Short-term Impacts on Coastal Sub-Regions

Description of Input-Output Model

Overview

- **Explanation of short-term impacts**
- **Brief description of input-output models**
- **Legal mandates?**
- **IMPLAN software and data**
- **Steps used to construct input-output model**
  - **Region of influence area designations**
  - **IMPLAN modifications**
  - **Data requirements**
- **Impact estimation issues**
  - **Capturing forward linkages**
  - **Avoiding double-counting impacts**
- **Comparison to other input-output modeling approaches**

Economic Impacts

What is meant by short-term impacts?

- The immediate regional impacts (sales, income, employment) that would occur in 2004 following implementation of a proposed regulation rather than a discounted stream of impacts in future years.

- No temporal effects

- Assumes the economic structure in each sub-region in New England will remain unchanged

- No price effects

Input-output Models

- I/O models capture inter-industry transactions between businesses and between businesses and final consumers in an economy
  - Industries use the products of other industries to produce their own products
  - Outputs from one industry become inputs to another

Basic Input-Output Logic
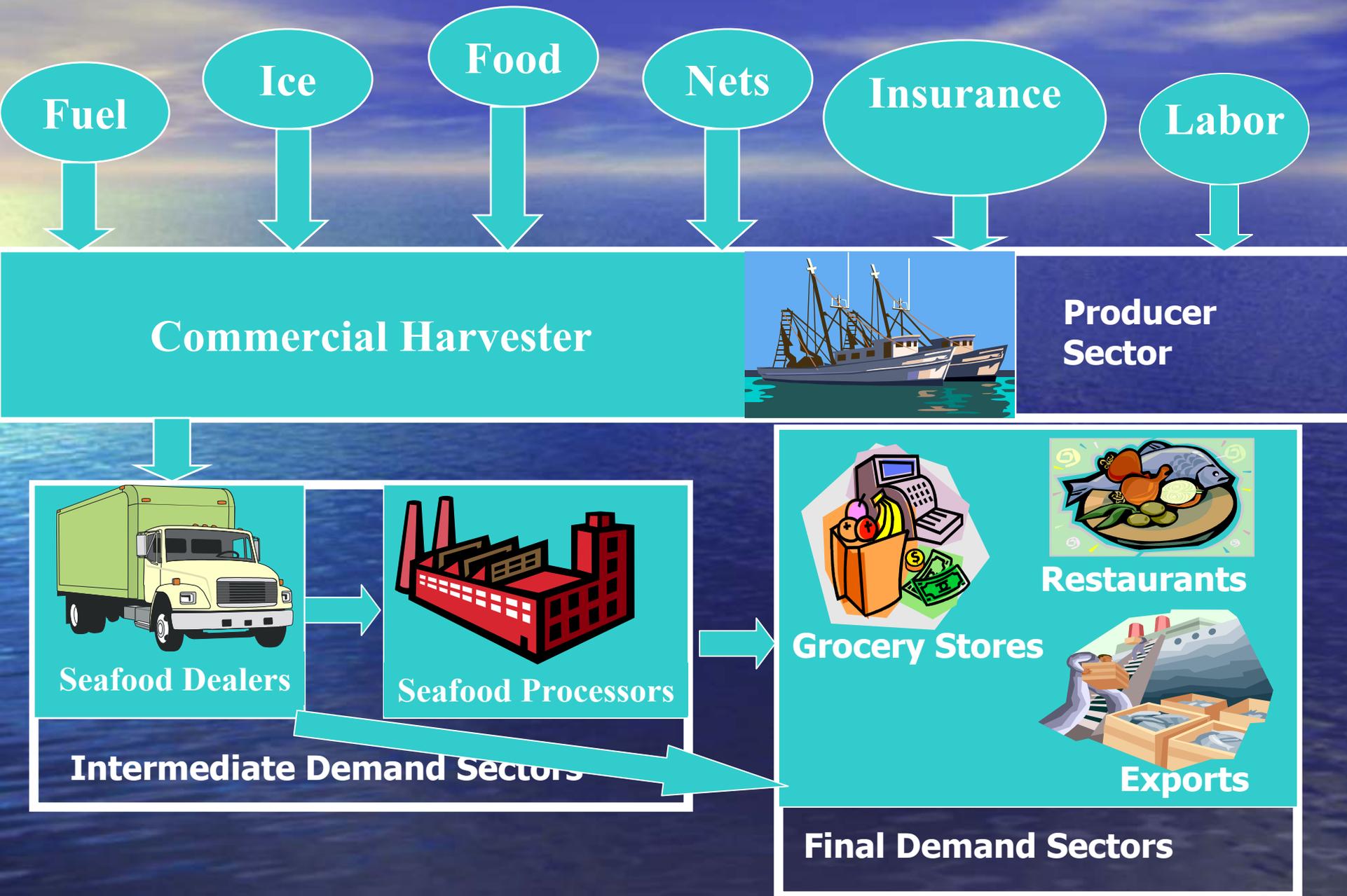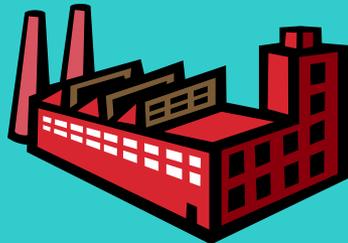
Fuel

