# Impacts of climate change on aquaculture and fisheries



### Presentation outline

- Introduction: ICAFIS
- Fisheries sector in Vietnam
- Climate Change impacts, policies and initiatives in Vietnam
- Developing a project to address CC adaptive activities in the fisheries sector

### **ICAFIS**

- Registered (March 2010) as a non-profit org. but with strong links with the Government
- Sustainability arm of the Vietnam Fisheries Society (VINAFIS)
  - >800 local branches
  - 34,000 members (farmers/fishers)
- Global focus, capacity building, research....



# The aquaculture sector in Vietnam

#### **Production**

2,671,800 Tonnes (FAO )2010

#### Consumption

Apparent per-capita 17.2 kg/year

### **Employment**

Livelihood for > half million people

### Inland fisheries in the Delta

- 40% to the country's inland capture fisheries nearly 850,000 t/yr (based on consump. est.)
- The bulk of it being from the floodplains of the Delta
- Fishery mainly artisanal and more intense in the flood period (seasonality)
- Mainly non-mainstream
- Livelihoods, food security, generating revenue
- Used also for aquaculture (feed)
- Impact from CC very difficult to predict

# Climate Change: What impact?

- 1. Temperature increase of +1.1°C by 2100
- 2. Increase average sea surface temperature
- Sea level rise at least +0.6m by 2100
- 4. Marine primary productivity +0.7-8.1% by 2050
- Increase ocean acidification due to CO2
- Impacts on freshwater systems (reduced water levels and flow rates)
- Increase in water run-off
- Intensification extreme weather events (floods, typhoons)

(IPCC, 2007; Nicholls et al., 2007; FAO, 2009; Nellemann et al., 2009)

# The impact of CC on fisheries

Water temperature increase by +1.1°C Shift distribution of many fish and by 2100 shellfish Change in ocean fish productivity Sea level to rise at least +0.6m by 2100 → Disappearance of coral reef ecosystems Marine primary productivity (micro organisms) +0.7-8.1% by 2050 Reduced oxygen in the oceans Increased ocean acidification Possible impact on fisher's safety at sea and livelihoods Impacts on freshwater systems (reduced water levels and flow rates). Shrinking of inland waters Intensification of extreme weather Salinization of river basins events Changes in rainfall and run-off. Impact on inland fisheries

(IPCC, 2007; Nicholls et al., 2007; FAO, 2009; Nellemann et al., 2009; SPC, 2008; Daw et all, 2009)

## The impacts of CC on aquaculture

Direct

Indirect

Impacts

(Daw et al., 2009; De Silva, 2010 modified)

#### Physical change

Sea level rise Salinity intrusion Ocean currents Temperature rise Ocean acidification

River flows

Rainfall patterns

Storm severity

Wave surges

Coastal erosion

Droughts

Enhanced stratification

Production and yield (+/-)

Stress on CaCO3 organisms (shellfish)

New diseases

Increased diseases susceptibility

Physical damage

Changes in spawning patterns

Fish kills (from upswellings)



Economic viability

Social impact

Fish oil & meal supply
Trash fish supply
Reduction in productivity

Loss of farming sites

Loss of livelihoods/increased vulnerability

Increased competition for scarce resources

+: increased growth rates
Food conversion efficiency
Decrease of some existing diseases (WSD)
Extended growing season



# F/A impacts on CC

F/A make a minor, but still significant contribution to global greenhouse gas (GHG) emissions throughout the sectors' supply chain

(FAO, 2009)

#### **Fisheries**

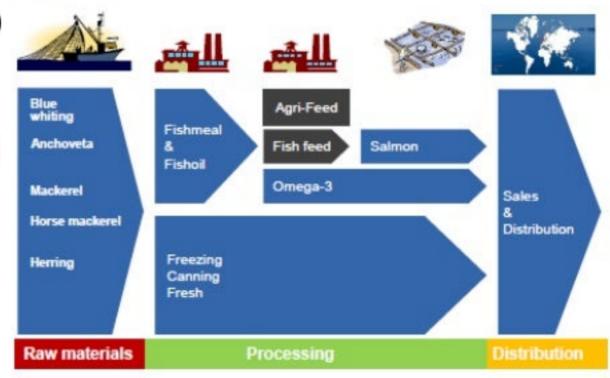
- Fuel inefficient fishing methods
- Emissions associated with trading products worldwide, including air freight and shipping

#### Aquaculture

- Carbon footprint is lower than other farmraised protein industry e.g. livestock
- LCA: shrimp farming produces 11,10 kg CO2/kg
- •Tilapia, carps, bivalves 1.67, 0.80, 0.01 kg CO2/kg

(Davies, 2010)

#### Value Chain



# **Economic impact**

#### Capture fisheries

- Global annual loss in landed value between US\$ 17 and 41 bln (World Bank, 2010)
- Mostly in LDCs countries (Allison et al, 2009)

#### Aquaculture

- No global data
- Vietnam with +1m slr scenario:
  - 11% of the population affected especially in Mekong and Red River Deltas
  - impact on 7% of agriculture land
  - reduce GDP by 10%
  - Pangasius industry reduction in margins US\$ 145,000/ha by 2020
  - Shrimp profit fall by US\$ 6,500/ha in 2020, and by US\$ 47,500/ha in 2050

(Dasgupta et al, 2007, Kam et al, 2010)