STRATEGIC FRAMEWORK FOR FISHERIES, AQUACULTURE AND CLIMATE CHANGE

A proposal by the Global Partnership Climate Change, Fisheries and Aquaculture (PaCFA)

This document has been prepared by the Global Partnership Climate Change, Fisheries and Aquaculture (PaCFA) to support the process of the United Nations Framework Convention on Climate Change (UNFCCC) in response to the need for concerted action on fisheries, aquaculture and climate change. It lays the groundwork for a coordinated response from the fisheries and aquaculture sector to climate change, notably through a strategic approach to maintain or enhance the health and resilience of global oceans and waters, and strengthening the capacity of dependent people and communities, integrating these closely into broader development strategies.

Global Partnership Climate, Fisheries and Aquaculture

PaCFA is a voluntary global level initiative among international organizations and sector bodies with a common concern for climate change interactions with global waters and living resources and their social and economic consequences. PaCFA members share a commitment to raising awareness of the vital importance of these issues, developing effective tools and management approaches to address them, and building international development support to implement change and bring about lasting positive outcomes.
An immediate aim is to highlight key issues to alert and inform decision makers and climate change negotiators at UNFCCC meetings. From this, global, national and local responses can be formulated and implemented for adaptation and mitigation in aquatic ecosystems and for fisheries and aquaculture and in national and local responses to climate change.

The PaCFA members are: Benguela Current Commission (BCC); Convention on Biological Diversity (CBD); European Bureau for Conservation and Development (EBCD); Food and Agriculture Organization of the United Nations (FAO); Global Ocean Ecosystem Dynamics (GLOBEC); Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Culture Organization (UNESCO-IOC); International Coalition of Fisheries Associations (ICFA); International Council for the Exploration of the Sea (ICES/CIEM); International Fund for Agricultural Development (IFAD); International Collaborating Centre for Aquaculture and Fisheries Sustainability (ICAFIS); Network of Aquaculture Centres in Asia-Pacific (NACA); Network of Aquaculture Centres in Central-Eastern Europe (NACEE); North Pacific Marine Science Organization (PICES); Organización del Sector Pesquero y Acuitola del Istmo Centro-americano (OSPESCA); Organization for Economic Cooperation and Development (OECD); Secretariat of the Pacific Community (SPC); Southeast Asian Fisheries Development Center (SEAFDEC); United Nations Development Program (UNDP); United Nations Environmental Program (UNEP); United Nations International Strategy for Disaster Reduction (UN ISDR); World Bank; WorldFish Center.

For more information, see www.climatefish.org

KEY MESSAGES

1 Our oceans and aquatic ecosystems are key in regulating the world's climate – they are resilient but at increasing risk.

2 Oceans and aquatic ecosystems are our largest natural carbon sink – we must keep them healthy to absorb our emissions.

3 Millions of people depend on the world's aquatic ecosystems for a living and billions benefit from fisheries foods and products – aquatic ecosystems are critical to global food security and economic prosperity.

4 Climate change will cause unprecedented disruptions to aquatic and coastal systems – we must understand the risks for everyone to act wisely.

5 Climate stress is here: oceanic dead zones, acidification, disturbed freshwater processes, falling groundwater levels, pressure on aquatic stocks – we must address these changes.

6 New prospects for oceans and aquatic ecosystems with resilient communities and ecosystems and food and livelihood benefits are possible – we must act now to decelerate damage and benefit from change.

7 Connecting local interests to global needs can build stronger communities with shared aims – we can create new patterns of global partnership.

8 Climate change mitigation and adaptation can fit with increased wealth through good stewardship – we should support these positive links.

9 A global blue carbon fund will create a vital dynamic for change and for building and applying investment at all levels – we can connect private, public and civil society interests and aims.

10 PaCFA offers the global community a voice to strengthen and safeguard our common goals for the world's oceans and aquatic ecosystems – we can gain by sharing, acting and informing together.

