Strengthening Adaptive Capacities to the Impacts of Climate Change in Resource-poor Small-scale Aquaculture and Aquatic Resources-dependent Sector in the South and South-east Asian Region

Aqua Climate

Aqua Climate

Development of methodology for assessing vulnerability and developing adaptation strategies for small-scale aqua farmers in Asia

Why?

"Those who carry almost zero responsibility for climate change are bearing the brunt of its effects widening the gaps between the haves and have-nots"

Quote from UNDP

Why focus on small scale?

- 80 % of all aquaculture is undertaken in Asia
- The vast majority of aquaculture production is undertaken by small-scale farmers with less than 1 ha of ponds.
- Small-scale farmers have very little financial capacity to invest in new adaptive strategies

Project goal and objectives

Goal

- To identify and demonstrate the potential of integrated adaptation strategies to sustain small-scale aquatic farming systems under different climate change scenarios.

Objectives

- Assess the impacts and vulnerability of climate change (environmental and socio-economic) in selected aquaculture systems
- Explore potential adaptive measures to address CC impacts
- Determine awareness/knowledge level, perceptions of risks, attitudes of farmers towards perceived risks from climate change
- Develop guidelines for policy measures and decision support tools
- Develop wider awareness of the results by publishing and disseminating through various sources and networks

Partners and Case studies

Network of Aquaculture Centres in Asia-Pacific (NACA) **(Coordinator)**

- Akvaplan-niva (APN), Norway;
- BioForsk, (BF), Norway;
- Kasetsart University (KU), Thailand;

Country case studies and local partners

- **India**- **Extensive shrimp poly culture in ponds.** Central Institute of Brackishwater Aquaculture,
- **Philippines – Semi-intensive milkfish in ponds.** Bureau of Fisheries and Aquatic Resources,
- **Sri Lanka – Tank based fisheries.** University of Kelaniya,
- **Vietnam – Intensive catfish in ponds.** Can Tho University,
- **Vietnam – Semi-intensive shrimp in ponds.** Research Institute for Aquaculture 2,

Study Approach

Recommendations, Guidelines, Briefs

Present adaptation Meas.
- Farmer
- Science and Technology
- Policy and Institutions

Future adaptation Meas.
- Farmer
- Science and Technology
- Policy and Institutions

Develop adaptation measures

Prioritise Risks

Present Risks

Future Risks

Sensitivity
- Crop production
- Economic
- Socio-economic

Present Exposure
- Temperature
- Rainfall
- Sea Level Rise

Future Exposure
- Temperature
- Rainfall
- Sea Level Rise

Small scale farmer

Methodology – stakeholder data collection

- Farmer Focus Group meetings
  - Crop calendars
  - Seasonal calendars
  - Risk assessment
- Stakeholder workshops
  - Farmers
  - Science and Technology
  - Institutions
- Stakeholder panel consultation
- Questionnaire development and data collection (100 to 200 per case study)

Capture and document farmer's perceptions and knowledge

- Climate scenarios present 2020 and 2050 and impacts

Focus group meetings discussions

A focus group of 8 - 10 farmers (random sampling) who represented fish farmers in different locations of the study area, from different age groups, varied experience in farming) and owning farms of different sizes.

The meetings took place close to the farms in their own setting

The aim was to

- Identify their perceptions of climate change
- Develop crop calendars
- Develop seasonal calendars
- Undertake risk assessment of the present climate impacts

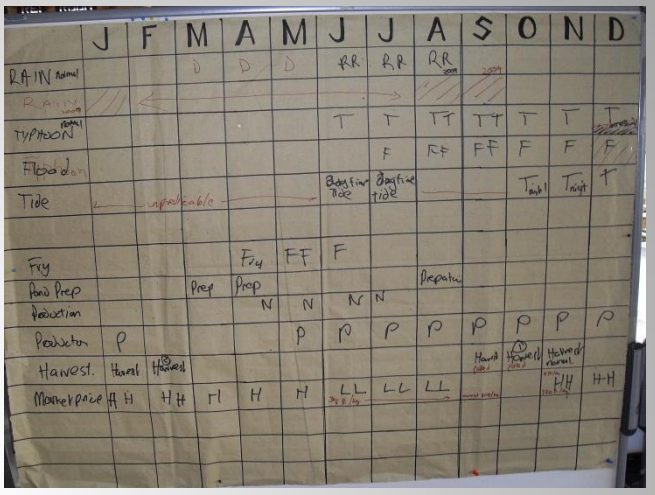
Farmer focus group discussions
Dumangas, Philippines

