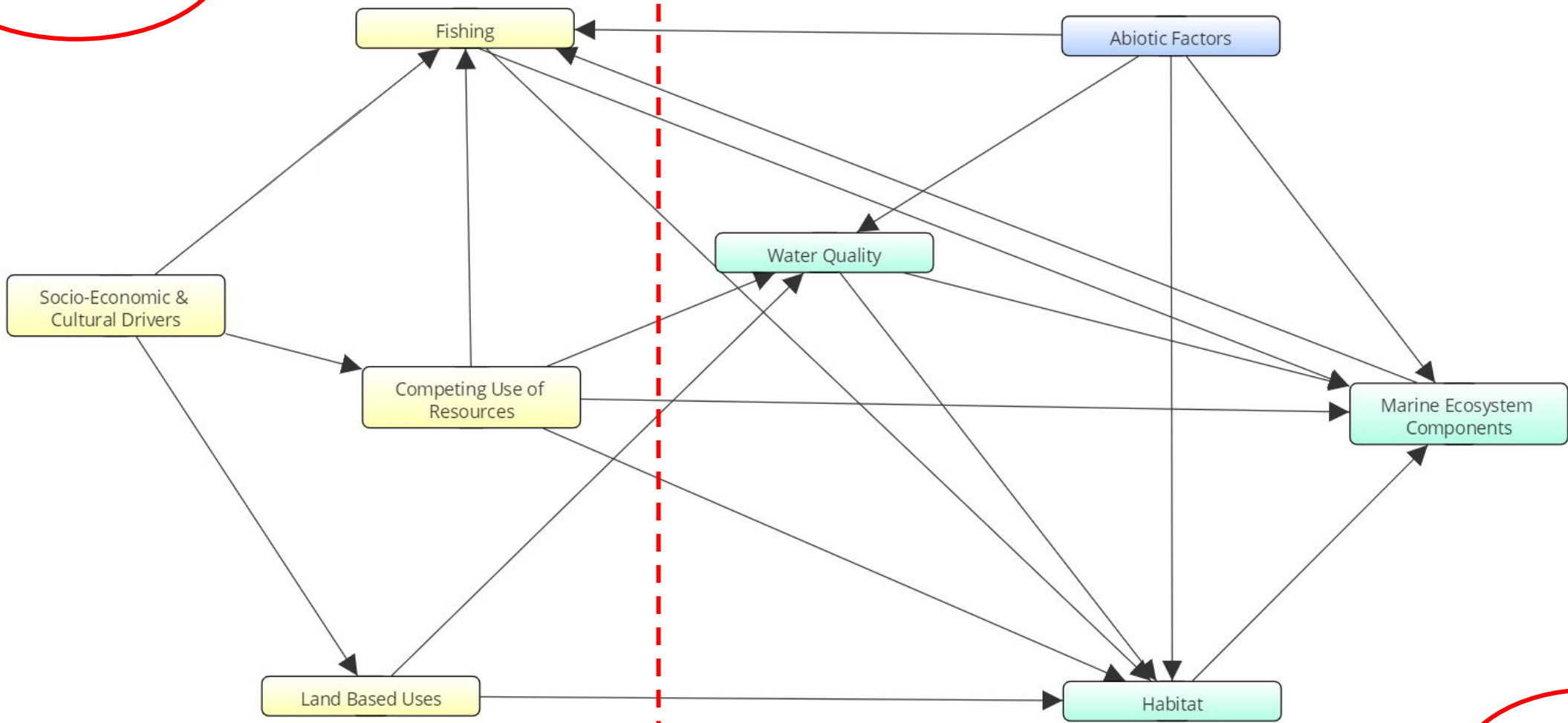


Review and Status of the SSC's Generic Ecosystem Conceptual Model

February 4, 2021

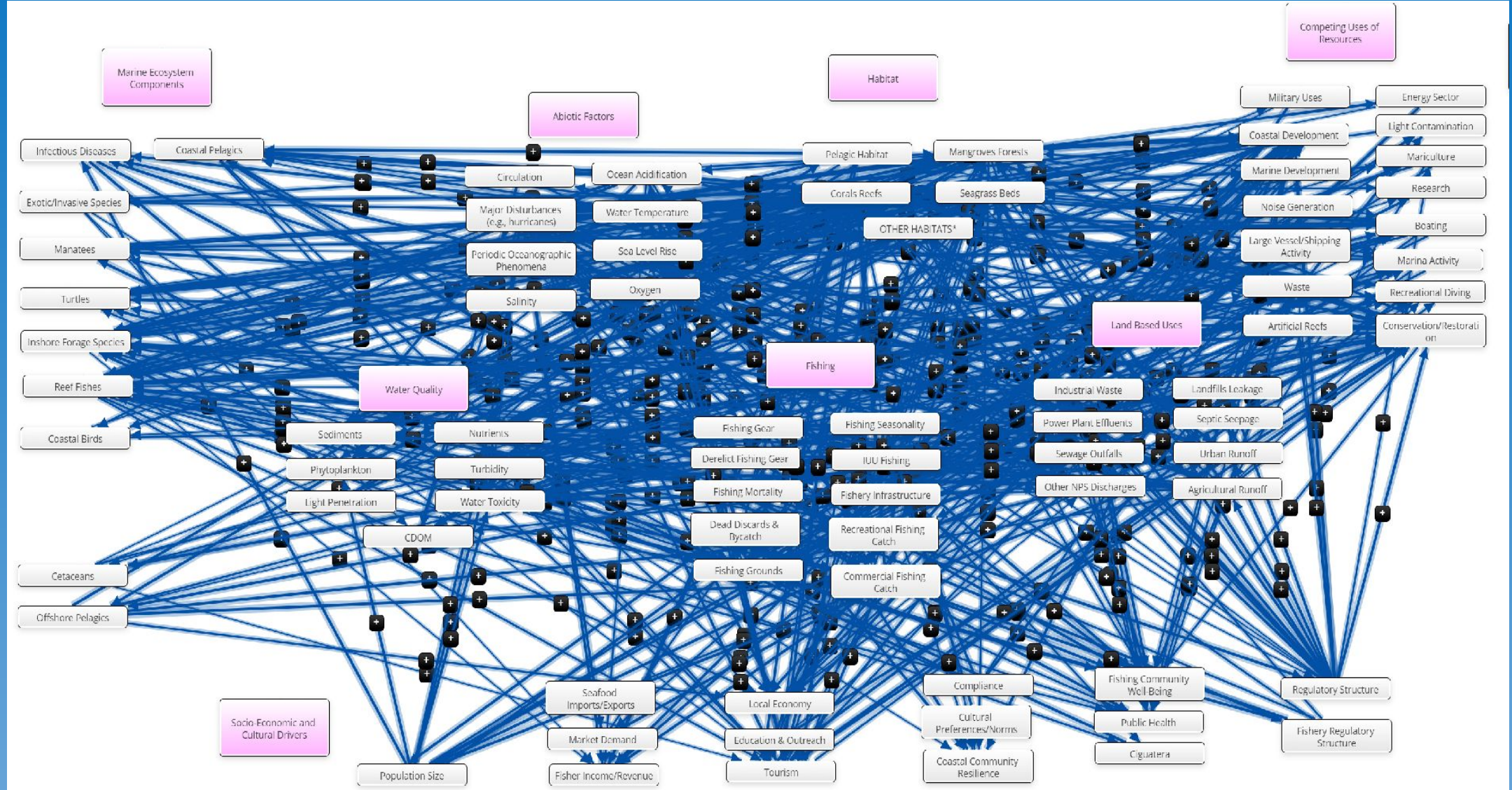
Single Generic Model

- Evolved Process
- Complexity
 - Reflects diverse expertise and experience of SSC
- Time vs Model Development □ 1 model vs 3 models
- Independence of product
- Suitability of generic model for comparison purposes



SSC Ecosystem Conceptual Model

(Inter-Connections; September 2020)



Conceptual Model has 8 Submodels

Submodels have variable number of components

- Marine Ecosystem Components (12)
- Competing Use of Resources (15)
- Socio-economic and Cultural Drivers (16)
- Land-Based Uses (8)
- Fishing (10)
- Water Quality (6)
- Habitat (5)
- Abiotic Factors (9)

Over 64,000 potential connections!

