

An underwater scene with several sharks swimming in the dark blue water. A large plume of bubbles rises from the bottom right towards the surface, where sunlight is filtering through. The overall atmosphere is deep and mysterious.

# **ASSESSING THE SOCIAL AND ECONOMIC IMPACTS OF MARINE PROTECTED AREAS**

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# DESIRED FEEDBACK

## EXPERIMENTAL DESIGN

Study design

Outcome well-being indicators

Covariates: controlling for treatment biases and confounding factors

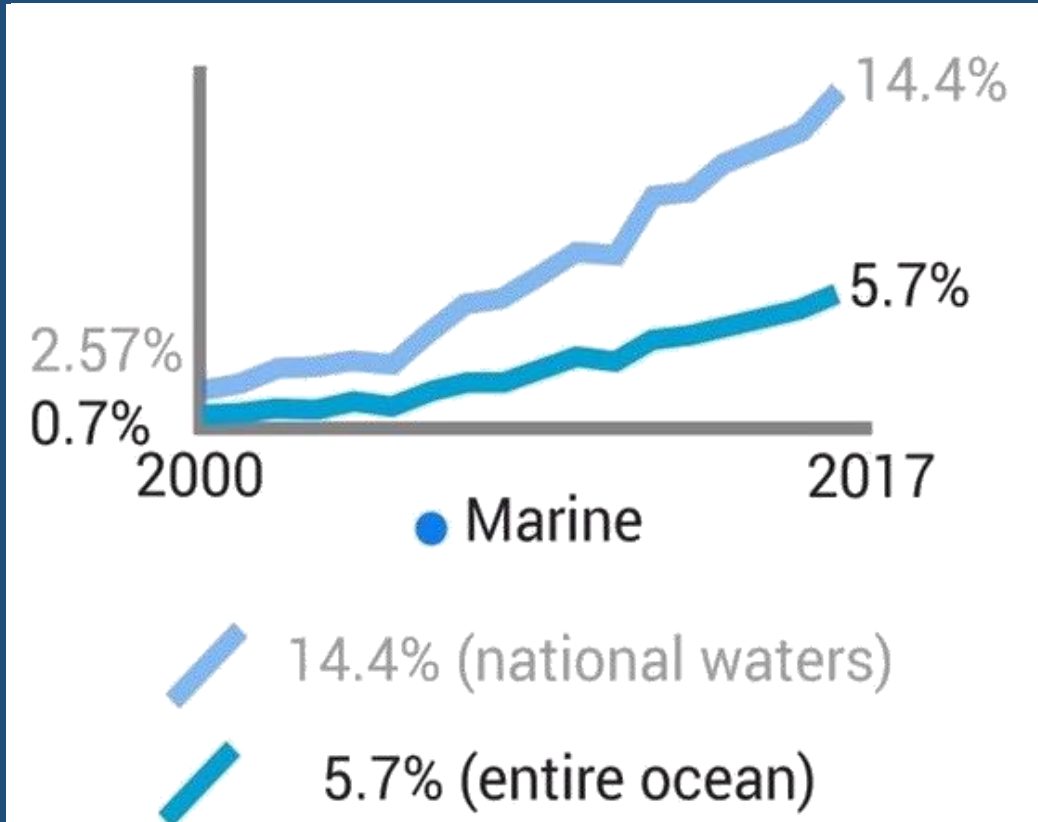
Other relevant data sources

# STUDY BACKGROUND

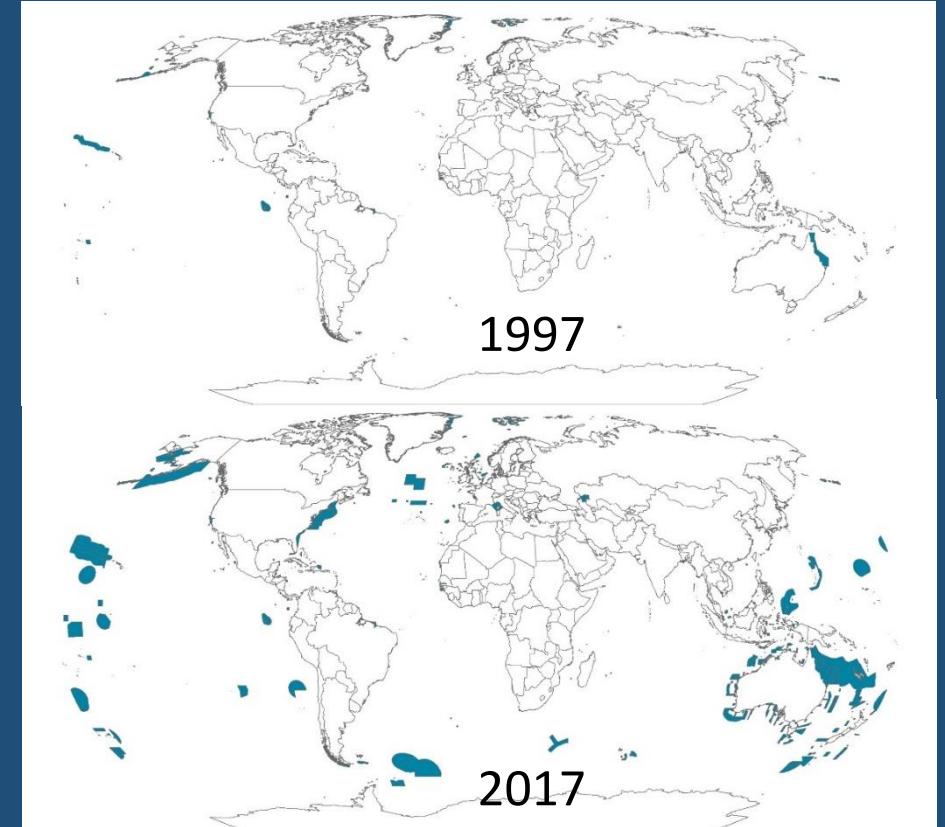


Simultaneous high dependence and negative impacts on marine resources

# STUDY BACKGROUND



UNEP-WCMC 2017



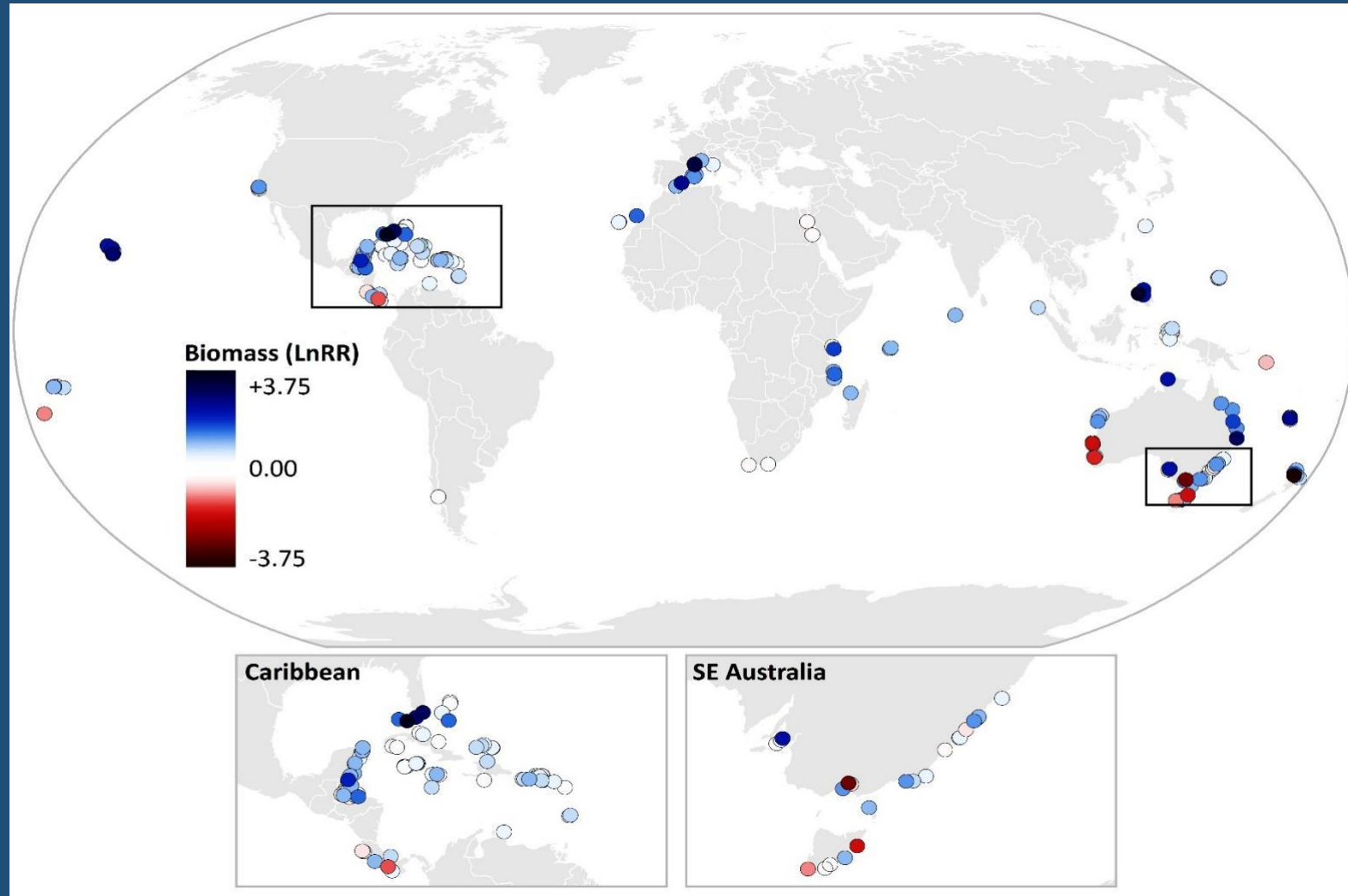
UNEP-WCMC 2017

Rapid increase in MPA numbers and size

# STUDY BACKGROUND



# STUDY BACKGROUND



Gill et al 2017

Ecological impacts well studied, however social impacts unclear

# RESEARCH QUESTIONS

1. Impacts of MPAs on U.S. coastal populations
2. Variation of impacts across:
  - different contexts (e.g. mainland vs. offshore)
  - social groups (gender, age, ethnicity)
3. Role of governance and context in impacts



