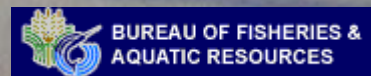
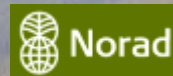


AQUA PARK

Planning and management of
aquaculture parks for
sustainable development of
cage farms in the Philippines

www.aqua-park.asia



AquaPark Project Activities to date

- Environmental surveys (Panabo, Sual and Quezon Province)
- Identification of stakeholder issues
- Production survey
- Wave modeling for new expansion area
- Sediment impact modeling
- Mooring design
- Oil spill contingency
- Better Management Practices
- Economic survey
- Socio-economic survey

AquaPark Activities for the next year

- Development of a MP Framework
- Better Management Practices
 - LGU
 - Operators
- Oil spill contingency plan for Panabo MP
- Capacity building BFAR & NIFTDC for GIS and wave modelling
- Production optimisation
- Integrated Multi-trophic aquaculture

AquaPark follow-on from EMMA 2

- This proposal is a follow-on from EMMA.
- EMMA project developed environmental monitoring surveys methodology and carrying capacity model for of 3 aquaculture areas in the Philippines that were at risk from fish kills.
- The project donated the necessary equipment and trained staff in survey methodology, data collection and analyses of data.

AquaPark Objectives

- Existing mariculture parks
 - calculate sustainable aquaculture carrying-capacity for these zones,
 - Recommend cost effective design of moorings and cages
 - develop guidelines for good aquaculture practice in these zones
 - Strengthen the planning and management of mariculture parks
 - Recommend optimal business model for Mariculture Parks

AquaPark Objectives

- Re-organisation of existing aquaculture areas into parks
 - Assess the possibility and methodology of reorganising existing aquaculture production into aquaculture parks
 - Assess carrying capacity
 - Assess present production
 - Assess most suitable sites
 - Discuss with stakeholders and LGUs on best way to organise the production to relocate to mariculture park area

AquaPark Objectives

- New areas
 - Develop the methodology to identify new aquaculture zones using
 - Wave modelling
 - Classification of site exposure
 - GIS
 - Recommend optimal mix of multitrophic integrated aquaculture
 - Fish
 - Mollusc
 - seaweed

AquaPark Objectives

To provide the local, regional and central Government of the Philippines the tools for planning responsible and sustainable cage culture.

- Site selection
- Carrying capacity
- Cage design
- Integrated aquaculture

Case studies

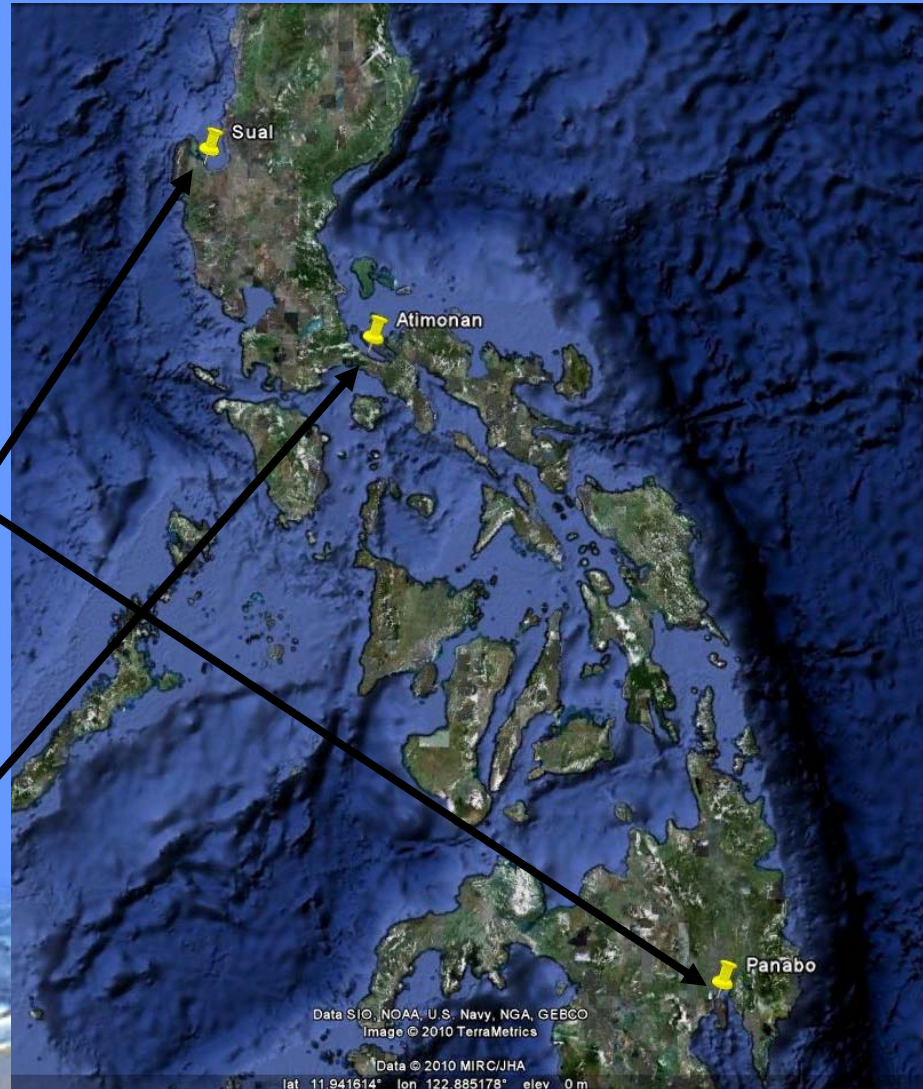
The project will select three case study areas:

- existing mariculture park area
- existing aquaculture production area that could be incorporated into a mariculture park
- new area identified for aquaculture development

Case study sites

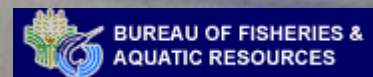
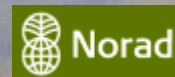
The project will select three case study areas:

- Panabo - existing mariculture park area
- Sual - existing aquaculture production area that could be incorporated into a mariculture park
- Quezon Province - new area identified for aquaculture development



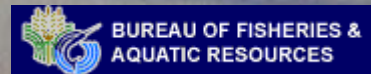
AquaPark Outputs

- Site selection criteria using modelling and GIS
- Carrying capacity estimation
- Integrated Multi-trophic aquaculture planning
- Socio-economic analysis (positive and negative impacts)
- Financial analysis (operator, LGU, Mariculture Park and regional differences)

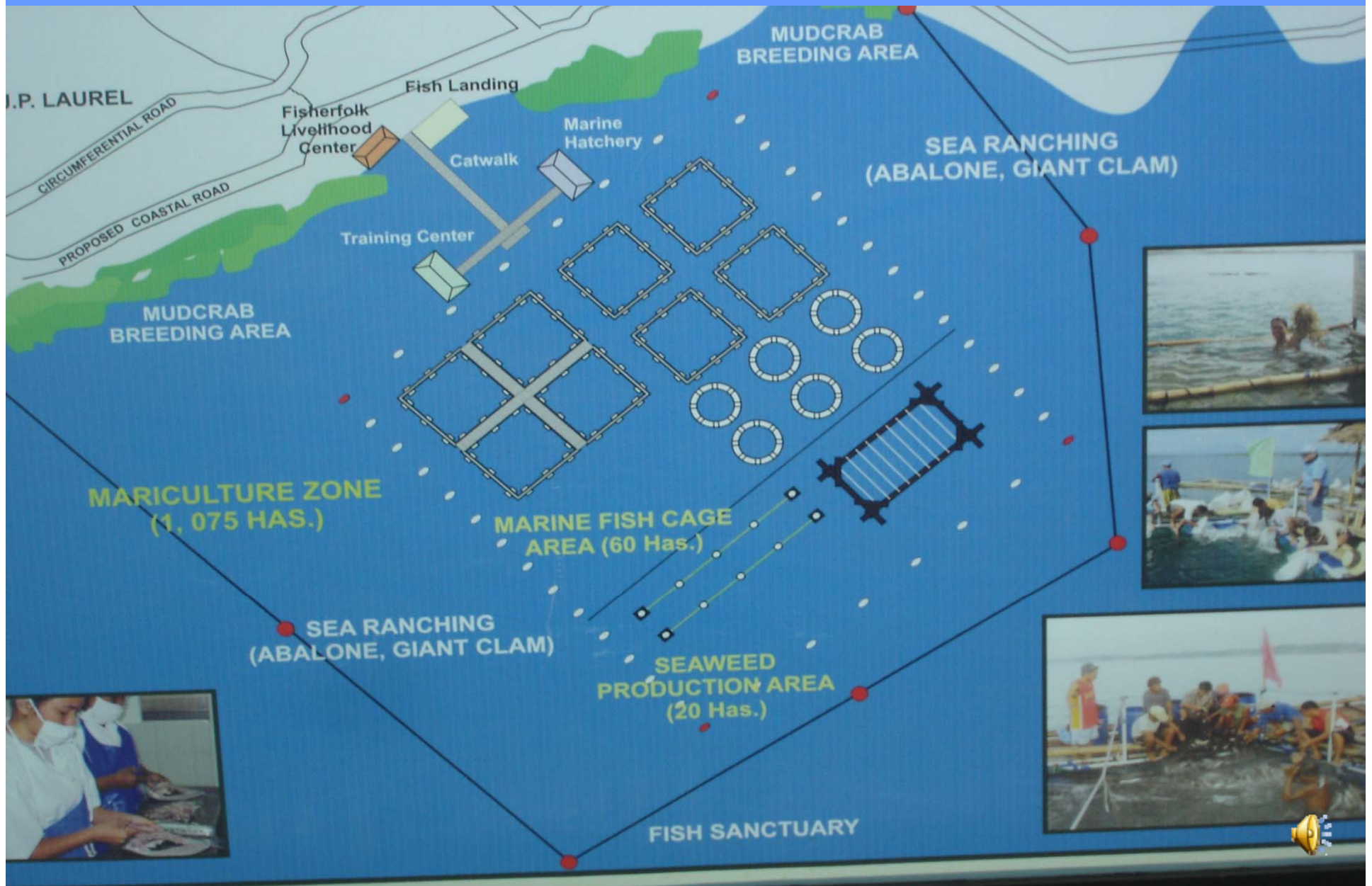


AquaPark Outputs (secondary)

- Mariculture Park Planning Framework
- Better Management Practices
- Improved mooring design
- Oil Spill Contingency planning



LAYOUT PLAN OF PCMP



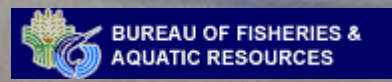
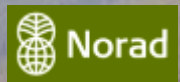


© 2010 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2010 GeoEye
Image © 2010 TerraMetrics
7°17'03.35" N 125°42'08.36" E elev 0 m

©2010 Google™

Eye alt 3.36 km

AquaPark Mid-term meeting - interim results



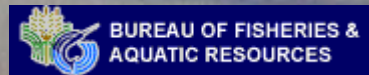
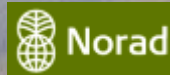
Actual Park

Mar 3, 2010



7°16'57.95" N 125°41'58.35" E elev 0 m

Eye alt 3.61 km



©2010 Google

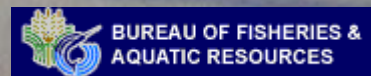
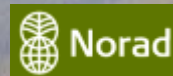
AQUA PARK