Mar Ecosystem Drivers										Abiotic Factors					Habitat		Water Quality			Fishing			Land-based Uses			Competing Uses										Marine Resources										Socio-economic Cultural Drivers																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
ID	Category	Sub-category	Parameter	Unit	Value	Score	Weight	Impact	Direction	Source	Depth	Temperature	Salinity	pH	Dissolved Oxygen	Chlorophyll a	Plankton	Macroalgae	Seagrass	Coral	Shells	Traps	Boats	Harvest	Bycatch	Discards	Waste	Runoff	Deforestation	Urbanization	Industrial	Agriculture	Transport	Recreation	Energy	Water	Land	Marine	Coastal	Offshore	Deep	Shallow	Open	Protected	Unprotected	Managed	Unmanaged	Traditional	Modern	Local	Global	Individual	Community	Government	Private	Non-profit	Academic	Industry	NGO	Media	Education	Research	Policy	Law	Regulation	Enforcement	Monitoring	Reporting	Transparency	Accountability	Stakeholder	Participation	Equity	Inclusion	Justice	Resilience	Adaptation	Mitigation	Prevention	Restoration	Conservation	Protection	Management	Governance	Leadership	Collaboration	Partnership	Cooperation	Coordination	Communication	Education	Training	Capacity	Knowledge	Skills	Attitudes	Values	Beliefs	Norms	Customs	Traditions	Heritage	Culture	Society	Economy	Politics	Law	Regulation	Enforcement	Monitoring	Reporting	Transparency	Accountability	Stakeholder	Participation	Equity	Inclusion	Justice	Resilience	Adaptation	Mitigation	Prevention	Restoration	Conservation	Protection	Management	Governance	Leadership																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Abiotic	Temperature	Surface	25°C	°C	25	10	0.1	High	Positive	Solar	0-10m	25	35	8.1	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1

Connections between Submodels

Priority Connections between Components within Each Pair of Submodels

Identify the 3 most important connections, their direction, and their strength

- Interim Results for the Council and its EBFM TAP
- Results should also be made available to other interested user groups
 - Caribbean Lenfest project/team
 - SEFSC's Ecosystem Status Report

Priority Assessment Form

56 Sets of Comparisons

[illegible]

Example: The three most important component connections from the *Socio-Economic and Cultural Drivers (S-E-C)* submodel affecting the *Fishing* submodel could be:

- Seafood Imports/Exports affecting Commercial Fishing Catch
- Market Demand affecting Commercial Fishing Catch
- Tourism affecting Recreational Fishing Catch