# STUDY OUTLINE

## Design

Neyman-Rubin model:

$$\text{Impact} = T_{\text{outcomes}} - C_{\text{outcomes}}$$

Quasi experimental Difference in Difference with matching

- Match MPA and non-MPA communities based on relevant covariates
- Difference in trends in MPA vs non-MPA populations

$$\text{ATT} = E\{E(Y_i | X_i, T_i = 1) - E(Y_i | X_i, T_i = 0) | T_i = 1\}$$

Y= $\Delta$  outcomes; T=treated; X=covariates



# STUDY OUTLINE

Outcome (human well-being) indicators:

Economic wellbeing

Educational attainment

Employment

Health

Empowerment

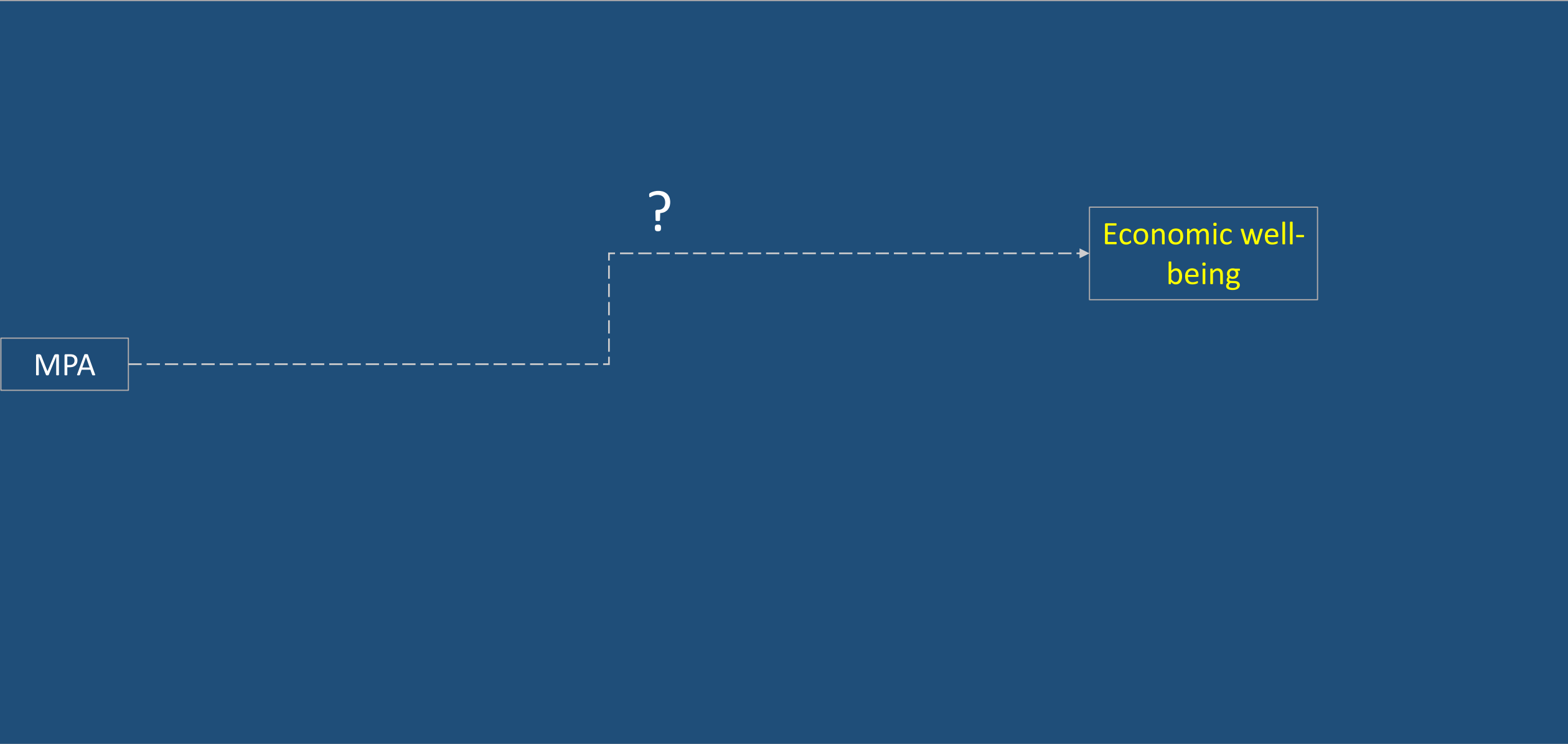


# CAUSAL PATHWAY

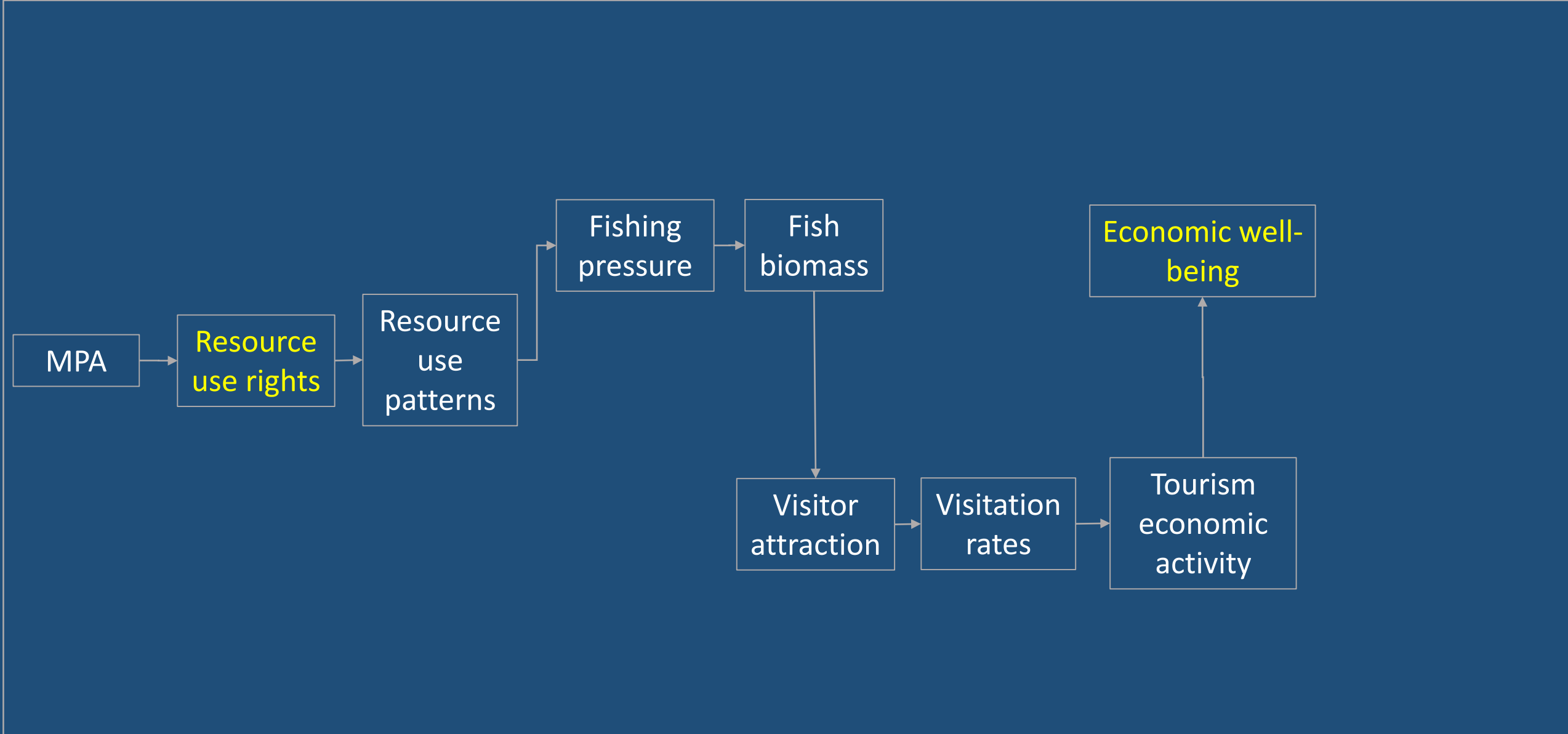
MPA

?