**Planning and management of aquaculture parks for
sustainable development of cage farms in the
Philippines**

www.aqua-park.asia

Site selection criteria

**Use of Geographical Information System (GIS)
for objective science based site selection**

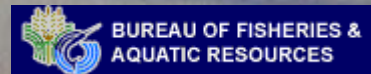


Site selection criteria – Factors to consider

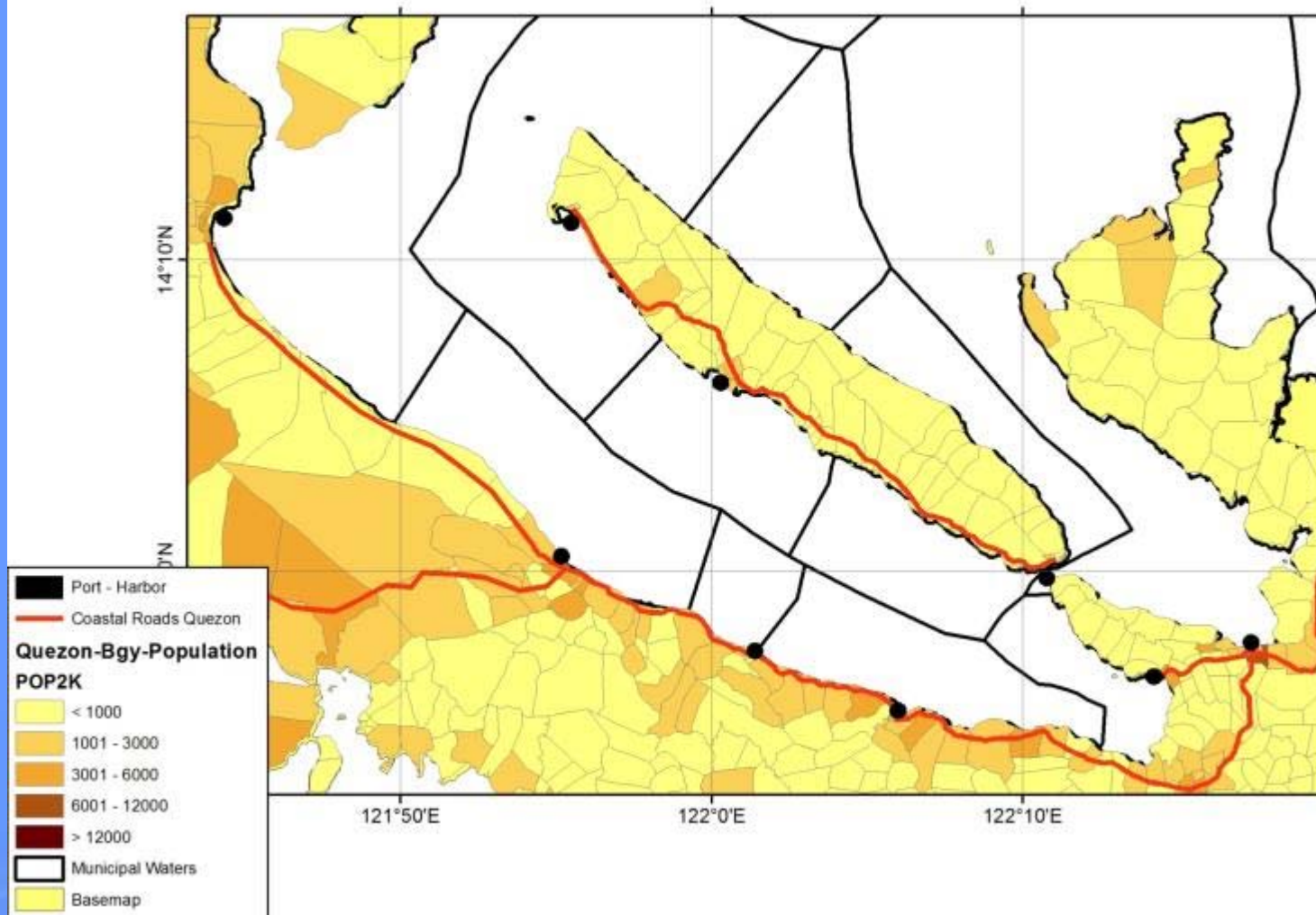
- Conflicting uses of area
- Shore line contour
- Depth profile
- Currents
- Maximum wave height
- Dissolved oxygen concentration
- Pollution (organic and inorganic)
- Phytoplankton and zooplankton occurrence and distribution
- Potential danger of red tides, plankton blooms, biofouling

Site selection criteria – Factor to consider

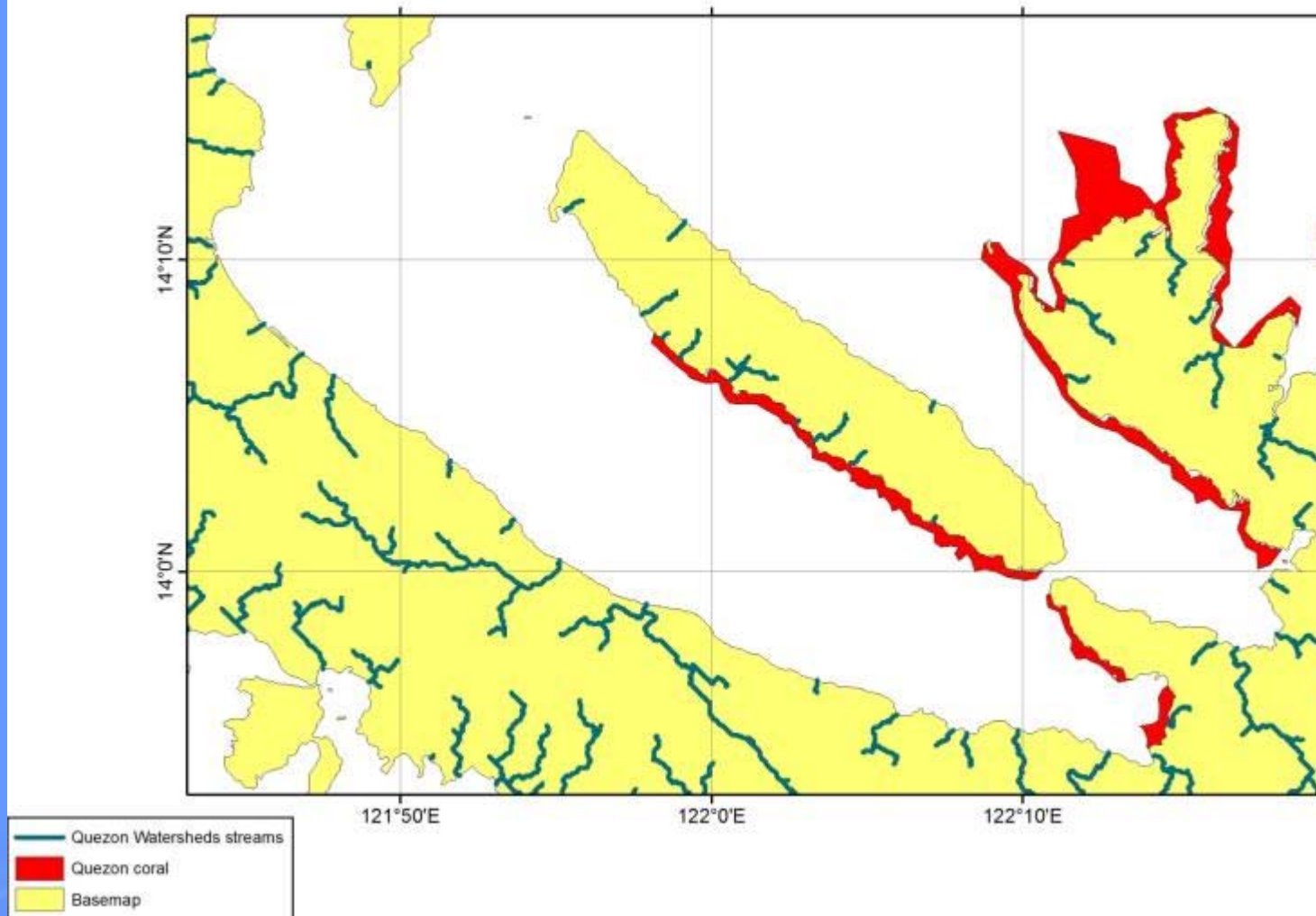
- Flora and fauna studies (indicator organisms)
- Accessibility to the site – roads, transportation, airport, port, etc.
- Infrastructure - facilities, security, communication, electricity, freshwater
- Potential for expansion - availability of adjacent area
- Environmental assessment, monitoring and control – bioremediation and mitigation
- Legal framework – policies, regulations, licenses, permits, concessions, etc.
- Public and government acceptance of project



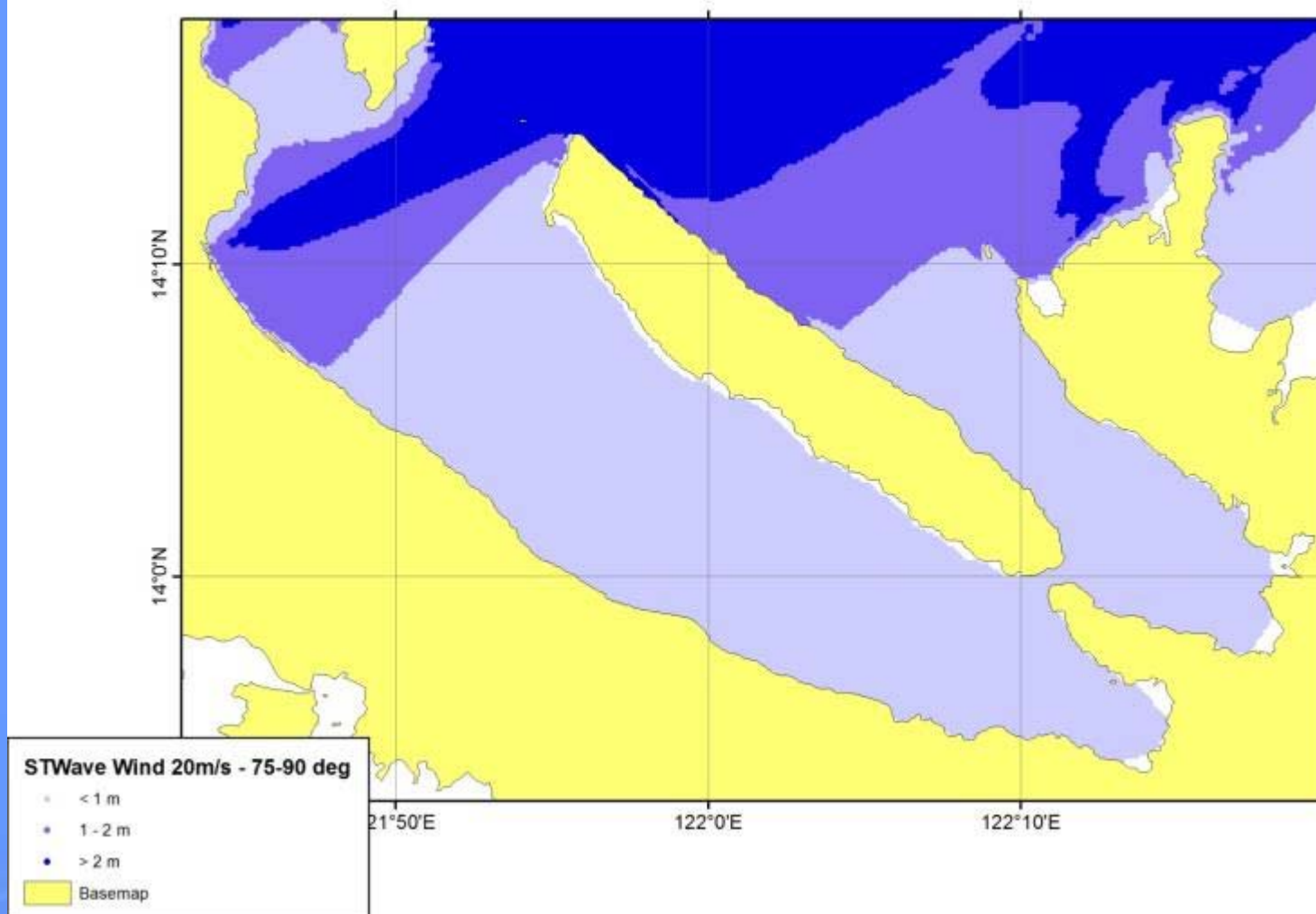
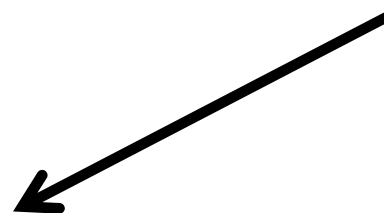
Basemap



