

Coastal and Marine Spatial Planning (CMSP) in the context of Ecosystem-based Management (EBM)



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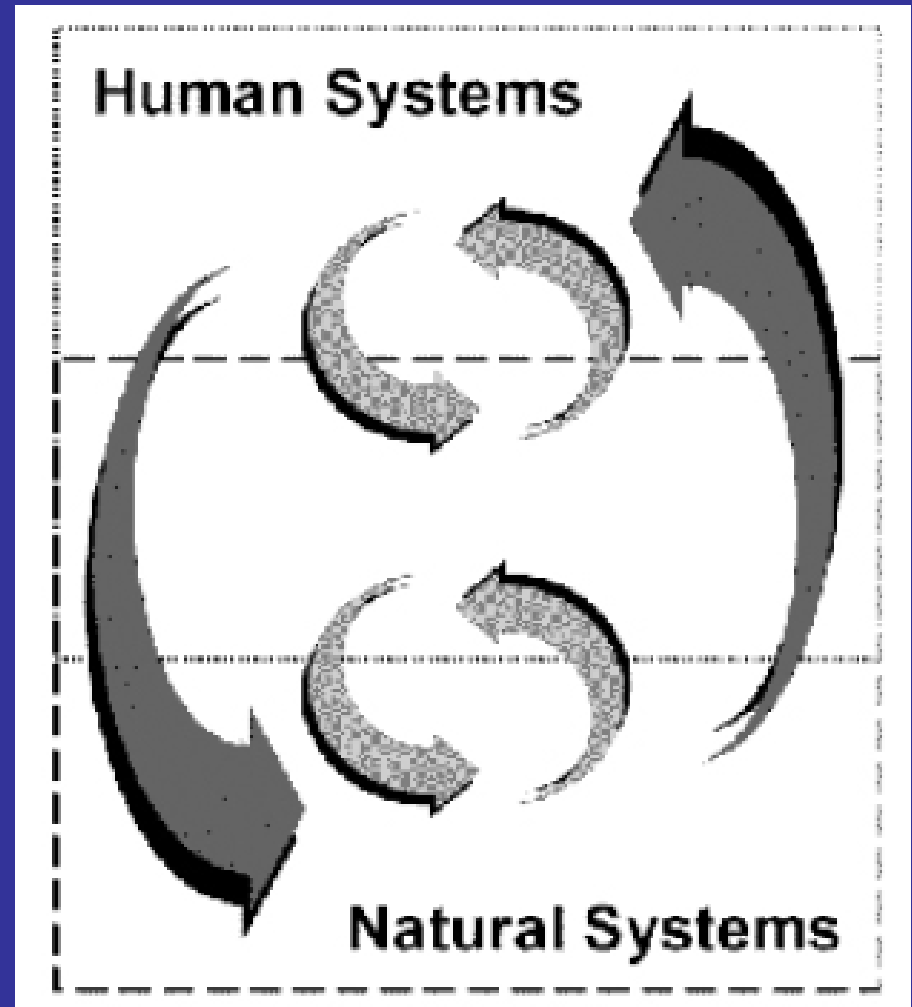
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Coupled Nature-Human (CNH) Systems

- CNH concept arose from theoretical ecology
- Spatial and temporal dimensions
- Application of CNH thinking to natural resource management comprises ecosystem-based management (EBM)
- Initial steps comprise an ecosystem approach to management (EAM)