Farmer focus group discussions
Gullalamoda, India

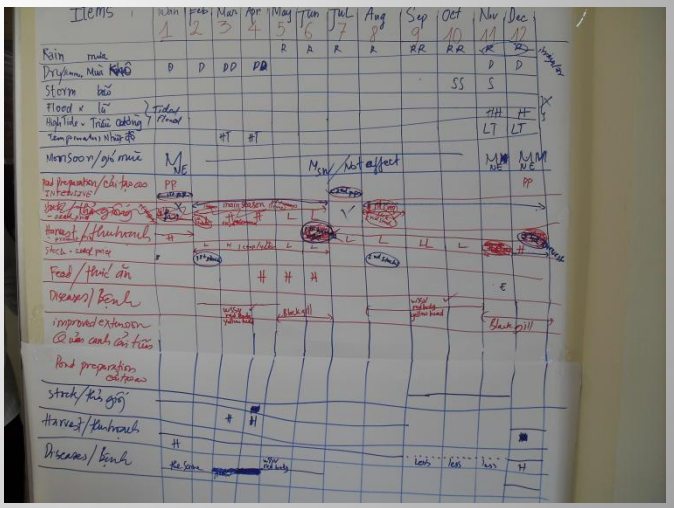
Seasonal and crop calendars

Objectives

- To identify periods of
  - Climate stress, risk, hazards, etc.
  - Production stocking, harvesting, diseases, , etc
- To identify vulnerable periods
- To analyze changes in seasonal activities
- To understand coping strategies
- To evaluate the climate information for planning potential avoidance of risk periods



Seasonal and crop calendar
Dumangas, Philippines



Seasonal and crop calendar
Ca Mao, Vietnam

Risk assessment

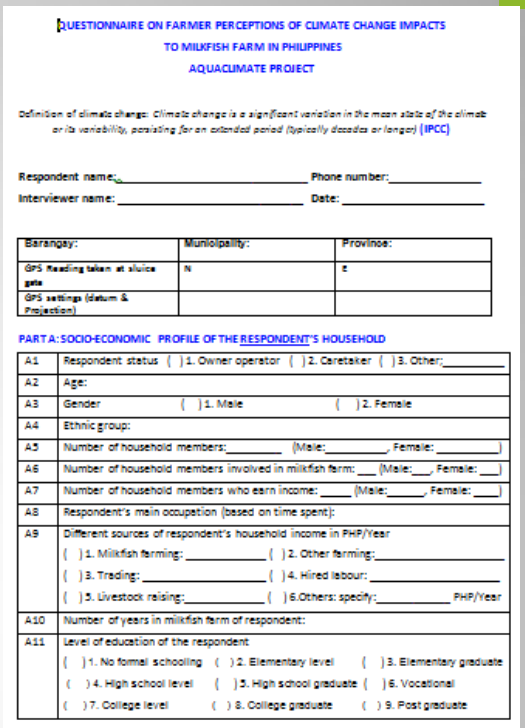
- **Risk** – The chance of something happening that will have an impact upon successful commercial production. It is measured in terms of consequence and likelihood;
- **Consequence** – The outcome or impact of an event expressed quantitatively, ranging from 5. Catastrophic to 1. insignificant or positive;
- **Likelihood** – Used as a general description of probability or frequency. Can be expressed quantitatively from 5. Almost certain to 1. Rare;

