quartiles, with dark brown for the upper quartile (highest vulnerability), yellow for the lowest quartile and grey where no data were available. Originally published in ref. 3.

DOUBLE JEOPARDY

In a recent analysis[3], we, together with collaborators, demonstrated that African and southeast Asian countries are the most economically vulnerable to climate change impacts on their fisheries and aquaculture sectors (Fig. 1). This vulnerability arises from a relatively high reliance on fisheries combined with low levels of societal capacity to adapt to anticipated temperature increases. Of the 33 nations identified as being most vulnerable to climate impacts on

their fisheries sectors, 19 are among the world's least developed countries, whose inhabitants are twice as reliant on fish and fisheries for food as those of more developed nations. Not only are the most vulnerable countries highly dependent on fish for protein, they also rely on fish and fisheries products as a source of income, producing around 20 per cent of the total tonnage of global fish exports, a fraction worth about US$6.2 billion.

African and southeast Asian nations face the double jeopardy of high vulnerability to climate effects on both their fisheries and agriculture sectors. By 2050, the global yield of rain-fed maize is forecast to decline by 17 per cent and the yield of irrigated rice by a fifth as a result of climate change, with sub-Saharan Africa and south Asia being the worst hit[4]. Three countries in particular have both the highest national vulnerability to climate impacts on fisheries and 'extremely alarming' global hunger indices: Sierra Leone, Niger and the Democratic Republic of the Congo[5]. Clearly these nations deserve the greatest support for adaptation and development to face off against these challenges.

DEDI ADHURI, WORLDFISH CENTER

African and southeast Asian countries are the most economically vulnerable to climate change impacts on fisheries resources.

POLICY PROGRESS

Until now, the fisheries sector has been rather slow to get involved with both climate change and development issues — one of the reasons why fisheries and aquaculture are often left out of global policy processes. This is changing: partnership and collective action are *mots du jour*. One example is a collaborative effort of the UN Food and Agriculture Organization, the World Bank's PROFISH programme — an initiative to tackle unsustainable fishing practices — and international non-profit research group the WorldFish Center in Penang, Malaysia. This coalition aims to share the task of achieving representation for the sector in high-level climate policy dialogues by joining forces with other agencies such as the UN Environment Programme, regional intergovernmental organizations such as the Secretariat of the Pacific Community, and representatives of fisherfolk's organizations worldwide. Such alliances can be used to highlight vulnerability, adaptation needs and mitigation opportunities in the aquatic sector.

Here we identify four key areas where policy responses and associated research are needed, and we call upon delegates and decision-makers participating in the UN Framework Convention on Climate Change process to take these on board in considering how best to involve the fisheries sector in mitigation and adaptation efforts[6–8].

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First, consideration should be given to the ability of aquatic production systems to reduce emissions of CO_2 and other greenhouse gases. Fisheries currently account for about 1.2 per cent of global oil consumption; this is comparable to the fuel consumption of the Netherlands — the eighteenth most fuel-intensive economy. Despite this apparent appetite for energy, the fisheries sector is relatively fuel-efficient compared to other protein production systems. The energy content of captured fish is around ten per cent of the fuel used to catch it[9]. Though the sector cannot make a major contribution to global emissions reductions, options should be pursued wherever there are synergies between mitigation, adaptation and sound environmental management. With substantial overcapacity in the global fishing fleet, emissions reductions could be achieved by taking excess capacity out of commission — that is, by reducing fleet size. This could aid efforts towards sustainable fisheries management, and countries could even gain carbon credits for doing so if this could be demonstrated as a legitimate offsetting activity.

Second, it is important to increase the fisheries sector's socio-ecological resilience and ability to respond to the opportunities and challenges of climate change. This can be done by maintaining larger stock sizes, achieved in part by reducing subsidies that artificially sustain the profitability of dangerously depleted fisheries. While reducing capacity is essential, over-regulation of the activities of the remaining fishers is counter-productive. Management measures should be supported that still allow fishing fleets to be mobile and flexible in what they catch so that they can adapt to anticipated changes in stock distribution and catch composition. Promoting less capital-intensive fisheries enterprises and providing opportunities for fishers to diversify into supplementary or alternative activities are key factors in building capacity to adapt to climate change; they reduce the risk of livelihood failure by spreading risk across more than one income source.

INTEGRATED EFFORTS

Third, there is a need for adaptation approaches that involve managing an integrated portfolio of natural resource sectors such as water resources, forestry, farming, aquaculture and capture

fisheries. The poorest people often rely on two or more such sectors to sustain their livelihood. One novel cross-sectoral scheme in the Solomon Islands, funded by the Australian government, is assessing the potential for carbon sequestration by mangrove forests — ecosystems threatened by unsustainable aquaculture — which could then be eligible as a source of carbon credits under the UN programme Reducing Emissions from Degradation and Deforestation, or REDD. Researchers are examining how such an approach might be used to promote conservation, mitigate climate change and help alleviate poverty among people dependent on the mangroves and adjacent marine ecosystems.

Finally, thought should be given to mainstreaming fisheries in wider development processes. Climate change is not the only stress facing fishing and fish-farming communities. Many fishing communities are poorly served by infrastructure, markets and social services, and are thus economically, socially and politically marginalized. Building adaptive capacity to address these multiple stressors will require cross-sectoral approaches implemented through newly decentralized governance approaches. The world's least developed countries are among those eligible for UN funding to engage in long-term adaptation planning through the National Adaptation Programmes of Action. In countries where fisheries are important, sector-specific adaptation needs should be planned and budgeted for in this process. All sectors will be vying for a place at the climate change negotiating table in Copenhagen. The agencies representing the fisheries sector are calling, above all, for fisheries to be remembered when, as is hoped, commitments to funding adaptation are agreed this December.

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Nicholas Dulvy is the Canada Research Chair in Marine Biodiversity and Conservation at Simon Fraser University, Vancouver, Canada, and Edward Allison is the Director of Policy, Economics and Social Sciences at the WorldFish Center, Penang, Malaysia.
e-mail: nick_dulvy@sfu.ca or e.allison@cgiar.org