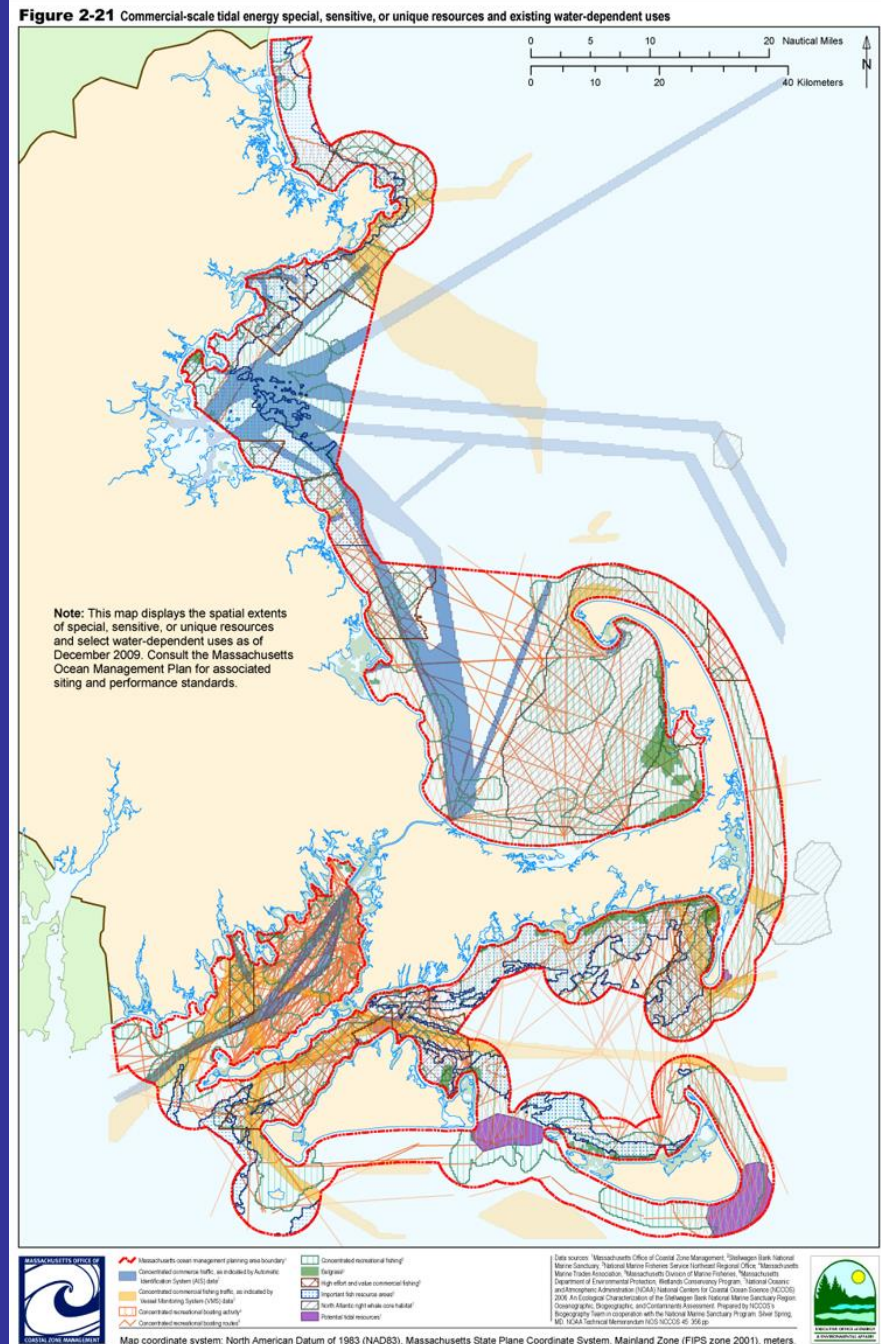


US National Science Foundation

CMSP for EBM

- The coastal ocean is becoming more crowded
- Seems sensible to plan for ways to mitigate any conflicts
- When one type of human use (or non-use) could displace or exclude another, how can we assess such tradeoffs?
- What are the effects on the ecosystem?...on humans?
- Can **planning** help to realize an “ecosystem-based approach to management”?

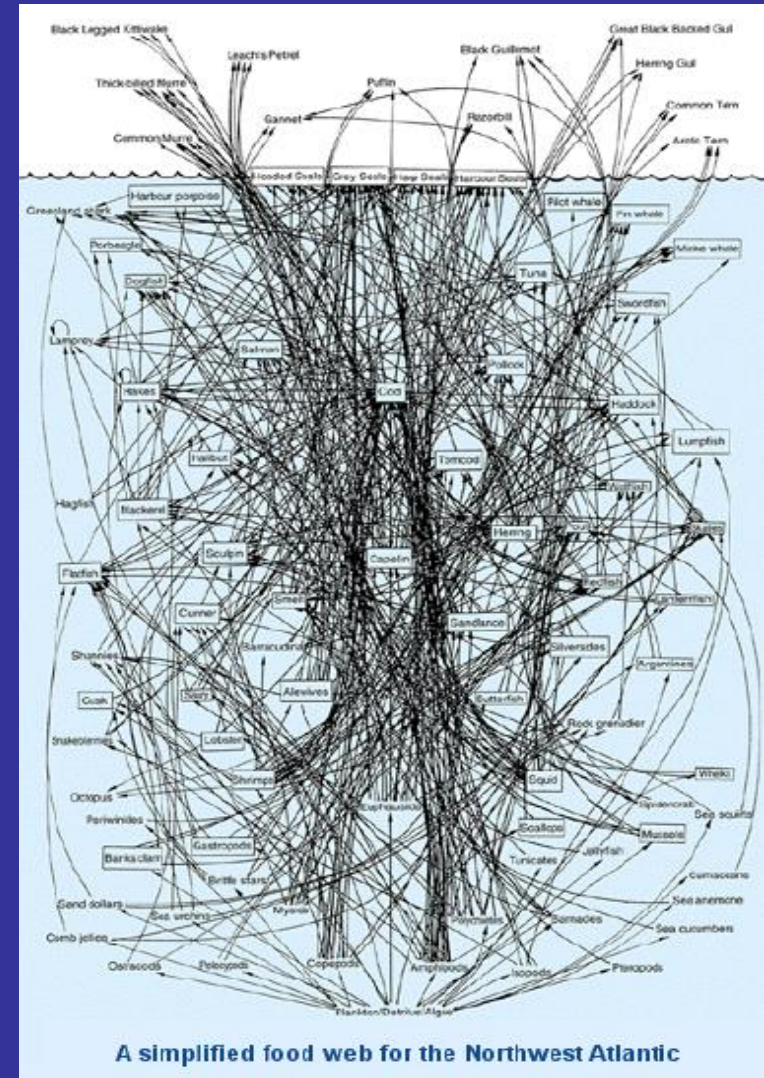
Massachusetts Ocean Plan



Marine Food Web

- Ecologists build models of marine food webs
- These models may recognize humans as a component
- Typically do not model the complexity of the human system explicitly

