Preliminary results

Assessing the Influence of Hydroelectric Dams on Fisheries Systems of the Madeira Basin, Brazilian Amazon

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Dams in the Amazon

- Governmental investment on dams has accelerated
  - 2010 PAC2: 76 dam projects are being developed in Brazil
  - The 2011 Decanal Plan for Energy Expansion included projects in Peru, Bolivia, Guiana and Peru.

- Most planned dams will be in the Amazon: “unexplored potential”

- Investment in both large dams and PCHs (Pequenas Centrais Hidreletricas – small dams).

GREAT CHALLENGE

To ally political and economic
interests with environmental conservation

Future view: new hydroelectric projects

Which require knowledge of biodiversity, ecosystem dynamics, to inform the strategies decision-making and environmental management.

Hydro Dams in the Amazon
Pros

- Increased energy supply in Brazil
- More secure and efficient energy production
- Reduced risks of energy rationing and blackouts
- Less dependence on other sources of energy
- New jobs during construction phase
- More income to local and regional governments
- Possible local and regional development

Hydro Dams in the Amazon
Cons – Ecological Impacts

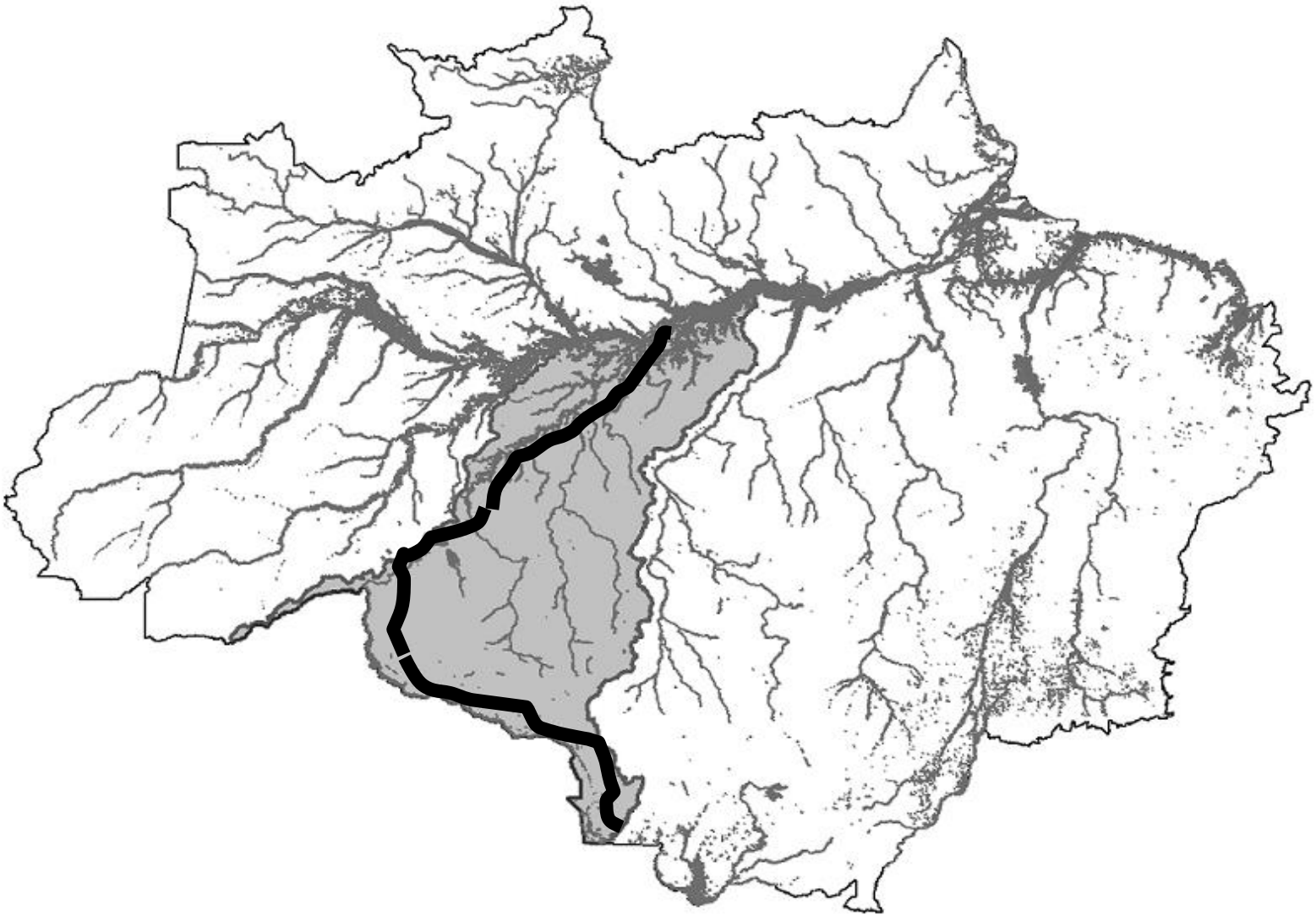
- Flooding or impacting conservation areas
  - Loss of biodiversity
  - Habitat fragmentation
  - Displacement of wildlife
  - Mess up migration of migratory fish
- Land use and land cover change – directly and indirectly (e.g. resettlement projects, construction of roads, urbanization)
- Climate change – draughts, elevation in temperature, exacerbating El Nino, etc.