The great water masses of the oceans and the world's inland waters – lakes, inland seas and rivers – are critical in the process of climate change and hold an essential influence in our society's ability to mediate, respond to and survive its effects. Ocean currents transport heat around the globe, interacting with atmospheric processes, influencing and regulating regional and global climates. Their mass and relative stability confer important moderating influences, and their chemical and biological functions mediate climate and atmosphere exchange processes and establish key conditions for ecosystem support, biodiversity and for the essential supply of food and other products around the world. Aquatic ecosystems play a crucial role in buffering and distributing climatic shocks, whether from storms, floods, coastal erosion or drought. The ability of major oceanic and other aquatic systems to maintain their function under natural and human-induced variability is a vitally important factor in providing the relatively stable climatic and resource conditions on which our societies have depended.

However, there is increasing evidence of change, associated primarily with global warming, and increasing concern that self-regulating and buffering processes will break down, leading to irreversible consequences. If oceans and waterbodies and their productive systems are less able to respond to changes in temperature, chemistry and other factors, the opportunities for protection against further climate change impacts will become critically compromised.

HEALTHY OCEANS AND CLIMATE CHANGE

- Oceans are the earth's main buffer to climate change and will likely bear the greatest burden of impacts.
- Oceans removed about 25% of atmospheric carbon dioxide emitted by human activities from 2000 to 2007.
- Oceans absorb more than 95% of the sun's radiation, making air temperatures tolerable for life on land.
- Oceans provide 85% of the water vapour in the atmosphere, and these clouds are key to regulating climate on land and sea.
- Ocean health influences their capacity to absorb carbon, and to buffer climate change impacts.

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OUR OCEANS AND AQUATIC ECOSYSTEMS ARE KEY IN REGULATING THE WORLD'S CLIMATE – THEY ARE RESILIENT BUT AT INCREASING RISK

Oceans are the largest long-term sink for carbon and some 93% of the global quantity of CO2 – 40 Tt – is stored and cycled through the oceans. Oceans removed about 25% of CO2 emitted by human activities from 2000 to 2007. Coastal vegetated habitats – in particular, mangroves, salt marshes and seagrasses – the Earth's blue carbon forests – cover <1% of the seabed, but account for more than half of all carbon storage in ocean sediment. They comprise only 0.05% of terrestrial plant biomass, but store a comparable amount of carbon per year, and thus rank among the most important carbon sinks on the planet.

Blue carbon sinks and estuaries are estimated to capture and store between 235–450 Tg C every year – equivalent of up to half the emissions from the entire transport sector. In inland areas, the role of ponds and wetlands is also critical, with significant potential for taking up carbon, but also significant potential for its release, if for example peatland soils are disturbed.

OCEANS AND AQUATIC ECOSYSTEMS
ARE OUR LARGEST NATURAL CARBON SINK – WE MUST KEEP THEM
HEALTHY TO ABSORB OUR EMISSIONS

2

The supply of food from aquatic sources through fisheries and aquaculture is one the major elements in human nutrition and well-being, and the basis and support for significant economic activity in almost all parts of the world. In 2006, capture fisheries and aquaculture supplied about 110 m tonnes of food fish, making available an average of 16.7 kg per person. Additionally, some 33 m tonnes were landed for non-direct use, primarily for fish meal and oil production. At 51.7 m tonnes and valued at US$78.8 billion, aquaculture accounted for 47% of food fish supply in 2006, and for the first time rose to more than 50% in 2007.

More specifically, the ecosystem services associated with coastal and wetland systems are also highly important, from nutrient cycling, physical protection, hydrological buffering to support of valuable aquatic species. Coastal ecosystem services alone have been estimated to be worth over US$25 000 billion annually, ranking among the most economically valuable of all ecosystems.

Human populations have always been close to water – for fishing and food supply, health and sanitation, transport and trade. Fifty percent of the world's population lives along the coast, and more live around inland water margins. Population densities in coastal regions are about three times as high as the global average, and 23% of the world's population lives both within 60 miles of the coast and less than 330 feet above sea level. Sixty percent of the world's cities with a population of over 5 million are located within 60 miles of the coast.

