

# The potential impacts of climate change on agriculture and fisheries production in 72 tropical coastal communities



@JoshuaCinner

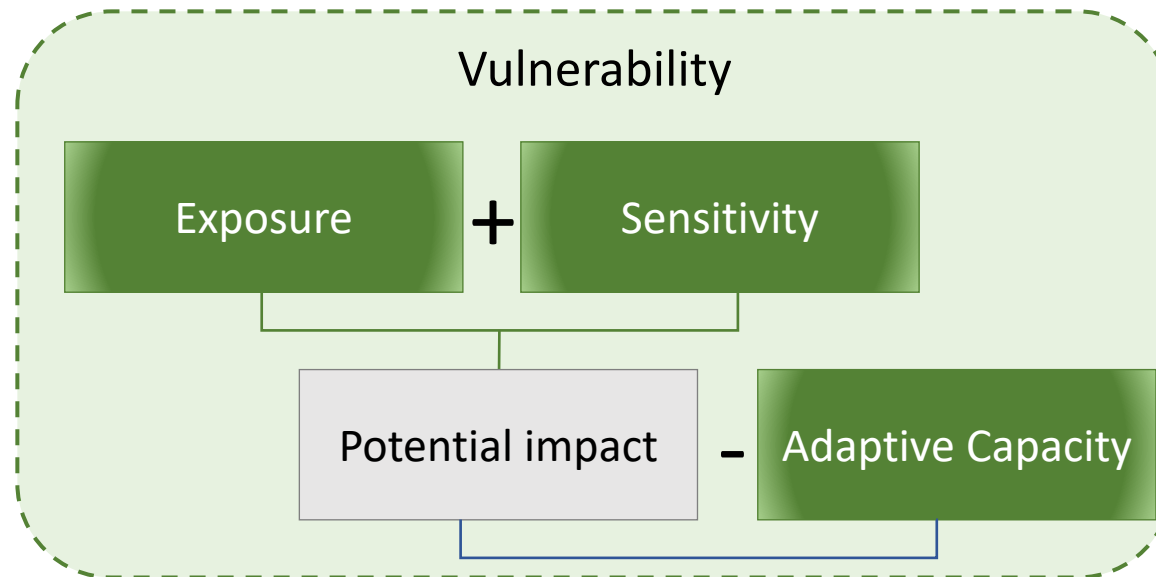


ARC CENTRE OF EXCELLENCE  
Coral Reef Studies

**Joshua E. Cinner**, Iain Caldwell, Lauric Thiault, John Ben, Julia L. Blanchard, Marta Coll, Amy Diedrich, Tyler D. Eddy, Jason D. Everett, Christian Folberth, Didier Gascuel, Jerome Guet, Georgina G. Gurney, Ryan F. Heneghan, Jonas Jägermeyr, Narriman Jiddawi, Rachael Lahari, John Kuange, Wenfeng Liu, Oliver Maury, Christoph Müller, Camilla Novaglio, Juliano Palacios-Abrantes, Colleen M. Petrik, Ando Rabearisoa, Derek P. Tittensor, Andrew Wamukota, Richard Pollnac

# Vulnerability framework

$$V = (E + S) - AC$$



# Communities rely on both Ag and Fisheries



## Assessments are often sectoral

[nature](#) > [nature ecology & evolution](#) > [review articles](#) > [article](#)

Review Article | [Published: 22 August 2017](#)

## Linked sustainability challenges and trade-offs among fisheries, aquaculture and agriculture

[Julia L. Blanchard](#) , [Reg A. Watson](#), [Elizabeth A. Fulton](#), [Richard S. Cottrell](#), [Kirsty L. Nash](#), [Andrea Bryndum-Buchholz](#), [Matthias Büchner](#), [David A. Carozza](#), [William W. L. Cheung](#), [Joshua Elliott](#), [Lindsay N. K. Davidson](#), [Nicholas K. Dulvy](#), [John P. Dunne](#), [Tyler D. Eddy](#), [Eric Galbraith](#), [Heike K. Lotze](#), [Olivier Maury](#), [Christoph Müller](#), [Derek P. Tittensor](#) & [Simon Jennings](#)

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SCIENCE ADVANCES | RESEARCH ARTICLE

ENVIRONMENTAL STUDIES

## Escaping the perfect storm of simultaneous climate change impacts on agriculture and marine fisheries

[Lauric Thiault](#)<sup>1,2\*</sup>, [Camilo Mora](#)<sup>3</sup>, [Joshua E. Cinner](#)<sup>4</sup>, [William W. L. Cheung](#)<sup>5</sup>, [Nicholas A. J. Graham](#)<sup>6</sup>, [Fraser A. Januchowski-Hartley](#)<sup>7,8†</sup>, [David Mouillot](#)<sup>7,4</sup>, [U. Rashid Sumaila](#)<sup>9</sup>, [Joachim Claudet](#)<sup>1,2</sup>

# Scale issue

National scale assessments miss critical intra country variability in vulnerability