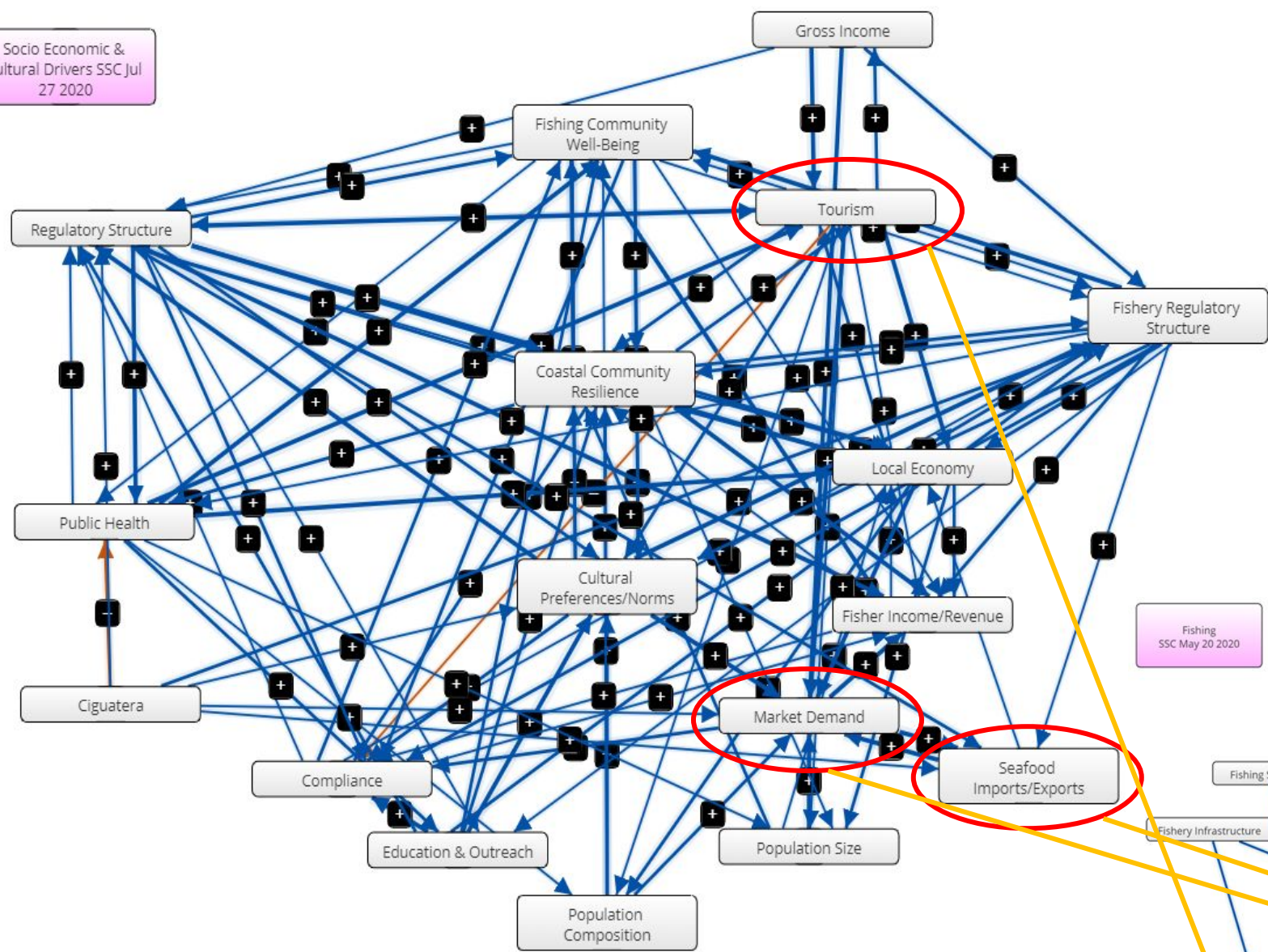
In this case, two of the driver components affect the same target component.