Consequence Likelihood	1. Insignificant	2. Minor	3. Moderate	4. Major	5. Catastrophic
5. Almost Certain	5 = Medium	10 = Medium	15 = High	20 = Extreme	25 = Extreme
4. Likely	4 = Low	8 = Medium	12 = High	16 = High	20 = Extreme
3. Possible	3 = Low	6 = Medium	9 = Medium	12 = High	15 = High
2. Unlikely	2 = Low	4 = Low	6 = Medium	8 = Medium	10 = Medium
1. Rare	1 = Low	2 = Low	3 = Low	4 = Low	5 = Medium

Questionnaire

- Developed a 10 page questionnaire for farms in each case study
- Tested questionnaire on a small sample and revised
- Undertook questionnaire interviews on 200 farms (over1,000 in total)
  - Farmer and farm information
  - Farm location GPS reading
  - Farm productivity information
  - Economic information
  - Socio-economic information
  - Perception of climate change and impacts
  - Facilitating and enabling agencies

Quantitative data / outputs



QUESTIONNAIRE ON FARMER PERCEPTIONS OF CLIMATE CHANGE IMPACTS
TO MILKFISH FARM IN PHILIPPINES
AQUACLIMATE PROJECT

Definition of climate change: Climate change is a significant variation in the mean state of the climate or in variability, persisting for an extended period (typically decades or longer) (IPCC)

Respondent name:_____ Phone number:_____
Interviewer name: _____ Date: _____

Barangay:	Municipality:	Province:
GPS Reading taken at sluice gate	N	E
GPS settings (datum & Projection)		

PART A: SOCIO-ECONOMIC PROFILE OF THE RESPONDENT'S HOUSEHOLD

A1	Respondent status ( ) 1. Owner operator ( ) 2. Caretaker ( ) 3. Other:_____
A2	Age:
A3	Gender ( ) 1. Male ( ) 2. Female
A4	Ethnic group:
A5	Number of household members:_____ (Male:_____, Female: _____)
A6	Number of household members involved in milkfish farm: ___ (Male:___, Female: ___)
A7	Number of household members who earn income: ____ (Male:____, Female: ___)
A8	Respondent's main occupation (based on time spent):
A9	Different sources of respondent's household income in PHP/Year ( ) 1. Milkfish farming: _____ ( ) 2. Other farming:_____ ( ) 3. Trading: _____ ( ) 4. Hired labour: _____ ( ) 5. Livestock raising:_____ ( ) 6.Others: specify:_____ PHP/Year
A10	Number of years in milkfish farm of respondent:
A11	Level of education of the respondent ( ) 1. No formal schooling ( ) 2. Elementary level ( ) 3. Elementary graduate ( ) 4. High school level ( ) 5. High school graduate ( ) 6. Vocational ( ) 7. College level ( ) 8. College graduate ( ) 9. Post graduate

Testing the questionnaire, Vietnam

Stakeholder workshop – present climate change

Facilitated stakeholder workshop format

- Presentation of background information
- Stakeholders divided into 3 groups
  - Farmers
  - Scientists and Academics
  - Representatives from Institutions, Government, NGOs, etc.
- Identify present issues
- Prioritise present issues
- Identify potential solutions and measures
- Identify responsibilities
- Estimate timescale to implement