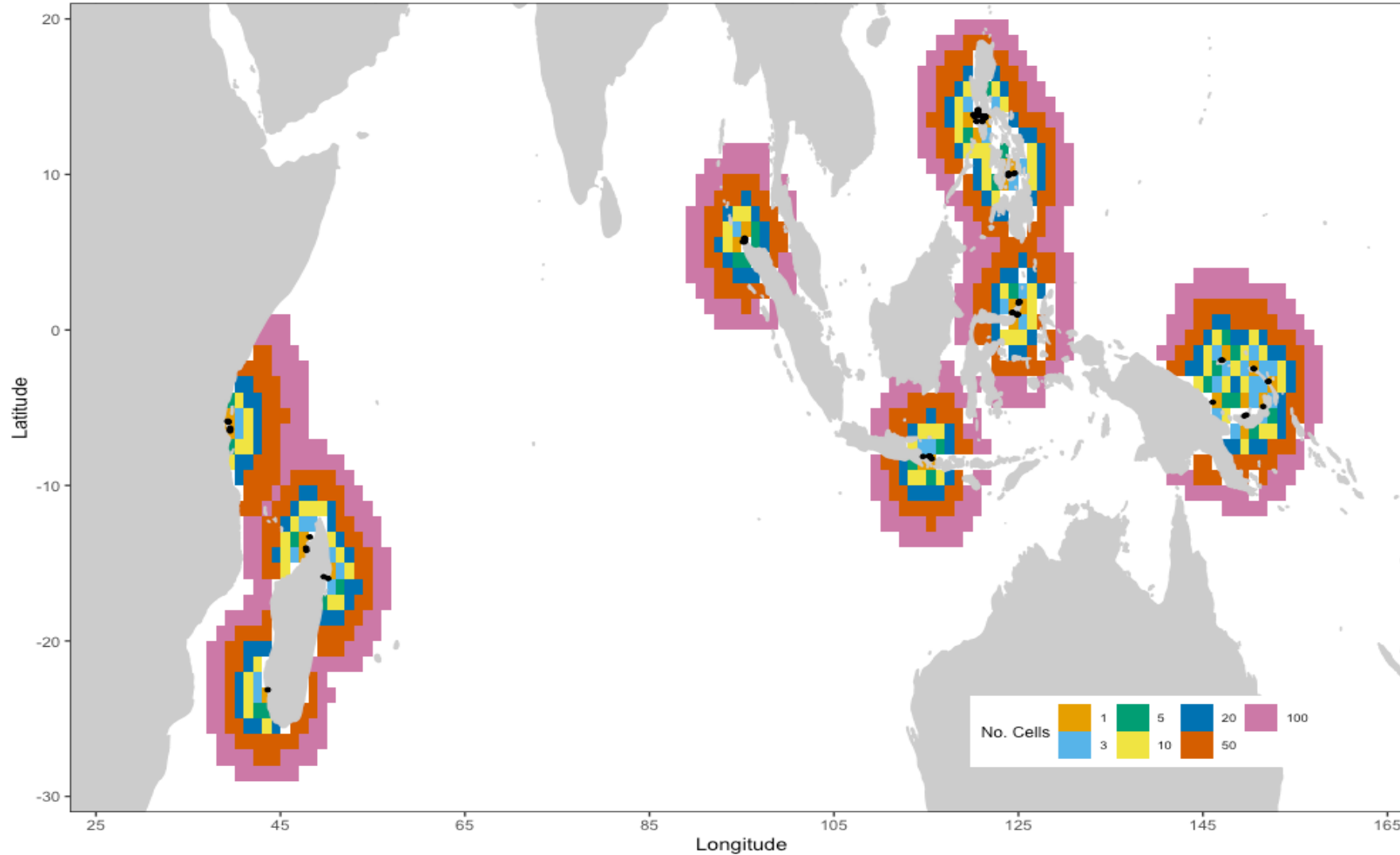


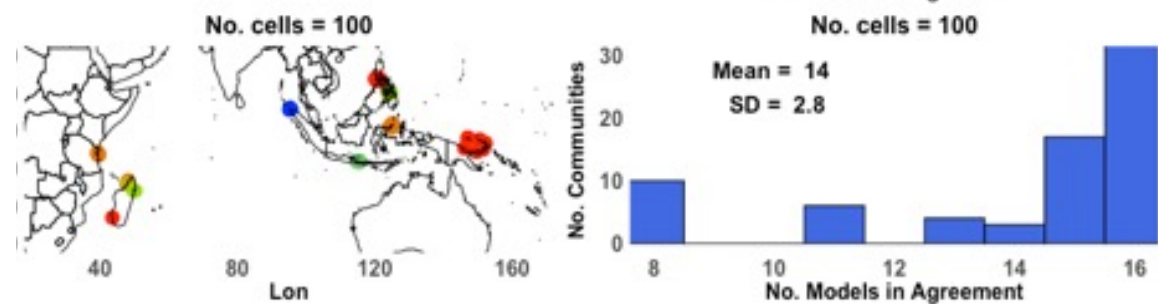
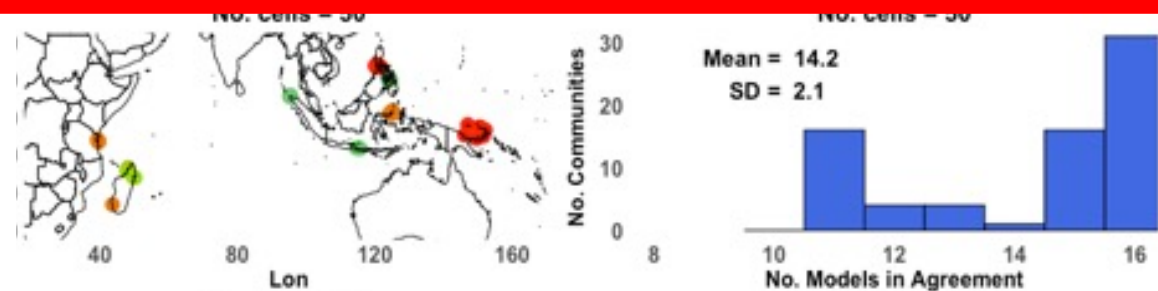