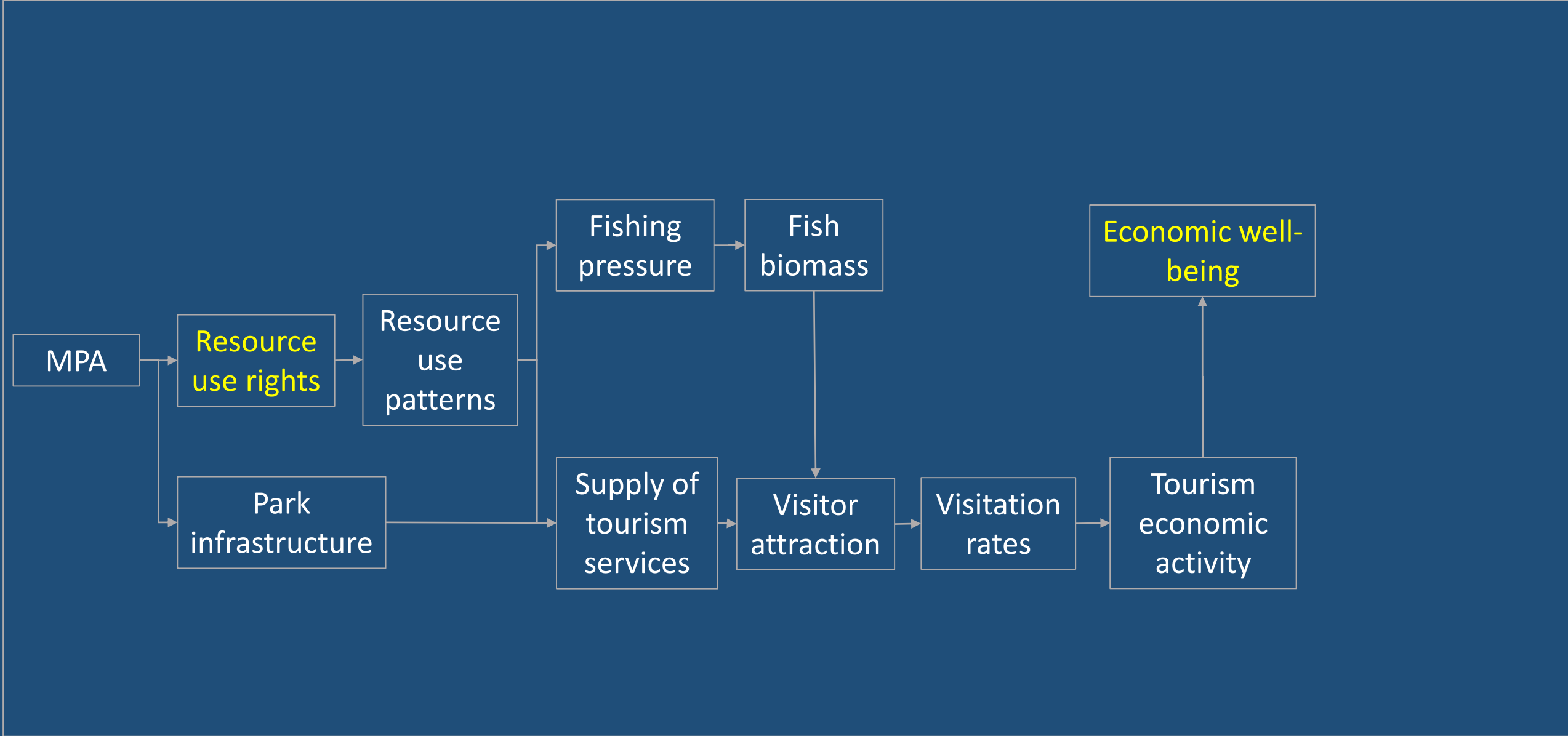
Economic well-being



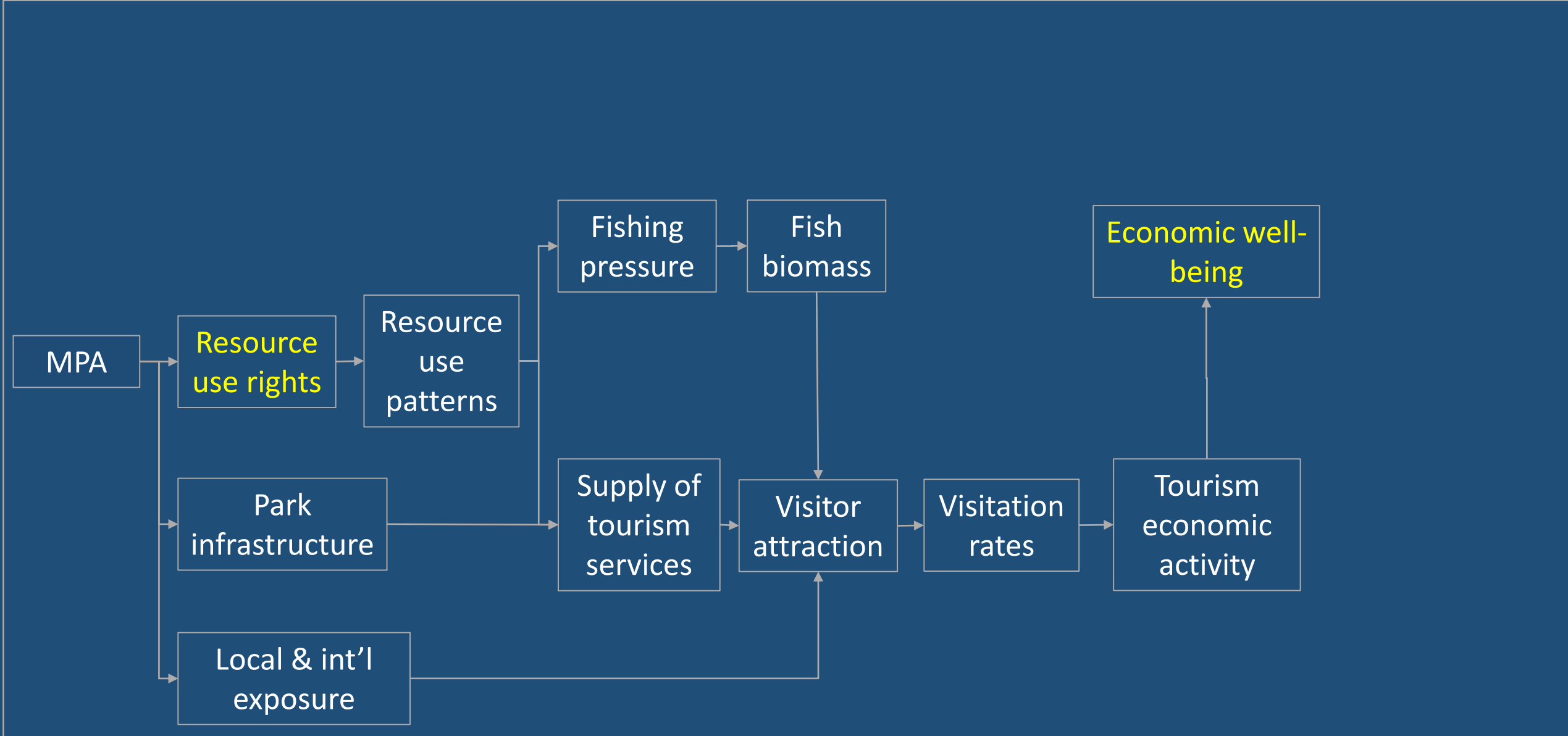
# CAUSAL PATHWAY- TOURISM



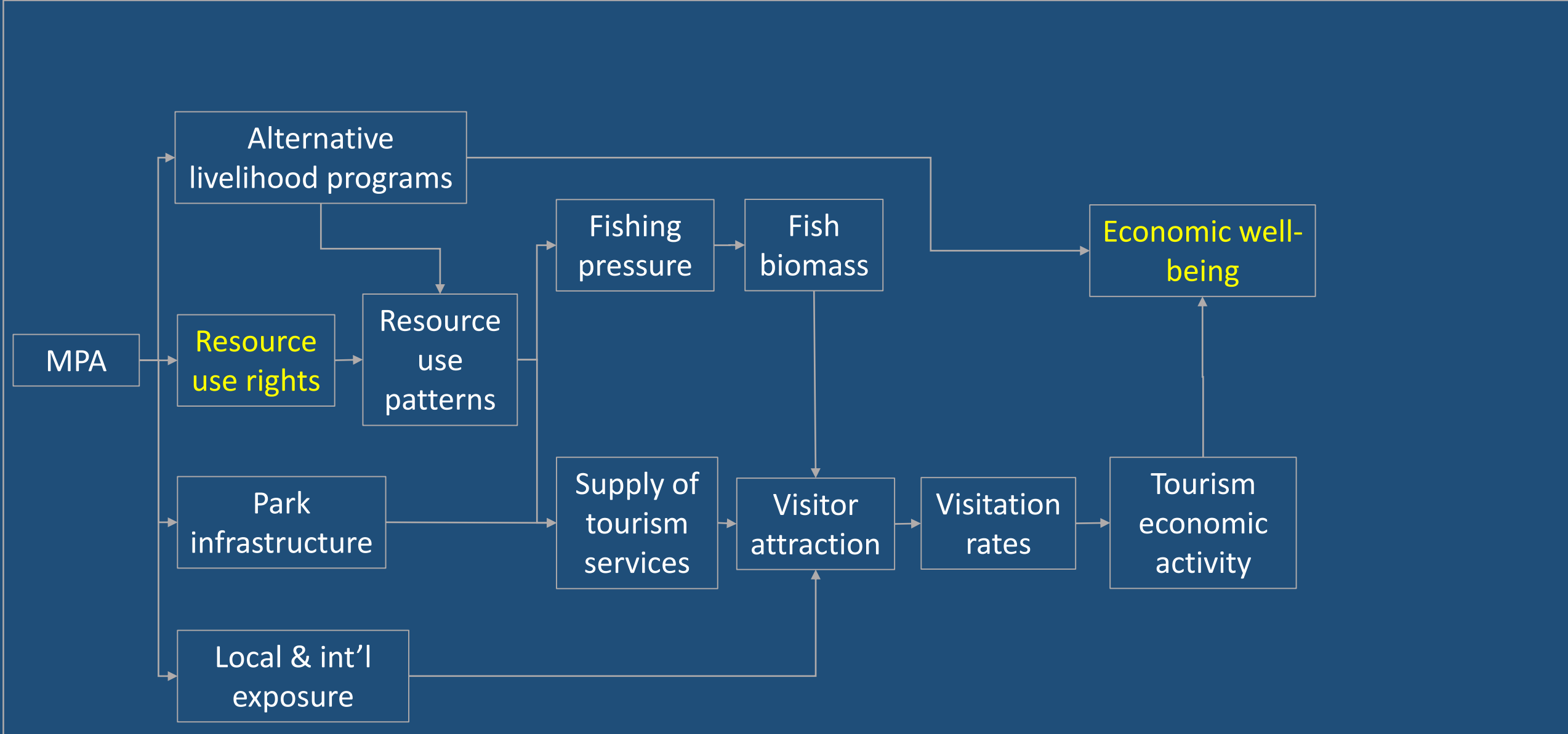
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