Belo Monte Dam

Construction of the Belo Monte Dam project, near Altamira. Photo by © Greenpeace/Daniel Beltra.

Zebra Fish at Xingu River

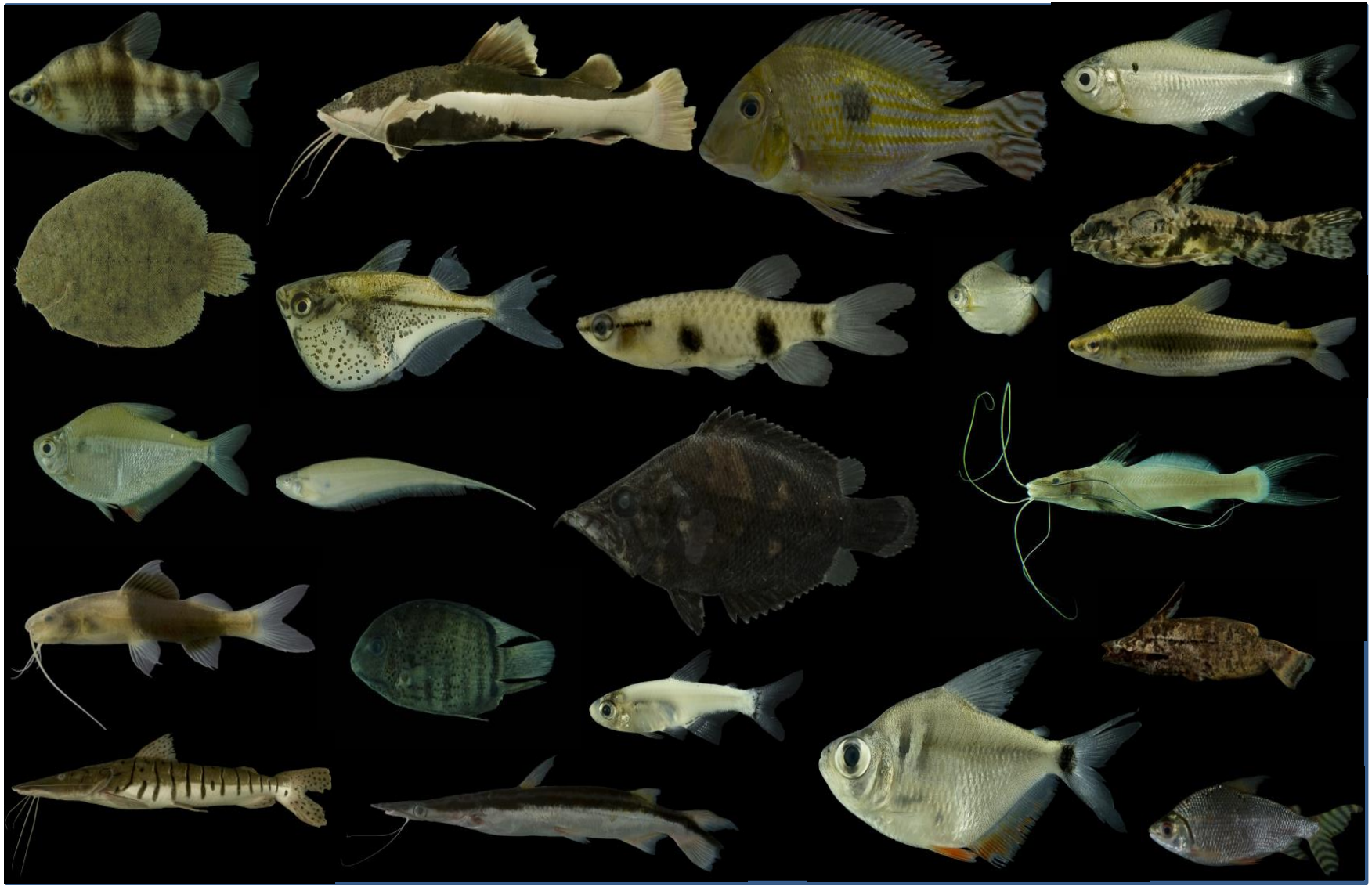
MADEIRA BASIN IN BRAZIL



Drainage area: 1,3 million km²

1/5 of the Amazon basin

Madeira fish richness: 1050 species

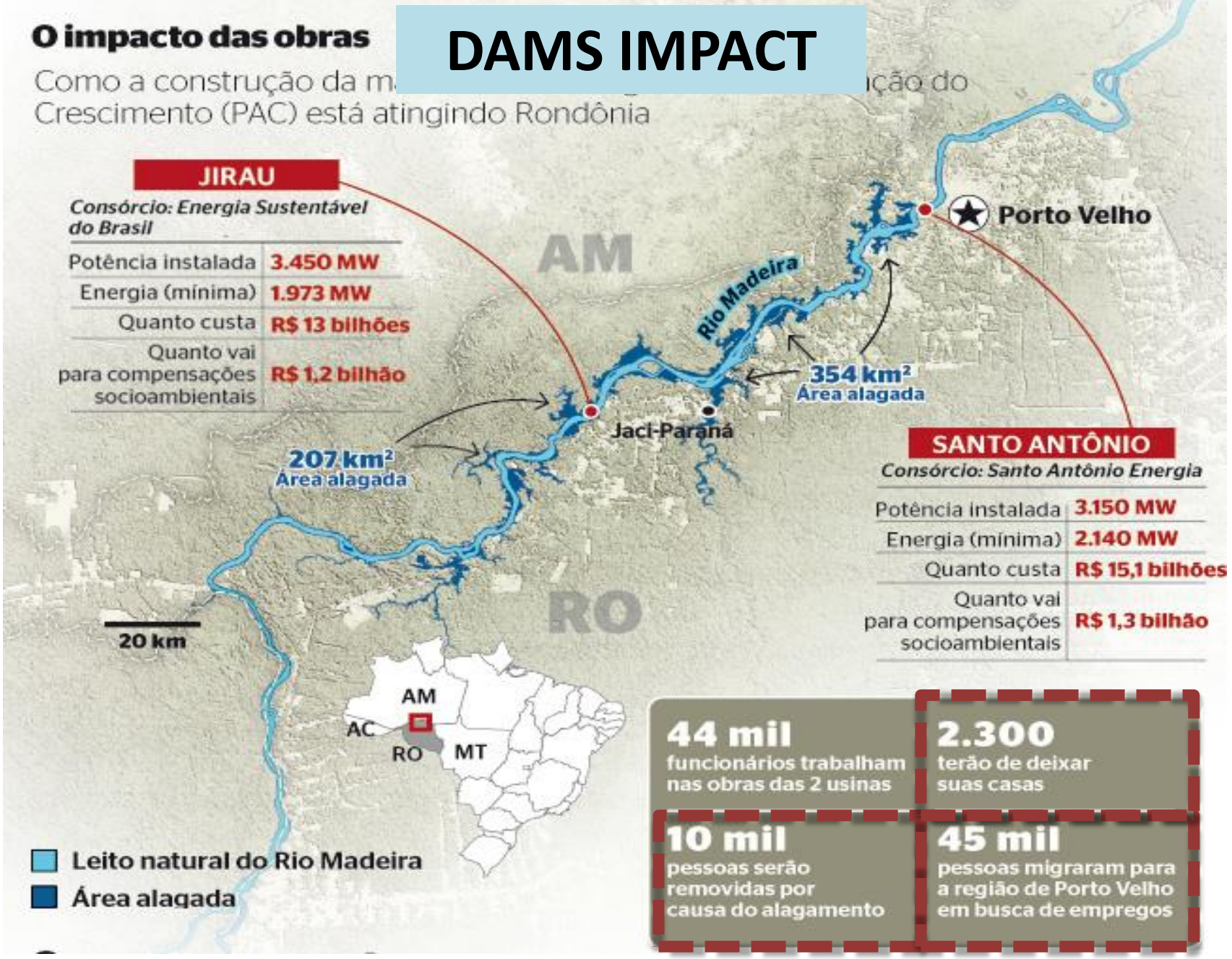


THE MADEIRA DANS

JIRAU DAM

SANTO ANTÔNIO DAM

DAMS IMPACT


O impacto das obras
Como a construção da ma ção do
Crescimento (PAC) está atingindo Rondônia
JIRAU
Consórcio: Energia Sustentável do Brasil
Potência instalada 3.450 MW
Energia (mínima) 1.973 MW
Quanto custa R$ 13 bilhões
Quanto vai para compensações socioambientais R$ 1,2 bilhão
AM
Rio Madeira
Porto Velho
354 km²
Área alagada
Jaci-Paraná
207 km²
Área alagada
SANTO ANTÔNIO
Consórcio: Santo Antônio Energia
Potência instalada 3.150 MW
Energia (mínima) 2.140 MW
Quanto custa R$ 15,1 bilhões
Quanto vai para compensações socioambientais R$ 1,3 bilhão
RO
20 km
AM
AC
RO
MT
Leito natural do Rio Madeira
Área alagada
44 mil
funcionários trabalham nas obras das 2 usinas
2.300
terão de deixar suas casas
10 mil
pessoas serão removidas por causa do alagamento
45 mil
pessoas migraram para a região de Porto Velho em busca de empregos

Dams impact in Fishery System

Dams generally results **in changes in physical and chemical conditions regime of rivers, promoting alterations and discontinuity in river's flow and sediments.**

Fish species: Diversity, composition, distribution and abundance

These alterations can have significant **local and regional social-economic impacts,** especially in the **Fishery System** where impact Fishermen livelihoods, changing their access to fisheries resources.

(Agostinho *et al.,* 1997; Benedito-Cecilio & Agostinho, 2000; Bonner and Wild 2000; Olden and Naiman 2010; Petesse and Petrere, 2012)

