FUTURE Science Program

Forecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of North Pacific Marine **E**cosystems

FUTURE Science Program

- Review of FUTURE structure and activities
- Next steps for PICES integrative science program?

FUTURE Science Program

FUTURE objectives

- **To understand how marine ecosystems in the North Pacific respond to climate change and human activities**
- To forecast ecosystem status based on current knowledge of how the natural world functions
- To communicate new insights to PICES scientists, their governments, stakeholders, and the public

FUTURE Science Program

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FUTURE Science Program

FUTURE implementation

Initial Implementation:
Advisory Panels on Coastal Impacts, Climate Variability, and Outreach/Forecasting
(2009-2014)

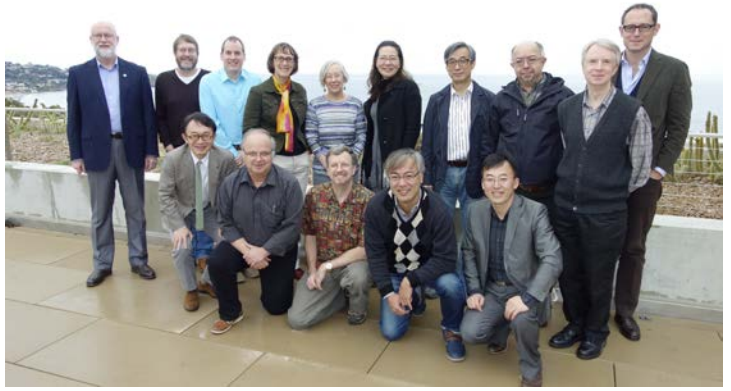
2014: FUTURE Evaluation Panel

FUTURE Science Program

FUTURE implementation

Initial Implementation:
Advisory Panels on Coastal Impacts, Climate Variability, and Outreach/Forecasting
(2009-2014)

New Implementation:
FUTURE Scientific Steering Committee
(2015-2019 …)



FUTURE Science Program

FUTURE SSC membership

Jackie King, Ian Perry, Tom Therriault 

Guangshui Na, Fangli Qiao 

Toyomitsu Horii, Mitsutaku Makino 

Sukyung Kang, Sinjae Yoo 

Oleg Katugin, Slava Lobanov 

Steven Bograd, Manu Di Lorenzo, Ryan Rykaczewski 

FUTURE Science Program

FUTURE SSC membership

Jackie King, Ian Perry, Tom Therriault

Co-Chairs

Guangshui Na, Fangli Qiao

Toyomitsu Horii, Mitsutaku Makino

Sukyung Kang, Sinjae Yoo

Oleg Katugin, Slava Lobanov

Steven Bograd, Manu Di Lorenzo, Ryan Rykaczewski

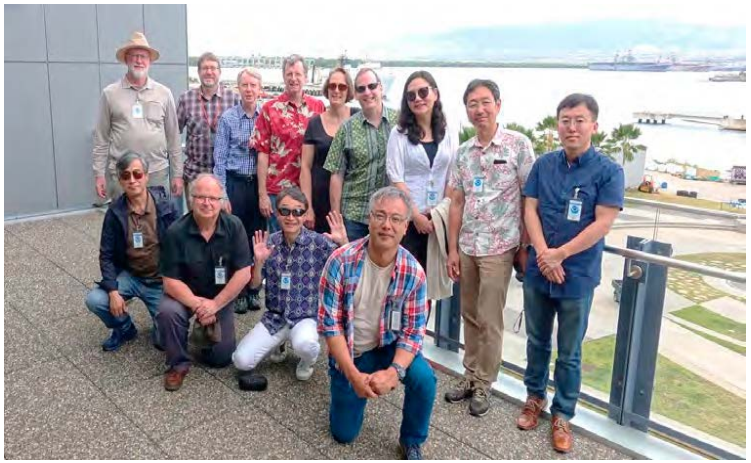
FUTURE Science Program

FUTURE activities

during 2017

FUTURE Scientific Steering Committee

- Inter-Sessional Meeting (April 2017, Honolulu):
  - Developed FUTURE Product Matrix and Roadmap
  - Drafted outline for FUTURE synthesis publication



FUTURE Science Program

FUTURE product matrix

FUTURE Research Themes

	What determines an ecosystem's intrinsic resilience and vulnerability to natural and anthropogenic forcing?						How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?							How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?				
	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5
PICES Scientific Reports																		
No. 39 Expert Group: SG-HD Mitsutaku Makino and David L. Fluharty (Eds.) 2011. Report of the Study Group on Human Dimensions. PICES Sci. Rep. No. 39, 40 pp.																		X
No. 40 Expert Group: WG-20 Michael G. Foreman and Yasuhiro Yamanaka (Eds.) 2011 Report of Working Group 20 on Evaluations of Climate Change Projections. PICES Sci. Rep. No. 40, 165 pp.	X						X	X	X								X	
No. 41 Stewart M. McKinnell, Enrique Curchitser, Cornelius Groot, Masahide Kaeriyama and Katherine W. Myers PICES Advisory Report on the Decline of Fraser River Sockeye Salmon Oncorhynchus nerka (Steller, 1743) in Relation to Marine Ecology. PICES Sci. Rep. No. 41, 149 pp.	X	X	X					X	X						X			
No. 42 Expert Group: WG-22	X	X					X											

FUTURE Science Program

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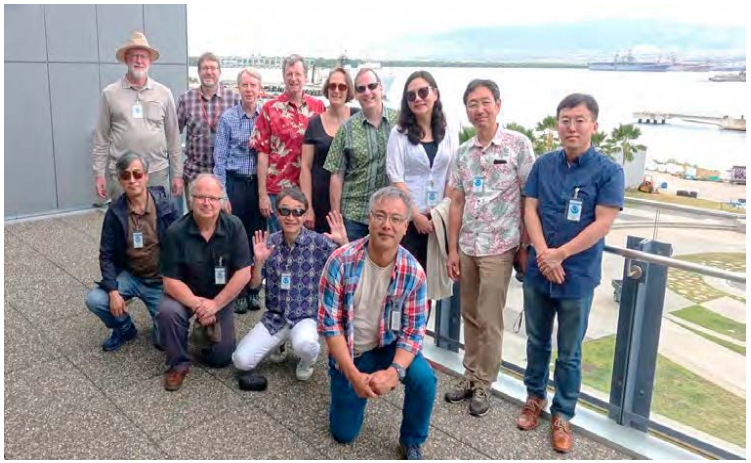