Ice

Food

Nets

Insurance

Labor

Commercial Harvester

Producer Sector

Seafood Dealers

Seafood Processors

Intermediate Demand Sectors

Grocery Stores

Restaurants

Exports

Final Demand Sectors

Input-output Models

- I/O models track the linkages between businesses and final consumers (market and non-market financial flows)

- I/O models also provide estimates of the direct, indirect, and induced changes that will occur in a particular geographic region from fishery management actions

Direct - sales, income and employment generated from ex-vessel purchases of seafood

Indirect - sales, income and employment of businesses that supply seafood harvesters (e.g., commercial fishers must purchase fuel, oil, bait, insurance, etc.)

Induced - sales, income and employment resulting from expenditures by employees of the direct and indirect sectors (e.g., crew purchase groceries and incur auto loans)

Limitations / Assumptions

Limitations

- I/O analysis is not a substitute for benefit cost analysis
  - I/O describes the effects of expenditures
- I/O models are generally static and simply provide a snapshot of changes in impacts rather than a discounted sum of future impacts

Assumptions

- Constant returns to scale
- No supply constraints
- Fixed commodity input structure

Legal Mandates

Are there legal requirements that mandate NMFS to conduct I/O assessments?

NO !

Why construct I/O models?

- I/O analyses can be used to help fulfill the requirements of NEPA, EO12866, and maybe even National Standard 8 of the Sustainable Fisheries Act
  - References made to examining "direct and indirect effects" in NEPA and National Standard 8
  - NEPA requires broad consideration of the distributive effects
- "NMFS Guidelines for Economic Analysis of Fishery Management Actions" specifically mentions that I/O models could be used to estimate the regional income and employment effects
- "Considering Cumulative Effects under the NEPA" by the Council on Environmental Quality I/O models are referenced as a cumulative effects analysis method

Components of IMPLAN

Software

- Simply provides a user-friendly platform from which I/O models of regional economies can be developed

Data

- National-level technology matrices
- Estimates of sectoral activity for industry output, employment, value-added, and final demand for each county in the U.S. for 528 industrial sectors (4-digit SIC)

IMPLAN's Fishing-Related Sectors

| IMPLAN Sector Name	IMPLAN Sector	SIC Sector
Commercial Fishing	25	0910
Wholesale Trade	447	5000, 5100
Prepared Fresh or Frozen Seafood	98	2092
Canned & Cured Seafoods	97	2091

IMPLAN Data

Default IMPLAN data and sector breakouts are generally not capable of being used to describe the economic activity associated with fishery management actions

Steps Used to Construct I/O Model

- **Developed geographical region of influence (ROI) area designations (distinctive fishing subregions - communities)**
- **We used a functional economic area concept to develop ROI's**
  - **A semi self-sufficient economic area centering on the needs of the impacted industries**
  - **Considered ports of landings, location of harvesters, dealers, and processors, and source of seafood dealer purchases**