Stakeholder workshop, Can Tho, Vietnam

Predict future climate change

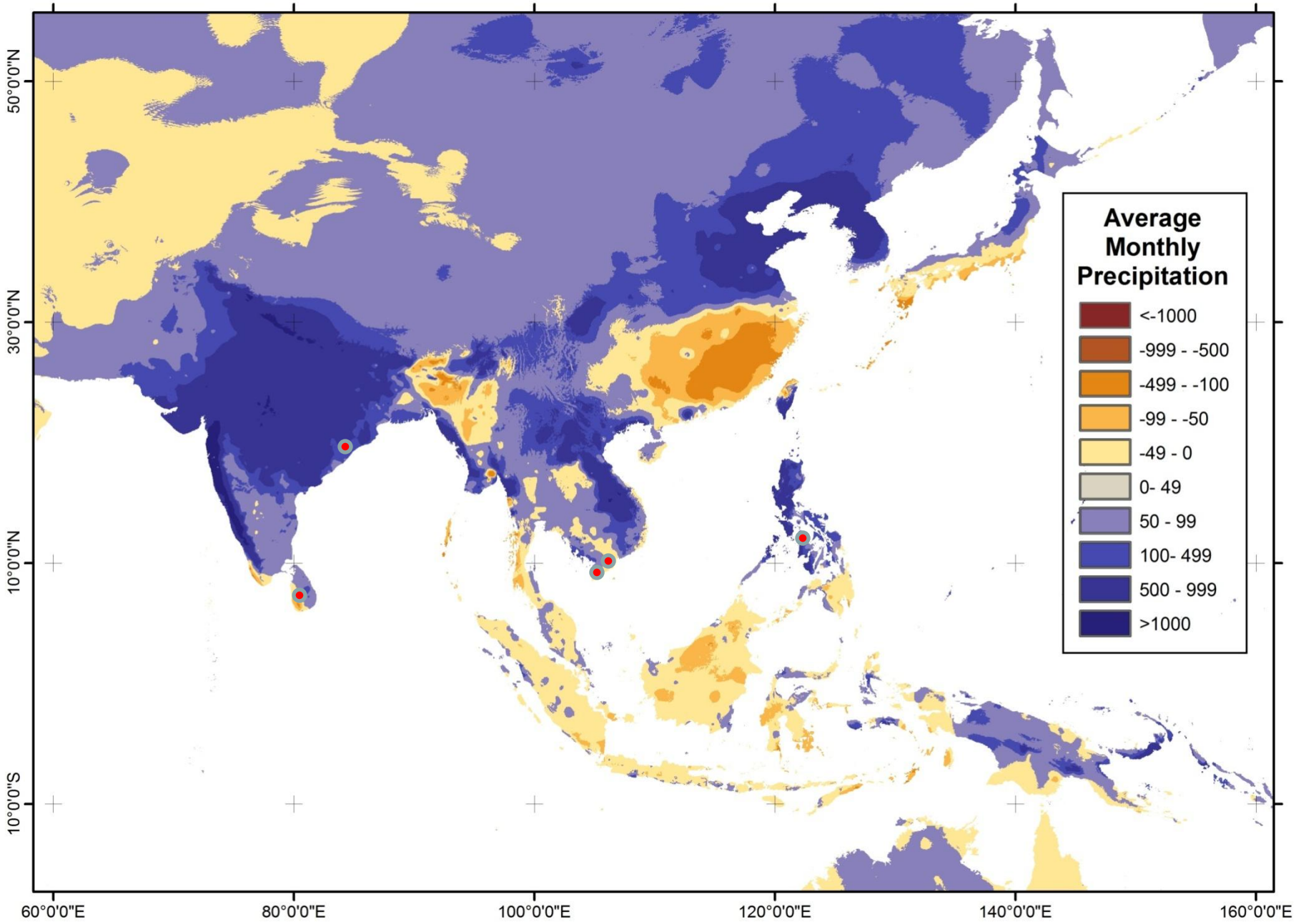
The output from the downscaled CSIRO climate model and A2 scenario was converted to GIS and used to predicted future Climate Change for the 4 case study areas at the time scales **Present, 2020 and 2050**.

Climate changes that were considered included;