FUTURE Science Program

FUTURE liaisons

	Committee	WG	Section	AP/SG
Jacquelynne King	FIS	WG-34*, WG-36	S-CCME*	
Ian Perry	BIO*, HD	WG-32, WG-37*		
Guangshui Na	MEQ	WG-31*, WG-39*	S-HAB	
Fangli Qiao	POC, TCODE		S-CC	CREAMS
Mitsutaku Makino	HD*	WG-36*		SG-MES
Toyomitsu Horii	MEQ	WG-30*	S-HAB*	
Sukyung Kang	FIS*	WG-34	S-CCME	
Sinjae Yoo	BIO	WG-33*, WG-35*		NPCOOS
Oleg Katugin	FIS	WG-32*	S-MBM*	
Vyacheslav Lobanov	MONITOR*	WG-38		CREAMS*/NPCOOS*
Emanuele Di Lorenzo	POC*	WG-38*, WG-40		
Steven Bograd	POC, MONITOR	WG-33, WG-35	S-CC*, S-MBM	
Ryan Rykaczewski	TCODE*, BIO	WG-37, WG-40*		
Tom Therriault	MEQ*	WG-39		NIS*

*Primary liaison members

FUTURE Science Program

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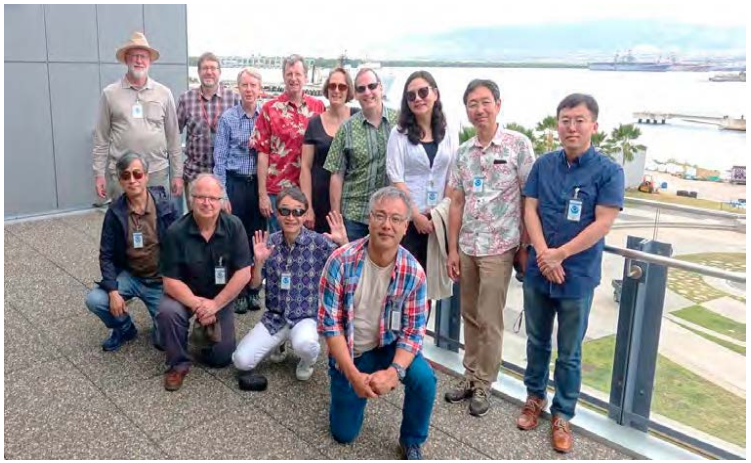
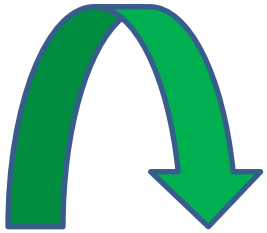
- New Working Groups formed …



FUTURE Science Program

FUTURE parenting



Working Group 35:
THIRD NORTH PACIFIC ECOSYSTEM STATUS REPORT

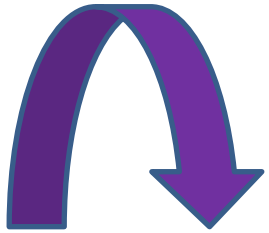
FUTURE Science Program

FUTURE parenting

Working Group 36:
COMMON ECOSYSTEM REFERENCE POINTS ACROSS PICES COUNTRIES

FUTURE Science Program

FUTURE parenting



Working Group 40:
CLIMATE AND ECOSYSTEM PREDICTABILITY

FUTURE Science Program

FUTURE parenting

Working Group 35:
Third North Pacific Ecosystem Status Report

Working Group 36:
Common Ecosystem Reference Points across PICES Countries

Working Group 40:
Climate and Ecosystem Predictability

FUTURE Science Program

FUTURE activities

during 2017

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- Inter-Sessional Meeting (April 2017, Honolulu):
  - Developed FUTURE Product Matrix and Roadmap
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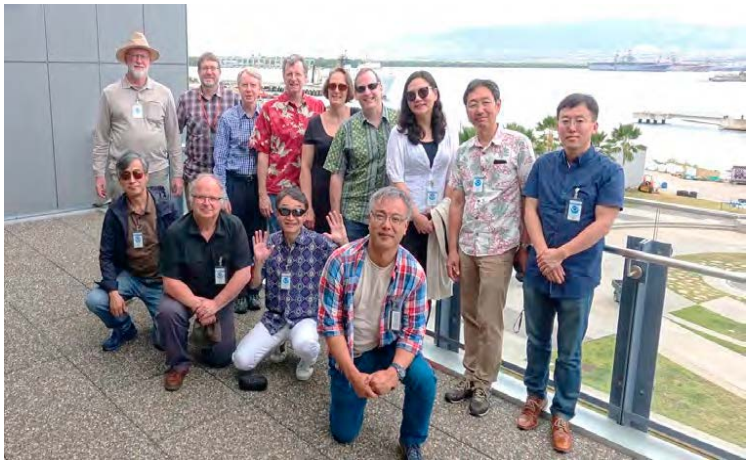
- Strengthened inter-collaboration between PICES Expert Groups & Committees
- New Working Groups formed …
- Developing a survey for PICES next-phase Science Program



FUTURE Science Program

FUTURE Survey

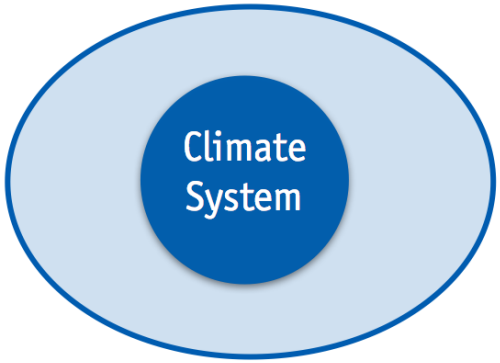
Example survey question …

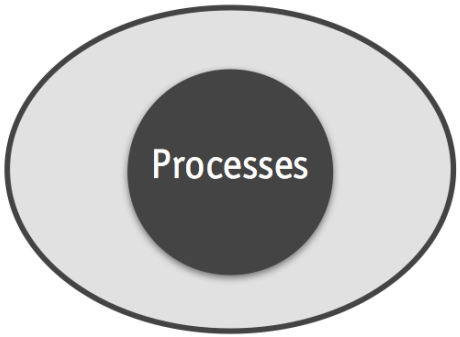
With this survey, we intend to gauge the views of the broader PICES community regarding critical research challenges of the coming 1-2 decades that would benefit from an integrative approach.