The role of aquatic foods is particularly important. Fisheries and associated industries employ 38 million people directly, and another 162 million indirectly. Capture fisheries, aquaculture and post-harvest and distribution activities, and the provision of a range of goods and services, all contribute to employment and livelihoods. These activities are important in almost every part of the world. The demand for aquatic products, and their value, has supported extensive transport linkages and major trade volumes. Although relatively insignificant in GDP terms in most countries, fisheries are much more socially important, particularly in vulnerable communities. Their particular food value, especially for maternal and child nutrition, place their importance in human and development terms at much higher levels than defined by GDP alone. Coastal communities, fishers and fish farmers, particularly in poorer economies are often vulnerable through a range of interconnected poverty processes. Their location, coupled with their dependence on aquatic products for food and income, make them even more vulnerable to climate change.

IMPORTANCE OF FISH TO PEOPLE

- Aquatic foods provide essential nutrition for 3 billion people and at least 50% of animal protein and minerals to 400 million people in the poorest countries.
- Over 500 million people depend – directly or indirectly – on fisheries and aquaculture for their livelihoods.
- Aquaculture is the world's fastest growing food production system, growing at 7% annually.
- Fish products are among the most widely-traded foods, with more than 37% by volume of world production traded internationally.

3 MILLIONS OF PEOPLE DEPEND ON THE WORLD'S AQUATIC ECOSYSTEMS FOR A LIVING AND BILLIONS BENEFIT FROM FISHERIES FOODS AND PRODUCTS – AQUATIC ECOSYSTEMS ARE CRITICAL TO GLOBAL FOOD SECURITY AND ECONOMIC PROSPERITY

The loss of the ocean's carbon sinks, and their crucial role in managing climate, health, food security and economic development in the coastal zones, is an imminent threat. The build-up of carbon dioxide and other greenhouse gases in our atmosphere is changing features of the earth's climate, oceans, coasts and freshwater ecosystems, air and sea surface temperatures, rainfall, sea level, acidity of the ocean, wind patterns and the intensity of tropical cyclones are all changing. Impacts are anticipated across terrestrial and aquatic ecosystems, global food supply, human, animal and plant pathogens, security of habitats and economic assets, risk from extreme climatic events, and social and political disruption. Within this, the impacts for aquatic systems and for the people dependent on them are no less critical.

Though the precise consequences cannot be defined at this stage, there are two main pathways of climate change which will affect fisheries and aquaculture, dependent communities and their economic activities:

- Physical and chemical changes in oceans and freshwaters will change aquatic production, catch composition and species distribution through a complex interplay of ecological changes. These will affect fisheries production, composition and location – and will have important impacts on aquaculture productivity and security.
- Physical changes to coasts, estuaries, wetlands, lakes and rivers caused by changing weather patterns, weather driven natural extreme events and sea-level rise.

These will affect safety and security for people, their habitation and their means of production, including fisheries and aquaculture assets and infrastructure. There may also be indirect effects on other, particularly vulnerable people who are forced to migrate from other impacted areas. It is clear that fishers, fish farmers and coastal inhabitants will bear the full force of these impacts through less stable livelihoods, changes in the availability and quality of fish for food and rising risks to their health, safety and homes.

Many fisheries-dependent communities already live a precarious and vulnerable existence because of poverty and their lack of social services and essential infrastructure. The well-being of these communities is often further undermined by overexploited fishery resources and degraded ecosystems. The implications of climate change for food security and livelihoods in small island states and many developing countries are profound.

Based on the likely nature and scale of climate change impacts, their probability of happening and the potential ability of systems and communities to respond to these, it has been possible to outline the potential vulnerability in various locations and communities. However, the specific impacts and their scale cannot be defined with much precision, nor social or economic outcomes. The concepts of ability to respond – the resilience of systems and communities – are only now being explored and addressed. The consequences for sustainability of aquatic ecosystems for fisheries and aquaculture, and for the people that depend on them, are therefore uncertain. Some countries and fisheries will benefit while others will lose – the only certainty is change –- and decision-makers must be prepared for it.