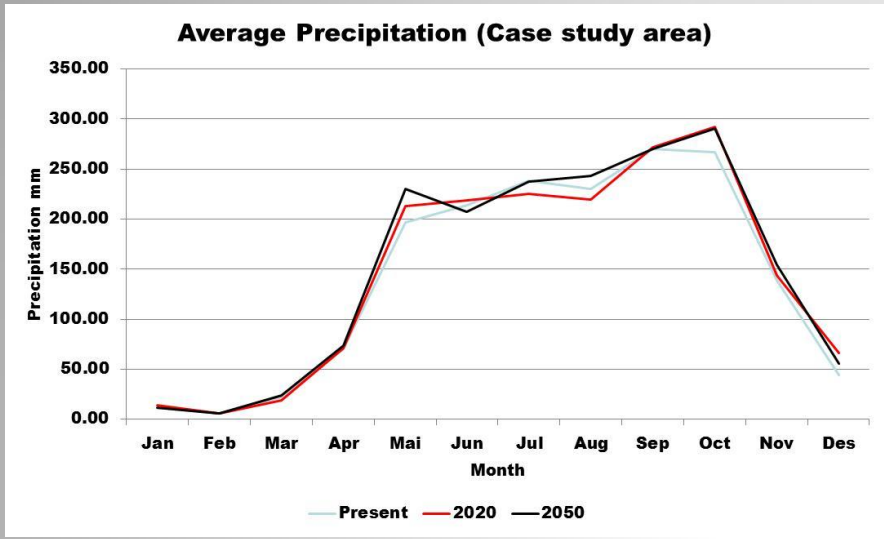
- **Temperature** change and seasonal patterns
  - minimum average monthly temperature
  - maximum average monthly temperature
- **Precipitation** change and seasonal patterns for the
  - Case study areas indicating precipitation at the farm ponds
  - River water shed area indicating potential change in river flows
- **Sea Level Rise** (linked to topography)
- **Storm surge risk** (linked to fetch)

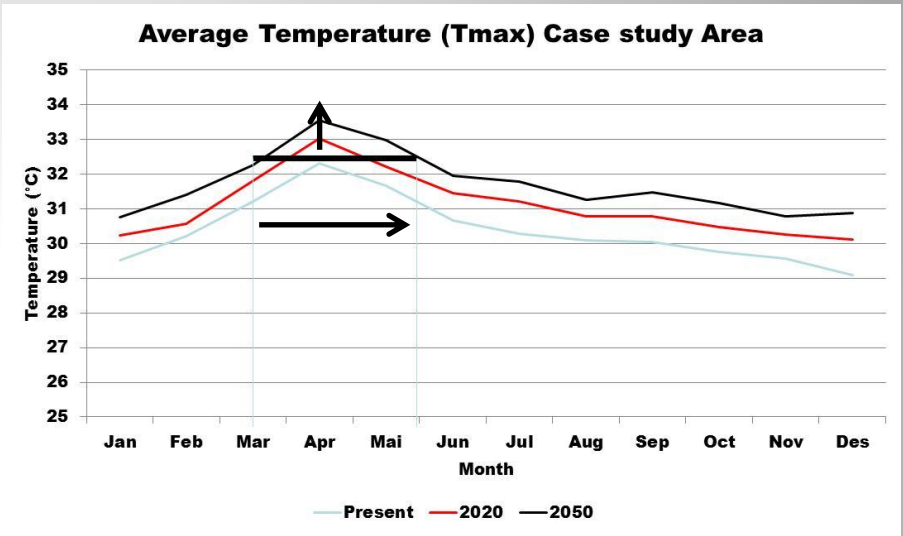
Projected Precipitation from CSIRO_A2a Model. June

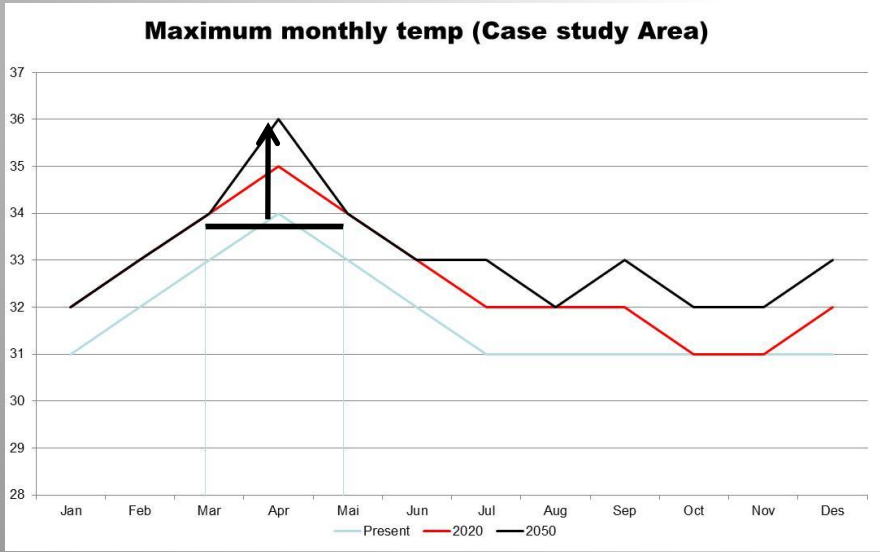
Change in precipitation from present to 2020 Positive values increase in precipitation, negative values decrease in precipitation