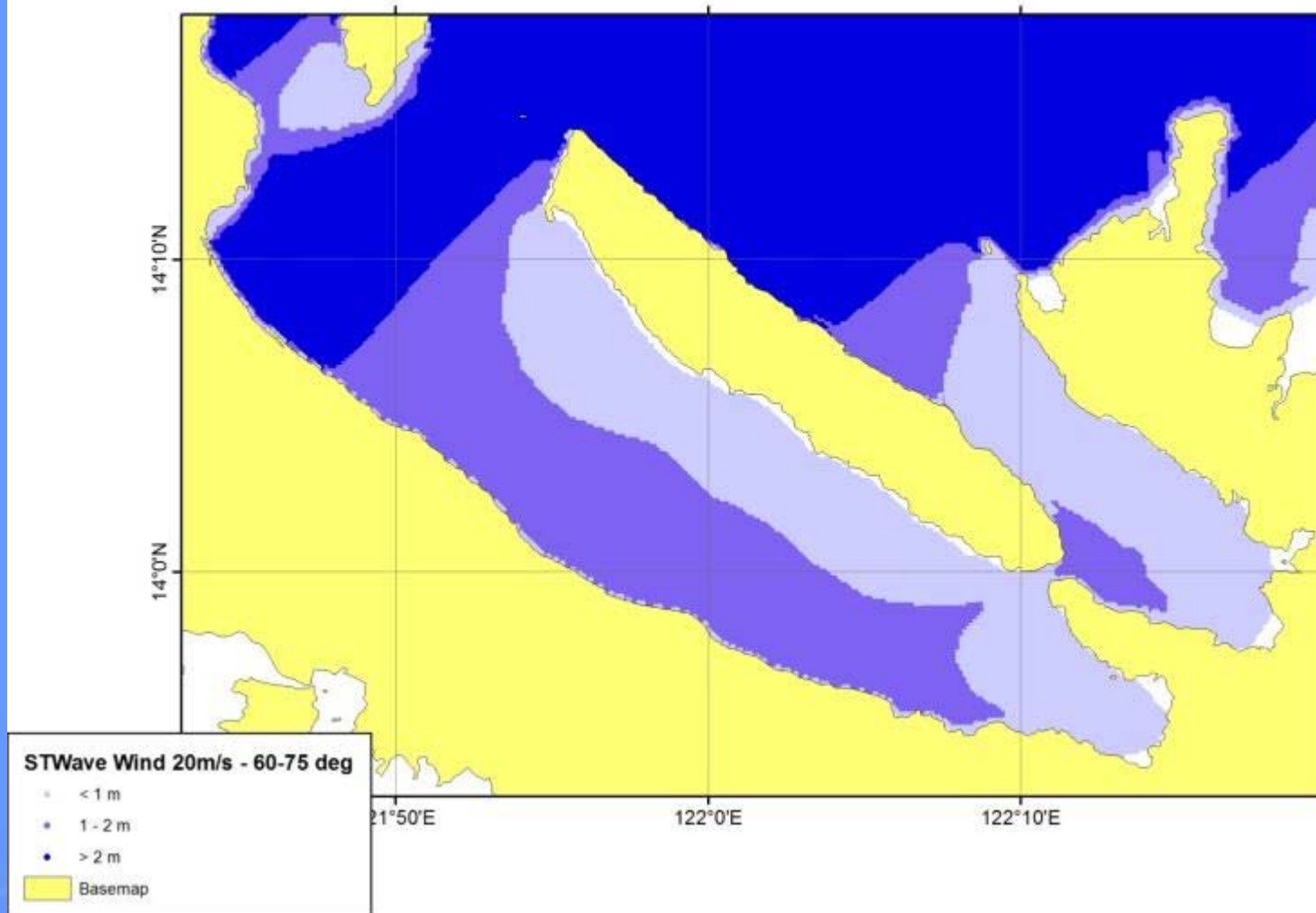
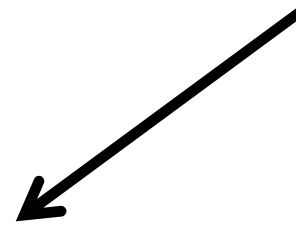
Sensitive areas



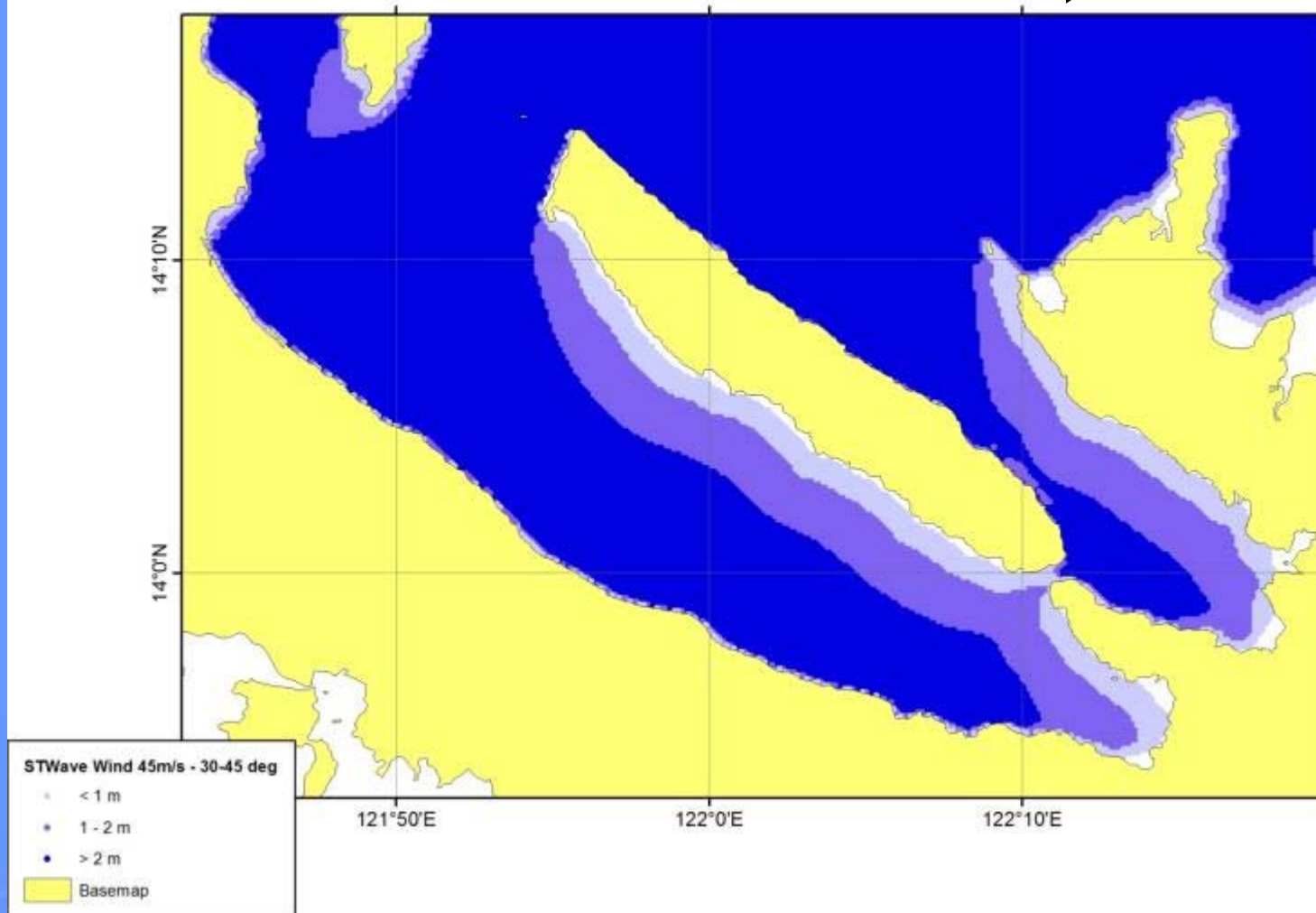
Wave model



Wave model



Wave model

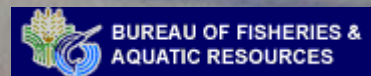
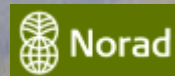


Criteria for cage fishfarming

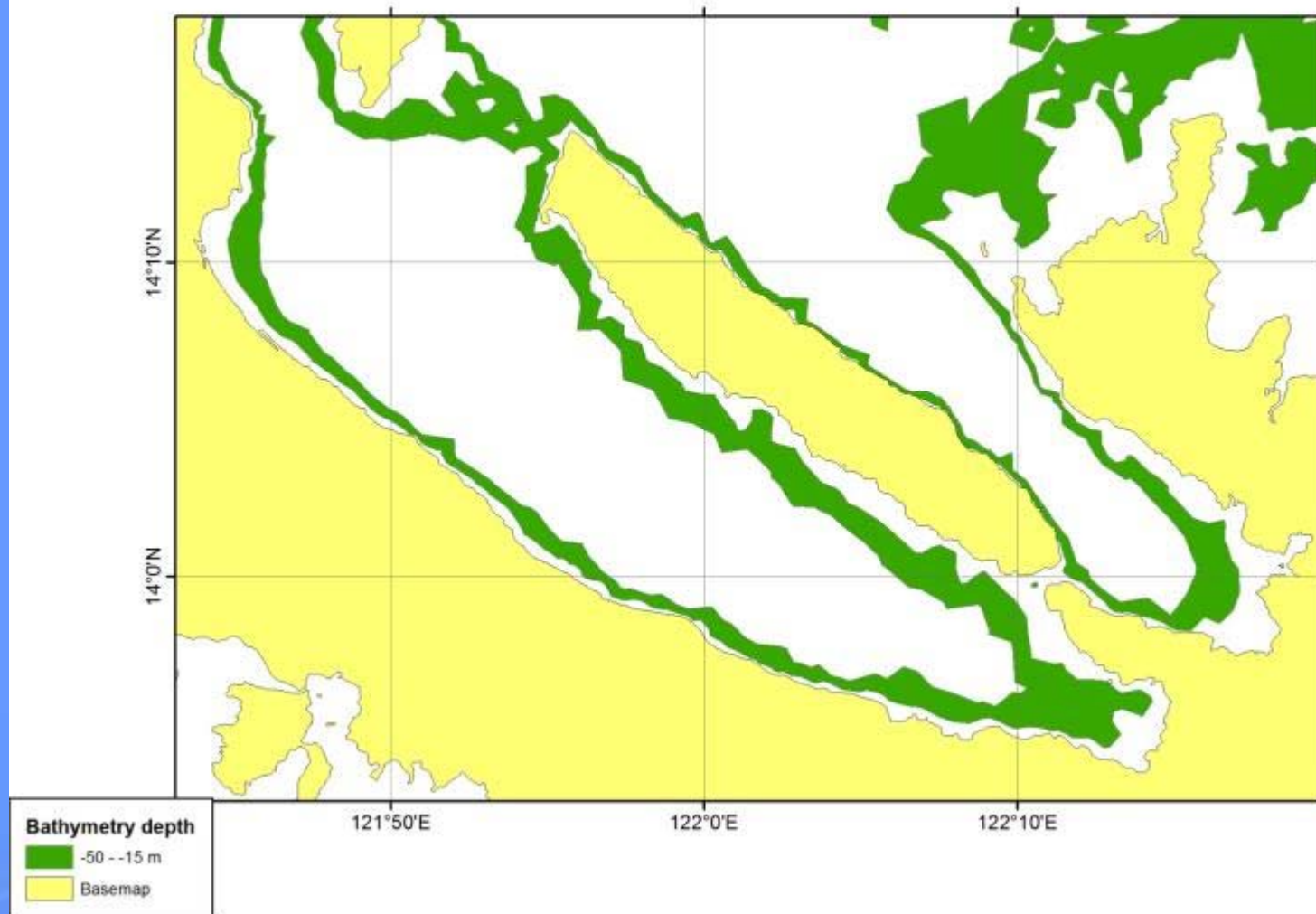
- Suitable depth
 - 15 to 50 m
- Infrastructure
 - Road preferable less than 1 km away