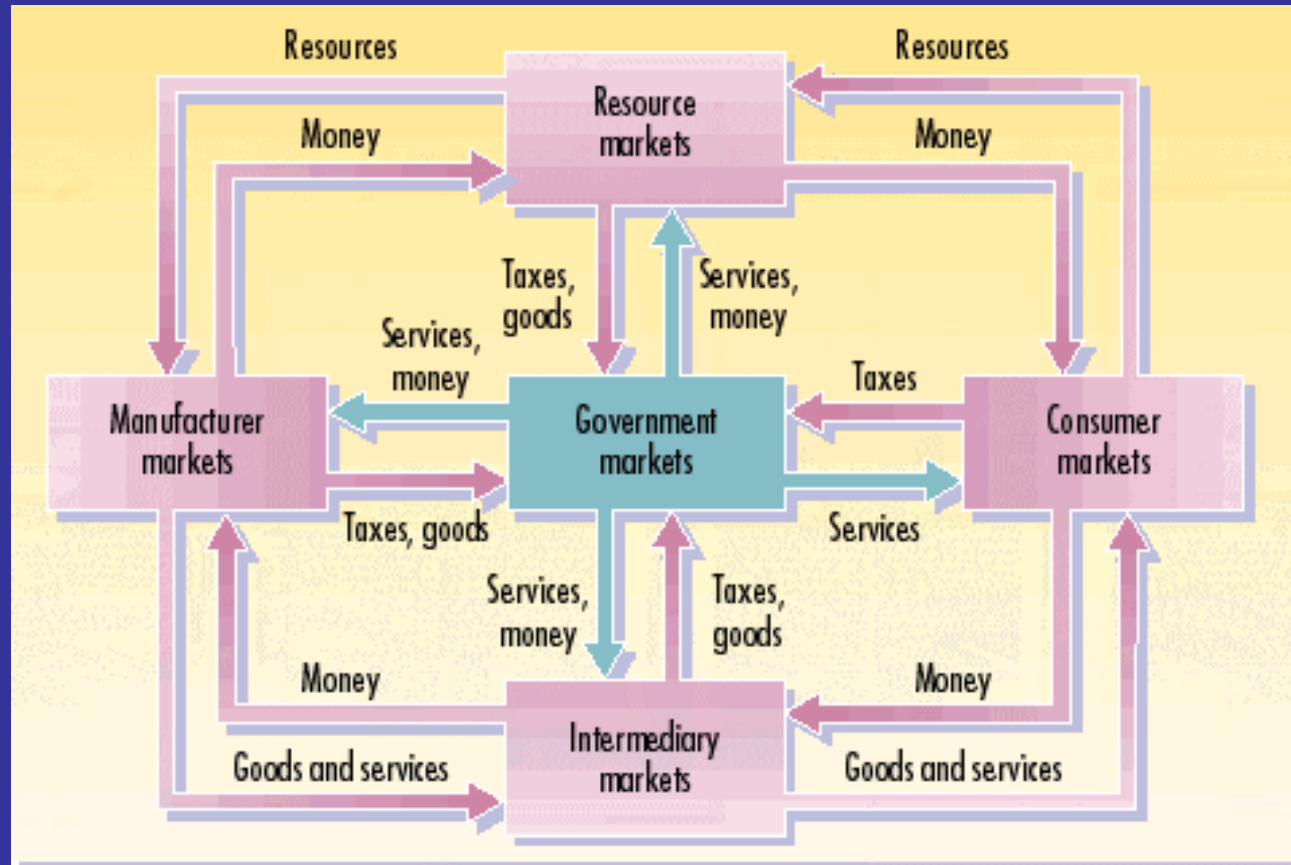
Natural Sciences and
Engineering Research Council
of Canada



NSERC (2008)

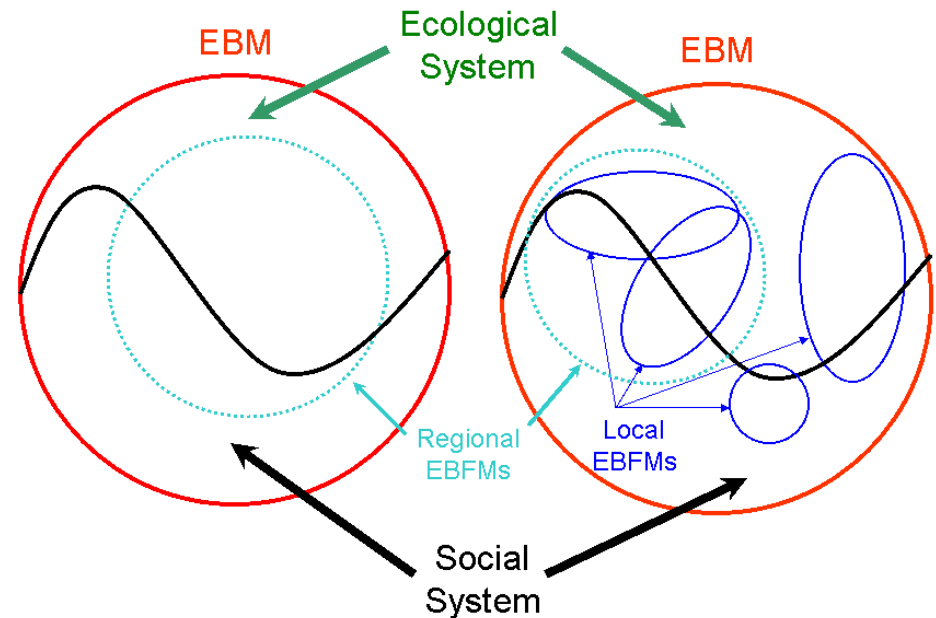
Regional Economy

- Economists build models of flows among industry sectors in an economy
- Typically do not model the complexity of the natural system explicitly