1. What do you see as key scientific factors that have the potential to inhibit research efforts with potential to generate understanding of ecosystem responses to climate change and human activities? (select all that apply)

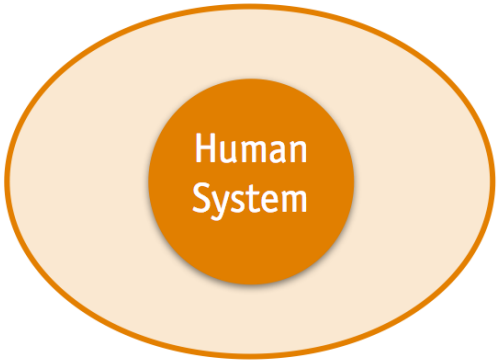
a. Limited integration of scientific efforts across spatial and temporal domains, from terrestrial systems (land use, urbanization, agricultural use, mining) through coastal systems (waves, tides, other shelf processes; and intense fishing activity; mariculture, commerce, and energy extraction) and on to basin-scale and global climate variability.
b. Limited interaction between disciplines of marine science; e.g., biological/fisheries oceanographers (who are more familiar with the processes and scales relevant to exploited resources and human interaction) with physical oceanographers and climate scientists.
c. Reluctance to challenge the recent hypotheses of colleagues by confronting those hypotheses with new data.
d. Other comments

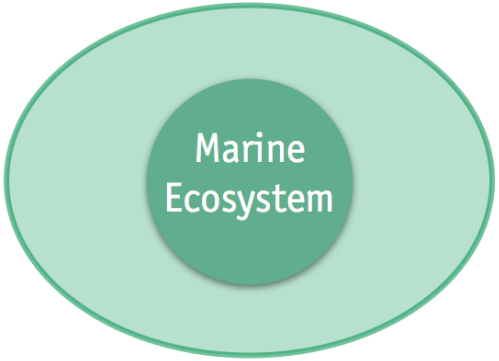
Elements of **FUTURE**
SCIENCE PROGRAM FOR 2020





dimensions of FUTURE Science Plan ...





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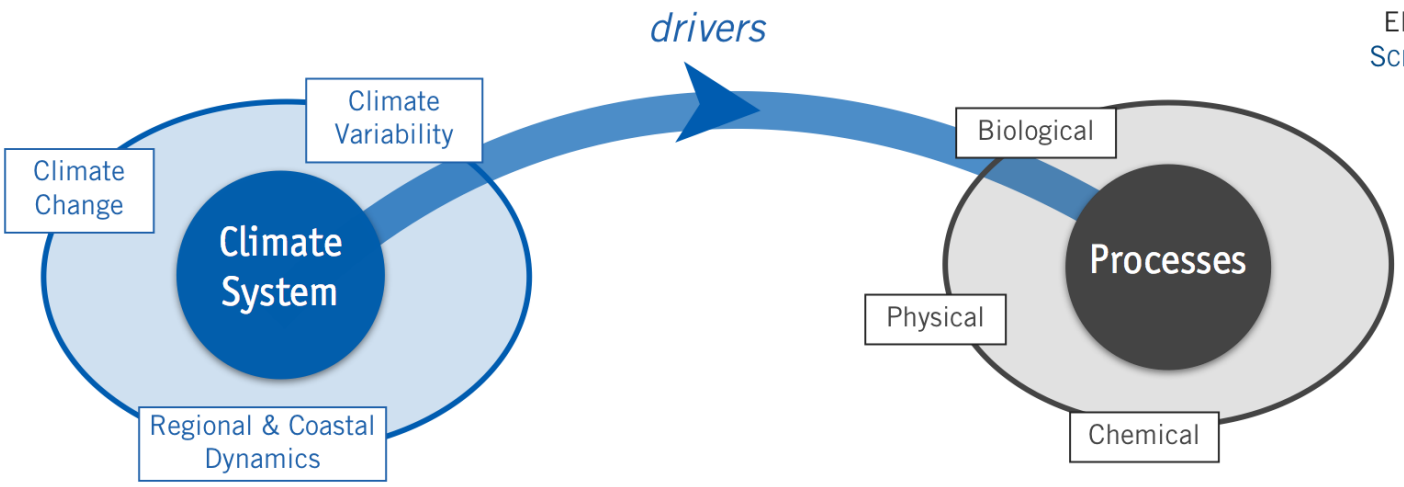

