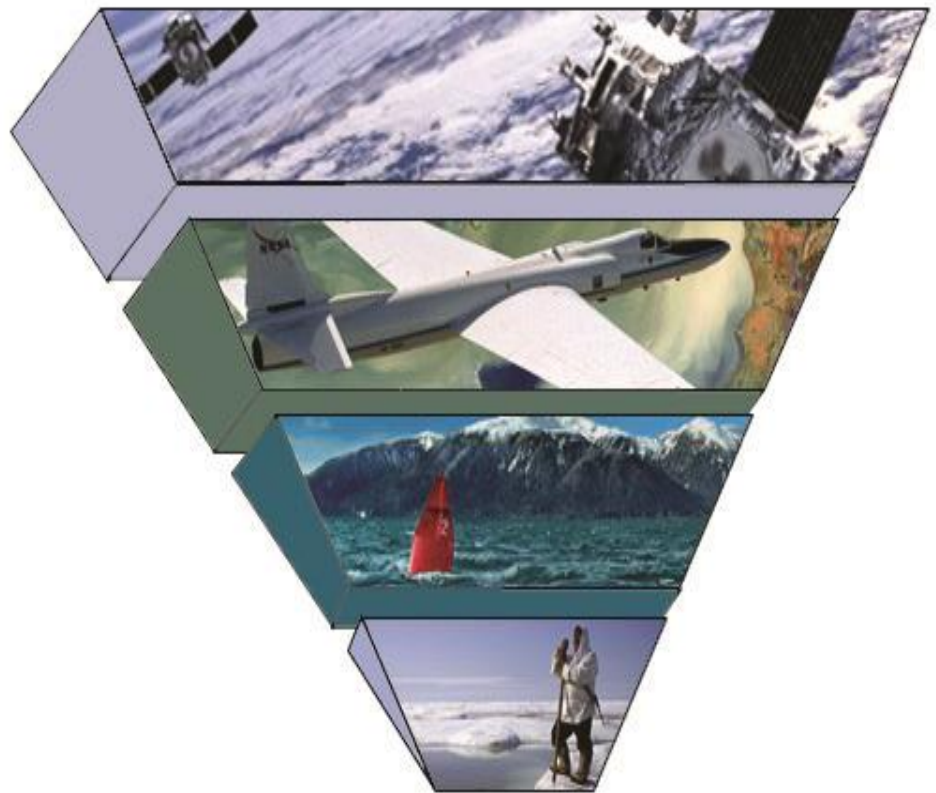


Why CBONS? Place Not Race!



- **Systematic, long term (series) of observations using reproducible, standardized collection methods;**
- **Local science teams work as partners with Academic/Gov't science teams to form a SSC.**
- **Rigorous methods to co-identify and monitor meaningful indicators that can be used to guide adaptation and responses on the ground.**

What is Community Based Observing?

Data Interoperability/Authoritativeness

Accessibility

Quality
Assured/Controlled
Variables co-identified
(extensive);
Structured Data Intakes;
Data interoperable;
Mixed Methods;
On-going Verification
and Validation; Local
Science Team Leaders

QA/QC variable;
Variables co-
identified (fewer)
Semi to Structured
Data Intakes; V&V
for protocols
variable; Individuals

QA/QC occurs less often;
Variables driven by
Scientists (usually single
to few); V&V for
protocols absent;
Individuals, usually a
restricted "backyard"
demographic.

Little to No QA/QC;
Variables at
random; V&V for
protocols absent;
open to anyone
with access.