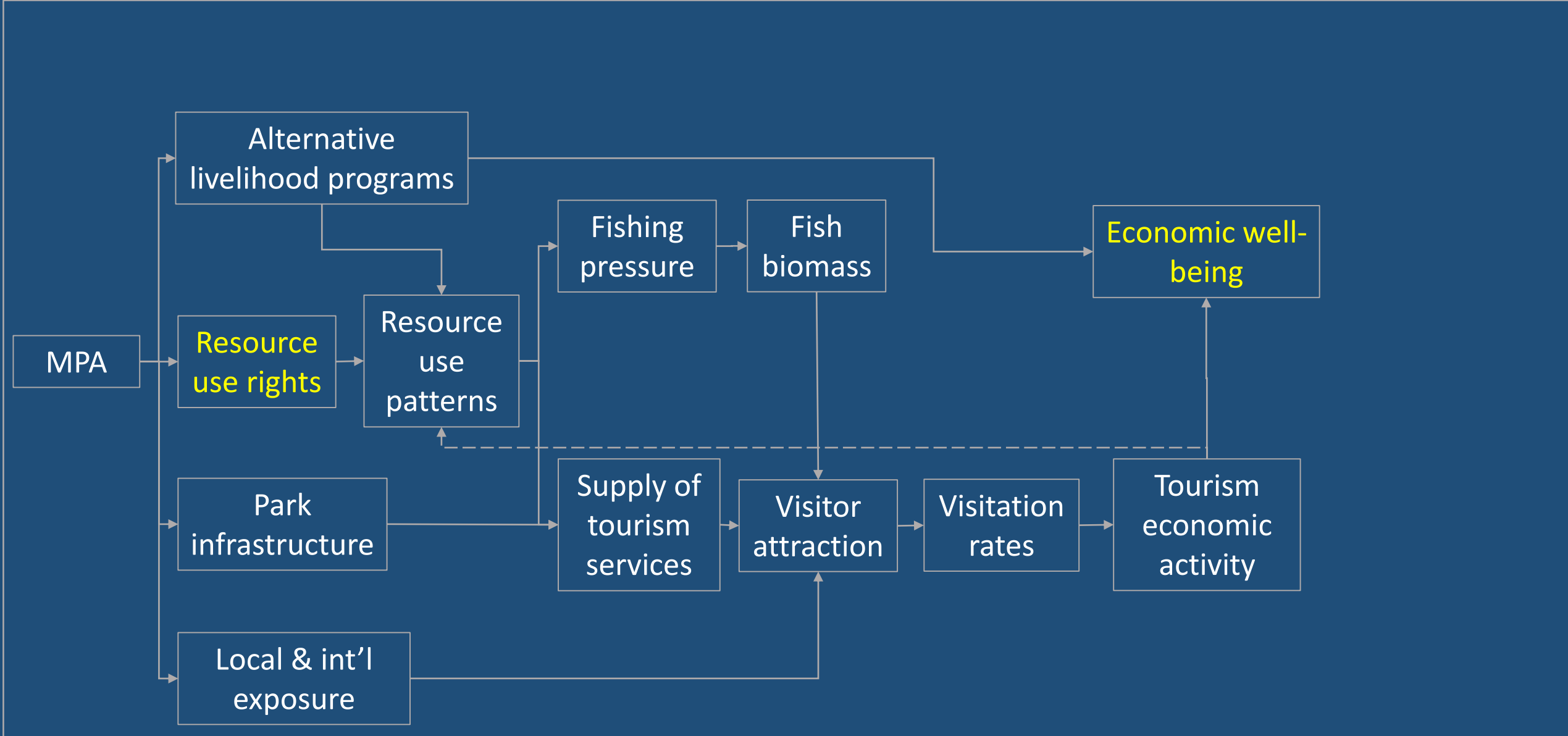
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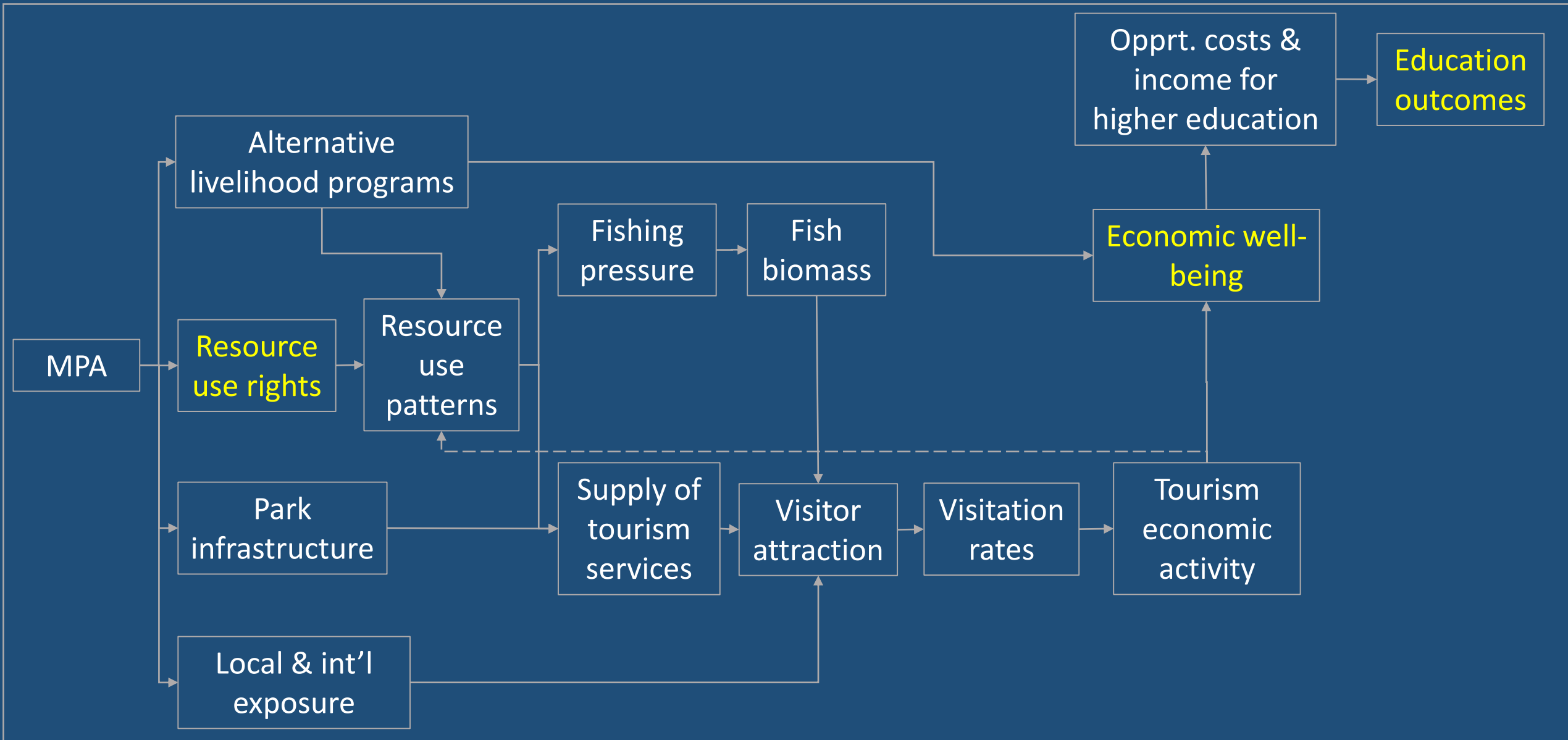
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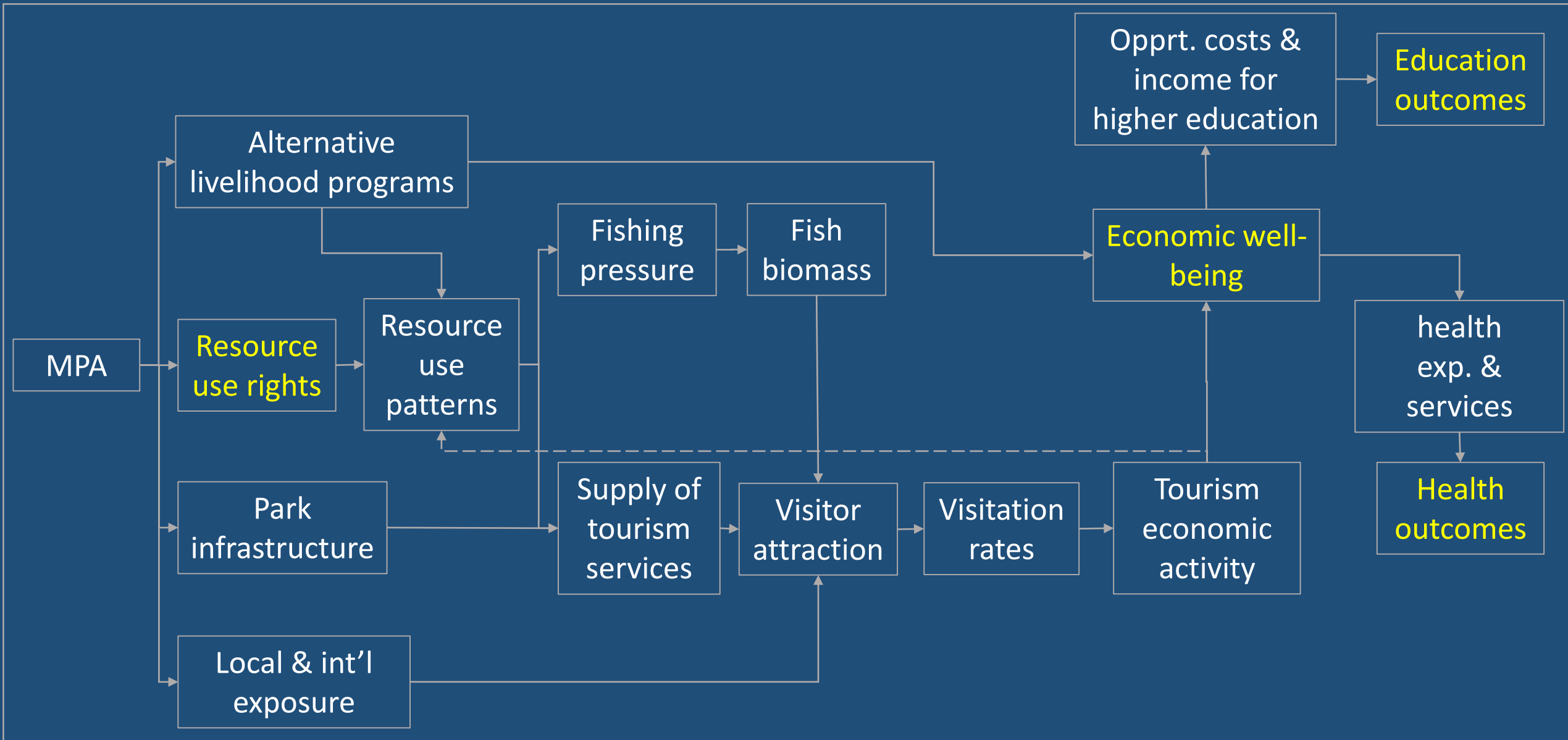