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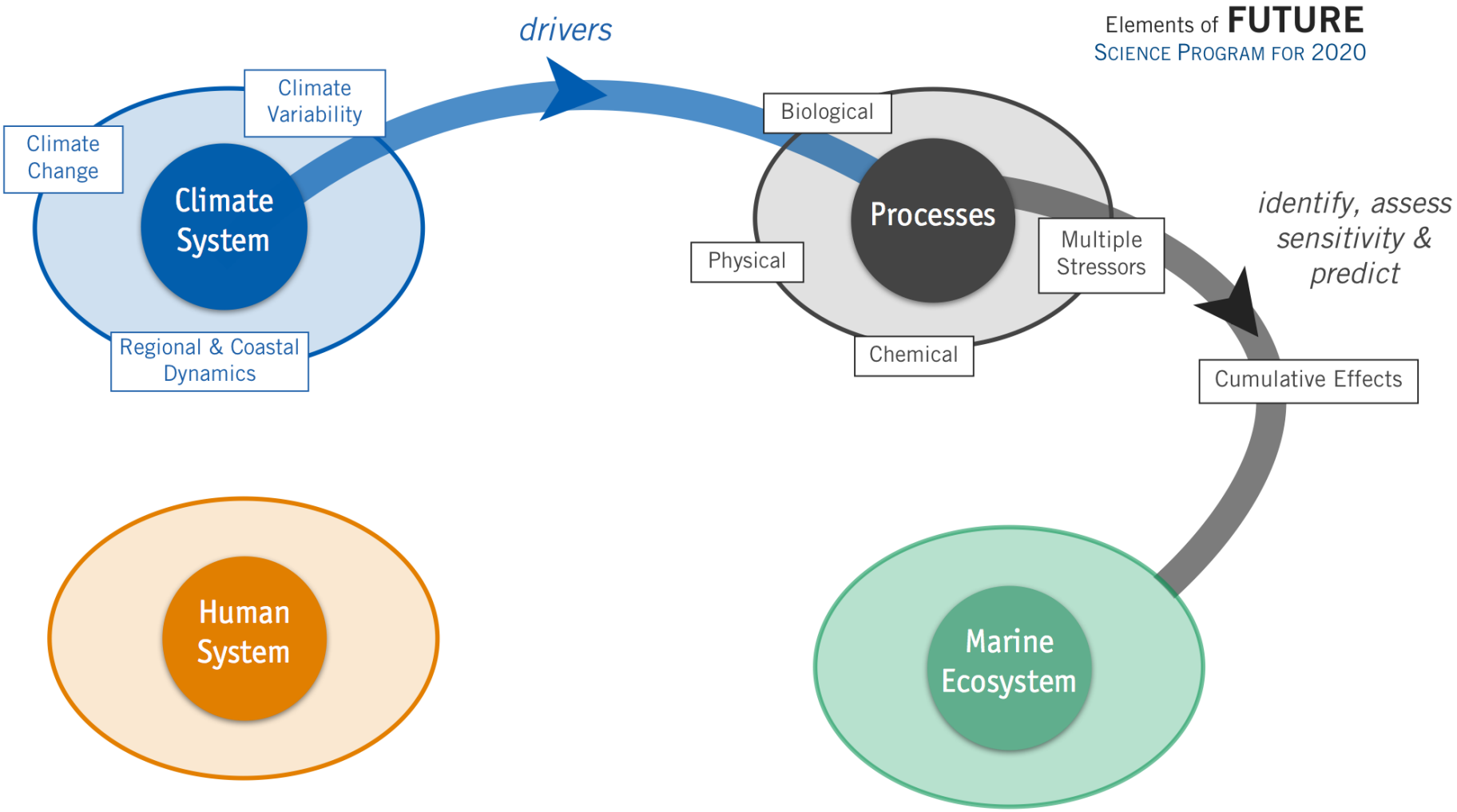
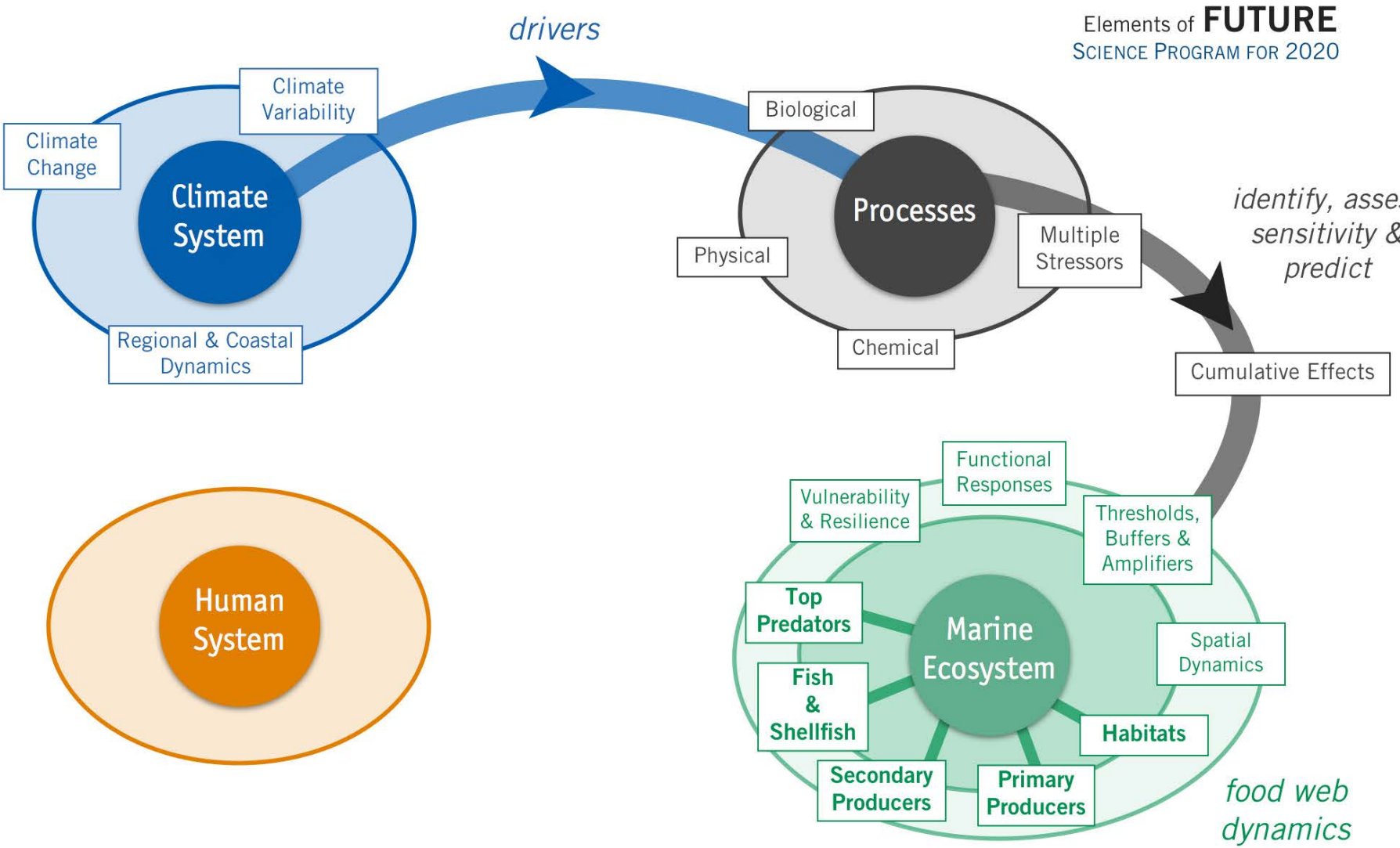