Linked Economic and Ecological Models

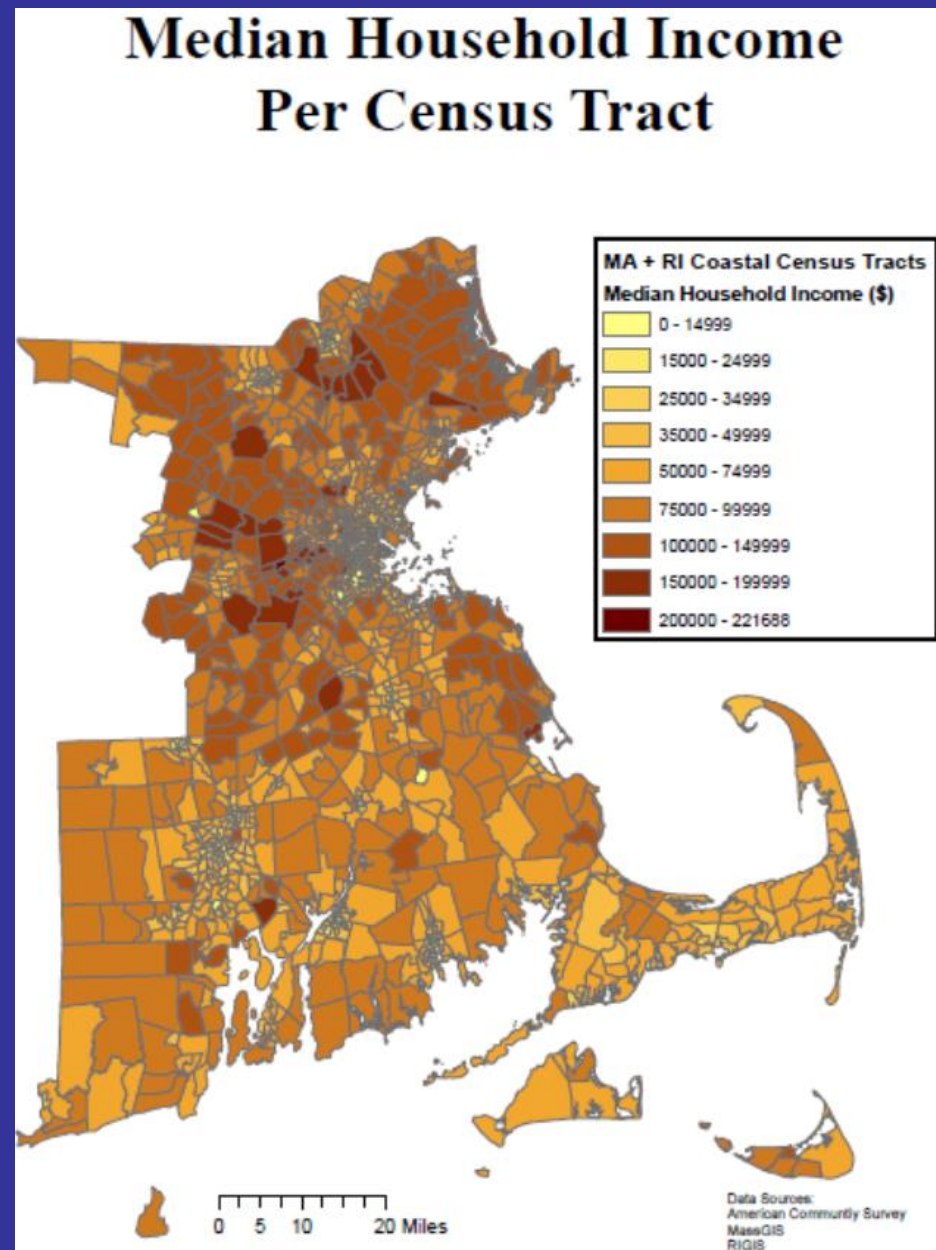
- CNH thinking suggests that distinct **models might be linked**
- Advantage is that we can examine the effects of changes occurring in one part of the system on another
- Linked models may enable an ecosystem approach and could facilitate planning within the context of EAM



CINAR (2011)