CLIMATE CHANGE WILL CAUSE UNPRECEDENTED DISRUPTIONS TO AQUATIC AND COASTAL SYSTEMS – WE MUST UNDERSTAND THE RISKS FOR EVERYONE TO ACT WISELY

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It is clear that changes are already under way, and the process of impact is not theoretical – rather it is a matter of understanding the likely consequences and the extent to which political and economic mobilization is feasible to address these. Though not necessarily directly linked to climate change, high nutrient levels from terrestrial sources are associated with increasingly large anoxic zones in offshore waters, with localised losses of fish and invertebrate stocks. Extreme blooms of jellyfish have been associated with high coastal nutrient levels in other systems. In many areas, the risks of HABs (harmful algal blooms) have also increased.

Higher levels of CO2 in the atmosphere result in higher levels being absorbed by waterbodies across the planet. The chemistry of the oceans is being altered on a scale not evidenced for at least 20 million years – and is happening at an unprecedented rate. The chemistry is simple: seawater is naturally alkaline but with the addition of CO2 it becomes less alkaline, moving towards acidity. Already some 500 Gt, representing around 25% of anthropogenic emissions to the atmosphere since pre-industrial times, have been absorbed by the oceans and resulted in a pH decline of 0.1 unit – an increase in acidity of 30%. Seawater acidity varies across the oceans but the global average pH was 8.2 before industrialization. If CO2 is to be emitted at the same rate, ocean pH will decline by 0.4 by 2100 and 0.7 by 2300.

In inland areas, climate change impacts are starting to show in changing seasonal meltwater patterns, greater risks of drought and flooding and more difficulties in maintaining hydrological balances for terrestrial needs, including water supply, sanitation and agricultural and industrial production. Growing use of groundwater has caused problems with declining water tables and, in some cases, mobilization of toxic elements such as arsenic. Together with water diversion and drainage developments, these are already showing negative impacts on inland fisheries and potentially constraining the future potential of aquaculture to meet food needs.

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CLIMATE STRESS IS HERE: OCEANIC DEAD ZONES, ACIDIFICATION, DISRUPTED FRESHWATER PROCESSES, FALLING GROUNDWATER LEVELS, PRESSURE ON AQUATIC STOCKS – WE MUST ADDRESS THESE CHANGES.

In conjunction with those working in consumer and industrial regulation and mitigation processes, and those addressing climate change issues in agriculture and forestry, the aquatic sector can make important, indeed indispensable, contributions to addressing the challenges of climate change. Of all the green or biological carbon captured in the world, over half (55%) is captured by marine living organisms, so called blue carbon. Maintaining or improving the ability of forests and oceans to absorb and bury CO2 is a crucial aspect of mitigation. The contribution of forests in sequestering carbon is well known while, in contrast, the critical role of the oceans and waters has been overlooked. It is important to highlight the vital contribution of the oceans in reducing CO2 levels in the atmosphere through sequestration and also through reducing the rate of ocean and coastal ecosystem losses.

There are three major pathways for engaging in mitigation:

1) Improving knowledge of water-climate interactions and how aquatic ecosystems functioning at various levels can take up and sequester CO2, the resilience of aquatic systems and their long term buffering capacities can be better defined. This can also help to identify management approaches which may be applied to protect or improve these functions.

2) Preventing the further loss and degradation of coastal and other aquatic ecosystems and catalyzing their recovery, it is estimated that the aquatic sector can contribute to offsetting 3-7% of current fossil fuel emissions (totalling 7 200 Tg CO2 per year) in two decades – over half of that projected for reducing rainforest deforestation. The effect would be equivalent to at least 10% of the reductions needed to keep concentrations of CO2 in the atmosphere below 450 ppm.

3) Defining ways in which these “Blue carbon” sinks could be further managed —and in some cases extended – for example in zones where sea level rise was likely to increase salinization in coastal lands and new forms of production might be required.