CBONS

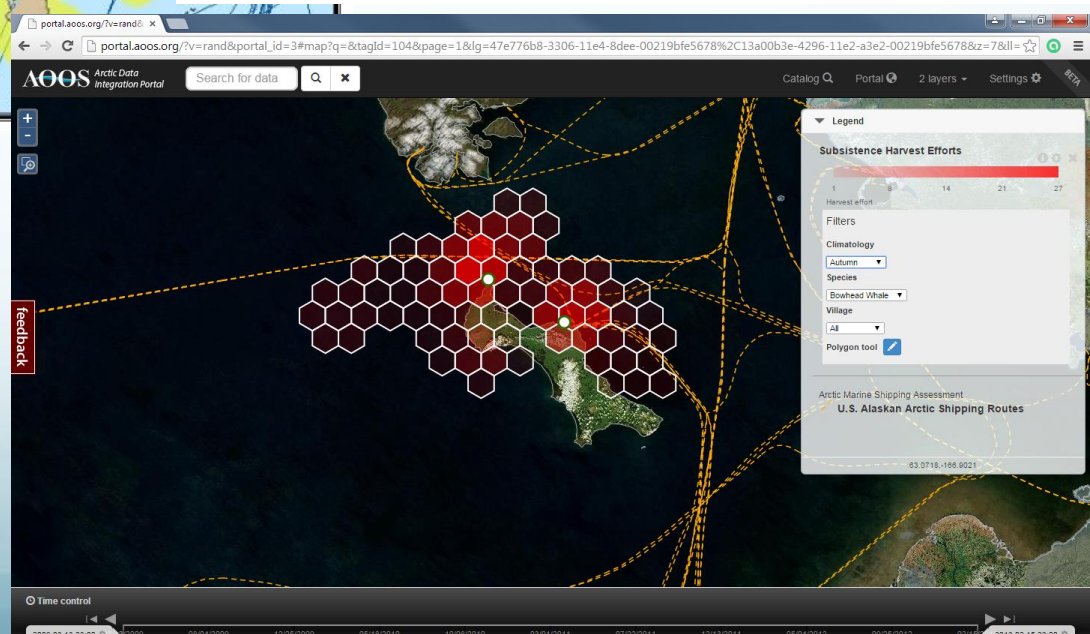
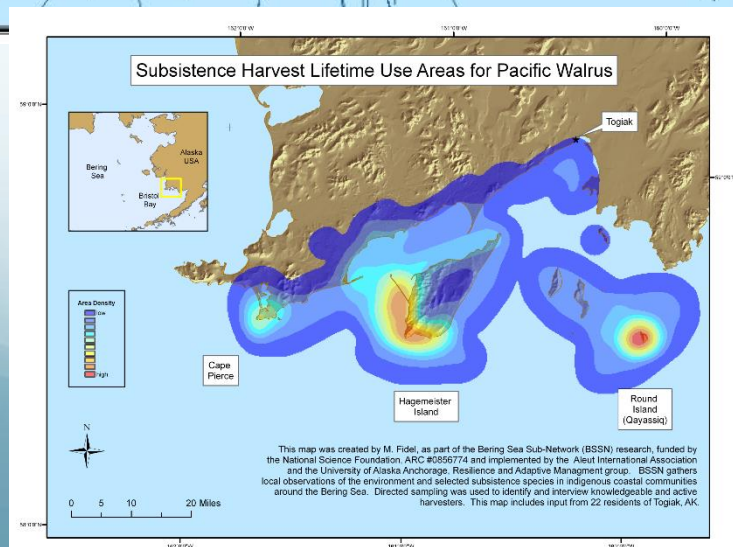