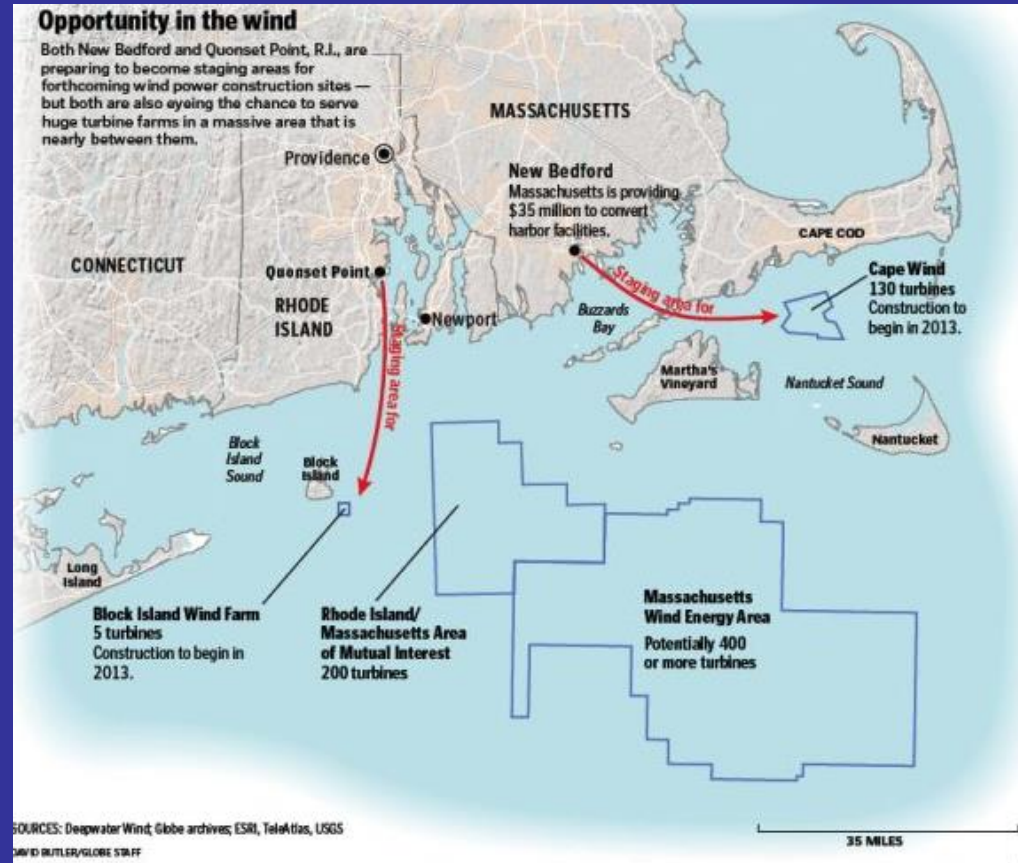
Distribution of Effects across Households

- There is now increased policy-level attention to issues of **wealth and income inequality**
- Pres. Obama: "...increasing inequality is most pronounced in our country, and it challenges the very essence of who we are as a people..."
- Effects on final consumers (**households**) in an economy also are important



Proposed Wind Farm Sites off Rhode Island and Massachusetts

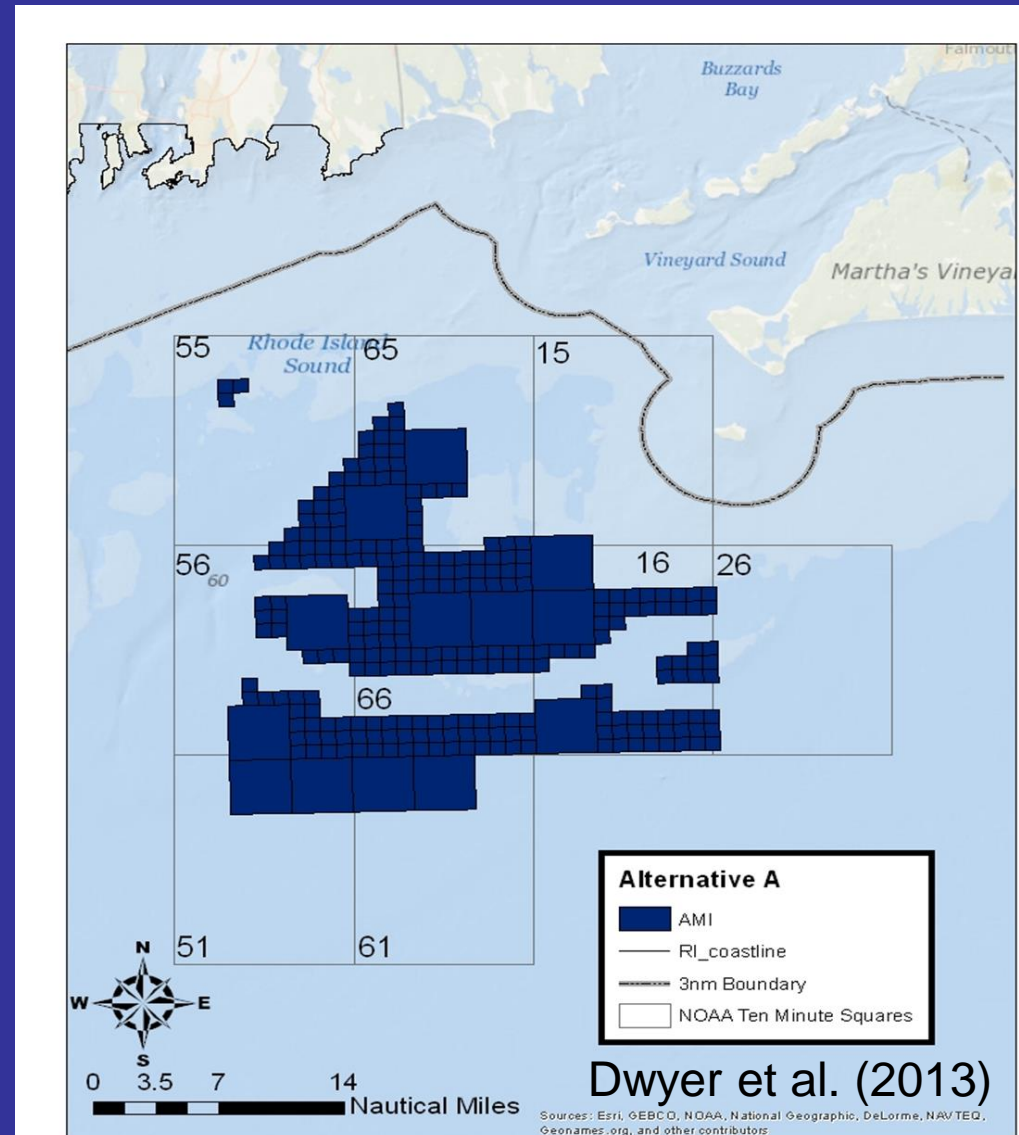
- Deepwater Wind's Block Island Wind Farm (BIWF) **[25 MW]**
- Cape Wind's lease area in Nantucket Sound (grandfathered) **[468 MW]**
- RI and MA "Area of Mutual Interest" (AMI) in Rhode Island Sound (North and South) **[1,000 MW]**
- Bureau of Offshore Energy Management (BOEM) Massachusetts Wind Energy Area **[2,000-13,000 MW]**