S-E-C Submodel Components

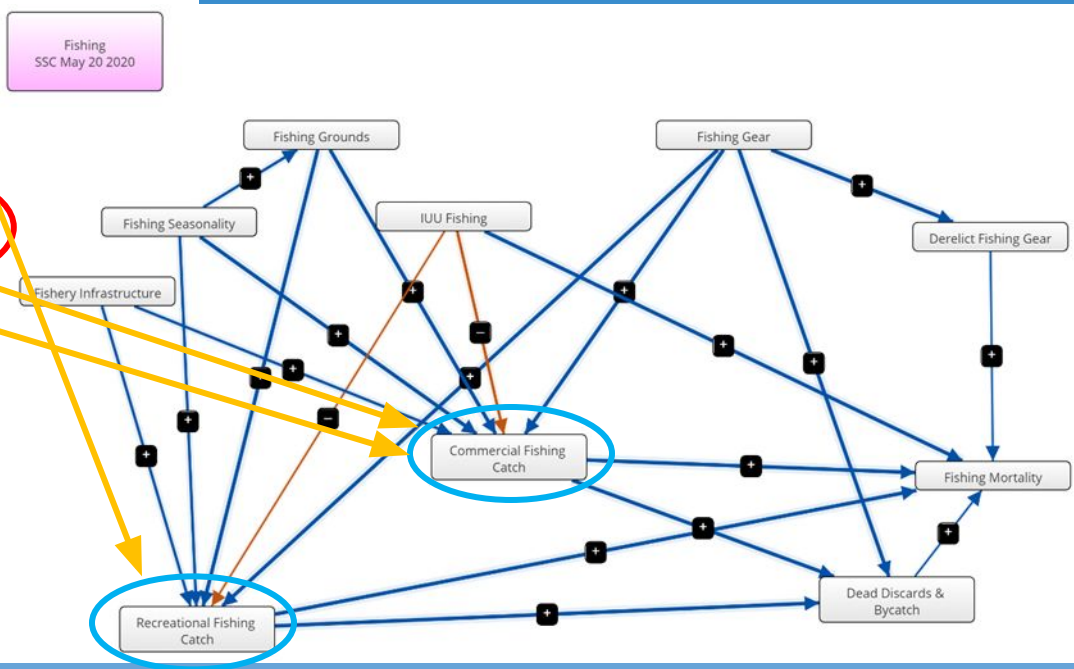
Fishing Submodel Components



Socio Economic & Cultural Drivers SSC Jul 27 2020



Fishing
SSC May 20 2020



	Fishing (response submodel)			
	Driver Component	Response Component	Direction (+/-)	Strength (L/M/H)
S-E-C (driver submodel)	Seafood Imports/Exports	Commercial Fishing Catch	0	M
	Market Demand	Commercial Fishing Catch	+	H
	Tourism	Recreational Fishing Catch	+	H

Example: Just 1 Out of 56 Sets of Comparisons

Quantitative
Outputs

		(Target)											
	(Driver)	Land Based Uses	SSC 1	SSC 2	SSC3	SSC 4	SSC 5	SSC 6	SSC 7	SSC 8	 Mean TallySum		
Competing Uses of Resources	Marine Development											0	0
	Coastal Development	Urban Runoff	3	3	3	3	3	3	3		3.0	7	21
	Coastal Development	Sewage Outfalls		3	1					3	2.3	3	7
	Coastal Development	Septic Seepage				3		2			2.5	2	5
	Coastal Development	Industrial Waste								3	3.0	1	3
	Military Uses	Industrial Waste	3								3.0	1	3
	Noise Generation											0	0
	Large Vessel/Shipping Activity											0	0
	Waste	Landfills Leakage				3					3.0	1	3
	Waste	Sewage Outfalls					3				3.0	1	3
	Artificial Reefs											0	0
	Energy Sector	Power Plant Effluents		2					2		2.0	2	4
	Light Contamination											0	0
	Mariculture	Agricultural Runoff	2								2.0	1	2
	Research											0	0
	Boating											0	0
	Marina Activity	Other NPS Discharges			2		2	2	2	2	2.0	5	10
	Recreational Diving											0	0
	Conservation/Restoration											0	0