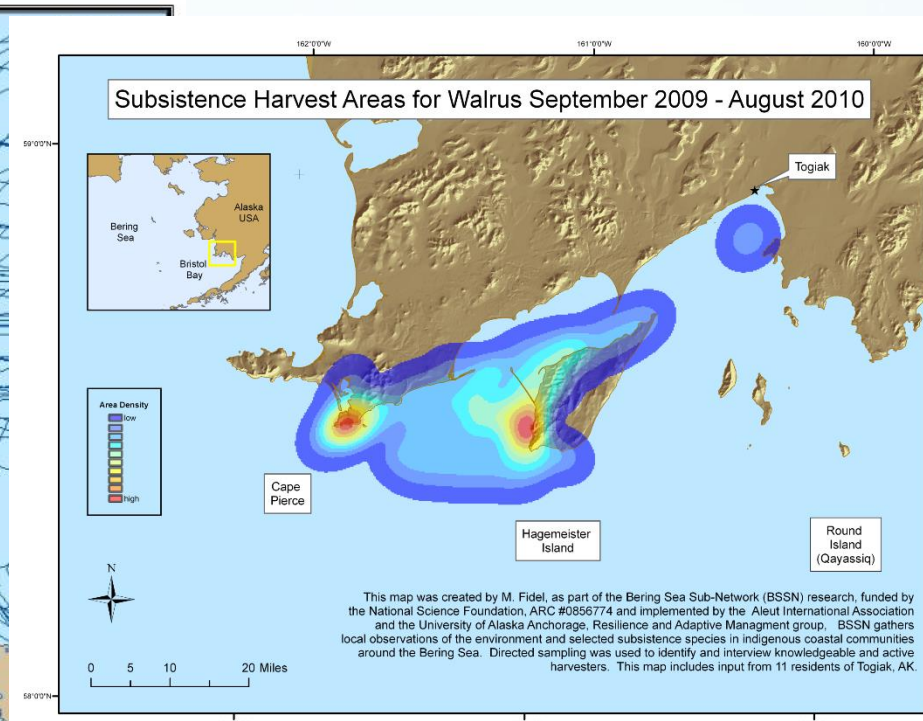
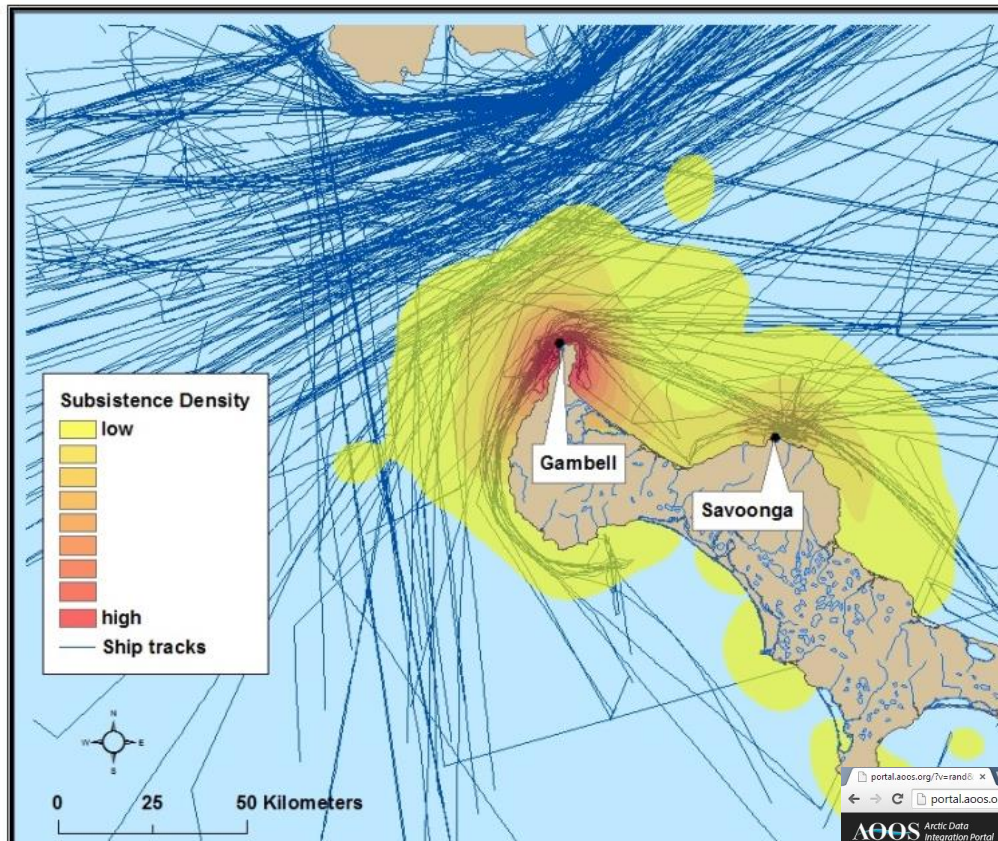
CBM