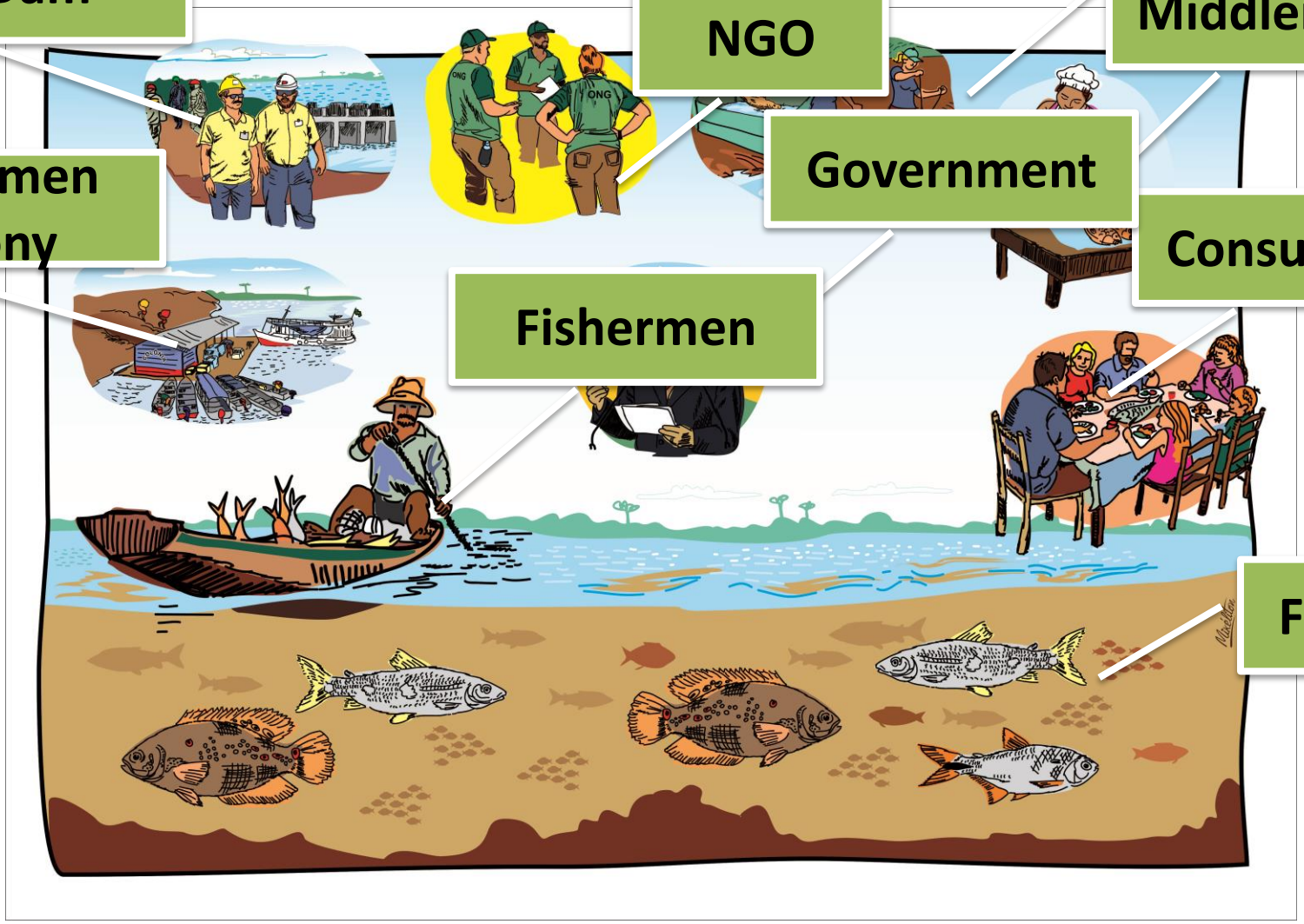
Research questions

Approach - to consider the stakeholder's perceptions to investigate:

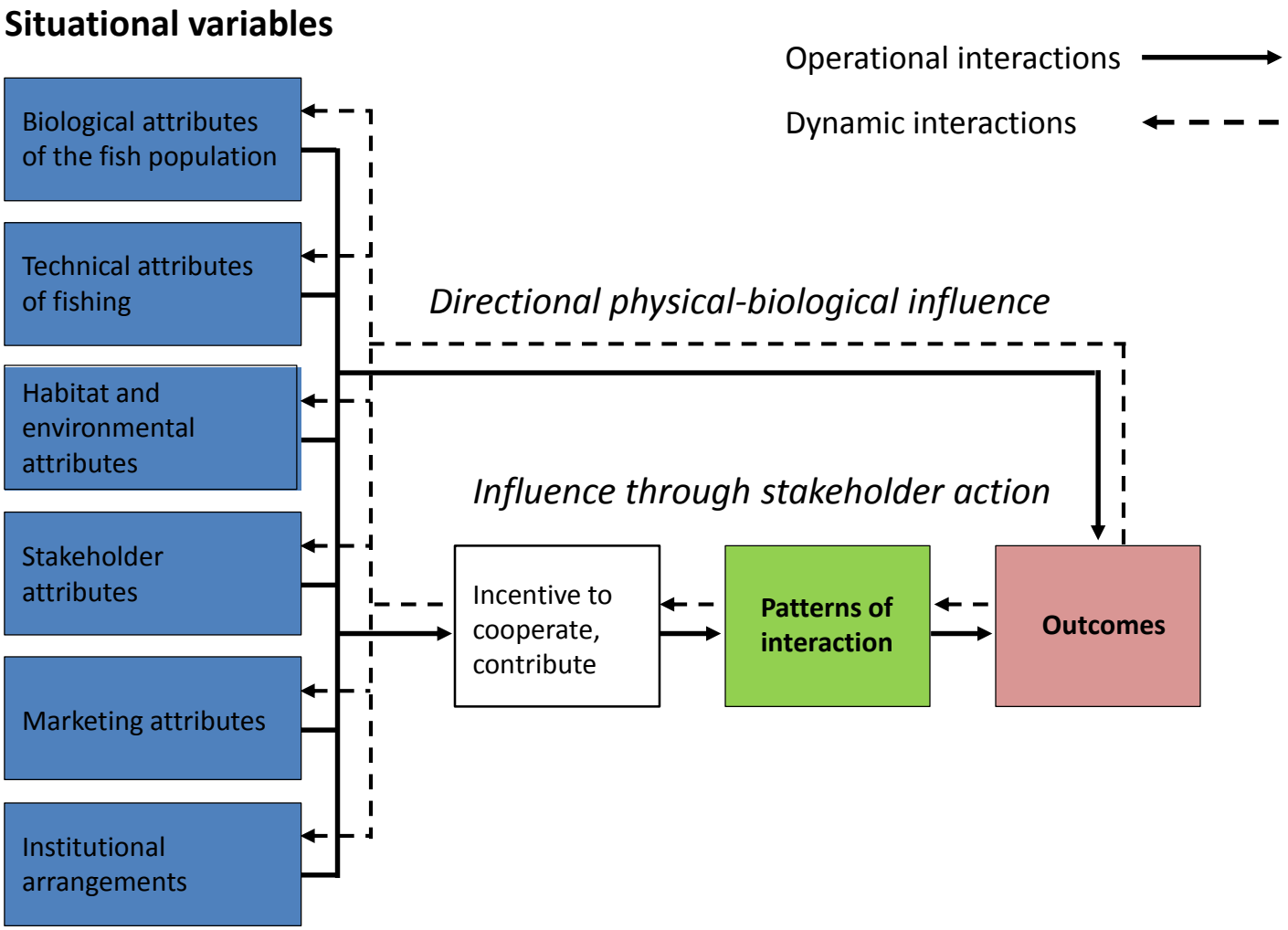
1)Which are the most important changes in the Madeira Basin Fisheries System after the implementation of the dams?