↑ 10 Connections given priority across SSC members

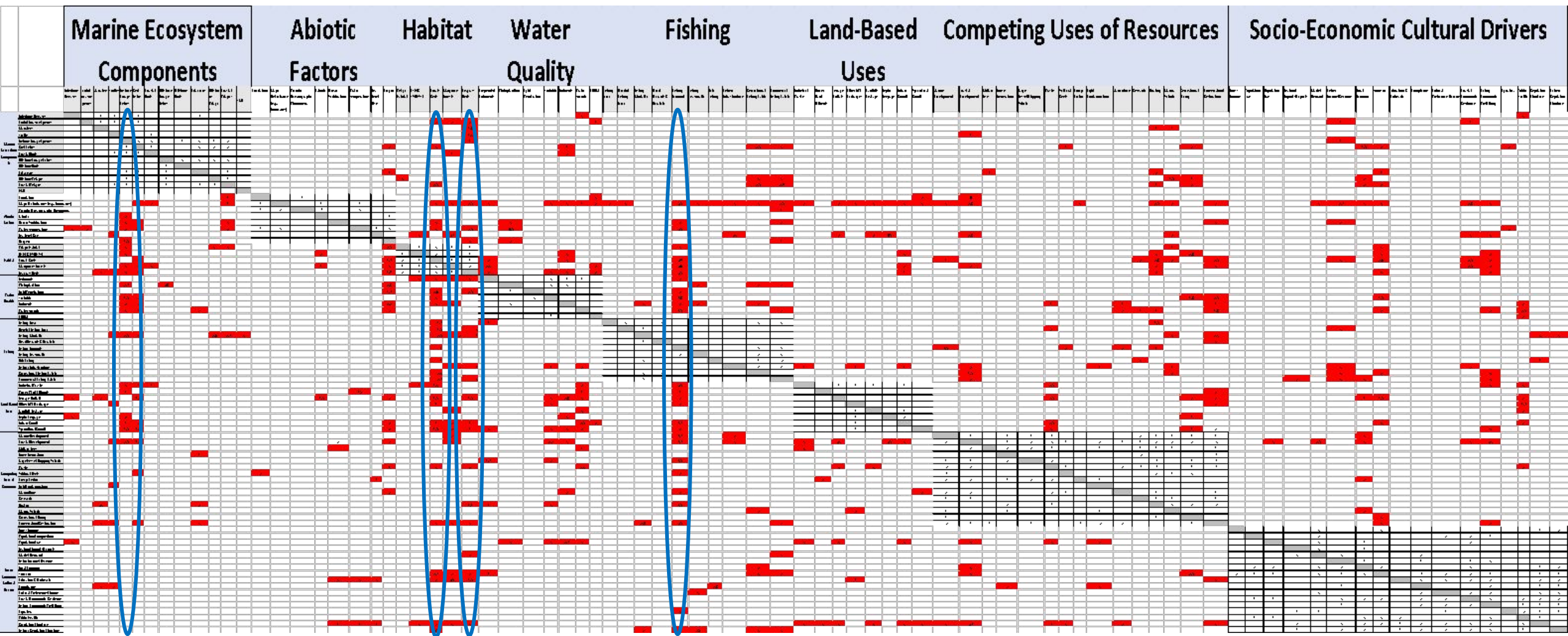
Overall Resultant Connections

- 484 = Connections identified between components across submodels
- 168 = Minimum number of connections if all agree on top 3
- 288% increase over the minimum

[illegible]

36 Natural Disturbances

19 Regulatory Structure



19
Inshore
Forage
Fishes

28 23
Coral Reefs
Sea Grass
Beds

27
Fishing
Grounds

Status of SSC Conceptual Model

- 484 = Connections identified between components across submodels
- 304 = Connections between components within each submodel
- 788 = Total connections including within submodels
- Quantitative Outputs – reflect Diversity and Strength within SSC
- Compilation still in process
 - Written description/definition of each component
 - Information/discussion regarding strength and direction of connections

Status of SSC Conceptual Model

- The SSC has finalized its Generic Ecosystem Conceptual Model for the U.S. Caribbean. The SSC believes its ECM in the current state meets the objectives that the SSC was tasked by the Council following the Caribbean Region EBFM Roadmap Implementation Plan.
- The SSC also feels that the generic model it developed should be sufficient and that developing three separate SSC Island-based models is not necessary to meet the objectives of the overall process of developing a fishery ecosystem plan, and specifically the next step of comparison of conceptual models.