Citizen Science

Observer Blogs

Building a Science of CBO

- **Methods and outcomes from CBO and CBONS help us develop a Science of Community Based Observing;**
- **Allows us to better translate data to decisions, because context is powerful.**
- **White Paper proposing a permanent CBO sub-group within CON has advanced through the Arctic Executive Steering Committee (White House).**
- **Allows us to harmonize methods and hence, data interoperability across Nations while respecting local cultures and practices.**



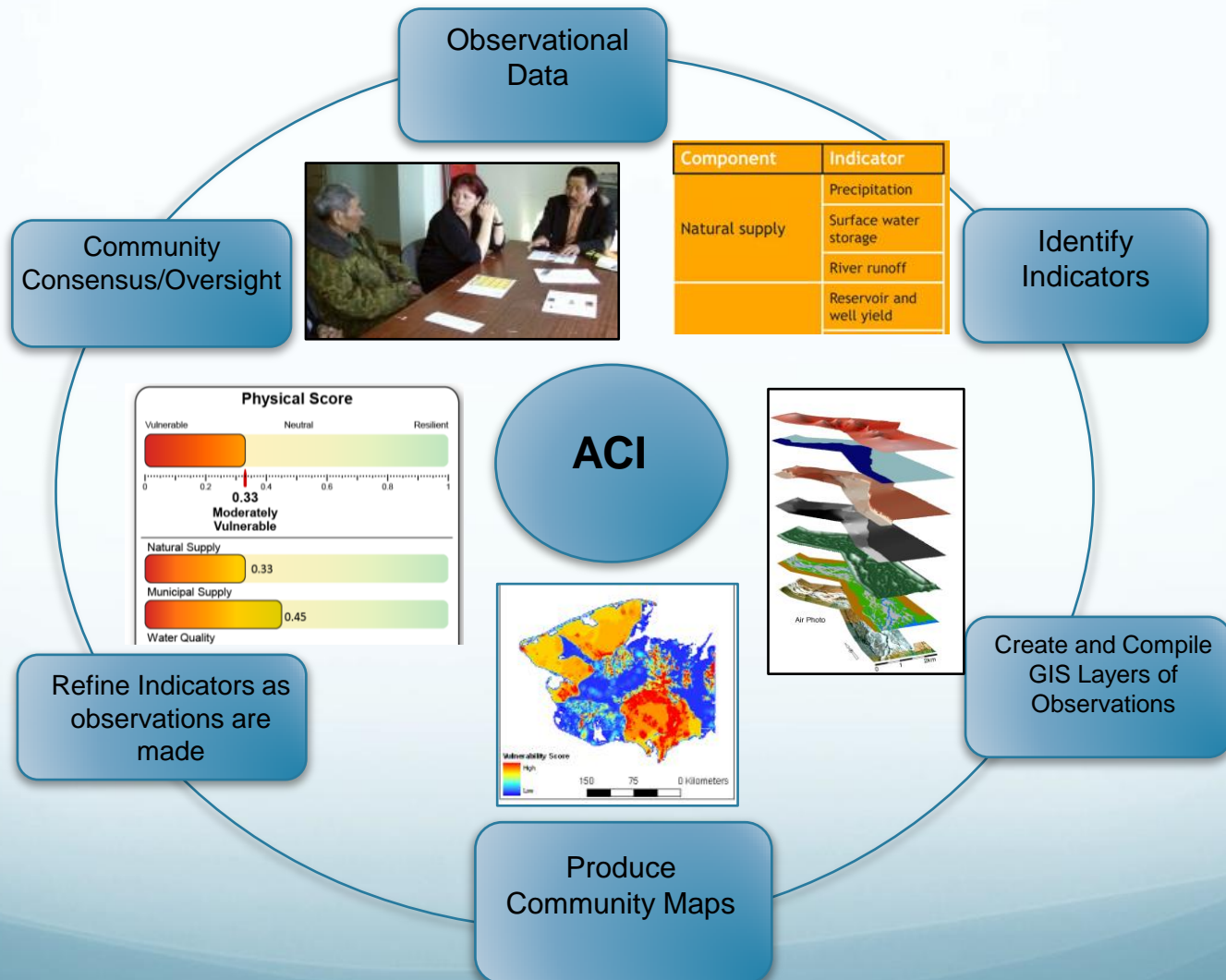
CBONS

- Enormous effort on “resilience” and “adaptation” but few tangible pathways to convert data to action.
- CBONS offer a systematic set of observations which are interoperable with other instrumented networks.
- CBONS allow information to be placed in a local and regional societal context. From this we can derive critical indicators.
- Indicators are a globally applied approach to guiding successful adaptation and avoiding harm.
- Indicators, in turn, help guide which variables are monitored at different scales.
 - What are we observing and why?