2) How do these changes influence the sustainability of the fisheries system?

Fisheries Systems



Fisheries System Framework



Modified from Lorenzen 2008

Methods

- **Data collect:**

  1 – Dams monitoring program:

  - Pre–dam (Apr/09 to Aug/11)

    * Reservoir closure - Sep/2011

  - Post-dam (Sep/11 to Sep/13

  (Doria *et al* - Annual Technical Reports)

  2 - Interviews with the stakeholders










AVISO
FICA PROIBIDO A VENDA DE MENOS DE 10Kg DE PEIXES AQUI NO FLUTUANTE
A DIRETORIA


2 - Interviews

Stratified random sample of the population - interview with the **Social Actors** involved in the fisheries systems.

Groups:

- **Fishermen -** the fisher that have more number of landing in the monitoring program (my database);

- **Managers** (GOV, NO GOV, SCIENCE, DAM) – the people that participated in the monitoring process (official documents) in different scale of decision

Sampling design

Group	Sub Group	Number of respondents
Fishermen	Fishermen	26
	Fishermen - Middleman	3
	Sub-Total	**29**
Managers	Federal Government	3
	State Government	2
	Municipal Government	1
	Fishermen Colony	3
	Non Government	4
	Dam builders	4
	Science	4
	Sub-Total	**21**
	Total	**50**

Theoretical approach

SITUATIONAL VARIABLES	DESCRIPTOR
Stakeholder attributes	
Fishermen social economics characteristics	Importance e dependency of the resource - Income flow from fishery *VS* others activities
Market attributes	Commercialization forms Supply and Demand Location of the sector (fish) Environmental characteristics (Biophysical factors) Environmental of catch Productivity of the system
Biological Attributes of fish population	Diversity and life cycle Exploitation and conservation status
Technical attributes of fishing	Technologies available
Institutional Arrangements (Governance System)	Network structure (Gov and Non Gov) Social Capital Operational rules (Before and after dam) Constitutional rules (Before and after dam) Conflicts or Problems Lobbying activities
Interactions	Information sharing among the users

(Lorenzen, 2008; Ostrom, 2009; Basurto et al 2013; Burns & Stohr, 2011)

Game to understand the institutional arrangements

1. Which institutions do you know that work with fishing / fishermen (government or not)?

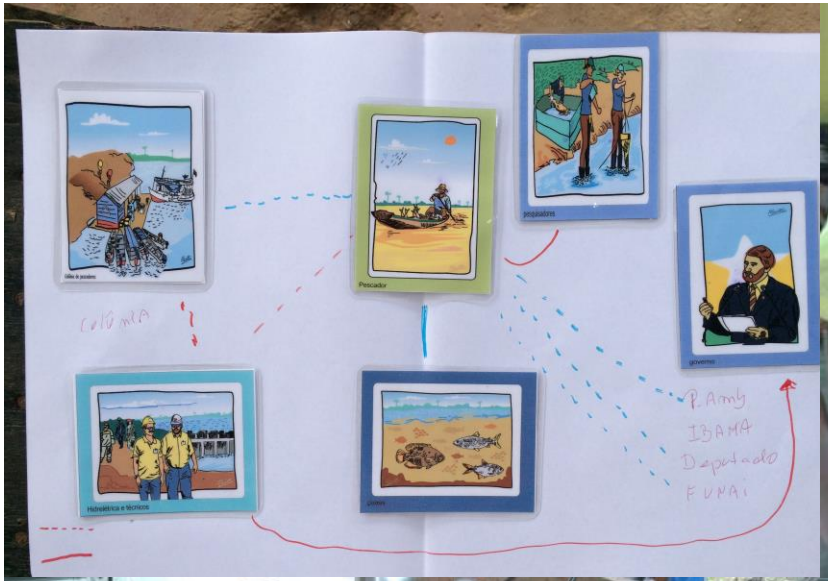
1.1 Make a list using the cards

1.2 Draw the Madeira Fisheries System.

1.3 Use lines to show links between the social actors

Continuous: strong / helps the fisheries sustainability

Dotted: weak/don't help


pesquisadores
Pescador
governo
Hidrelétrica e técnicos
P. Army
IBAMA
Deputado
FUNAI