Excluding factors

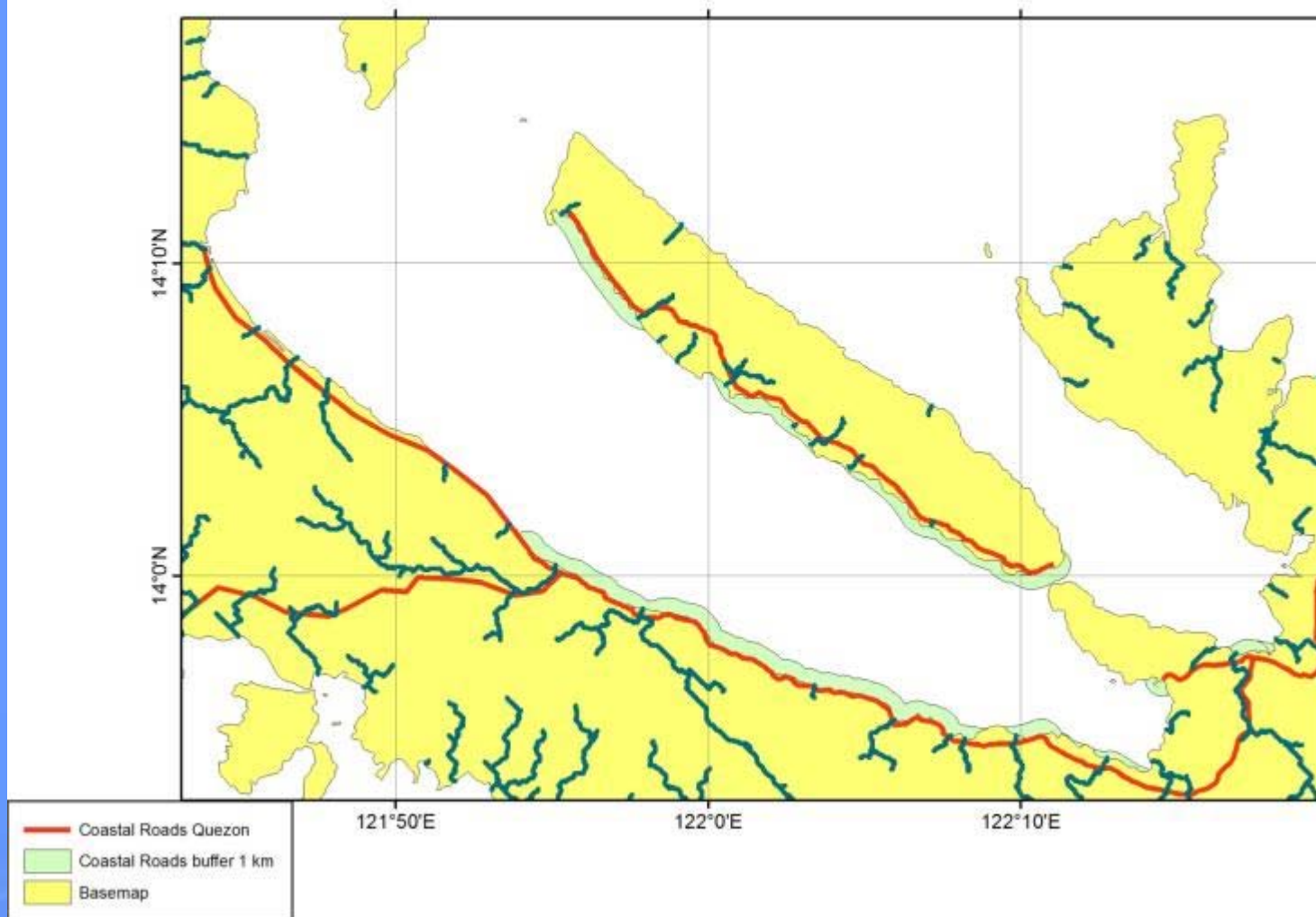
- Wave
 - More than 1 m height
- Rivers
 - Large river 3 km, other river 1,5 km
- Sensitive areas
 - Coral reef 300 m away