Elements of FUTURE
SCIENCE PROGRAM FOR 2020
drivers
Climate Variability
Climate Change
Climate System
Regional & Coastal Dynamics
Biological
Processes
Physical
Chemical
Multiple Stressors
identify, assess sensitivity & predict
Cumulative Effects
Human System
Marine Ecosystem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Primary Producers
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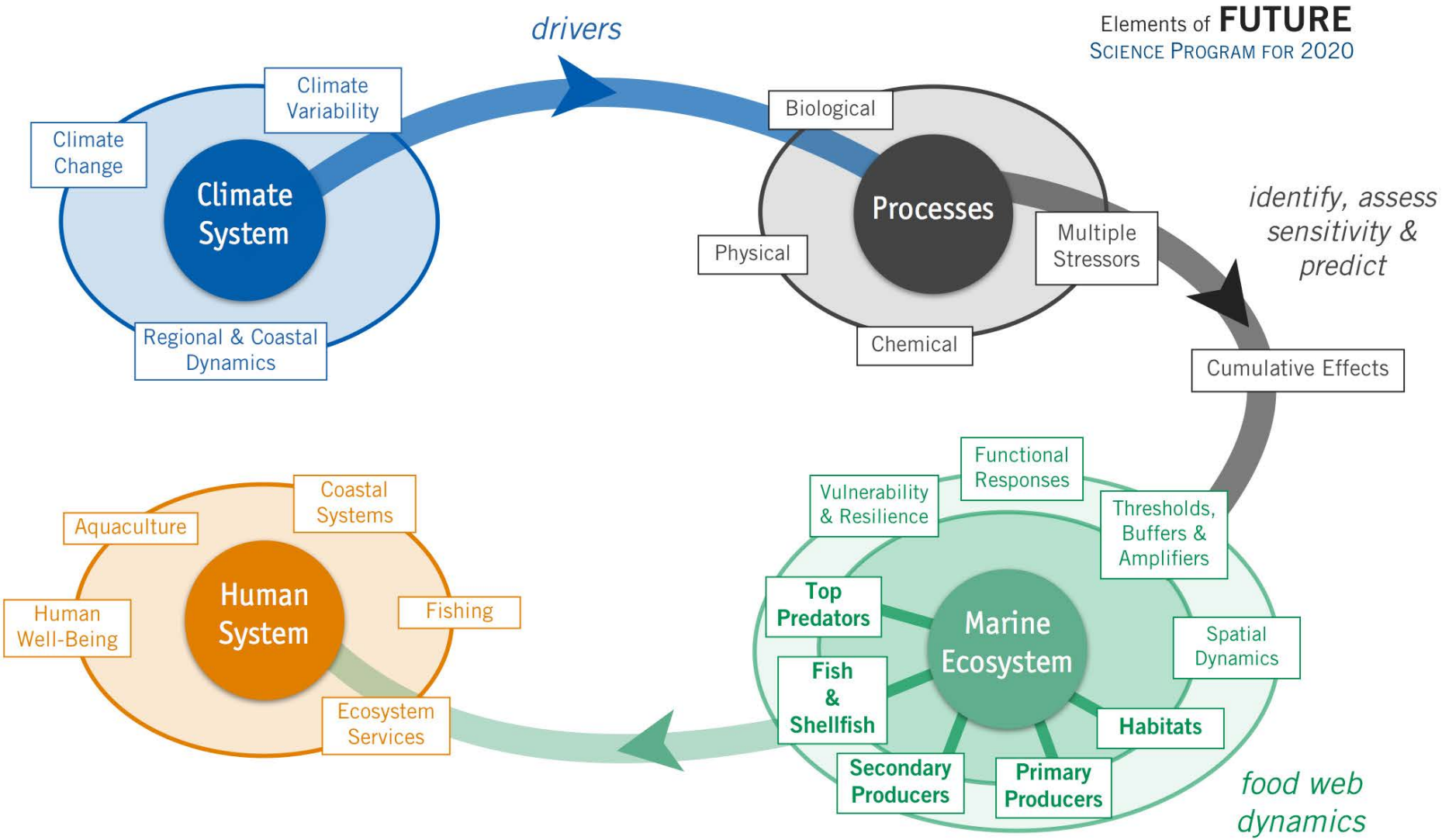