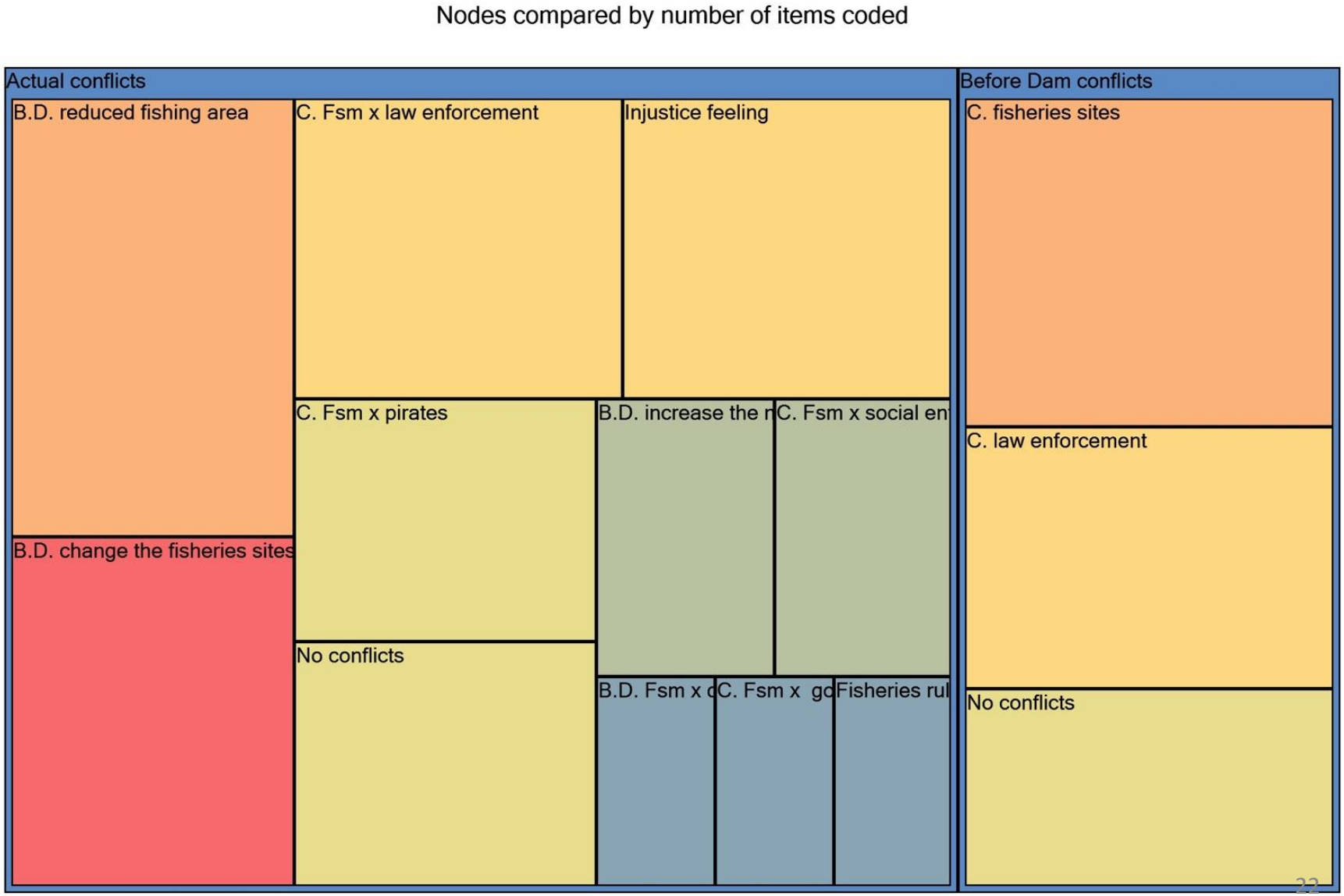

pesquisadores
Pescador
governo
Hidrelétrica e técnicos
IBAMA
SEDAM
Saci
Raimundo

Preliminary results

Number of analyzed interviews : 20 (12 fisher / 8 technical)