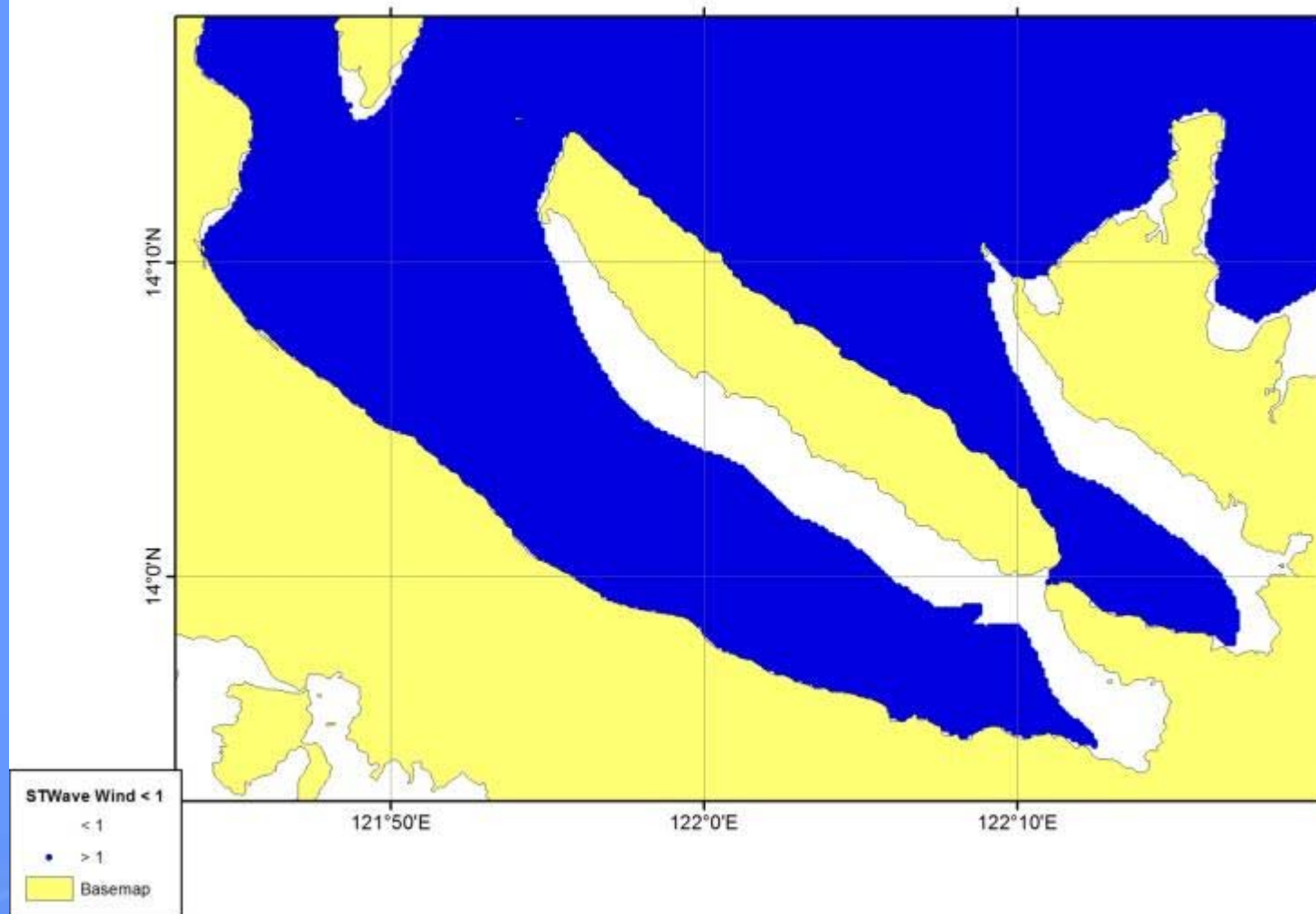
Criteria for mariculture park - depth



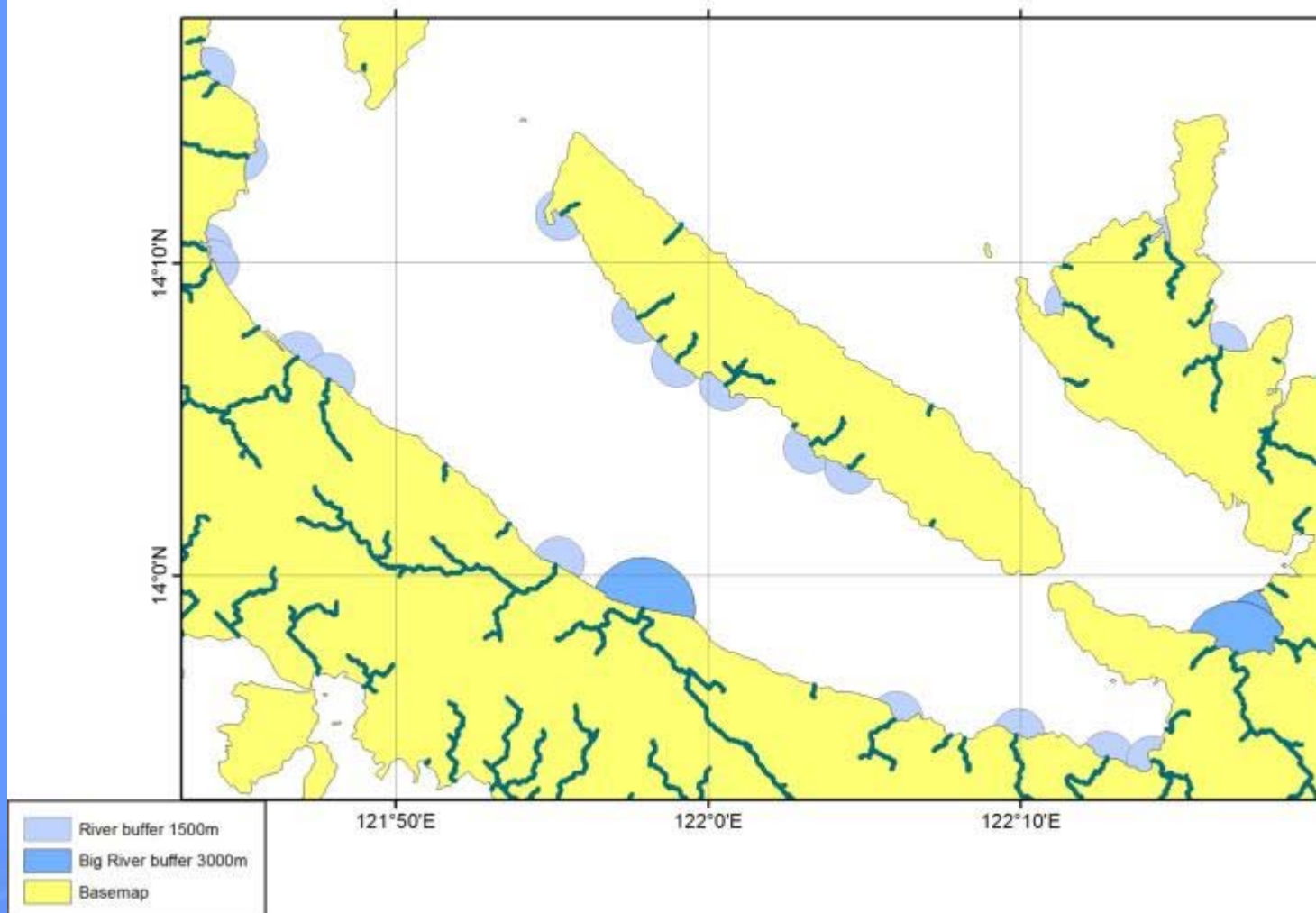
Criteria for mariculture park



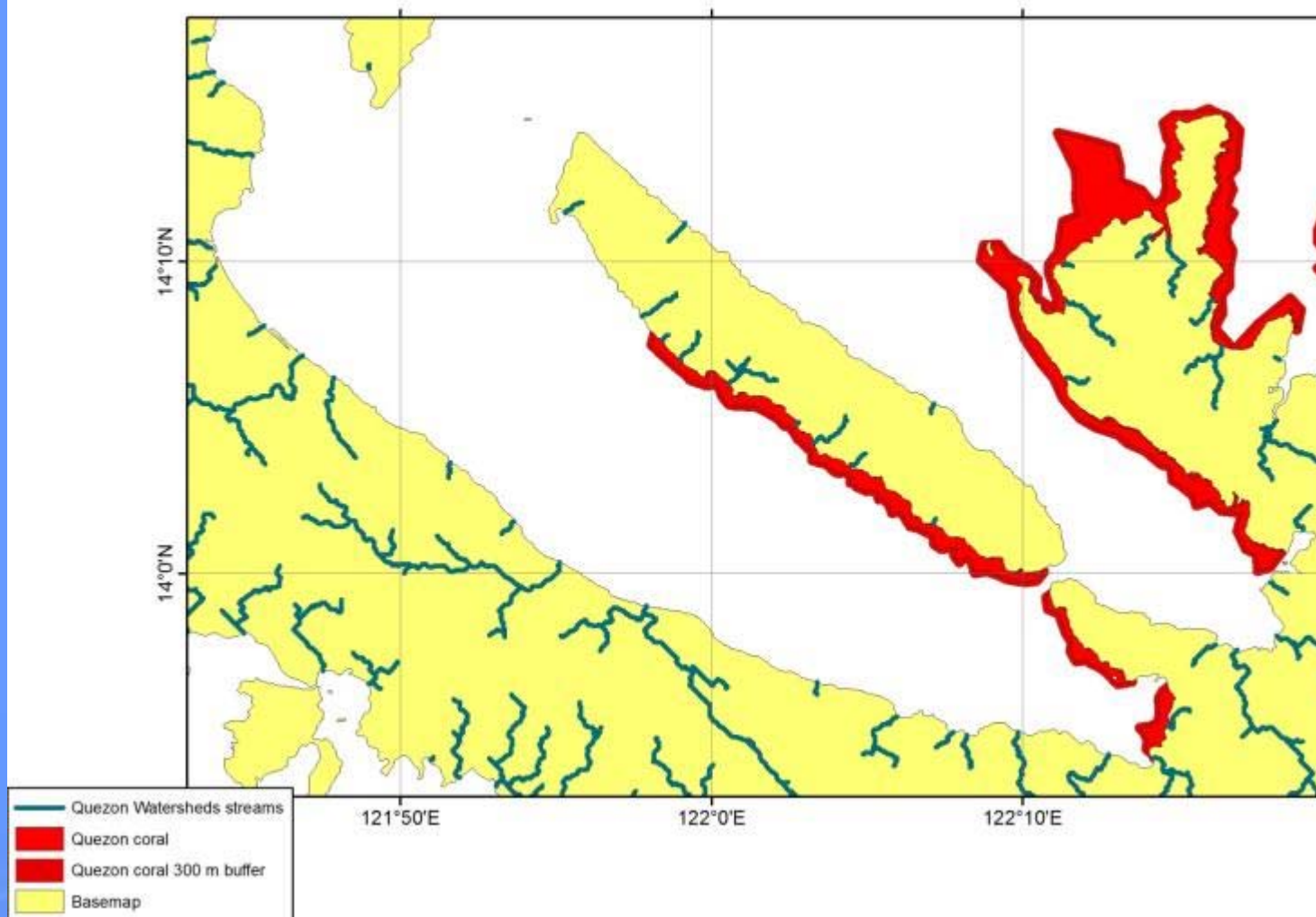
Criteria for mariculture park - waves



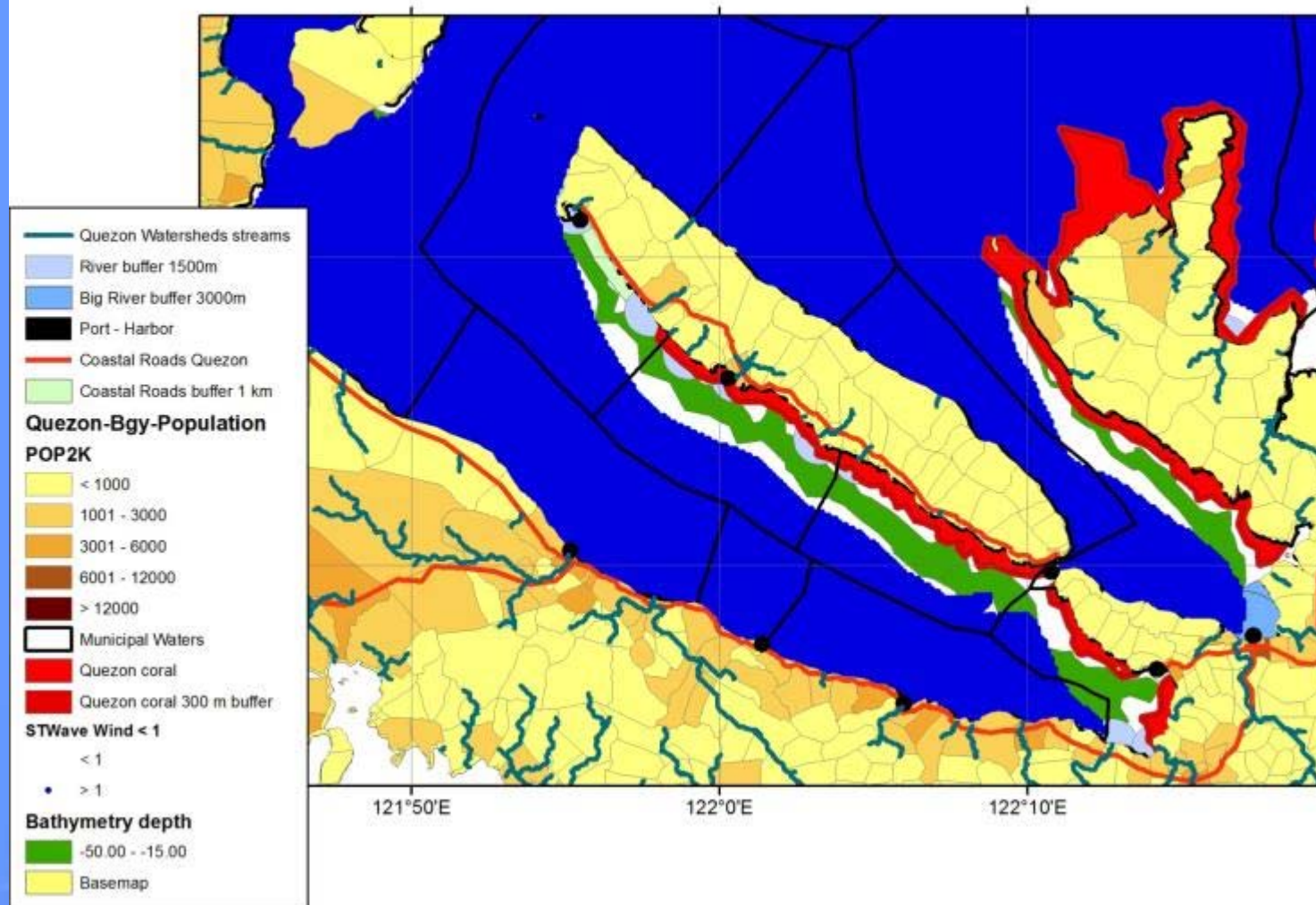
Criteria for mariculture park - rivers



Criteria for mariculture park - corals



GIS result

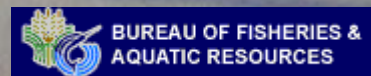
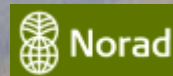


AQUA PARK

**Planning and management of
aquaculture parks for sustainable
development of cage farms in the
Philippines**

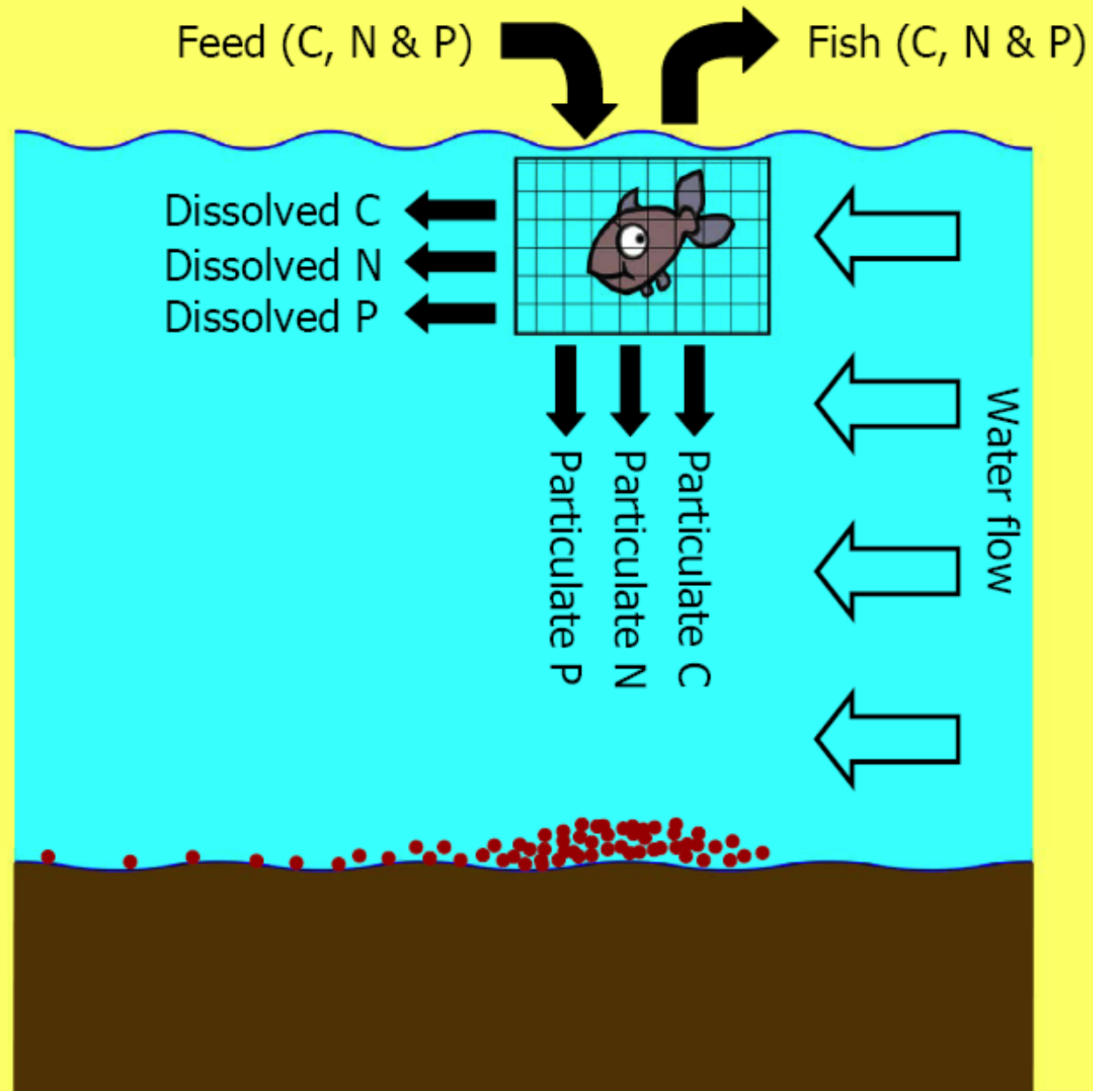
www.aqua-park.asia

Environmental impact

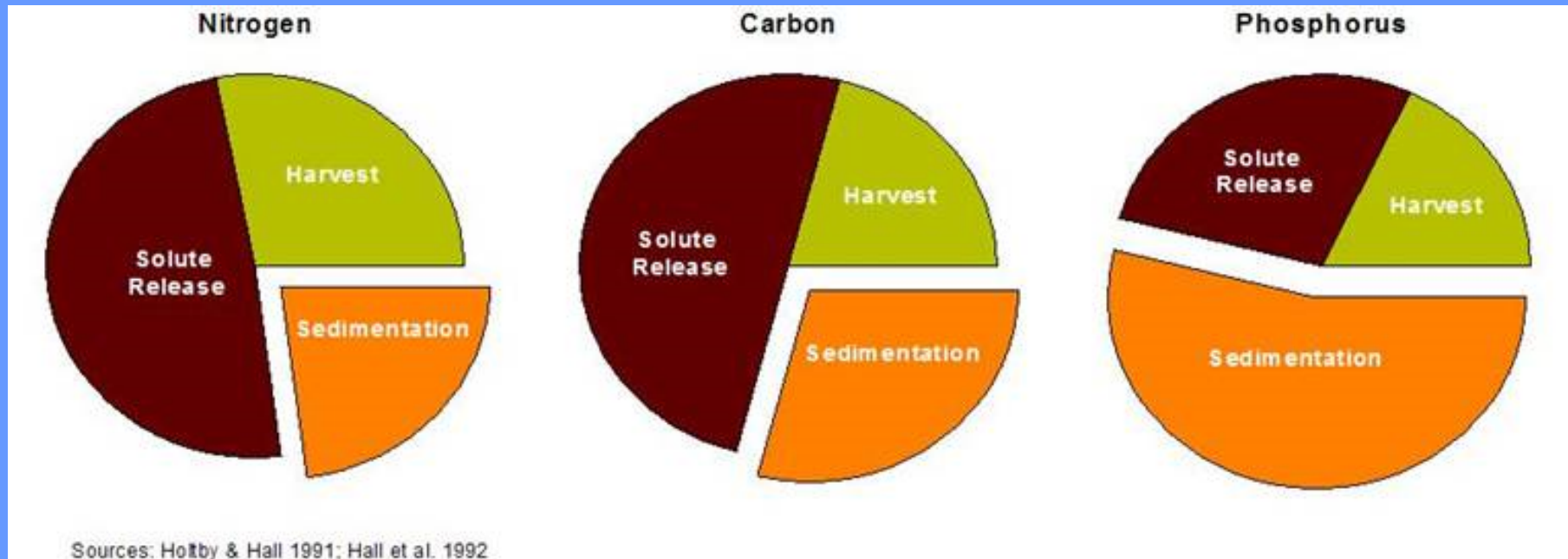


Nutrient balance

Simplified fish farm



Inputs, uptake and outputs



Less than 30 % of inputs are retained by the fish. The remainder go into the environment