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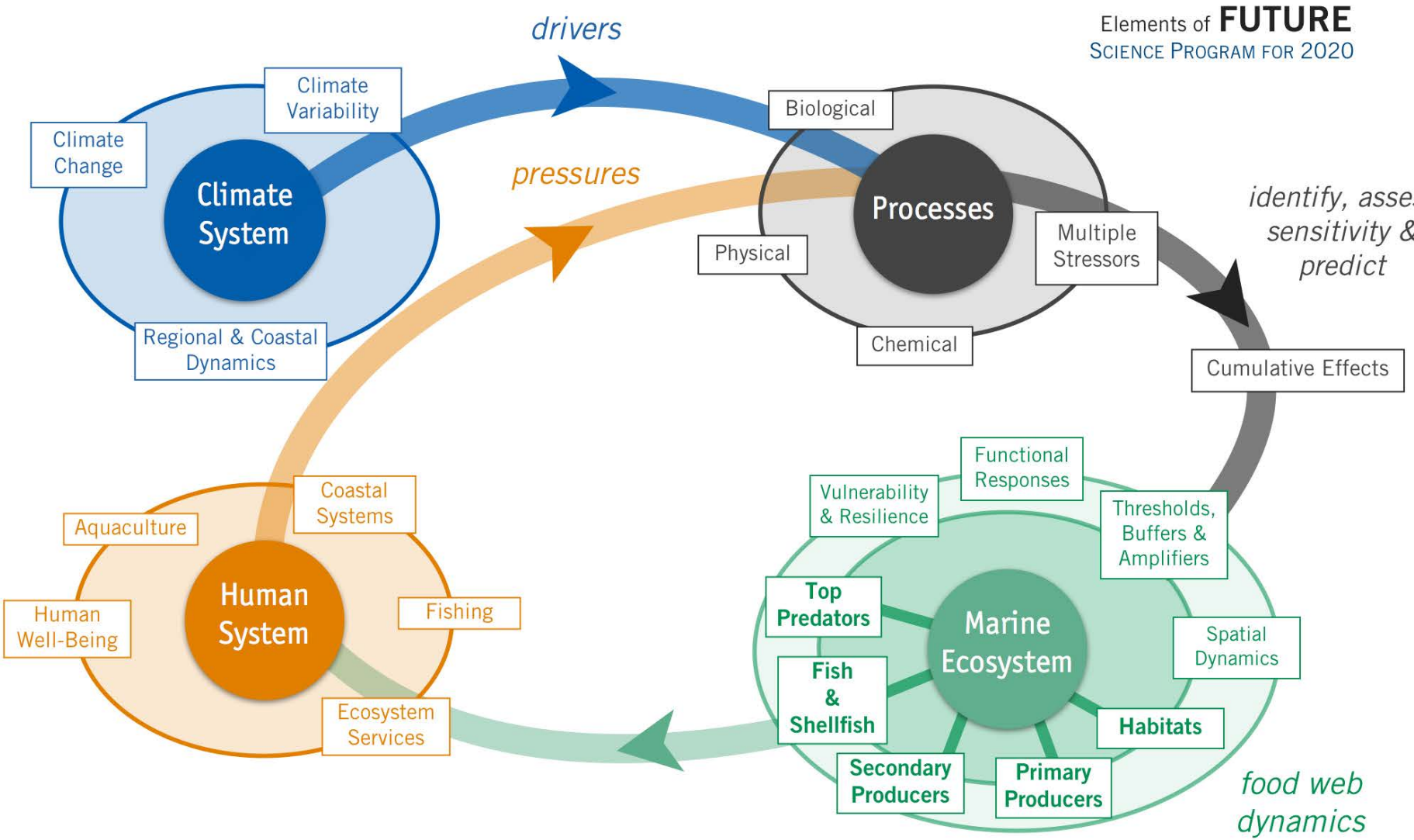
Aquaculture
Human System
Fishing
Human Well-Being
Ecosystem Services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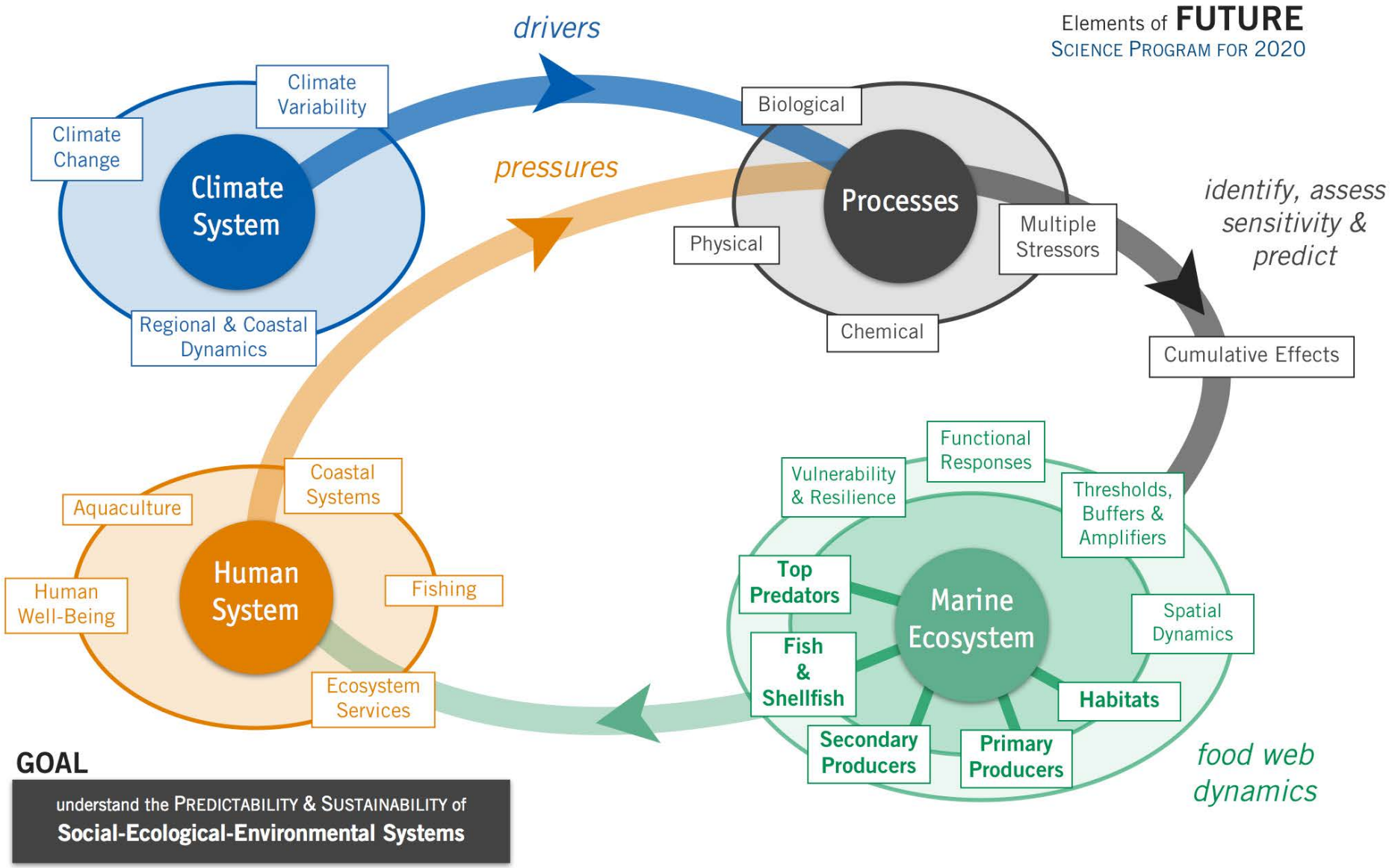
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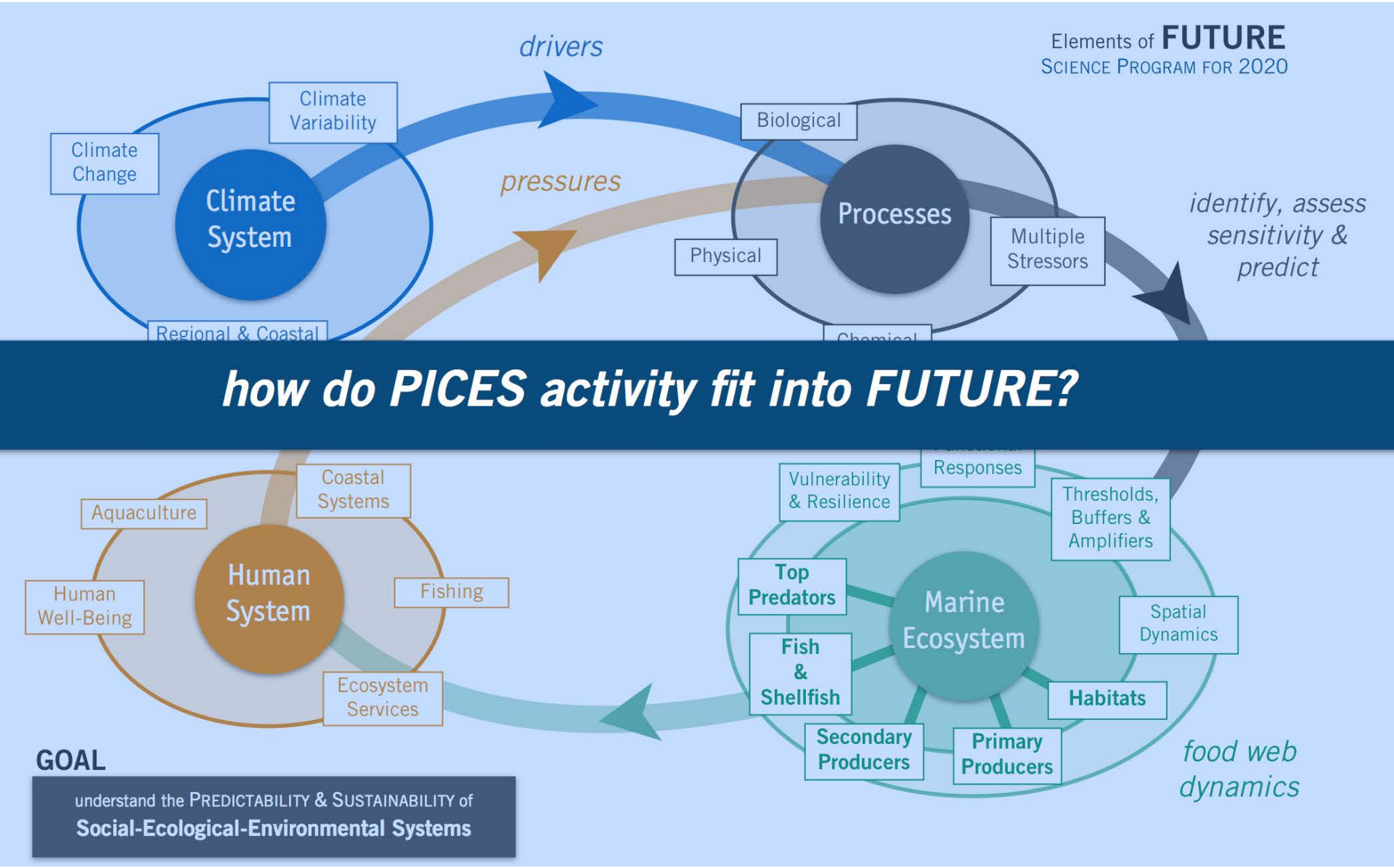
Ecosystem Services
GOAL
understand the PREDICTABILITY & SUSTAINABILITY of