Boston Globe (2013)

Potential Effects of Displacement of Commercial Fisheries from the RI/MA Area of Mutual Interest (AMI)

- NMFS compiles catch data at the level of 10' squares (numbered boxes)
- During 1998-2008, average annual commercial fishing revenues were **~\$12m**
- We assumed that commercial fishing would be excluded from the AMI
- Thus **~\$5m** in gross revenues would be lost to the coastal RI/MA economy
- **Caveats!** (assumptions regarding exclusion; fishermen's behavior; renewable energy impacts)

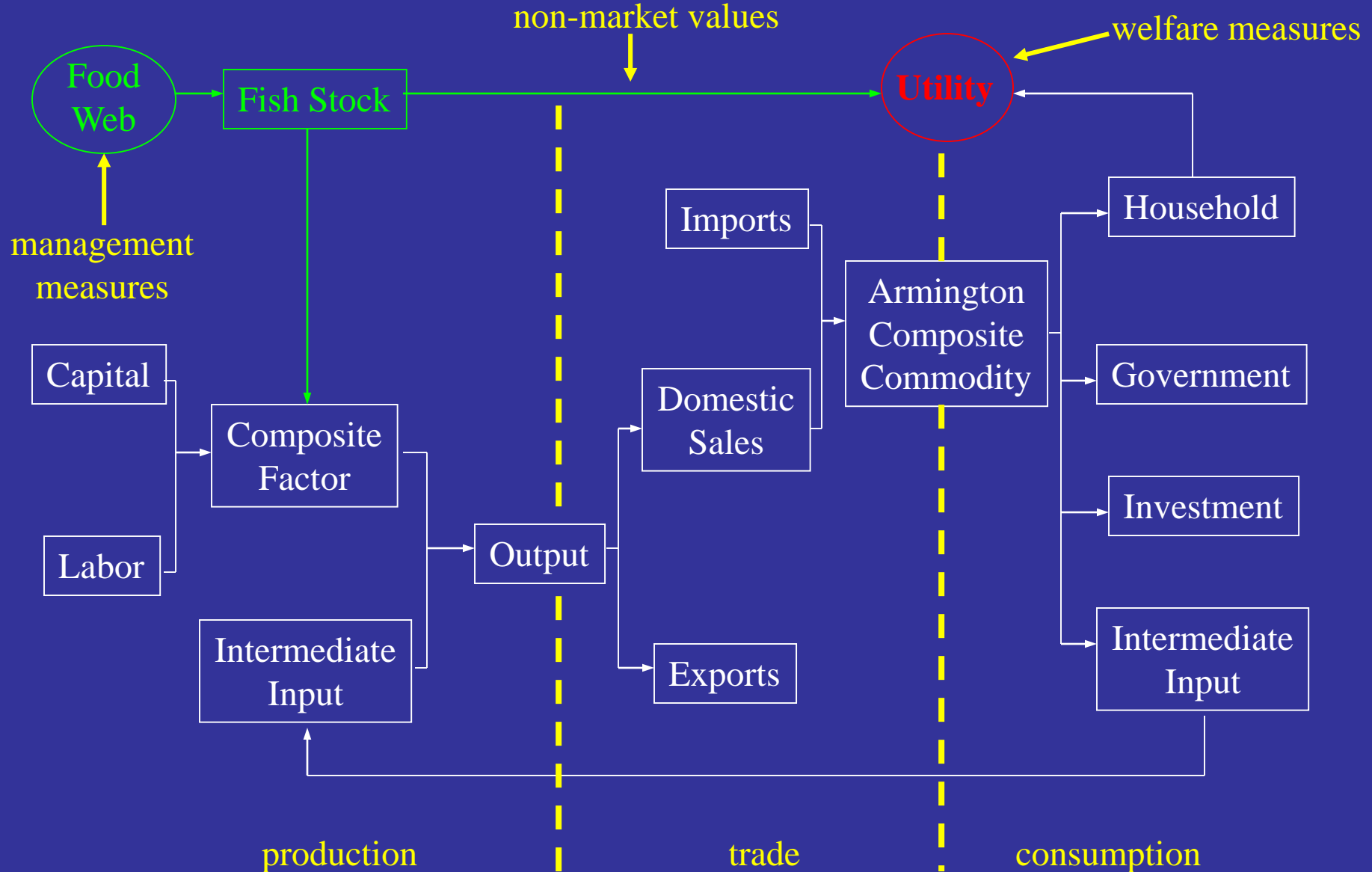


Baseline Regional Economy for Coastal RI and MA

Baseline Economy (\$m 2013)	Output	Regional Supply	Imports	Exports
Agriculture	965	4,479	4,207	693
Fishing	515	432	71	153
Fish Processing	800	343	81	538
Manufacturing	110,851	149,809	60,737	21,779
Other	469,400	412,617	84,306	141,089

- “Economy” encompasses coastal counties in Rhode Island and Massachusetts
- Fisheries and Fish Processing are distinguished from the rest of the economy