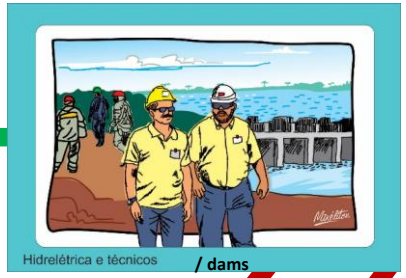
Descriptor / answer	N. respondent
Factor more important in the last 10 years	
Dam impacts	16
Changes in fish and fisheries	
• in the environmental dynamic	6
• in the fish dynamic	7
• decreased the amount of fish	8
Changes in life of the riverine community	
• in type of labor	8
• in livelihood (few fish and high cost)	5
• family reallocation	12
• Decreased the income from fishing	9

Conflits

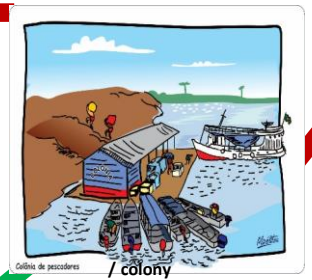

Nodes compared by number of items coded
Actual conflicts
B.D. reduced fishing area
B.D. change the fisheries sites
C. Fsm x law enforcement
C. Fsm x pirates
No conflicts
Injustice feeling
B.D. increase the n
C. Fsm x social en
B.D. Fsm x c
C. Fsm x go
Fisheries rul
Before Dam conflicts
C. fisheries sites
C. law enforcement
No conflicts

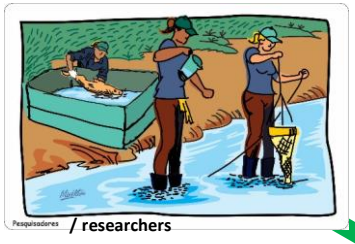
Madeira Fisheries System

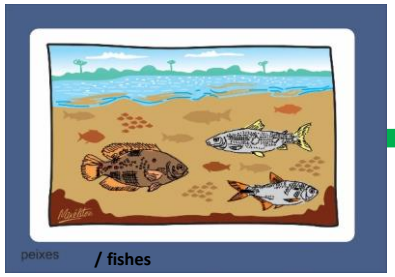
/ government



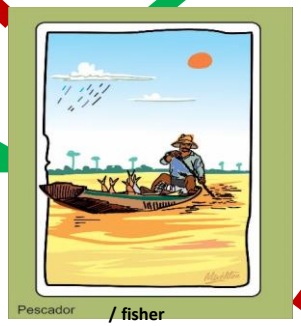
/ dams builders


/ colony


/ researchers



/ fishes



/ fisher

Cited < 25%:

Strong
Weak


NGO Middle man

Number of Draws analyzed: 51 (29 fishermen / 22 managers)

Descriptor / answer	N. respondent
Network interactions (evaluation)	
Govern evaluation (negative)	12
Negative evaluation of the dialogue between institutions	14
Procedures for decision-making	
No participate in dam discussion	14
No participate in fisheries discussions	12
The decisions concentrated in the Environmental agency	4
Share of fish and fisheries information	
No information shared	15
Social capital	
Fishermen colony evaluation (negative)	12
Lack of Leadership (negative)	8
Associated in the colony	12

Stakeholders perception

*"My impression is that there is no dialog**. It is like a conversation between a deaf and a mute person. Nobody wants to see anything.** From the point of view of the public agency, decisions were made right in the office. The agency leaders spoke but had not coherent proposals. In practice, alternatives were unfeasible. Many times, the position was not institutional, it was from the staff that was there" (Technician - company).*

..... *"the **economic power always overrides the social interests.** I see, I am sorry for the **ignorance of public agencies in regard to maintaining a minimum condition for these people**, I see the environmental agency IBAMA completely alienated, linked to version always given by the dam builders... This is rather a disappointing scenario" (Technician MPE).*

Stakeholders perception

*... "as the **fisher is weaker and the rope always breaks on the weakest side**, as everyone here we are like this due to the construction of this dam and "every man for himself"... **it is difficult, the government and nobody else looks after us**," (fisherman).*

***"We had to have studied each proposal, our mistake was only to listen to them, letting them deceive the people** ... the citizen cannot rush to sit down and talk and find out what he wants because then there is no return, not after the boat overturns. **For most, the dam was a disaster,** the live of the riverine people that go there and catch the fish that was there, coming from years of generations and generations, they took them away and relocated them to the city. There are many that are lost, some became "pé inchado" (alcoholic) and others became bandits," (fisherman).*

Preliminary conclusion

- ✓ There is a lack of fisher's organization;
- ✓ Inexistence or disorganization of fisheries management agencies and governance;
- ✓ Poor or no interaction between these agencies;
- ✓ The actors perspectives are not considered;
- ✓ Lack of fisheries monitoring and poor use of scientific data.;
- ✓ **Affect negativity → fisheries sustainability in this area**

THANKS !