- **Used this approach so we'd be able to predict how the impacts of the management actions would vary across semi self-sufficient fishing areas (geographic areas where similar fishing communities exist)**

Fishing Regions and Port Cities of New England
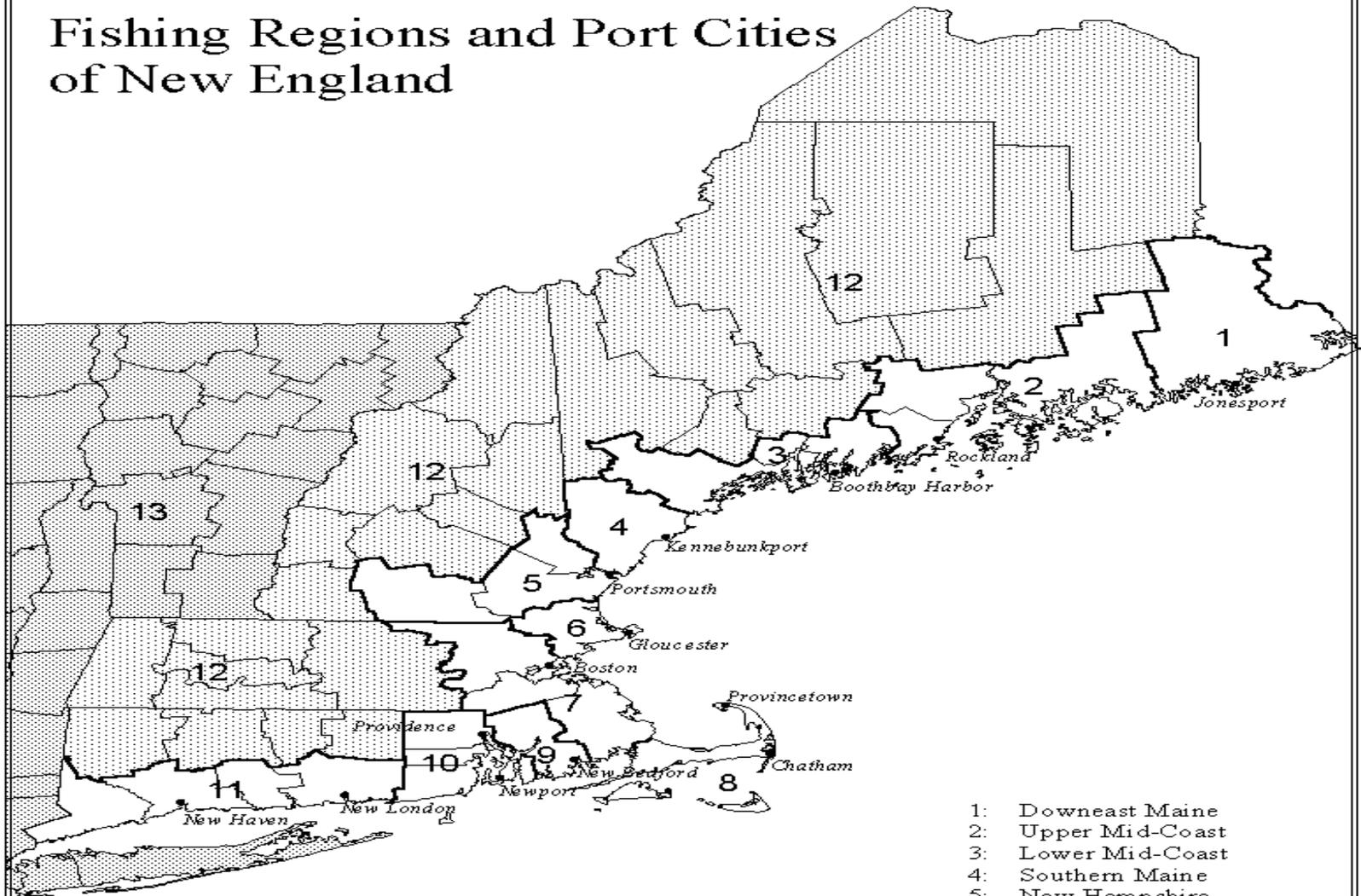
1: Downeast Maine
2: Upper Mid-Coast
3: Lower Mid-Coast
4: Southern Maine
5: New Hampshire
6: Gloucester, North Shore
7: Boston Area
8: Cape and Islands
9: New Bedford Coast
10: Rhode Island
11: Connecticut Coast
12: Near Coastal New England
13: Other US Regions