Status of SSC Conceptual Model

- The SSC recognizes its ECM will be useful in developing the next steps in the process of developing a fishery ecosystem plan and in addressing concerns specific to the SSC. Examples are given below:
 - Generate questions to help prioritize management strategies (e.g., management strategy evaluation).
 - Generate questions to help prioritize future research (identify data and knowledge gaps).
 - Develop hypotheses to be tested using available data in quantitative modeling approaches.
 - ~ 28% of identified linkages have data
 - Not account for data extent or quality

Status of SSC Conceptual Model

Examples (continued)

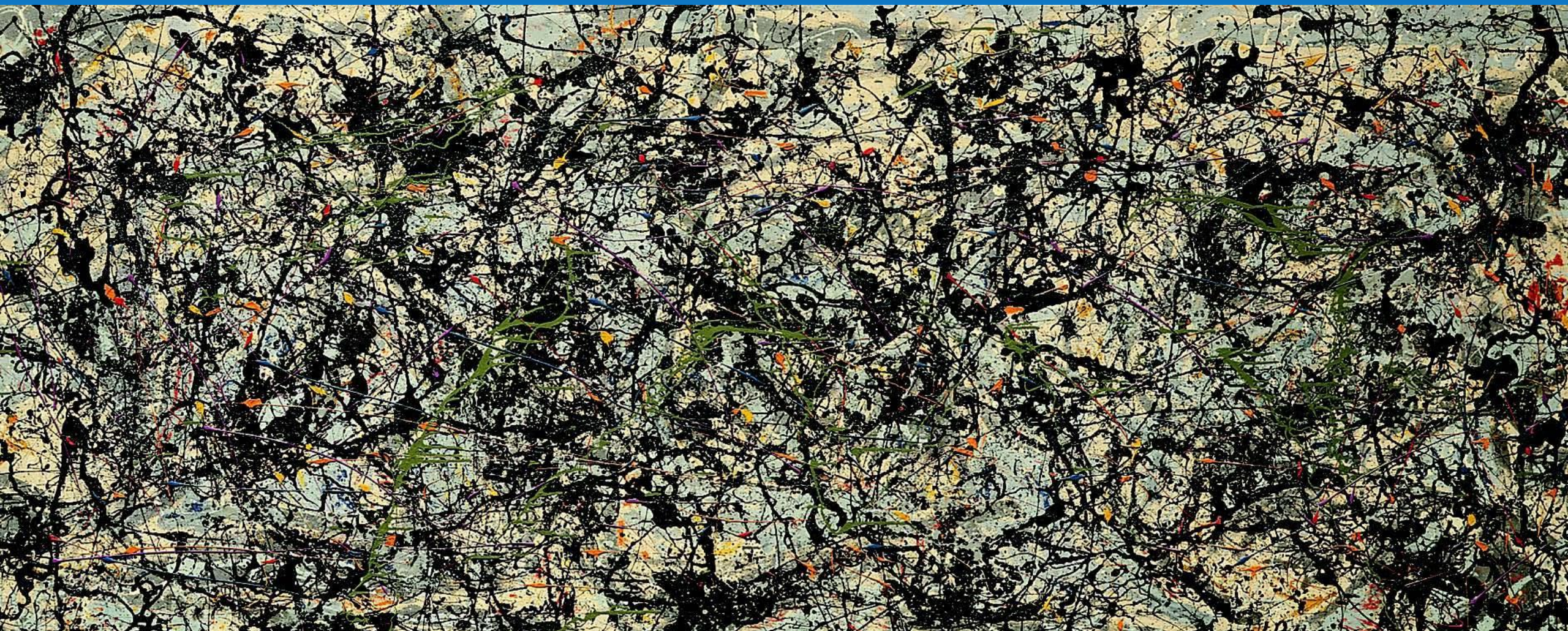
- Identify key ecosystem linkages and indicators for risk assessment.
- Explore different visualization and communication tools for effective outreach of conceptual model (or sub-model) outcomes.

Specific issues like magnitude, variability, and direction of the relationships would need to be confronted in order to realize these next steps.

SSC Ecosystem Conceptual Model



Autumn



Lucifer



Sea Change