Impact on the sediments

- Sustainable levels – slight build up of organic layer on the seabed
- Unsustainable level - Build up of thick organic layer on the sea bed
- Smothering of seagrass
- Smothering of corals

Impact on water column

- Increasing nutrient concentration in the water
- Sustainable levels lead to algae production – zooplankton production – increased wild fishery production
- Unsustainable levels leads to high algae production – algal bloom – algae die off – low/no oxygen – fish kill

Environmental survey - Sual

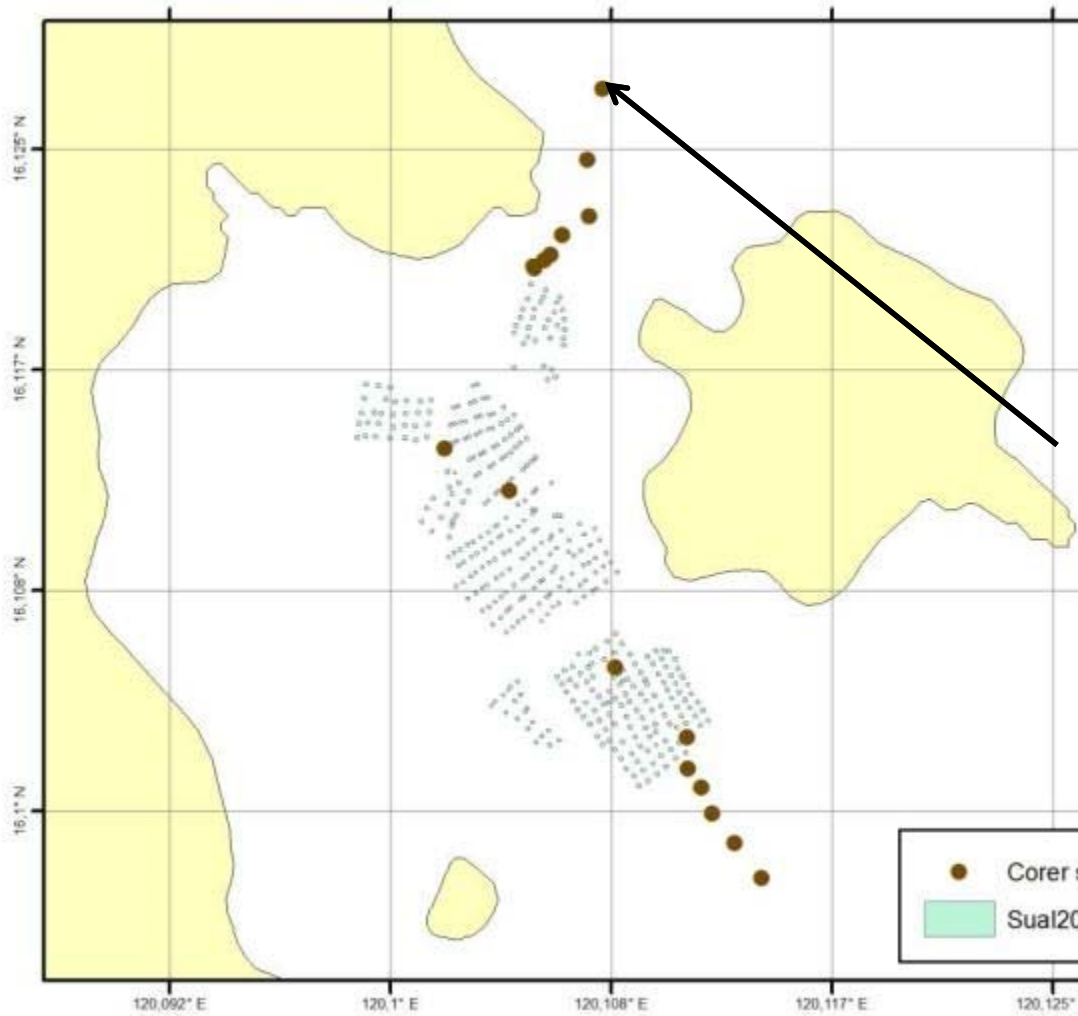


Natural sediment

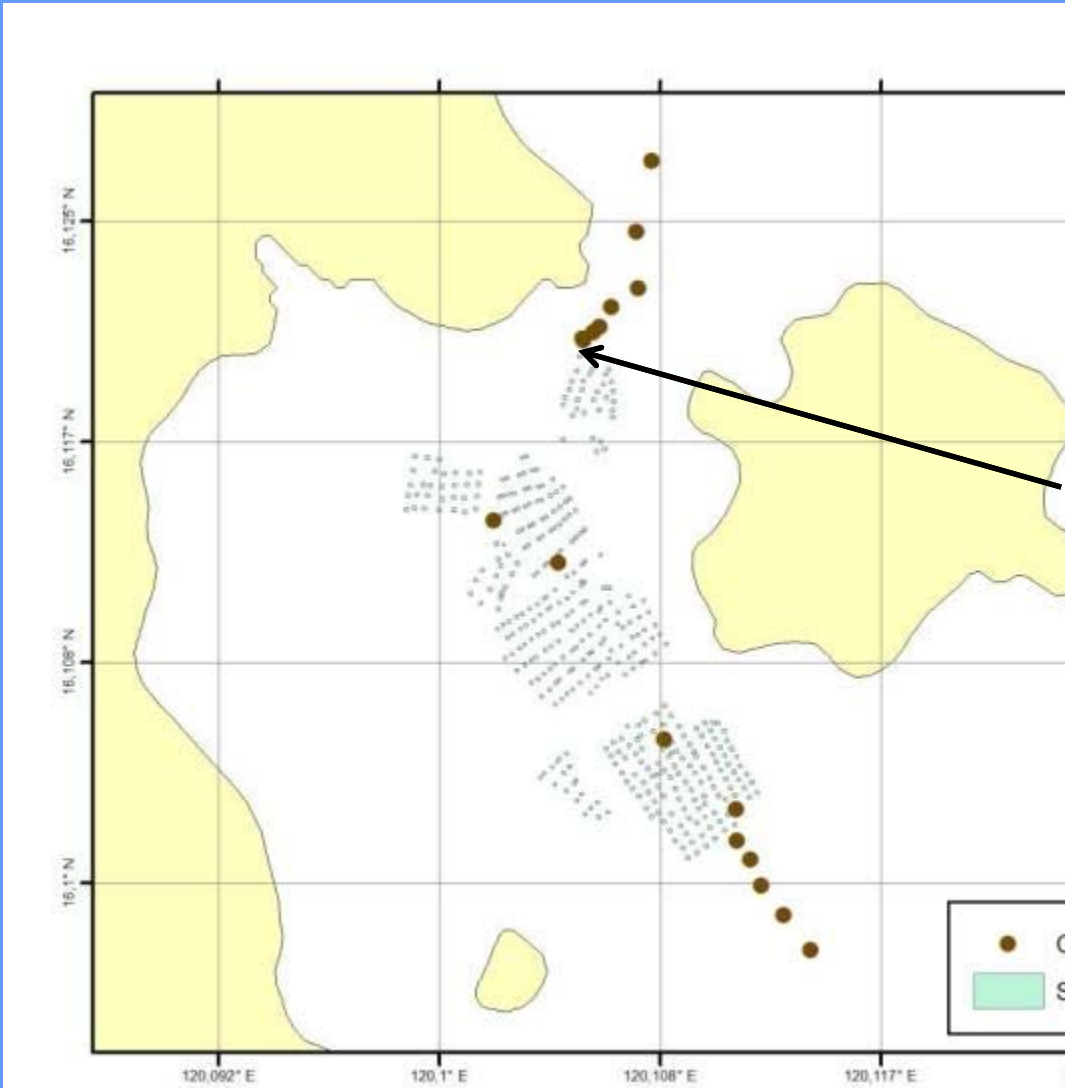
Heavily impacted sediment



Corer 800 m from cage no black layer



Corer at cage 20 cm black layer



Cumulative impact

- Increasing disease problems
- Lower survival
- Poor food conversion rate

Often blame

- Poor fry quality
- Poor food quality

But the problem is usually high environmental impact

Monitoring – Sediment and Water

Monitoring of the MP is necessary

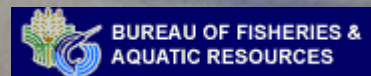
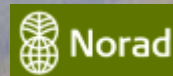
- To check the level of impact on the environment
- Check if the impact is getting worse, staying the same or getting better
- Early warning of future problems

AQUA PARK

**Planning and management of
aquaculture parks for sustainable
development of cage farms in the
Philippines**

www.aqua-park.asia

Estimation of carrying capacity



Carrying capacity

How much production is sustainable on the long term so that it does not over impact the environment or increase the risk of fish kills?

Depends on

- Level of production
- Food conversion rate
- Water exchange rate – flushing

Carrying capacity factors

Other nutrient inputs

- Rivers
- Agricultural run-off
- Livestock production
 - Pig pens along the river

Modelling carrying capacity

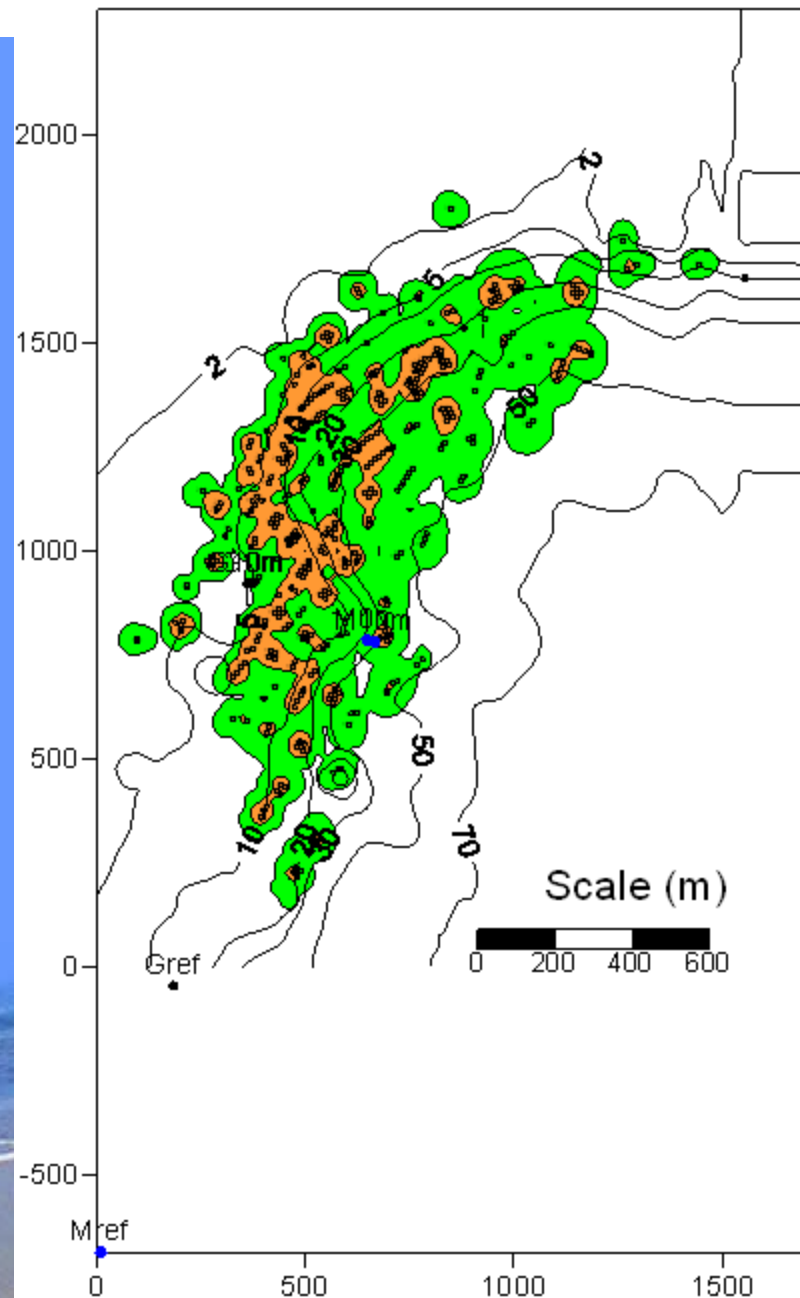


Model predictions - Panabo

Flux ($\text{g m}^{-2}\text{d}^{-1}$)