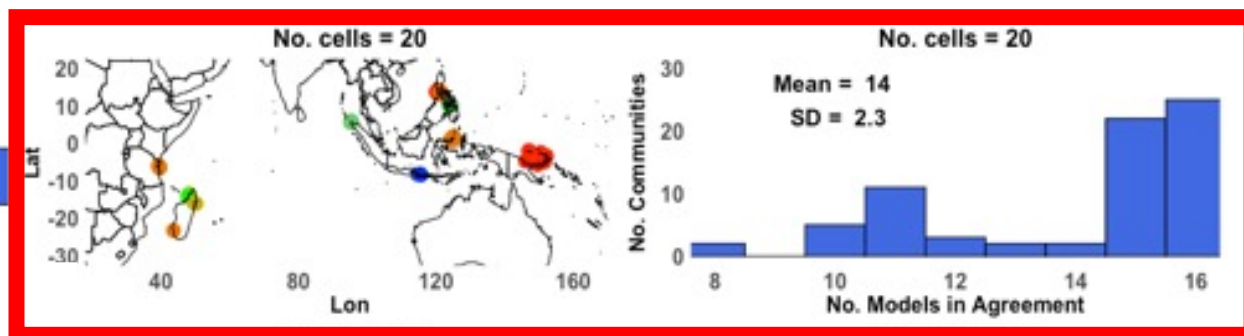
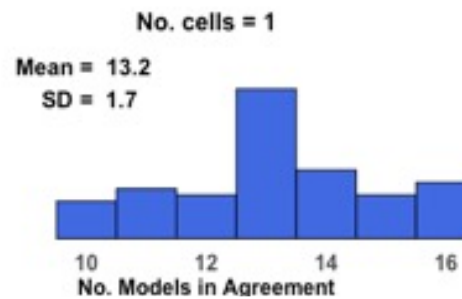
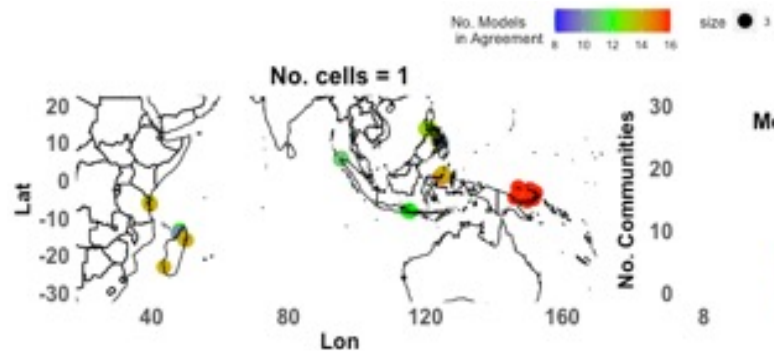