DOC/NOAA/NMFS, Woods Hole, MA, 2/9/00

IMPLAN Improvements

Decide how to disaggregate IMPLAN's single commercial fishing sector

Disaggregated by gear type & size class

– **Regulations often target specific gear sectors**

- **Grouped harvesting activities in New England into 17 distinct gear sectors (5 land groundfish)**

- **Created 187 new harvesting sectors (11 subregions * 17 gear sectors**

- **Separated the wholesale seafood dealer component from the default IMPLAN wholesale trade sector and created 11 new wholesale seafood dealer sectors (one for each subregion)**

- **Model consists of 725 industry sectors (527+198)**

New Harvesting Sectors

1) Inshore lobster
2) Offshore lobster
3) Large bottom trawl*
4) Medium bottom trawl*
5) Small bottom trawl*
6) Large scallop dredge
7) Medium scallop dredge
8) Small scallop dredge
9) Surfclam, ocean quahog

10) Sink gillnet*
11) Diving gear
12) Midwater trawl
13) Pots and traps
14) Bottom longline*
15) Other mobile gear
16) Other fixed gear
17) Hand gear

Data Requirements

Primary and secondary data

- **Output**

- **Employment**

- **Production functions**

Further modifications to IMPLAN default data

- **Institutional demand/sales**
- **Byproducts**
- **Foreign exports**

Impact Estimation

- **IMPLAN uses a final demand approach to generate impacts**
  - **How a change in retail seafood demand affects the retail support sectors and the backward linked industries associated with the processing, wholesaling, distribution, and production of seafood in a local economy**
- **Commercial harvesters (producing sectors) are regulated and not retailers (final demand sectors)**
  - **How a change in local seafood production affects the backward linkages associated with harvesting and the forward linked impacts associated with distribution, wholesaling, processing, and retailing**

- **A production-oriented approach (supply-side approach) is more appropriate for assessing the impacts of regulations**

Supply-side Approach

- **First step was to define estimated output (revenue) changes for the directly regulated sectors**

- **From there adjustments were made to account for output changes to the forward linked sectors without double-counting**

- **Harvester, dealer, and processor output changes were then applied to the IMPLAN-generated multipliers (captures backward linkages) to arrive at the economy-wide impacts of the proposed regulation**

- **The assessment does not capture the forward linked impacts associated with the final demand sectors (retail, hospitals, hotels, etc.)**

Impacts

- An additional step is required to estimate subregional impacts associated with the seafood processing sector and the remaining 527 default IMPLAN sectors in the model

- Assumed impacts would be distributed according to default IMPLAN output, employment, and income shares in each subregion

- In this manner, we can apportion the estimated New England impacts for these 527 sectors to each subregion without actually having constructed a full multiregional model

- Method suggested by Doug Olson from IMPLAN who also reviewed our modeling approach

Model Comparisons

- **NEFSC input-output model**
  - Internalizes the new fishery-related sectors and therefore explicitly details the inter-industry transactions between the fishery-related sectors and between the fishery-related sectors and all the other sectors in the model
- **FEAM model and U.S. Minerals Management Service model**
  - Changes in ex-vessel revenues are allocated to IMPLAN sectors according to proportions contained in a production function and then these output values are multiplied by the IMPLAN-generated multipliers to estimate impacts
  - This approach is unable to delineate impacts to sectors other than those contained in the production functions