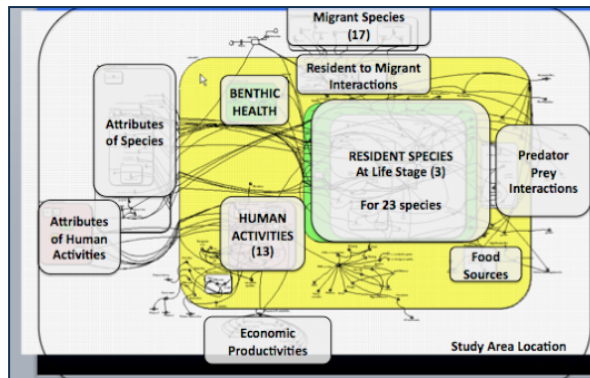


## MIMES FRAMEWORK

MIMES is a collaborative modeling environment based on a dynamic modeling software package called SIMILE, a product of Simulistics, Inc. of the UK. MIMES is constructed with compartments representing the biosphere, anthroposphere (economics, social structure, culture), and the underlying physical environment (earth, water, atmosphere). The meat of the model is in the internal dynamics within each compartment, and most important, in the ways the compartments interact.



Modeling Emergent Tradeoffs in MIMES

## DEMONSTRATION OF MIDAS

In the demo presented, the MIDAS program shows tradeoffs related to the sand lance fishery using the following scenarios:

- 1) **Continued closure of sand lance fishery:** In this scenario, no sand lance fishery is initiated and stocks of forage fish grow.

- 2) **Sand lance fishery, well managed:** In this scenario, a carefully managed sand lance fishery is initiated and maintained for sustainable yield.
- 3) **Sand lance fishery, high exploitation:** In this scenario, a sand lance fishery is initiated and intense fishing pressure results in a degraded stock.

The screen shows the impact on humpback whale watching, with the accompanying heat maps indicating the location of whales throughout one year with and without a sand lance fishery. **Press “play” to watch the simulation play out for the whole year.**

## BENEFITS OF MIDAS-MOP

MIDAS-MOP has unique characteristics that differentiate it from other coastal and marine spatial planning models:

- Analyze and share trade-off decisions to teach about human-natural interdependence
- Anticipate radical system phase shifts
- Weigh short vs. long-term benefits
- Incorporate non-monetary values
- Develop executable Ecosystem-Based Management models

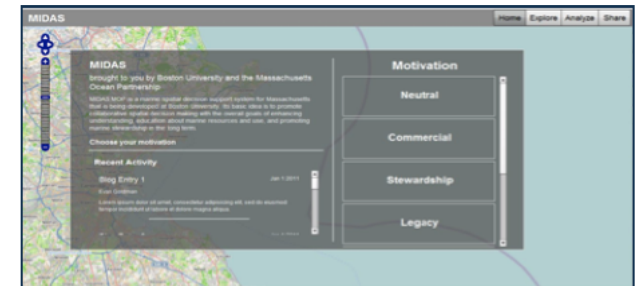
### Acknowledgements

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For more information, please contact Prof. Les Kaufman ([lesk@bu.edu](mailto:lesk@bu.edu)) or Prof. Suchi Gopal ([suchi@bu.edu](mailto:suchi@bu.edu)).

# MIDAS - MOP

## Marine Integrated Decision Analysis System for the Massachusetts Ocean Partnership



*MIDAS - MOP is a marine spatial decision support system for Massachusetts that is being developed at Boston University. Its underlying modeling framework is MIMES (Multi-scale Integrated Model of Ecosystem Services) that enables dynamic spatial modeling. The basic motivation of our approach is to promote collaborative spatial decision making with the overall goals of enhancing understanding, education about marine resources and use, and promoting marine stewardship in the long term.*

- **Boston University:** Suchi Gopal, Les Kaufman, Evan Walters, Evan Goldman, Marta Ribera & Ben Carr
- **University of Vermont:** Roel Boumans, (AFORDable Futures) & Joe Roman
- **University of New Hampshire:** Irit Altman.