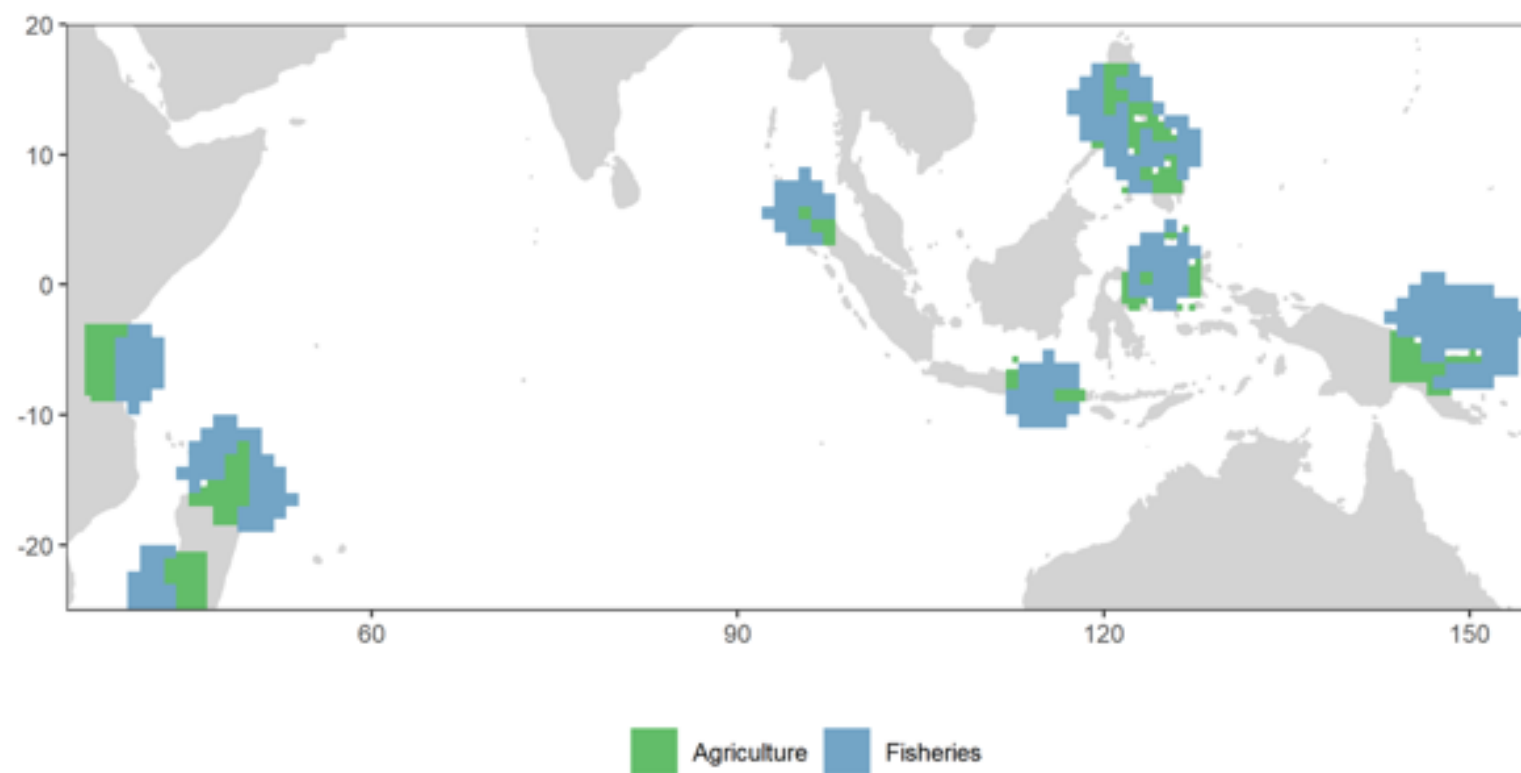
Yet climate models are not suitable to downscaled analyses

Trade-off between model performance and usefulness

# Area covered by different numbers of grid cells









# Research questions

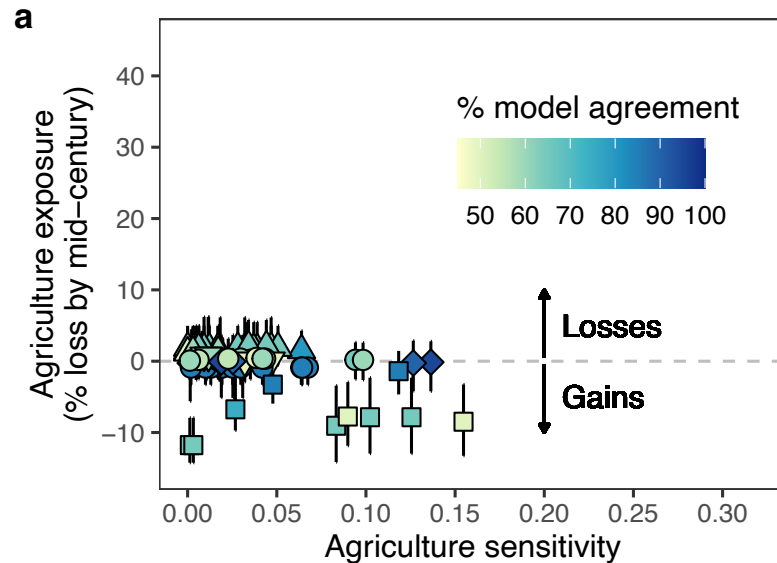
- “What are the potential impacts of projected changes to fisheries catch potential and agriculture on coastal communities?”
- “How much will mitigation measures reduce these potential impacts?” and
- “Are lower socioeconomic status coastal communities facing more potential impacts from climate change than their wealthier counterparts?”