Linked with this, and with the need for coastal, fishing and aquaculture communities to be able to adapt to the consequences of climate change, building capacity and resilience of communities will be essential – not just in protecting the lives and livelihoods of the many millions of people involved, but in maintaining the outputs and benefits derived from aquatic systems the world around.

NEW PROSPECTS FOR OCEANS AND WATERS WITH RESILIENT COMMUNITIES AND ECOSYSTEMS AND FOOD AND LIVELIHOOD BENEFITS ARE POSSIBLE – WE MUST ACT NOW TO DECELERATE DAMAGE AND BENEFIT FROM CHANGE

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Implementing adaptation and mitigation pathways for communities dependent on fisheries, aquaculture and aquatic ecosystems will need increased attention from policy-makers and planners. Sustainable and resilient aquatic ecosystems not only benefit fishers and coastal communities but also provide goods and services at national and global levels, for example, through improved food security and conservation of biodiversity. It is vital therefore to recognize this link and value in real terms the contributions that these communities can make on behalf of everyone.

Economic returns need to derive not just from the provision of aquatic products but from the public goods actions taken by communities in managing aquatic resources, protecting and enhancing aquatic ecosystems, and taking part in ongoing knowledge development about these systems and their role. For fishers, fish farmers and coastal peoples in the front line of climate change, for example, residents of low-lying developing countries and small island states, key actions should include securing resources to:

- fill critical gaps in knowledge to assess the vulnerability of aquatic ecosystems, fisheries and aquaculture to climate change;
- strengthen human and institutional capacity to identify the risks of climate change to coastal communities and fishing industries and implement adaptation and mitigation measures; and
- raise awareness that healthy and productive ecosystems, which arise from well-managed fisheries and aquaculture and careful use of catchments and coastal zones, are a cross-sectoral responsibility.

7

CONNECTING LOCAL INTERESTS TO GLOBAL NEEDS CAN BUILD STRONGER COMMUNITIES WITH SHARED AIMS – WE CAN CREATE NEW PATTERNS OF GLOBAL PARTNERSHIP

Fisheries and aquaculture activities make a minor but still significant contribution to green house gas (GHG) emissions during production operations and the transport, processing and storage of fish and fish products. The primary mitigation route for the sector lies in its energy consumption, through fuel and raw material use and through management of distribution, packaging and other supply chain components. In the fisheries and aquaculture sector, as is the case for the agriculture and forestry sectors, there are many examples of multiple-win measures that can reduce or sequester emissions, enhance adaptation and contribute to food security, rural livelihoods, poverty reduction and environmental services. For aquatic food, the role of aquaculture expansion and the necessary investments and safeguards may also be critical. Geo-engineering and renewable energy approaches may all have interaction/integration opportunities for fisheries and aquaculture. Specific interventions, such as aquaculture of algae and seaweeds to capture carbon in coastal zones and the intensive production of micro-algae for biofuels, are all engaging current interest and could have significant scope for expansion and value generation. While not all of these may prove to be viable or cost-effective, there are essential connections to be made with the needs and interests of aquatic people and communities.

More strategically, ecosystem based management and adaptation options that can both reduce and mitigate climate change, increase food security, benefit health and subsequent productivity and generate jobs and business are of major importance. This is contrary to the perception that mitigation and emission reduction is seen as a cost and not an investment. Improved integrated management of the coastal and marine environments, including protection and restoration of our ocean's blue carbon sinks, provides one of the strongest win-win mitigation efforts known today, as it may provide value-added benefits well in excess of its costs, but has not yet been recognized in the global protocols and carbon trading systems.

CLIMATE CHANGE MITIGATION AND ADAPTATION CAN FIT WITH INCREASED WEALTH THROUGH GOOD STEWARDSHIP – WE SHOULD SUPPORT THESE POSITIVE LINKS

8

The contribution of forests in sequestering carbon is well-known and supported by relevant financial mechanisms. It is equally important to explore options for developing a financial structure for managing the contribution oceans make to reducing CO2 levels, for supporting strategies and approaches for using aquatic systems to enhance mitigation, and for incentivising the potential role of aquatic communities in carrying these out.