- Changes from the baseline involve changing quantities and prices as the economy re-equilibrates

Basic Components of a CGE Model



Excluded Fishery Impacts “Multiply” through the Economy



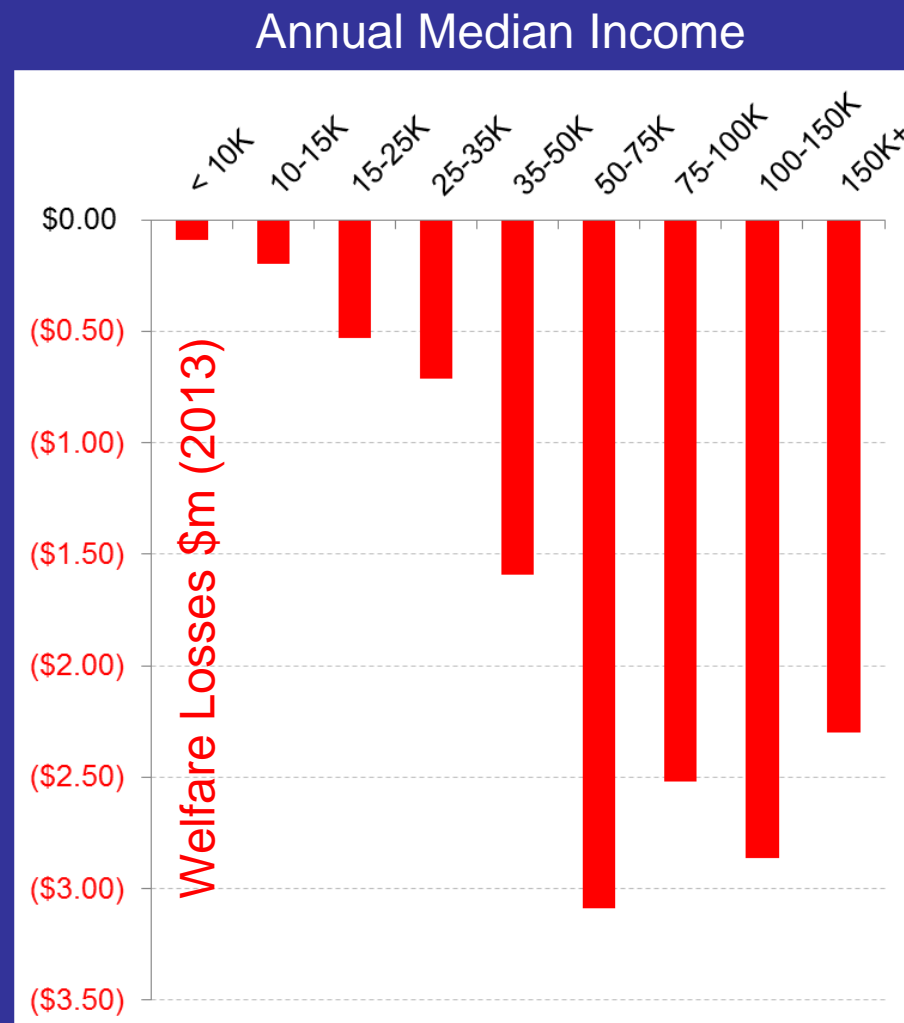
Table 2: Indirect and Induced Output Impacts of Lost Fishing on Other Industry Sectors (2013\$)

IMPLAN Sector	Industry	Indirect	Induced	Total
43	Maintenance and repair of nonresidential buildings	515,887	12,366	528,252
390	Wholesale trade	320,506	189,060	509,566
509	Owner-occupied dwellings	0	416,440	416,440
467	Hospitals	0	208,745	208,745
431	Real estate	33,146	148,711	181,857
397	Scenic and sightseeing transportation and support	176,105	4,198	180,303
465	Offices of physicians- dentists- and other health	0	173,039	173,039
481	Food services and drinking places	4,728	154,069	158,797
427	Insurance carriers	53,858	91,471	145,329
478	Other amusement- gambling- and recreation industries	109,263	24,693	133,956