# 3 key findings:

1- potential losses to fisheries (catch potential) is much higher than losses to agriculture

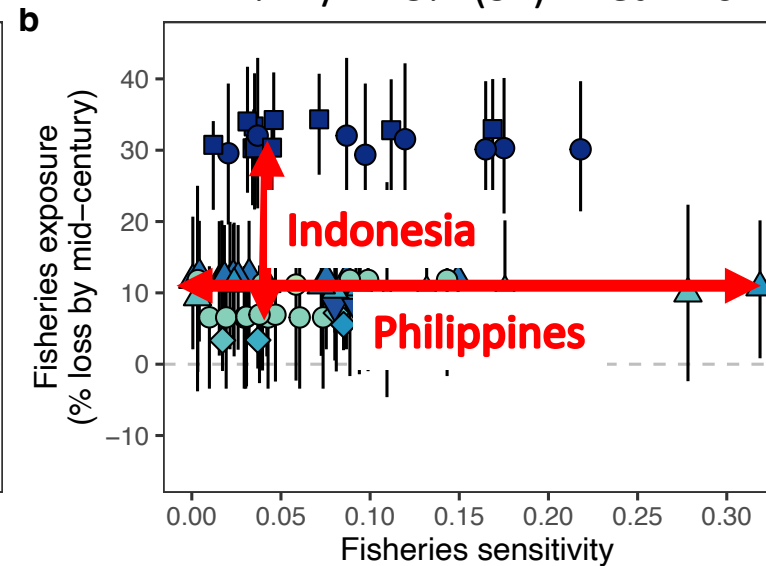
1.2% +/- 1.5% (SE) mean agricultural gain