TROPOMOD
predicted flux
(deposition) of waste
feed and faeces for
Panabo

The colours show
different amounts of
flux



Higher flux and
predicted impact
in the inshore
areas

Nutrient build up in an aquaculture zone

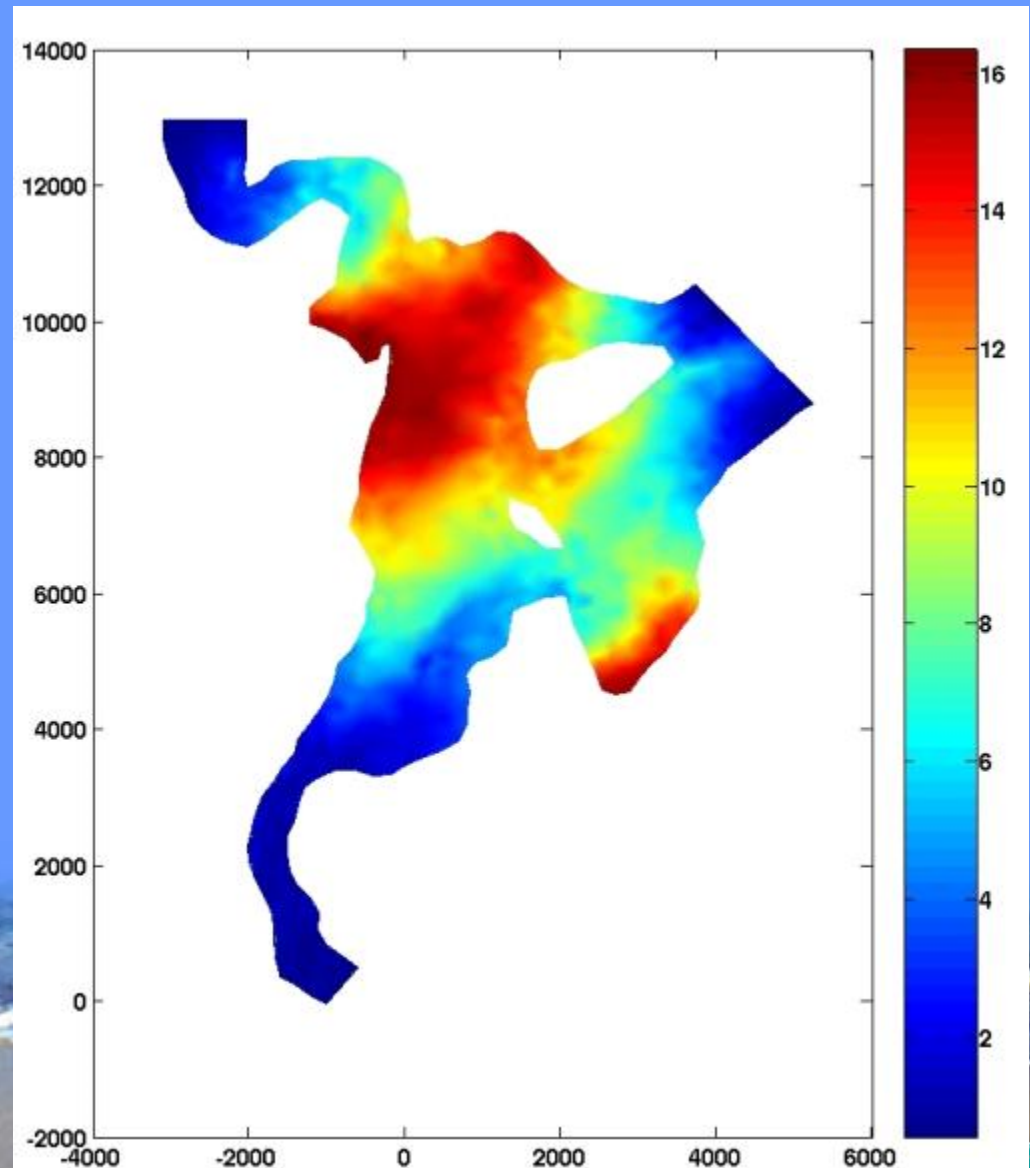
- High residence time, low flushing
- Low residence time, high flushing

Residence time

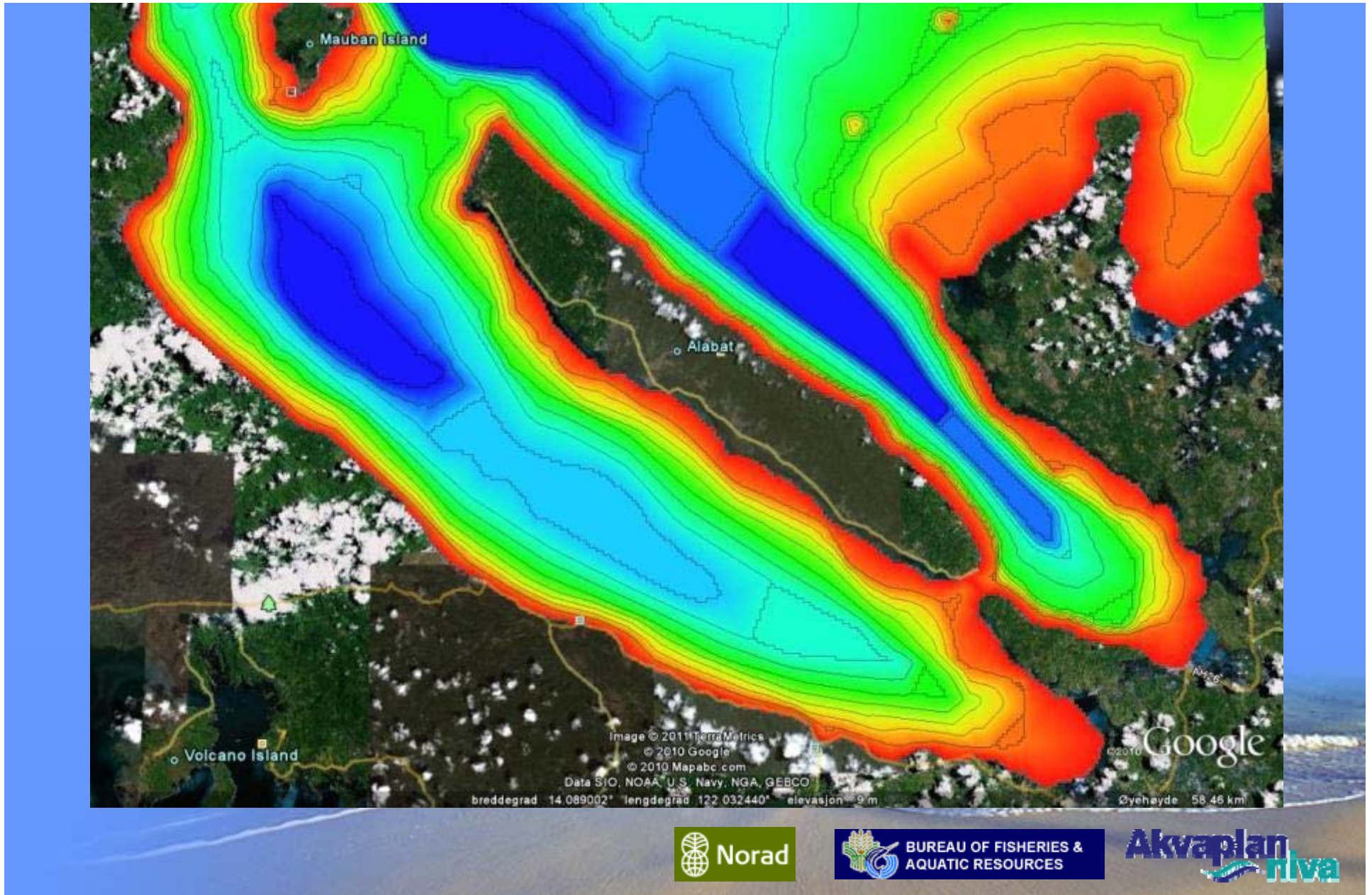
Refreshment

Nutrient levels

Eutrophic



Bathymetry



Other factors

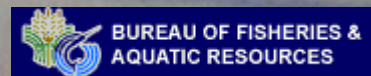
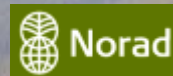
- Good site selection
- Water depth
- Extractive species

AQUA PARK

**Planning and management of
aquaculture parks for sustainable
development of cage farms in the
Philippines**

www.aqua-park.asia

Integrated Multi-trophic Aquaculture

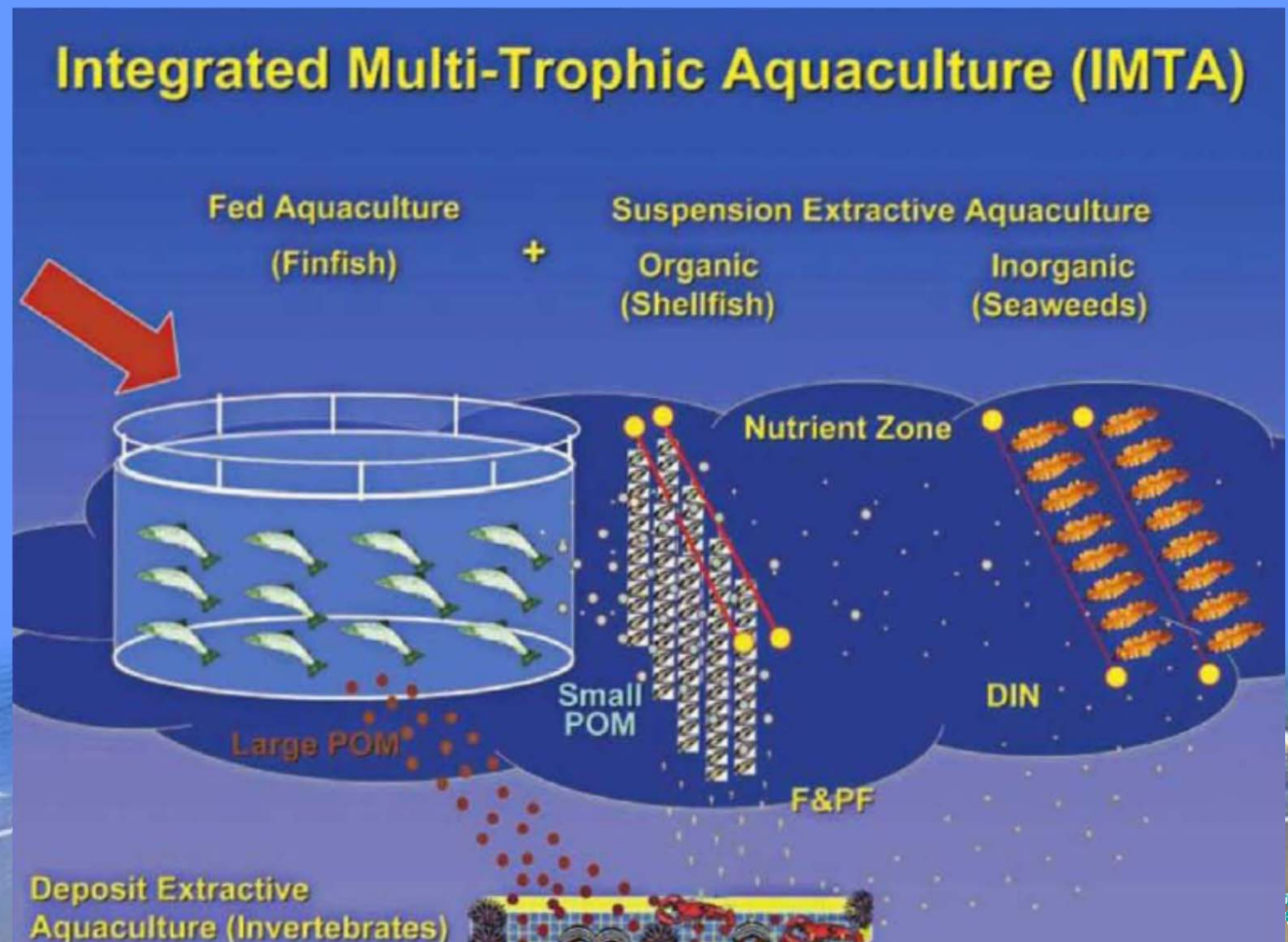


Theory

- Fed species
- 70% of feed nutrients are release to the environment
- Nutrients > Algae > Plankton > Fish
- Extractive species can capture some of these excess nutrients
- Nutrients extracted directly by algae
- Algae and zooplankton by molluscs (oysters, pearl oysters)
- Zooplankton by fish