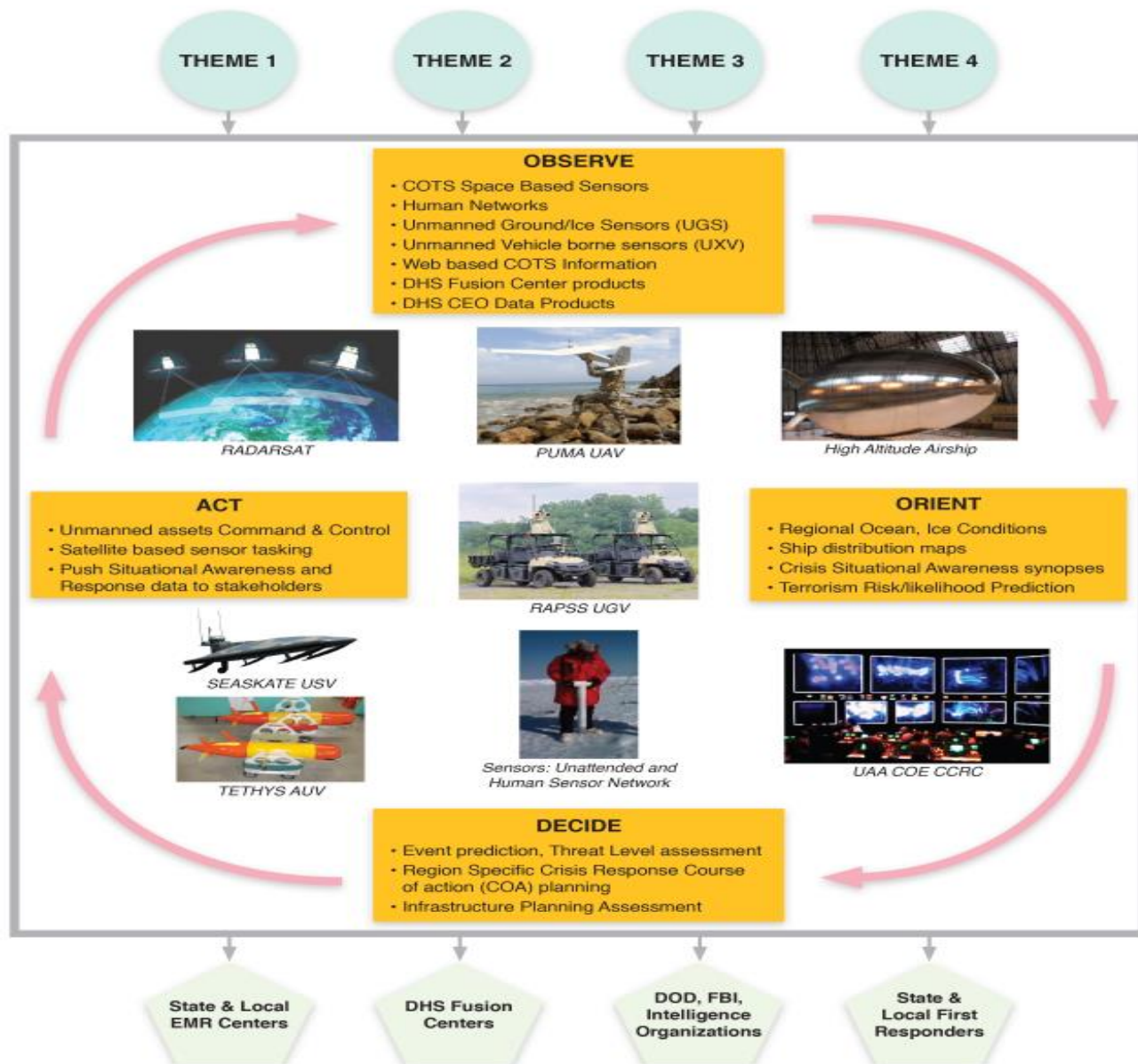
Indicators

- a)** Metrics we can tangibly work with to guide actions on the ground on a day-to-day, month-to-month basis.
- b)** That help constantly guide which variables we observe and why.
- c)** That engage people on the ground not as merely “if you see something say something” but also as first responders.
- d)** Indicators can be organized, weighted and analysed in partnership with communities on the ground using “adaptive capacity indices” (ACI).
- e)** ACIs can, in turn, be developed into Early Warning Systems (EWS).

Observations, Indicators and Adaptive Capacity Indices



CBON-SA/Community Observing Network for Adaptation and Security (CONAS)



The role of Indigenous science and local knowledge in integrated observing systems: moving toward adaptive capacity indices and early warning systems

Lilian Alessa, Andrew Kliskey, James Gamble, Maryann Fidel, Grace Beaujean & James Gosz

Sustainability Science

ISSN 1862-4065

Sustain Sci

DOI 10.1007/s11625-015-0295-7

Sust
Scienc

vol. 10 no. 2 April 2015

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Indicators Tables for Arctic PACE (Predicting Arctic Critical Events)

- Project within the DHS Arctic Domain Awareness Center (ADAC);
- Will drive the ADAC ISoS Decision Support Tool.