Agreement=  
69.1 +/- 4.82%



14.7% +/- 4.3% (SE) mean fisheries catch potential loss

Agreement =  
84.7 +/- 4.5%

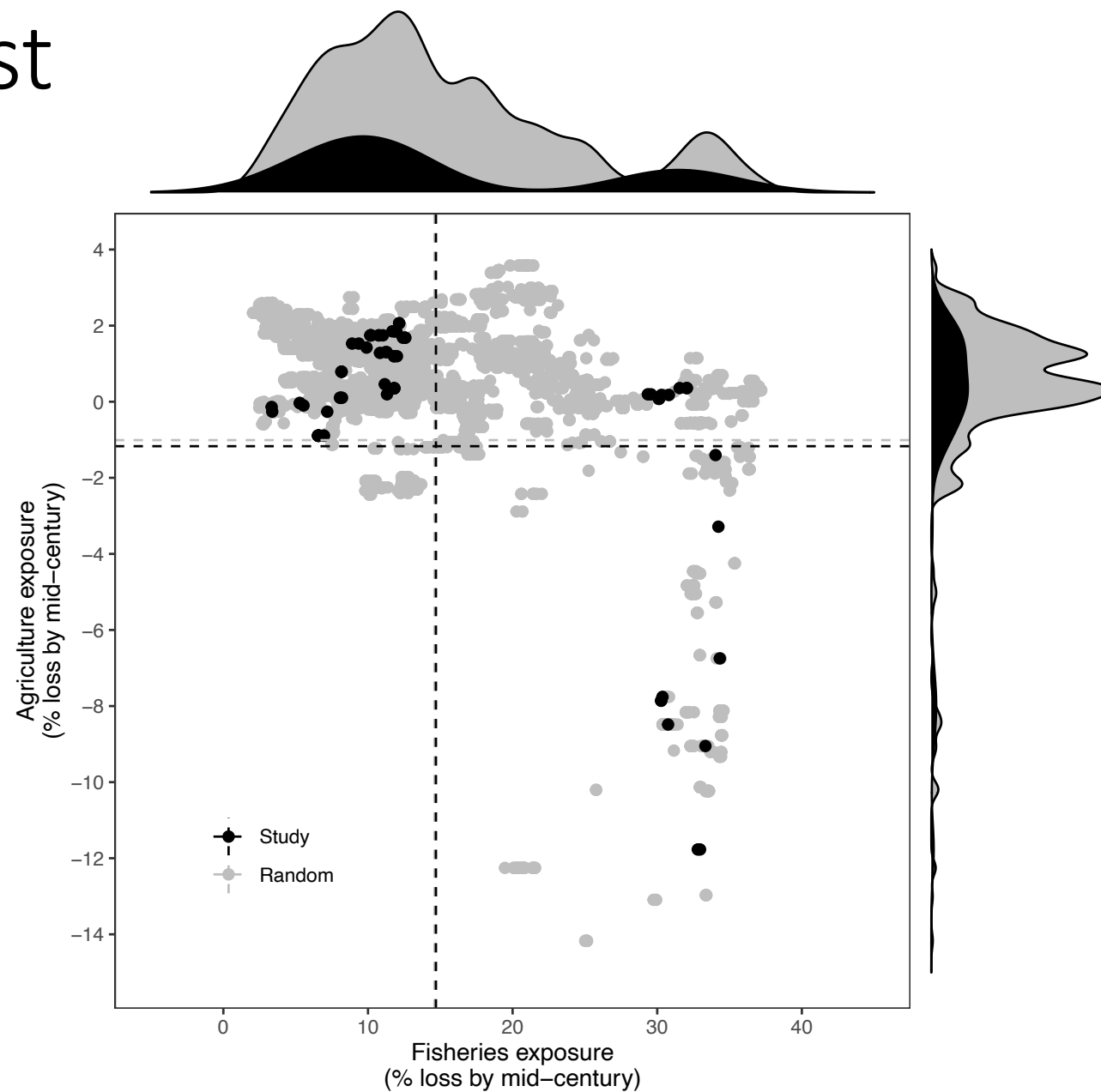


**c**

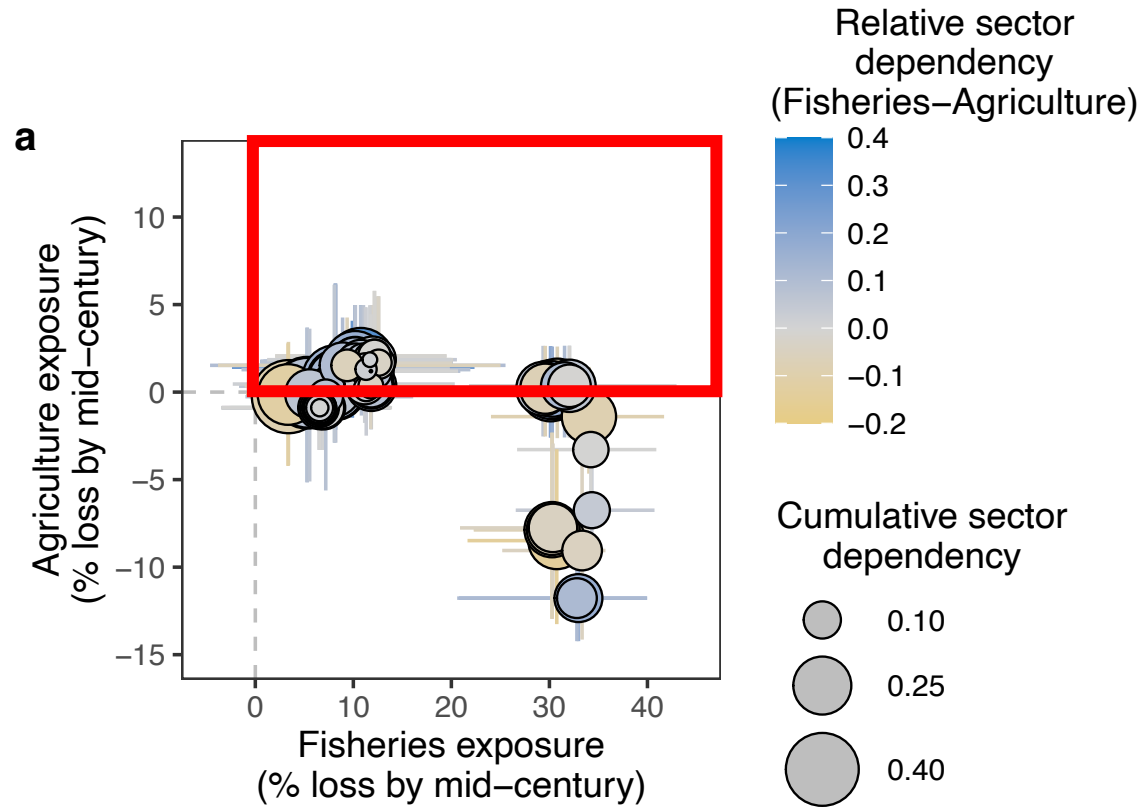
▼ Tanzania    ◆ Madagascar    ● Indonesia    ▲ Philippines    ■ Papua New Guinea