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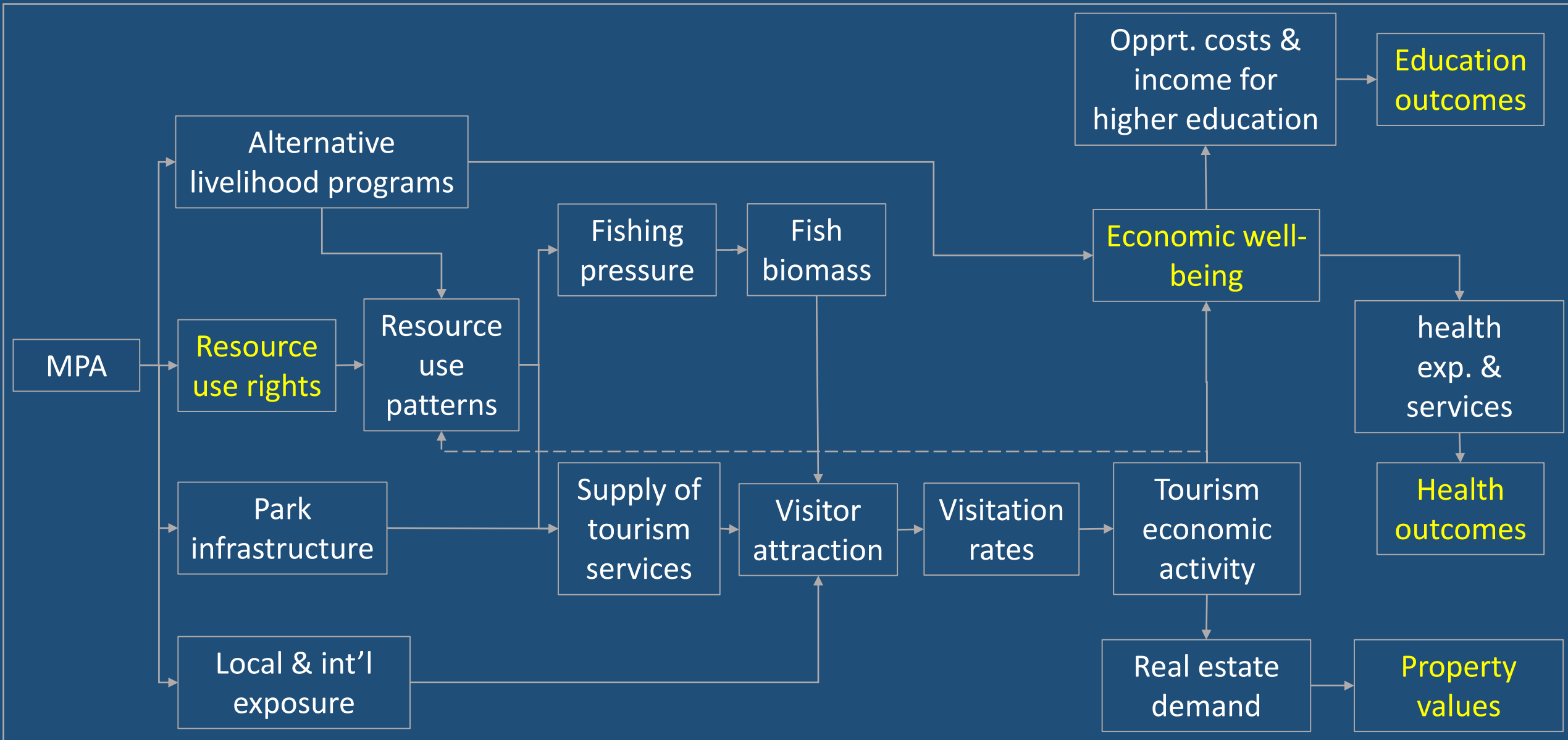