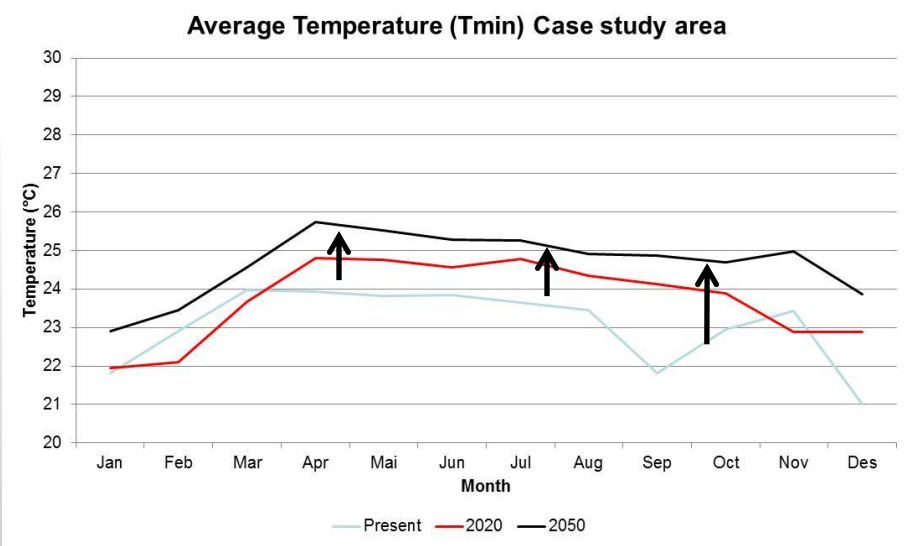


Vietnam Pangasius case study









Methodology - Analysis of information

- Analysis of
  - focus group meetings,
  - stakeholder workshops
  - questionnaires
- Stakeholder mapping and analysis
  - Primary and secondary stakeholders
  - Importance and influence
- Institutional mapping and analysis
  - Importance and influence
- Stakeholder workshop on future scenarios

Stakeholder workshop - future

Facilitated stakeholder workshop format

- Presentation of background information
- Stakeholders divided into 3 groups
  - Farmers
  - Scientists and Academics
  - Representatives from Institutions, Government, NGOs, etc.
- Identify future issues
- Prioritise future issues
- Identify future potential solutions and measures
- Identify responsibilities
- Estimate timescale to implement

Stakeholder workshop, Can Tho, Vietnam

Stakeholder mapping and analysis

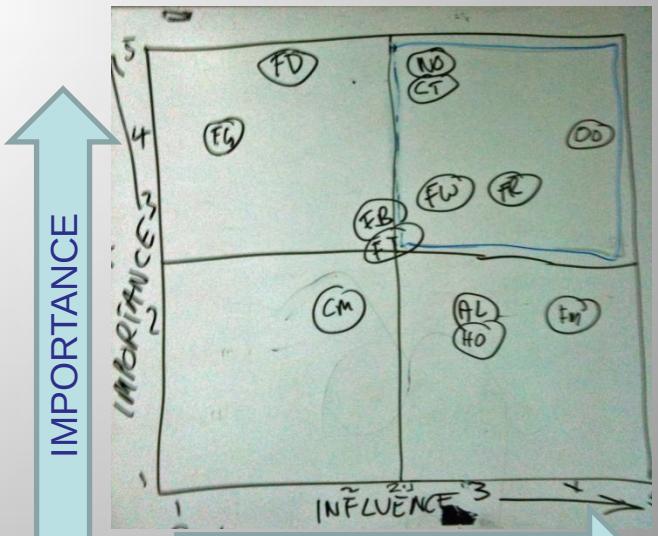
Mapping and analysis of stakeholders (person or organization who can be positively or negatively impacted by, or cause an impact).