Double that which could be buffered by strategic conservation

# Sensitivity test



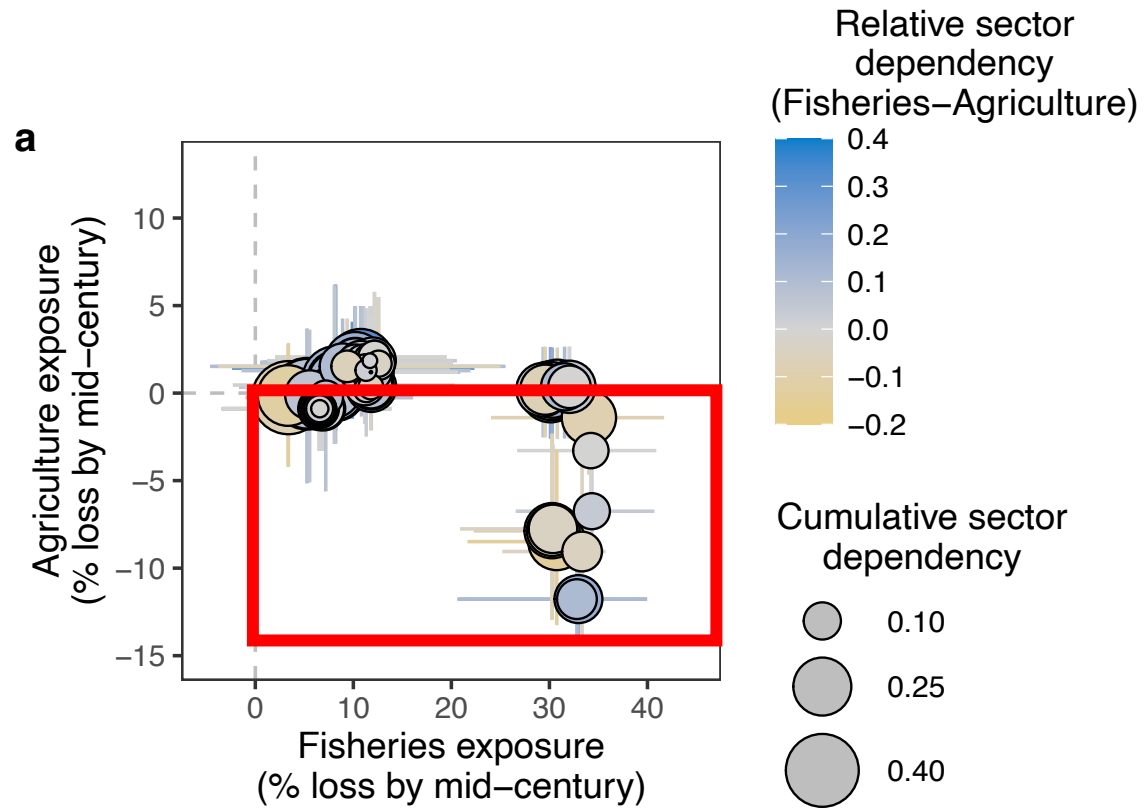
Key result #2:  
>2/3 of locations will bear a double burden of potential losses to both fisheries and agriculture simultaneously



But... mitigation could reduce the proportion of places facing a double burden to 1/3

## Key result #2:

>2/3 of locations will bear a double burden of potential losses to both fisheries and agriculture simultaneously



What about the 1/3 of sites with increased ag but decreased fish- is there substitutability?

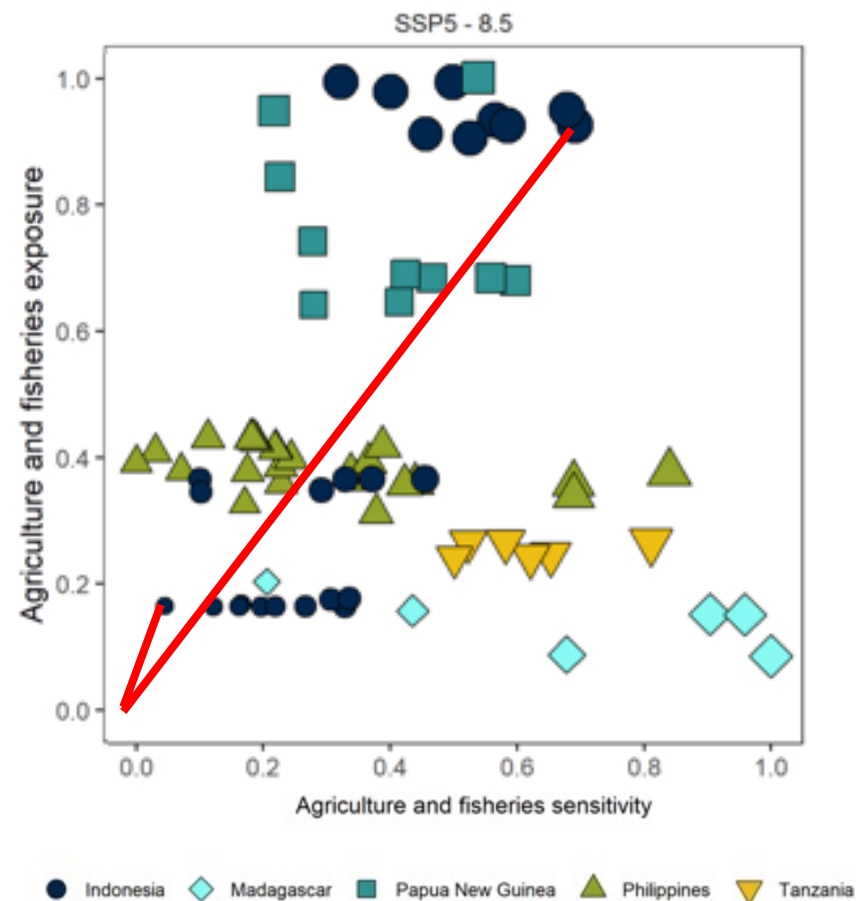
# Household scale engagement in both sectors

country	Number of households	Agriculture and fisheries	Agriculture, no fisheries	Fisheries, no agriculture
indonesia	1140	0.25	0.18	0.36
madagascar	339	0.42	0.33	0.16
papua new guinea	318	0.77	0.03	0.18
philippines	973	0.11	0.18	0.37
tanzania	238	0.69	0.04	0.26