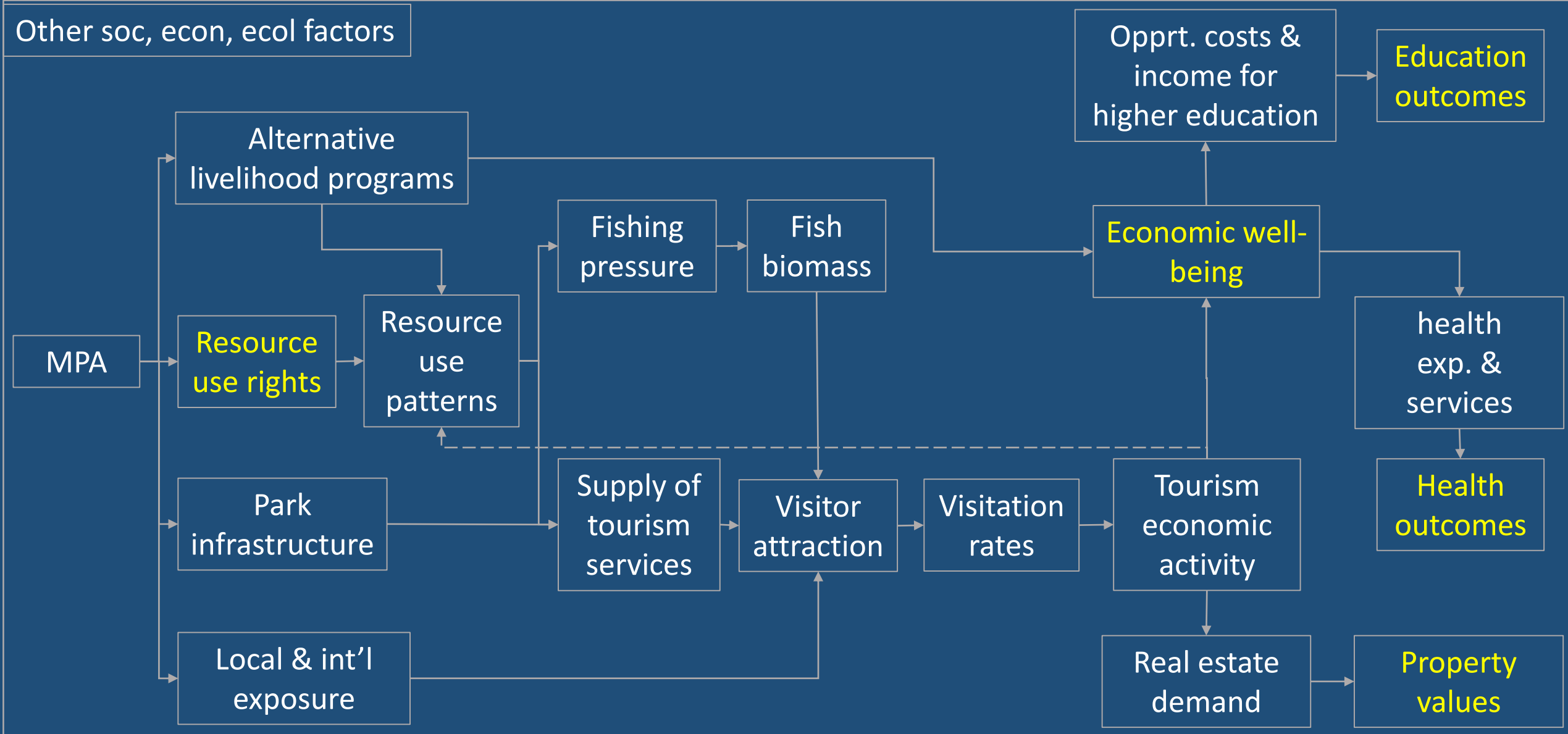
# CAUSAL PATHWAY- TOURISM



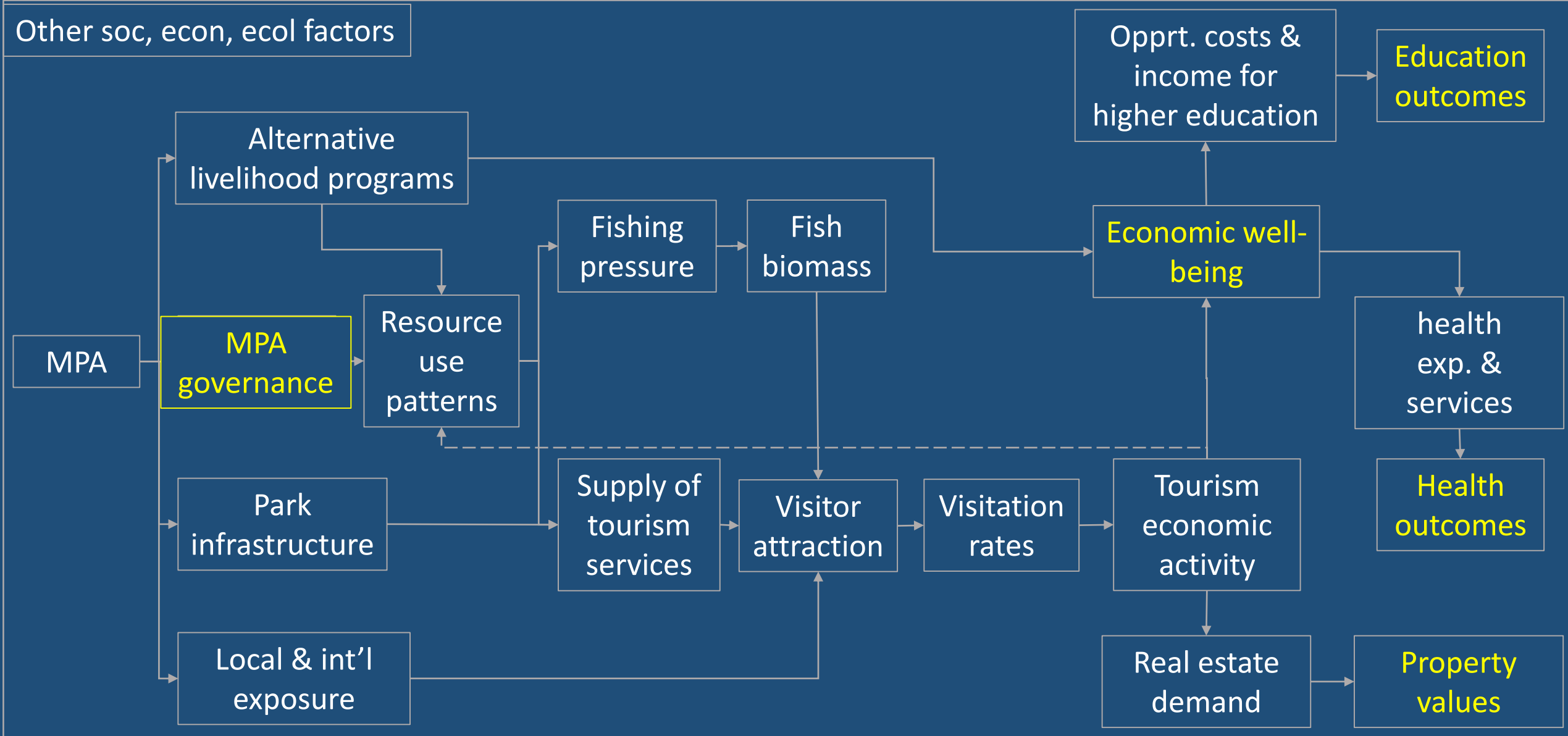
# CAUSAL PATHWAY- TOURISM



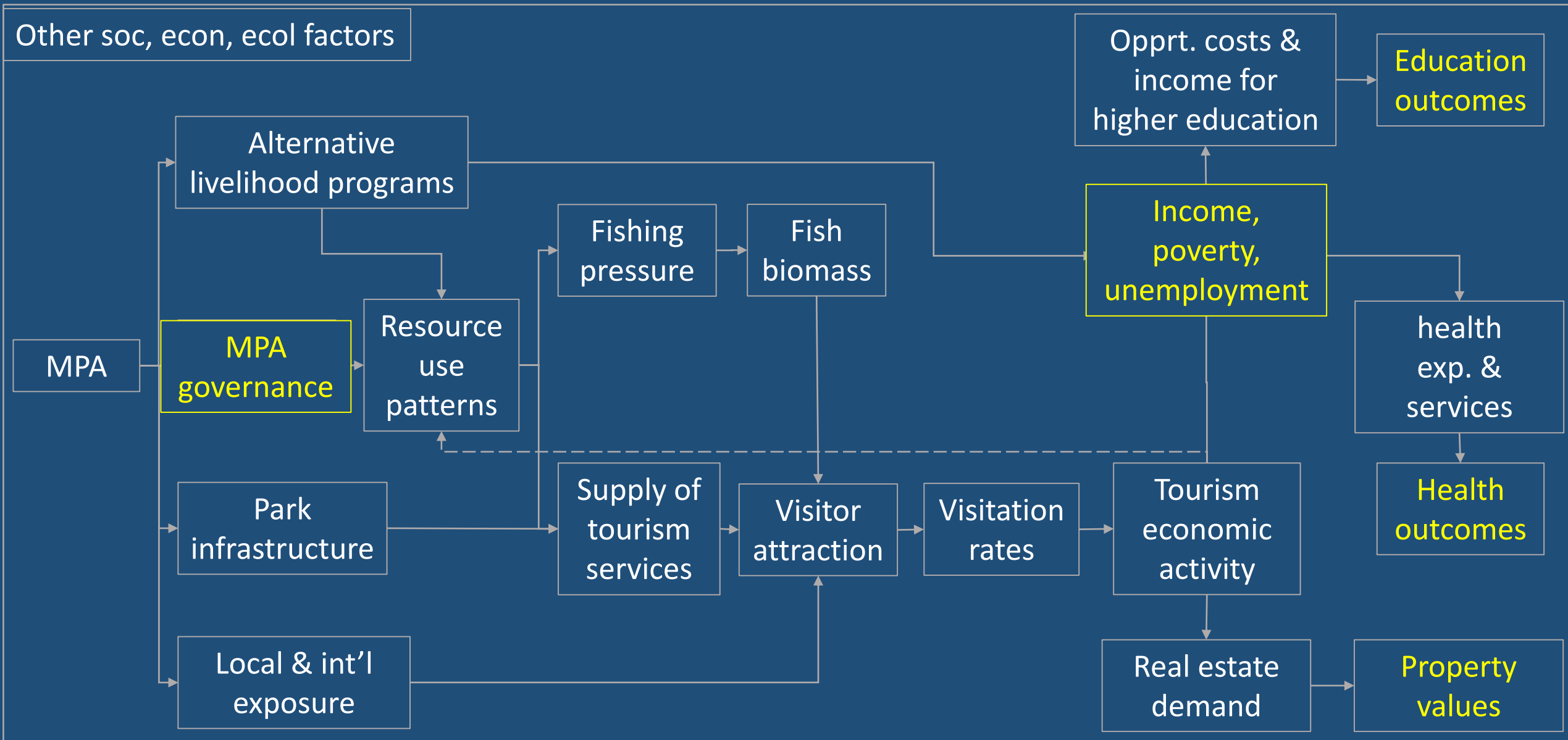
# CAUSAL PATHWAY- TOURISM



# CAUSAL PATHWAY- AVAILABLE DATA

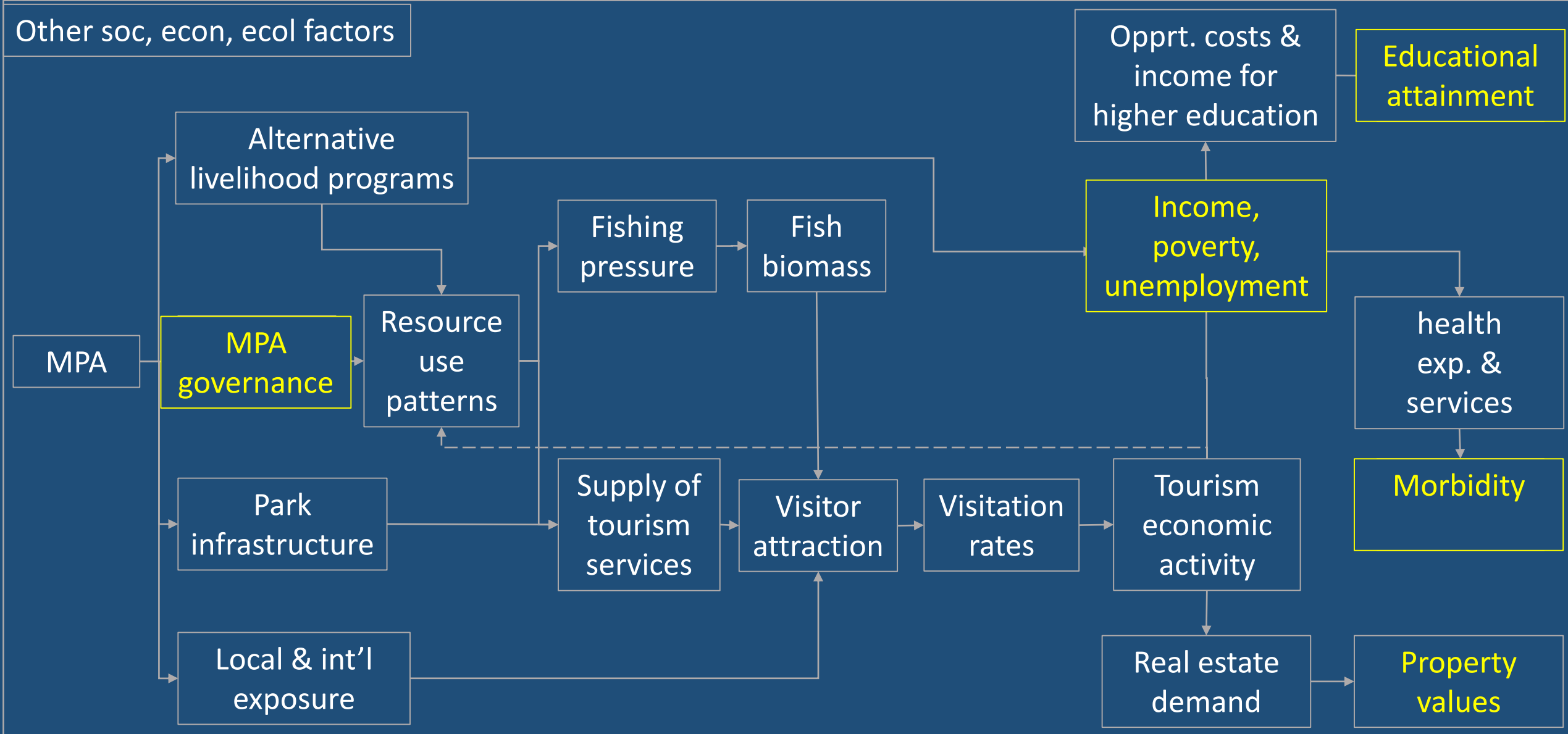


# CAUSAL PATHWAY- AVAILABLE DATA





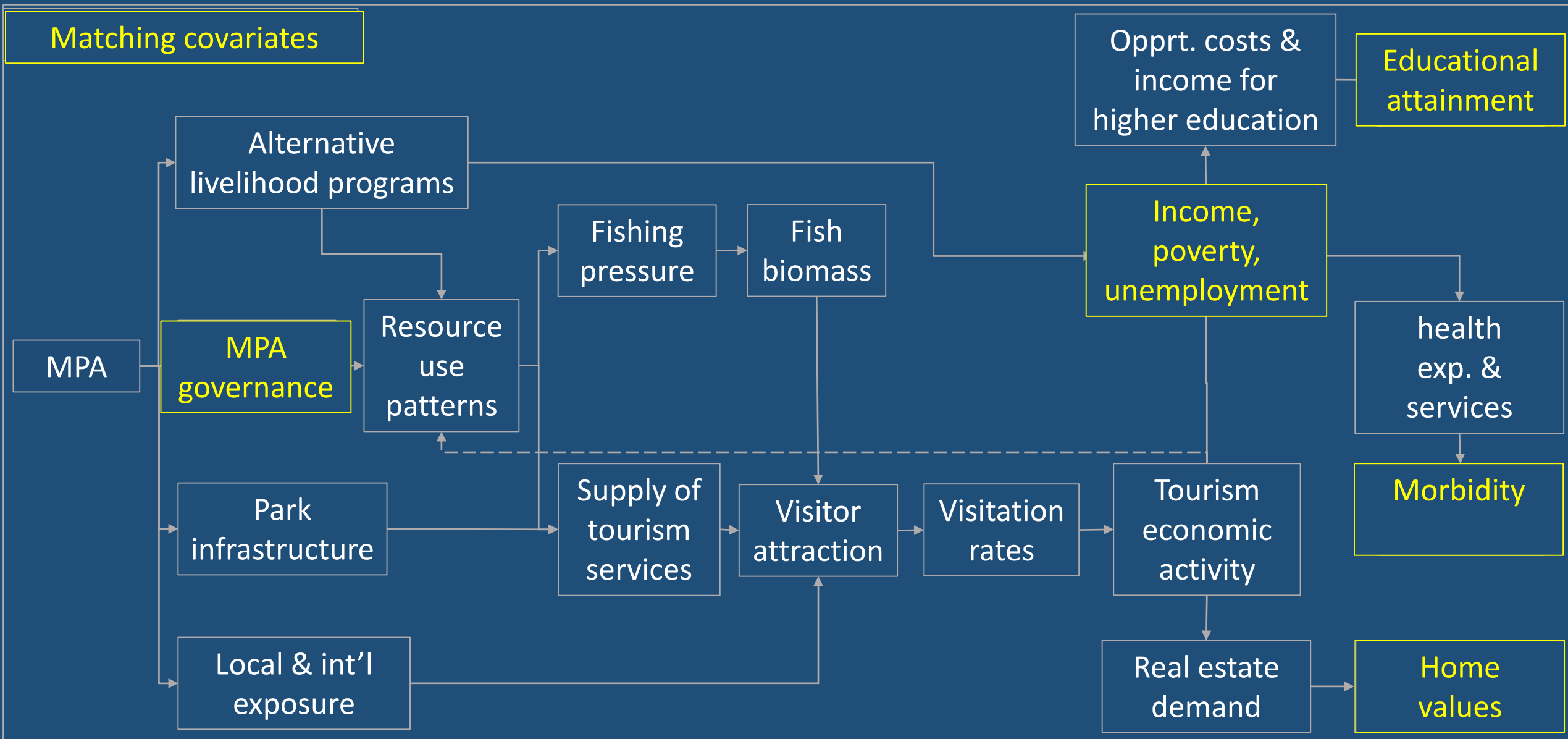
# CAUSAL PATHWAY- AVAILABLE DATA







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# MATCHING COVARIATES



## Treatment (location) bias:

← Least political resistance (no extractive uses)

High biodiversity/tourism value

# MATCHING COVARIATES



## Treatment (location) bias:

← Least political resistance (no extractive uses)  
High biodiversity/tourism value

## Other confounding factors:

← Historic social & economic conditions  
← Distance to population centers  
← Biophysical environment (coastal amenities)  
← Spatial temporal changes

# MATCHING COVARIATES



## Treatment (location) bias:

Population density

Proximity to population centers

Proximity to recreational beaches

## Other confounding factors:

Historic income, home values, dominant employment sectors (1970)