Social-Ecological-Environmental Systems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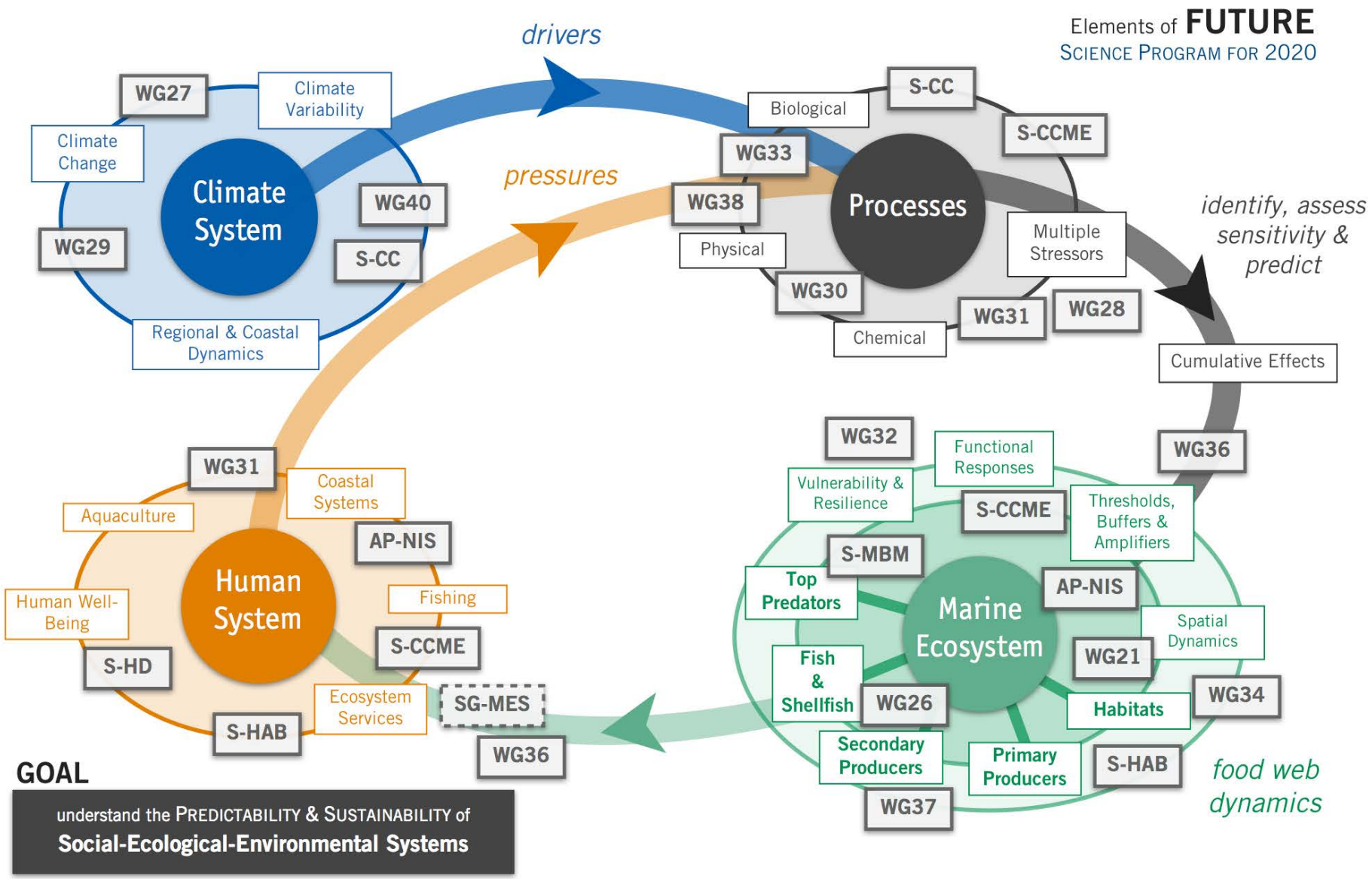
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Climate Change
WG40
S-CC
WG29
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S-CCME
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WG38
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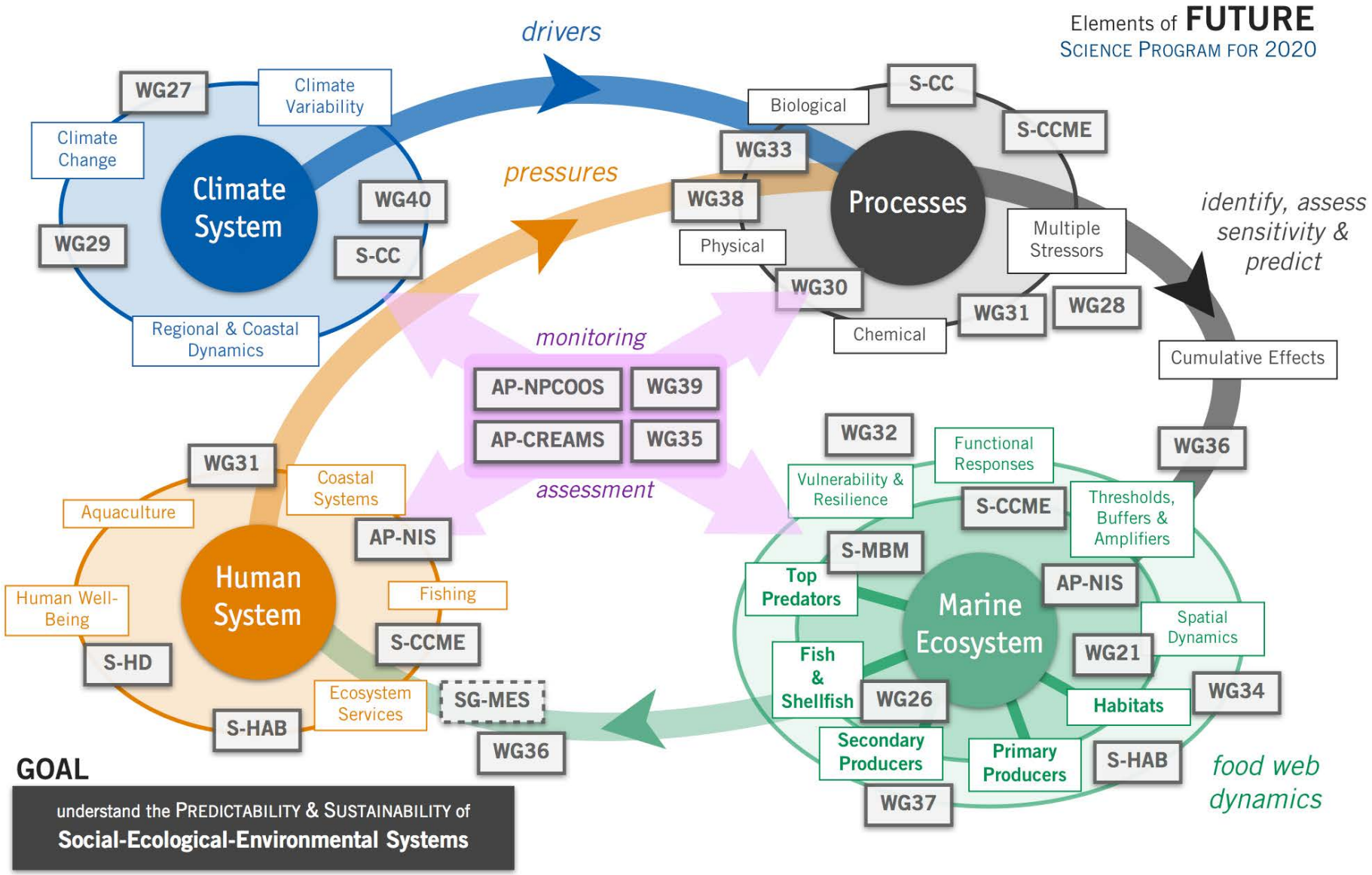
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FUTURE Science Program

- What are the gaps in FUTURE science?

FUTURE Science Program

- What are the gaps in FUTURE science?
- What new Expert Groups are needed to accomplish FUTURE objectives?

FUTURE Science Program

- What are the gaps in FUTURE science?
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- The next PICES Integrative Science Program …?