Types of stakeholders are:

- Upstream, production and downstream (value chain)
- **Primary stakeholders** : are those ultimately affected, either positively or negatively by Climate Change.
- **Secondary stakeholders** : are the 'intermediaries', that is, persons or organizations who are indirectly affected by Climate Change.

- **Key stakeholders** : Identify key stakeholders who have significant influence or importance.

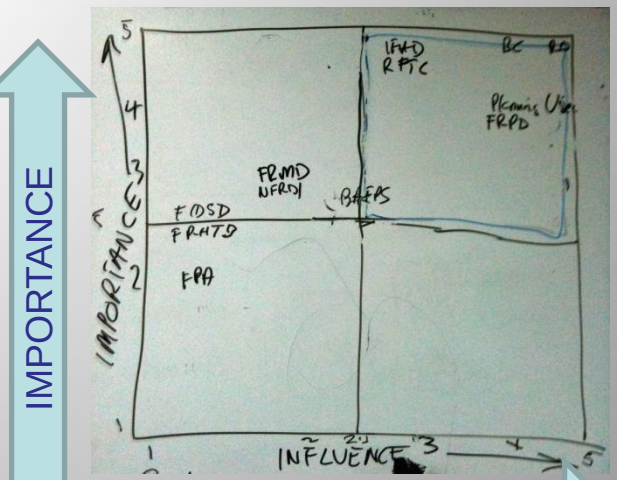
Stakeholder mapping and analysis, Philippines



Institutional mapping and analysis

- Identification of Institutions play a critical role in supporting or constraining people's capacity to adapt to climate change.
- Assess the importance and influence of each institution
- **Key institutions** : Identify key institutions who have significant influence or importance, who are effective to the farmers and who could assist in implementing adaptation measures.

Institutional analysis, Philippines



Main project outputs

- Assessment of the adaptive capacity
- Present and future adaptation measures
- Policy briefs and guidelines
  - Policy,
  - Science and technology
  - farmer
- Case study e-reports
- Description of methodology used
- Dissemination, sharing knowledge and networking
- NACA website links to reports

Policy Briefs

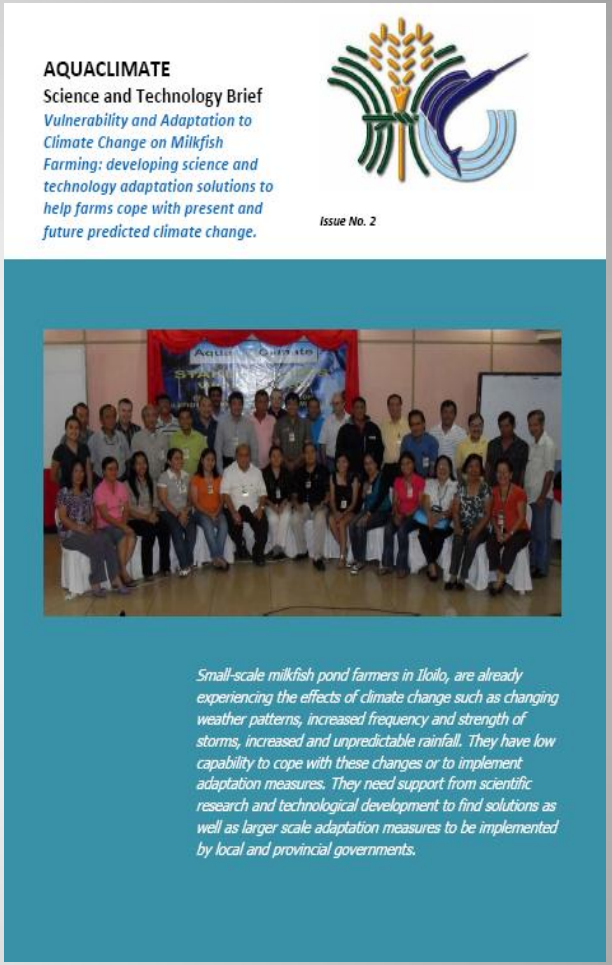
- For Policy makers to make well-informed decisions, short, and concise briefs that quickly and cogently relay the important policy facts, questions, and arguments about an issue.
- The policy brief concludes with policy recommendations