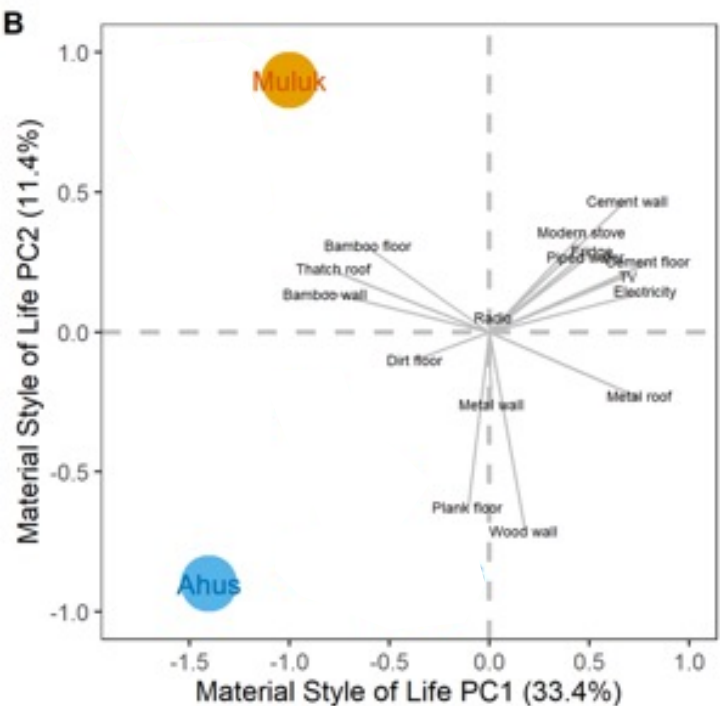


# Key result #3: Lower socioeconomic status communities are more likely to experience potential impacts

Step 1: Calculate potential impacts

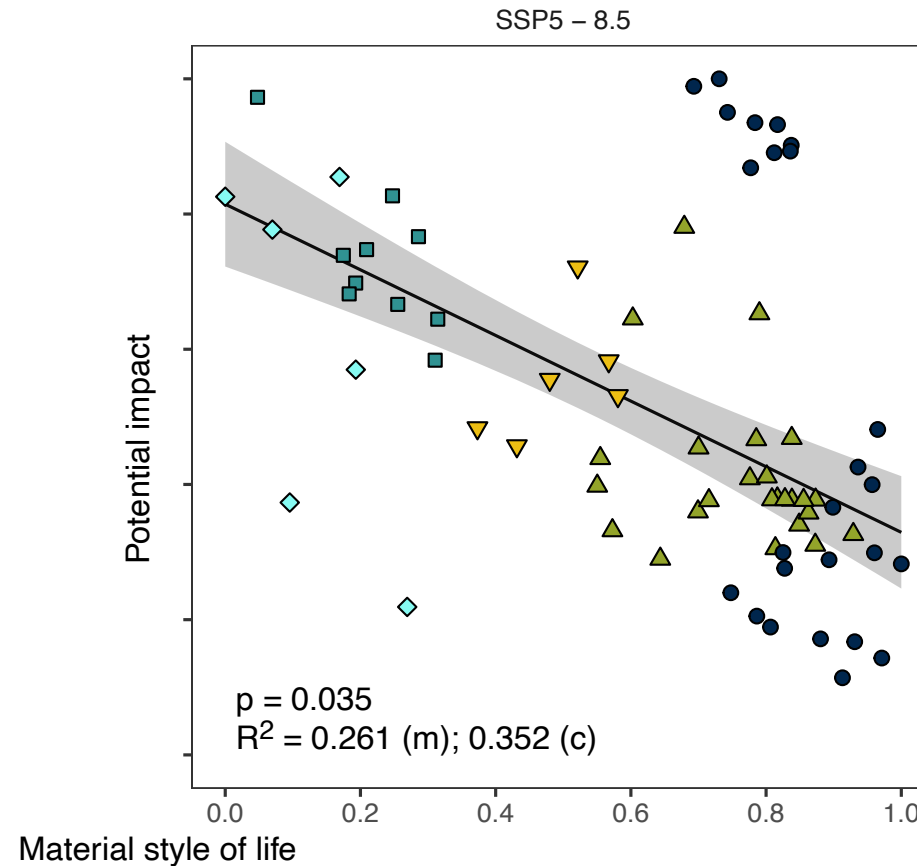


Step 2: Calculate socioeconomic status



# Key result #3: Lower socioeconomic status communities are more likely to experience potential impacts

Step 3: Plot potential impacts vs MSL



● Indonesia    ◆ Madagascar    ■ Papua New Guinea    ▲ Philippines    ▼ Tanzania







# Thank you!



*"We'd now like to open the floor to shorter speeches disguised as questions."*

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# Sensitivity test- does sensitivity change over time?