Integrated Multi-trophic Aquaculture

- Developing Integrated Multitrophic Aquaculture practice into Mariculture Parks



IMTA



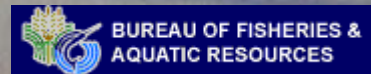
- Fish
- Molluscs
- Seaweed

AQUA PARK

AquaPark – Norad funded project

Planning and management of aquaculture parks for sustainable development of cage farms in the Philippines

Socio-economic factors



SOCIOECONOMIC FRAMEWORK - ADVANTAGES & BENEFITS

UPSTREAM OPPORTUNITIES /ACTIVITIES:

- Feeds Suppliers; Fry / Fingerlings Suppliers
- Development of Fish Hatcheries/Fish Nurseries
- Sellers/Suppliers of Bamboos, Nets, Ropes, Twines , boat makers
- Create employment (support staff)

ADDITIONAL
REVENUE TO
LGUs
(permitting,
licensing
system)

MARICULTURE
PARK

EFFECTS / DIRECT BENEFITS :

- Create employment opportunities to local communities; Livelihoods
- Incremental change of income for marginal fishing families – as caretakers, harvesters, cage makers, feeders, cage repairers, security guards, net washers, etc.
- Opportunity for cage workers to organize and unify into an alliance – strong support group to LGUs & MPs

DOWNSTREAM OPPORTUNITIES/ ACTIVITIES:

- Fish Traders, Fish Vendors
- Fish Processors; Ice Sellers
- Transport rentals
- Marketing channels and locations

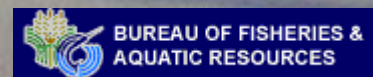
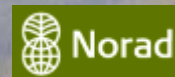
PERIPHERAL EFFECTS / INDIRECT BENEFITS:

- Establishments of General Merchandise (sari-sari) Stores; Bakeshops
- Establishments of coffee shops, restaurants etc.

MARICULTURE DEVELOPMENT AND MANAGEMENT

SOCIOECONOMIC BENEFITS FROM MARINE PARK:

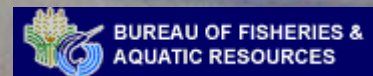
- Generate employment opportunities to trained local people and to those from outside that deliver the required support services to the MPs
- Opportunity for marginal fishers to organize & unify
- Provide direct benefits to marginal fishing families and community stakeholders (*directly engaged to the MP and those that have availed from government-initiated livelihood projects*)



MARICULTURE DEVELOPMENT AND MANAGEMENT

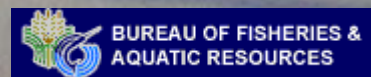
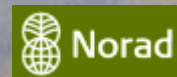
SOCIOECONOMIC BENEFITS FROM MARINE PARK:

- Upstream Activities:
- Opportunities to engage
- fry/fingerlings suppliers & feed suppliers;
- establishments of fish hatcheries & fish nurseries;
- suppliers of bamboos, fish nets, twines, ropes, plastic floaters, fish tubs, etc.



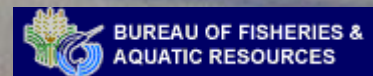
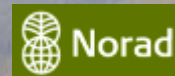
SOCIOECONOMIC BENEFITS FROM MARINE PARK: ..cont'd

- **Downstream Activities**: Create eventual livelihoods activities to Fish Processors, Fish Traders, Fish Vendors, Ice Sellers, etc.
- **Peripheral Activities**: Establishments of general merchandise stores, *sari-sari* stores, bakeshops, coffee shops, etc., that create strategic spread of additional income and human welfare;
- Also, create an opportunity to have a community-based efforts for a healthy marine resources and contribute to reverse the declining fishery



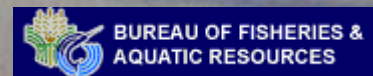
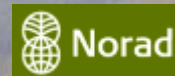
POSITIVE EFFECTS / IMPACTS:

- Marginal fishing families in the locality have the opportunities to avail government-sponsored training, capacity building to be engaged with MP activities
- Effects of MP establishments enhanced **Upstream Activities** that also create additional employment to qualified people supporting MPs ongoing activities
- Effects of MP operations create **Downstream Activities** that provide additional livelihoods opportunities and income to local people



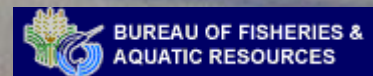
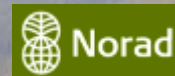
POSITIVE EFFECTS / IMPACTS:

- Due to increasing purchase power, new **Peripheral Activities** are also established and provide additional income
- Promotes functional partnerships among LGUs and private investors interested in MPs
- Develop / strengthen local special bodies (LSB's) (*e.g., Executive Management Council, Marine Park TWG, FARMC's , Bantay Dagat [seawatch]Task Force*)
- Promotes functional partnerships among LGUs and private investors interested in MPs



POSITIVE EFFECTS / IMPACTS.....*continued*

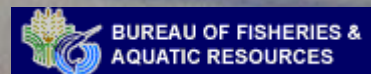
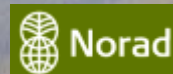
- Develops management partnerships among municipal LGUs, between municipal LGUs & provincial LGU, with community stakeholders, concerned NGA's (DA-BFAR, DENR).... leading to effective and sustainable MP co-management
- Generate revenues to LGUs (*e.g., licensing, permitting, penalties (if any), etc.*)
- Modeling the way for good local governance practices (*e.g., transparency, accountability, participatory, predictability*) – enhances sustainable socioeconomic activities



AQUA PARK

ECONOMIC IMPACT OF MARICULTURE PARK

AquaPark – Norad funded project

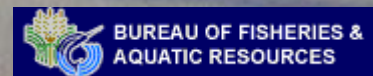
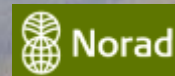


OUTLINE

- I. **Economic implications of MPs**
 - A. **For the different types of locators**
 - B. **For the Local Government Units**
 - C. **For BFAR in terms technical and infrastructure support.**

- II. **Impacts of MPs on the economy of the municipality**
 - A. **Job generation**
 - B. **Establishment of infrastructure**
 - C. **Trading/Marketing**

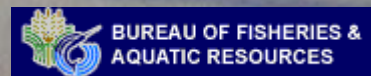
- III. **Cost comparisons**
 - A. **Local and regional market analysis comparisons.**
 - B. **Differences in regional input cost compari**
 - C. **Cost/benefit and breakeven analysis for support infrastructure/technical services**



KEY COMPONENTS OF THIS INVESTIGATION

ECONOMIC ASSESSMENT OF THE FOLLOWING:

- 1. Different aquacultural farming systems in the MPs;**
- 2. LGU and BFAR support for setting up and providing support of the MP**
- 3. Differences in regional input cost comparisons,**
- 4. Cost/benefit and breakeven analysis for support infrastructure**
- 5. Local and regional market analysis comparisons.**



ECONOMIC IMPLICATIONS OF MPs

For the different types of locators

A. Marginalized group

1. Cooperatives

- Agricultural Cooperatives (Bien coop)- self-finance - 1 unit
- Agrarian Reform Beneficiaries (DARBCO)- self-finance 1 unit

2. Women organization(KABIAC)- DIDP funded project 1 unit

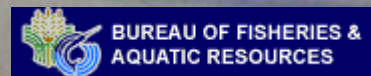
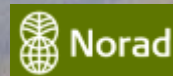
3. Out-of-school Youth (Caretaker's Assn)- BFAR funded unit

4. FARMC/Bantay Dagat -----(BFAR funded) unit

5. Fisherfolk Families and Organization/associations- 10 units
(BFAR/LGU financed)

5. Panabo Coastal Schools-Coastal Resource Management 2 units
(CRM)- DepEd/BFAR/LGU funded)

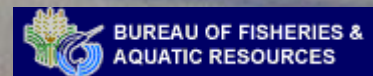
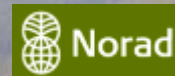
➤ **Most of the activities of the Marginalized Group will be production of fish for sustenance and for sale to earn money**



B. PRIVATE INVESTORS*

1. Small/Medium-scale businessmen (self finance)- - **90** units
2. Civic Organization – (group finance)- - - - - **8** units
3. Medical practitioners – (self-finance) - - - - - **30** units
4. ACES Polytechnic College – (self-finance) - - - - **8** units

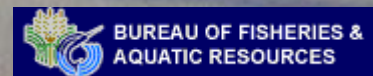
-
- *Local and foreign investors*



Project Implementation (2006-2010)

Requirements and Procedures for investors to operate marine fish cages

- Letter of Intent
- Application to operate marine fish cage (form at BFAR and LGU)
- Evaluation of applications (TWG-BFAR/LGU)
- Approval of applications (Mayor and BFAR Regional Director) 1-3 days;
- Payment of Permit at LGU Panabo;
- Lease Agreement (LGU/BFAR/Investor)
- Investors meeting (project construction, feed and fingerlings supply arrangement, caretaker, etc);
- Construction (schedule, materials, labor, etc) – 3 days



LOCAL GOVERNMENT UNITS

1. Investment on infrastructure (e.g. roads, markets, etc,
2. Investment on services
3. Power supply, etc.

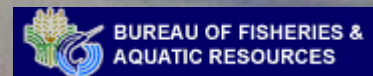
GOVERNMENT AGENCIES (BFAR, DAR, DENR, etc.)

1. Technical services
2. Legal services
3. Manpower development

PRIVATE SECTOR

1. Feed companies
2. Fish seed production
3. Laboratory services (fish disease lab, analytical lab, etc.)

*How can these infrastructures and services improve the life of the stakeholders?
Are these investments economically viable?



IMPACTS OF MPS ON THE ECONOMY OF THE MUNICIPALITY

1. Job generation

- a. Operations in the MP
- b. Laboratory services of private sector
- c. Marketing of materials needed in the MPs
- d. sales personnel of feed and seed companies
- e. Food and restaurants
- f. Others

2. Establishment of infrastructure

- a. Power supply (investment from private sector and the LGUs)
- b. Construction of roads, bridges, jetties, etc.
- c. Feed mills for the manufacture of feeds
- d. Others

3. Trading/Marketing

- a. Creation of trading/marketing within the municipality
- b. Others

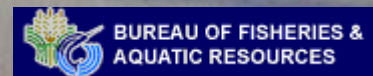
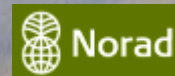


Table 1. Results of Financial Analysis in PCMP

Criteria	Less than 10 Cages	10-20 cages	More than 20 Cages
Average Fixed Expenses (% of sales)	24%	17%	17%
Average Variable Expenses (% of sales)	50%	26%	29%
Average Other Operating Expenses (% sales)	6%	14%	5%
Recovery from Depreciation	(4%)	(3%)	(2%)
Average Net Profit (% of sales)	24%	46%	51%
Average Net Profit Per cage (Php)	185,741	230,507	287,776
Average Return on Investment	72%	117%	112%

Table 2. Results of Financial Analysis of Grouper Culture in PCM

Criteria	Less than 10
Average Fixed Expenses (% of sales)	16%
Average Variable Expenses (% of sales)	35%
Average Other Operating Expenses (% sales)	17%
Recovery from Depreciation	(5%)
Average Net Profit (% of sales)	37%
Average Net Profit Per cage	(Php)286,363
Average Return on Investment	47%

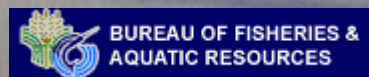
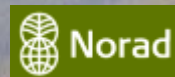


Table 5. Sensitivity of Specialty Products in SMP

Rate of Increase In Variable Cost Only	Decrease in Net Profit (%)	Resulting Net Profit Margin
Base Case for	MILKFISH FRY	18 %
10%	(5%)	13%
20%	(8%)	10%
Rate of Increase in All Costs		
Base Case for	MILKFISH FRY	18 %
10%	(10%)	8%
Rate of Increase in All Costs		
Base Case for	GROUPEL	47 %
10%	(7%)	40%
20%	(2%)	38%
Rate of Increase in All Costs		
Base Case for	GROUPEL	47 %
10%	(9%)	38%
20%	(15%)	32%
30%	(28%)	19%
Rate of Increase in All Costs		
Base Case for	TIGER LOBSTER	41 %
10%	(7%)	34%
20%	(11%)	30%
Rate of Increase in All Costs		
Base Case for	TIGER LOBSTER	47 %
10%	(15%)	32%
20%	(21%)	26%
30%	(27%)	20%



SALAMAT PO