## WHAT IS MIDAS-MOP?

MIDAS was originally developed to provide a means of transferring, from scientists to stakeholders, knowledge about policy tradeoffs compiled from theory, spatial and other types of data, and dynamic models. MIDAS for this project serves as a graphic end-user interface between MIMES, a complex dynamic research model, and the questions and needs of local managers and stakeholders.

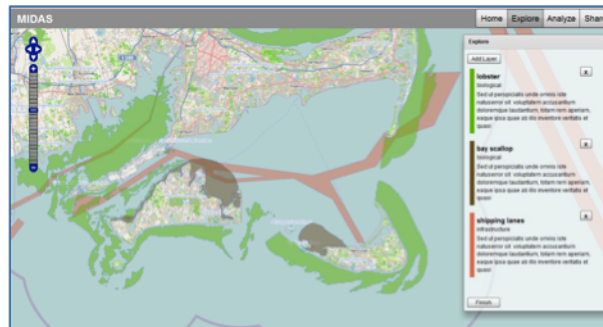
MIMES addresses the linked dynamics of natural, human, built, and social capital, allowing the integration of site-specific information with regional and global survey, Geographical Information System (GIS), and remote-sensing data. A fully functioning MIMES model is quite complicated and can take some time to run (depending on the server architecture etc). Hence MIMES and MIDAS are coupled in such a way that a user can select a limited number of specific probes to explore and analyze the modeling scenarios or view a community user created model and tradeoffs.

## MIDAS - USER INTERFACE

The MIDAS user interface consists of a series of screens, which are designed to help the user to explore spatial data (data view) and analyze trade-offs (model view).

**Motivation Screen:** User selects a motivation that best describes his/her interest. The program has the capability to pre-select GIS layers based on the selected motivation. The motivations are segmented into 7 different types:

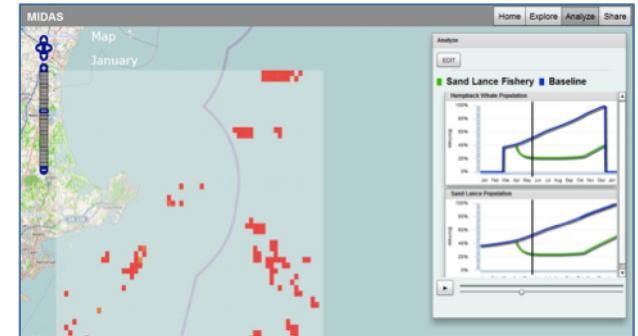
- a) **Neutral:** An objective perspective.
- b) **Conservation:** Protection of marine ecosystems, limiting ecosystem damage.
- c) **Enjoying Marine Resources:** Emphasis on marine recreational activities that can have significant economic and personal benefits.
- d) **Stewardship:** Promote the understanding of ocean's resources and enhance efforts to sustain them.
- e) **Legacy:** Ensure that fishing ports, grounds, and livelihoods, which constitute part of our national heritage, are available to future generations.
- f) **Commercial:** Activities such as fishing, whale watching, and the offshore renewable energy sector highlight the economics and the market price on marine commodities.
- g) **Regulation:** For stakeholders working for one of the regulatory bodies or who are interested in understanding the impact of a proposed regulation on ecosystem services.



MIDAS Explore (GIS) screen

**Explore (GIS) Screen:** Introduces the viewer to the study area and the many ecological, environmental, and social attributes related to its marine resources. There are over 80 GIS data layers, which are sorted based on motivation (preset by experts).

**Analysis Screen:** Allows the user to model marine uses and tradeoffs in the study area. There are many tradeoffs and scenarios to choose from, including a baseline (business as usual) and sand lance fishery. This screen shows the outputs from MIMES in the form of maps, tables, process flows and weights, and dynamical relationships.



MIDAS Analysis screen

We model two types of **tradeoffs**:

- o **Functional incompatibilities** arise where the occurrence of use A limits or fully prohibits the occurrence of use B because of inherent characteristics of the two uses or regulations do not allow uses to co-occur.
- o **Emergent tradeoffs** result from ecosystem dynamics. In this context, the occurrence of use A is functionally compatible with use B; however tradeoffs occur because the two uses rely on same ecosystem flows.

**Collaborate Screen:** Enables the user to specify a specific scenario as well as share or collaborate within a community to add to the increasing knowledge base in MIDAS.