Policy recommendations

Measures	Milkfish	Catfish	Shrimp, Vietnam	Shrimp, India
Weather forecasting	Early warnings at Barangay level	Early warnings at kommene level	Early warnings at kommune level and environ.monitoring	Timely warnings
Training	Climate school CC scenarios, models etc.	Pond designs, new systems etc	Two stage training Sustainable practices	Opt feeding, water management
Credit and crop insurance	Improve	Improve	Improve	Improve
Better coordination	PDDRM	DARD	DARD, Shrimp cooperatives	NacSa
Women's role	Adaptation (coastal restoration,	Accounting, processing Training, research	Accounting, processing, farm operations, training , research	Processing, training, research
Research	NFRDI, NIFTDC, SEAFDEC	CTU (new strains, poly culture, salinity)	RIA2	CIBA
Infrastructure	ICRMP	Canal and farm bund repairs	Canals and flows	Dredging, deepening, Farm bunds repair

Science and Technology Briefs

- Scientific research and technology development can play a strong role to support farmers in developing new adaptation measures.
- Recommendations on research and technology development that can be undertaken by Universities, Government research institutions
  - effect of temperature on breeding and fry fitness
  - selective breeding of temperature tolerant stains
  - research on the effect on pond primary productivity



Science and technology adaptation measures

Science and Technology	Philippine Milkfish	India shrimp	Viet Nam Shrimp	Vietnam catfish
Pond productivity				
Selective breeding or selection for tolerance				
Mangrove locations and species suitability				
Monitoring disease and pests				
Training and awareness				
Lessons learned				
Improving fish/shrimp productivity				
Better Management Practices				
Intensification				
Improve pond design				
Site zoning				
Improve water management				

Farmer technical briefs

- Farmers are already dealing with Climate Change and adapting the farming method and technology
  - They are able to cope with slow changes
  - They are unable to cope with rapid changes
- However, climate changes will be come stronger and more extreme in the future.
- These briefs recommend the adaptation measures that the farmer can take in the future to cope with the predicted future climate.
- How the farmers can help themselves


AQUACLIMATE
FARMER BRIEF
Vulnerability and Adaptation to Climate Change on Milkfish Farming: building farmer resilience to climate change and developing adaptation measures the Philippines
Issue No. 5
Small-scale milkfish pond farmers in Iloilo are already experiencing the effects of climate change such as changing weather patterns, increased frequency and strength of storms, increased and unpredictable rainfall. They have low capability to cope with these changes or to implement adaptation measures. To reduce their vulnerability, they first need to increase profitability which would then allow them to make the necessary adaptation measures to cope with the predicted climate changes. They also need support from scientific research and technological development to find solutions as well as larger scale adaptation measures to be implemented by local and provincial governments.

Farmer technical adaptation measures

Farmer technical adaptation	Philippines Milkfish	India Shrimp	Viet Nam shrimp	Viet Nam catfish
Strengthening dykes				
Improve pond fertilisation				
Nets on the top of dykes				
Install wave breakers				
Install intensification equipment				
Use electricity				
Buffers between farms				
Collective planning				
New species				
Additional fruit and vegetables				
Improve water exchange				
Improve sediment management				
Improve feed and feeding				
Use quality seed				
Stabilise water quality				

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Thank you