AMI Alt. A Welfare Changes (\$m 2013; Jobs)	Direct	Indirect	Induced	Total
Output	- 5.2	- 2.0	- 3.3	- 10.5
Value Added	- 2.5	- 1.1	- 2.0	- 5.6
Tax Receipts				- 1.7
Employment	- 113	- 14	- 25	- 152

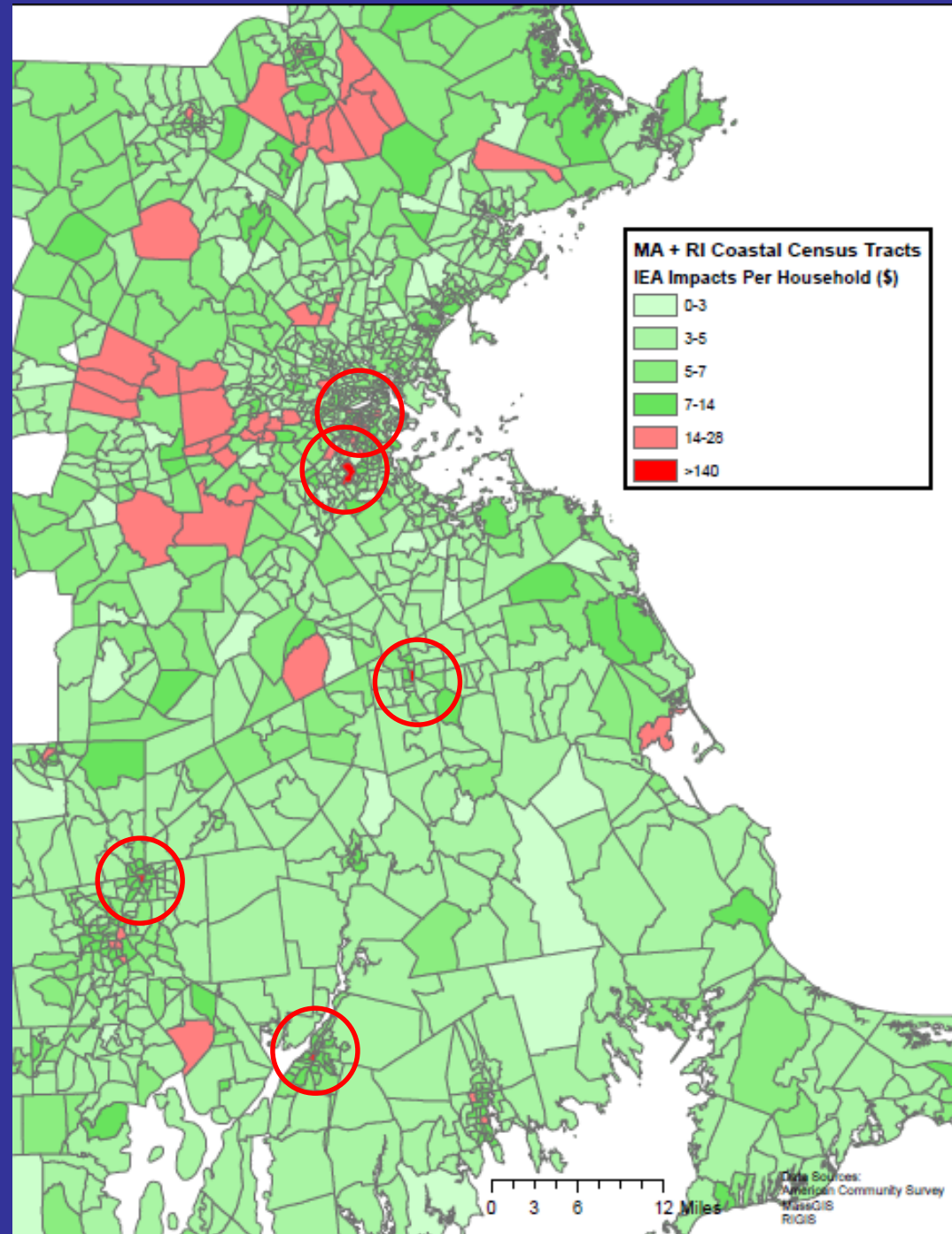
Potential Welfare Effects

- Welfare losses are lost EV (consumer surplus) from excluded fisheries and linked sectors (~\$14m)
- [Welfare changes from wind energy (if they exist) were not estimated]
- Impacts are progressive, showing how middle-class and wealthy households consume more seafood and are tied more closely to the regional economy
- Impacts comprise a larger proportion of household income for the less wealthy (not shown)



Inequality Aversion

- Societal concerns about wealth or income inequality
- Reflective of an “inequality” aversion (much like risk aversion)
- Weight impacts to low income groups more heavily (and v.v.)
- Losses to income categories are assigned to census tracts based upon median income
- Losses per household are estimated



Comments

- EBM involves understanding how changes to a coupled nature-human system play out across space and over time
- Using this knowledge, society may be able to plan better for the consequences of new ocean uses or the reallocation of existing ocean uses
- Many issues require further work, including:
 - the political economy of decision-making
 - exogenous influences on the coupled system (climate change)
 - the dynamic aspects of CNH