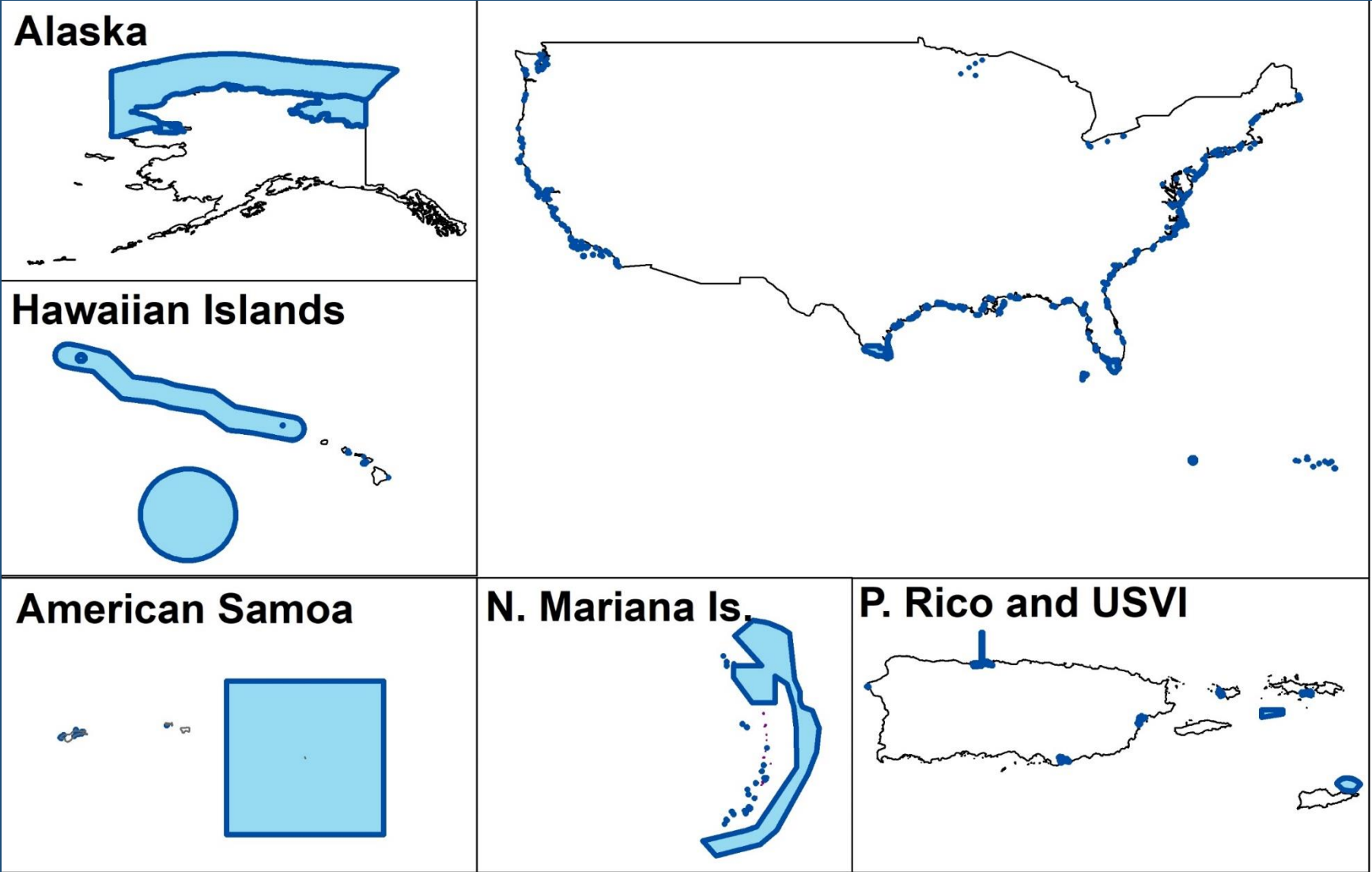
Proximity to population centers

Proximity to coastline

Match by State, distance

# MPA DATA

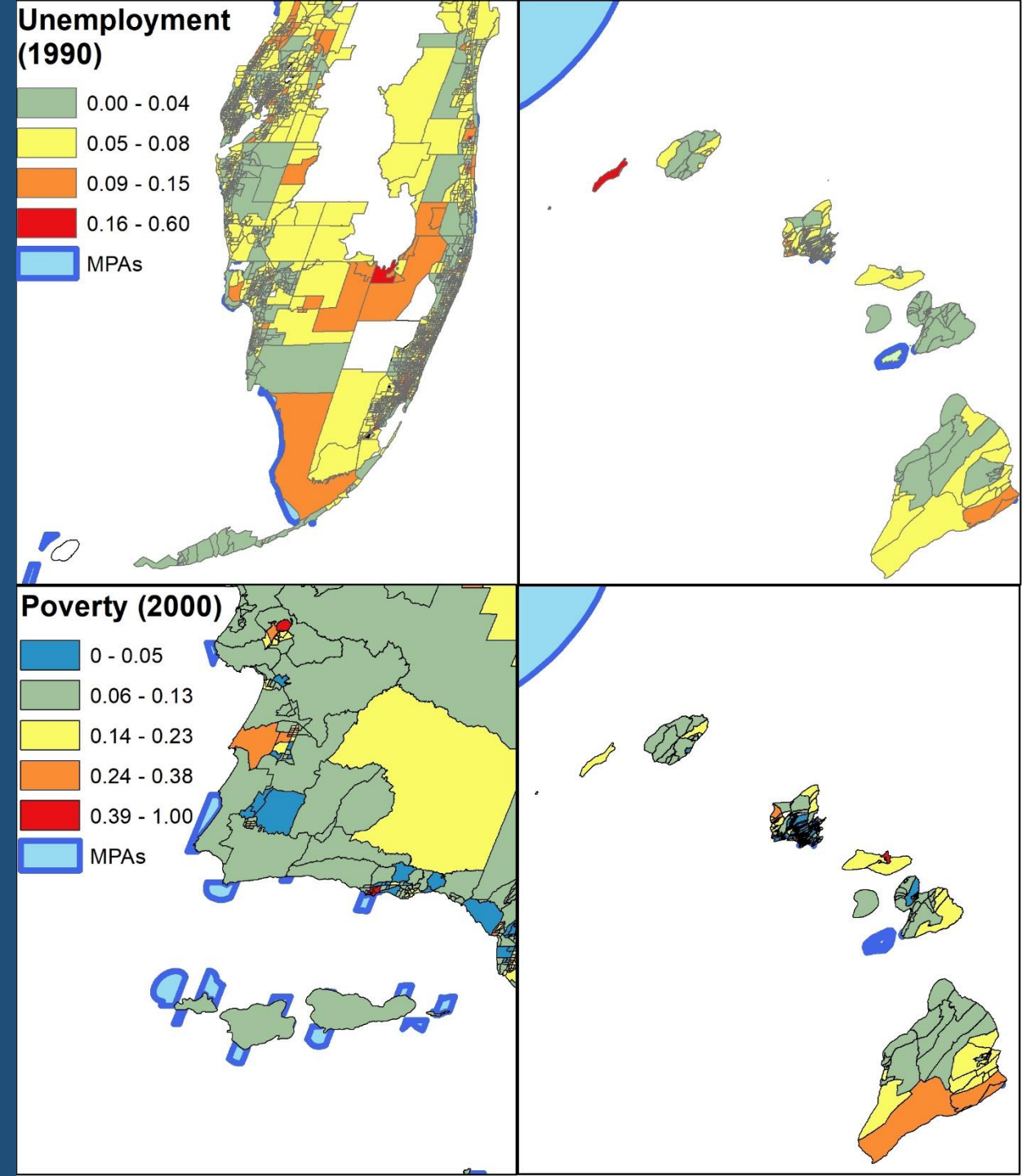
NOAA MPA spatial dataset: commercial fishing prohibited (n=329 MPAs)



# CENSUS DATA

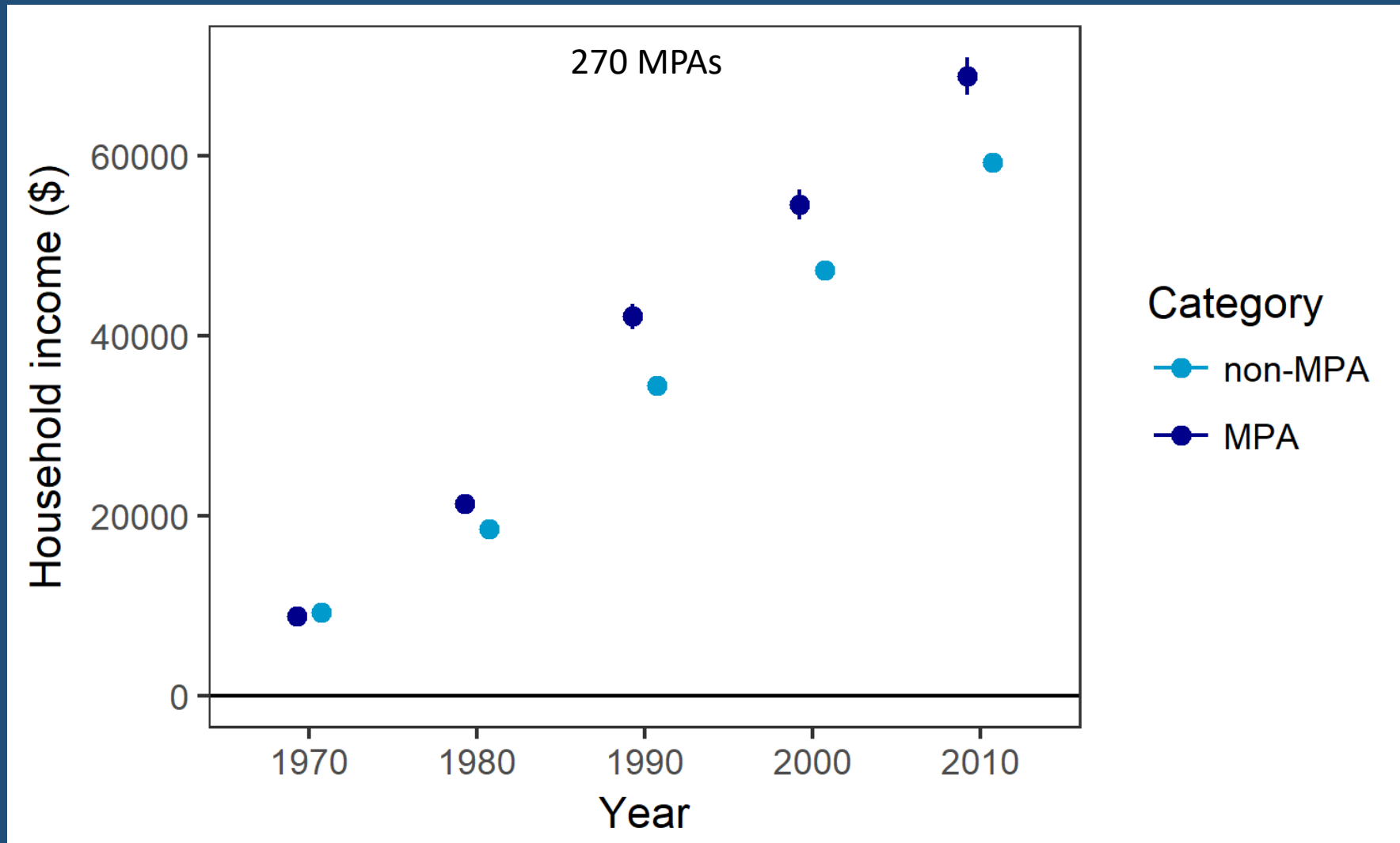
Longitudinal, spatially harmonized  
census tract data (1970-2010)

>26,000 coastal census tracts



# PRELIMINARY RESULTS:

## MPA VS NON-MPA INCOME DIFFERENCES



# NEXT STEPS

## Spatial heterogeneity

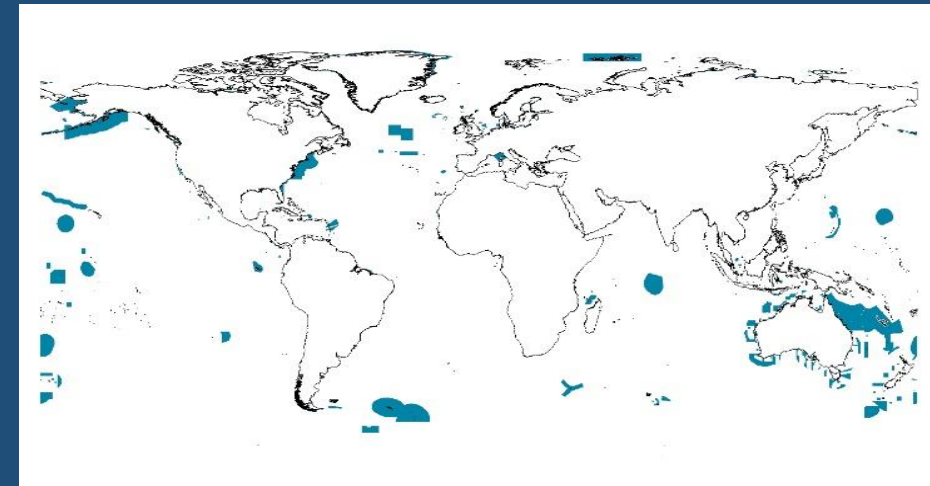
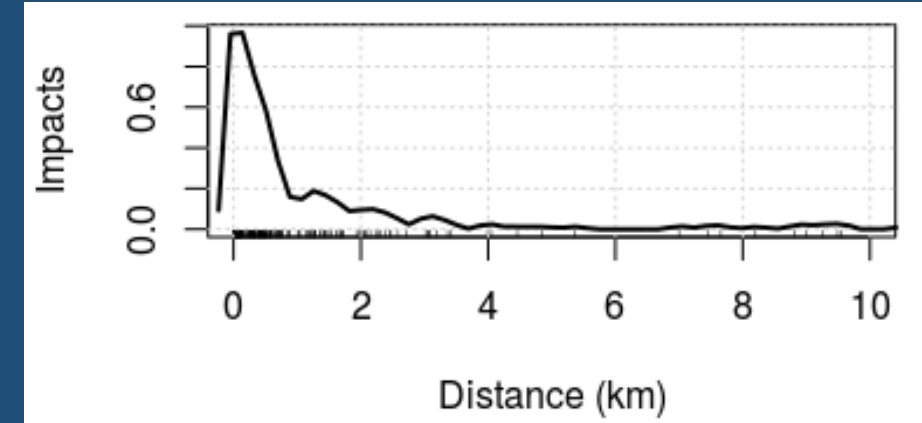
- small scale (spillover)
- large scales (e.g. island vs mainland, US vs non-US)

## Heterogeneity amongst groups

- social groups
- social outcomes

## Explaining heterogeneity

- context
- governance





# DESIRED FEEDBACK

## EXPERIMENTAL DESIGN

### Study design

- Causal pathway
- Alternative methodological approaches

**Outcome (well-being) indicators:** i.e. income, unemployment, property values

- Census indicators
- Other indicators?

**Covariates:** controlling for treatment biases and confounding factors

- Missing covariates?

### Other relevant data sources

- Non-census sources?

# THANK YOU

## Mentors:

Michael B. Mascia, **Conservation International**

Alex Pfaff, **Duke University**

Chris Kennedy, **George Mason University**

Susie Holst & Peter Edwards, **NOAA**



# MPA DATA

NOAA MPA Inventory spatial dataset