The ideal approach, based on the value of carbon potentially able to be sequestered, would be to establish a global blue carbon fund for protection and management of coastal and marine ecosystems and ocean carbon sequestration. With suitable market and valuation structures, blue carbon could be traded and handled in a similar way as green carbon – such as rainforests – and entered into emission and climate mitigation protocols along with other carbon-binding ecosystems.

The creation of a fund of this type could potentially engage private, public and civil society interests and aims, and operate at a range of levels – from supporting regional or national level investment in oceanic/aquatic management strategies, to supporting strategic and specific research on systems, processes and impacts, to creating income flows for specific communities, to building capacity at a range of levels and localized investment in ecosystem protection and enhancement. A number of priorities could be identified, including an action strategy to protect, manage and enhance remaining seagrass meadows, salt marshes and mangrove forests; follow-up measures to address management and enforcement; identify and address threats and constraints which restrict robust recovery potential inherent in blue carbon sink communities; maintain aquatic food and livelihood security by implementing comprehensive and integrated approaches to enhance the resilience of human and natural systems.

A number of beneficial mitigation strategies could be identified, including improving energy efficiency in marine transport, fishing and aquaculture sectors as well as marine-based tourism; sustainable, environmentally-sound aquatic-based production, including algae and seaweed; identifying and curtailing activities that negatively impact the ocean's ability to absorb carbon; ensuring that investments in restoring and protecting the capacity of blue carbon sinks to bind carbon and provide food and incomes is prioritized in a manner that also promotes business, jobs and coastal development opportunities; catalyzing the natural capacity of blue carbon sinks to regenerate by managing coastal ecosystems to promote rapid growth and expansion of seagrass, mangroves and salt marshes.

ACTIONS FOR A BLUE CARBON FUND

- Within international instruments on climate change, create mechanisms to allow the future use of carbon credits for marine and coastal ecosystem carbon capture and effective storage as acceptable metrics become available.
- Establish baselines and metrics for future environmentally sound aquatic carbon capture and sequestration.
- Consider establishment of enhanced coordination and funding mechanisms.
- Upscale and prioritize sustainable, integrated and ecosystem-based coastal/aquatic zone planning and management, especially in hotspots within the vicinity of blue carbon sinks to increase the resilience of these natural systems and maintain food and livelihood security from the oceans.

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A GLOBAL 'BLUE CARBON' FUND WILL CREATE A VITAL DYNAMIC FOR CHANGE AND FOR BUILDING AND APPLYING INVESTMENT AT ALL LEVELS – WE CAN CONNECT PRIVATE, PUBLIC AND CIVIL SOCIETY INTERESTS AND AIMS

The Global Partnership for Climate, Fisheries and Aquaculture (PaCFA), comprising 20 IGOs, NGOs and CSOs, was borne from a mutual desire to draw together potentially fragmented and redundant climate change activities through a multi-agency global programme of coordinated actions and the pressing need to raise the profile of fisheries, aquaculture and aquatic systems in the UN Framework Convention on Climate Change (UNFCC) negotiating process. PaCFA recognizes that many governmental, non-governmental and civil society organizations have become actively engaged in the search for improved knowledge of the likely impacts of climate change on fisheries and aquaculture and providing assistance to countries and communities to develop adaptation and mitigation policies and strategies within their own development plans. However, these actions tend to take place in isolation from each other with a minimum of communication, sharing of experiences and cooperation. The role of PaCFA is to increase the effectiveness of these actions through increased collaboration, complementing mandates and capabilities of each organization and maximizing the effectiveness of joint efforts.

PaCFA OFFERS THE GLOBAL COMMUNITY A VOICE TO STRENGTHEN AND SAFEGUARD OUR COMMON GOALS FOR THE WORLD'S OCEANS AND AQUATIC ECOSYSTEMS – WE CAN GAIN BY SHARING, ACTING AND INFORMING TOGETHER

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