- Expansion to include Digital Data Mining (DDM) to build rule sets for human responses to environmental change (MAS).
- Part of DOD Long Range Research and Development Planning Process (LRRDPP)

Type of Sensor	Indicator	Sub Indices
Remote Sensing	Sea ice	Extent, velocity, quality, pattern
	Marine debris	Bulk, diffuse, rigid, unknown
	Roads, building, and ports	
	Shipping patterns (AIS visible)	Baseline, irregular, proximity to habitat
	Phytoplankton and marine algae	Variation from baseline, pattern, density, types
	Oil / petrochemicals	Location at unfamiliar places, density
	Wetland drying / surface drying	Rates
	Greening / browning (NDVI)	Rates, types of vegetation, proximity to habitat, cause
	Phenology	Increased uncoupling
	Ocean temperature	Higher, lower, <u>phenologically disjunct</u>
	Coastlines	Erosion (rates & patterns), proximity to habitat, proximity to infrastructure, sedimentation
Buoy / Meteorological Station	Ocean temperature	Higher, lower, <u>phenologically disjunct</u>
	Salinity	Higher, lower, pattern
	Microbes	TBD
	Oil / petrochemicals	Location at unfamiliar places, density
	Precipitation / hydrology	Increase, decrease, rate (e.g., drought/flood), proximity to infrastructure
	Phenology	Increased uncoupling
	Species distributions / biodiversity	TBD
Community-based Observing Networks	Sea State; Sea Ice; Marine transit <u>inc.</u> patterns (AIS – dark)	Patterns and Occurrence
	Fauna - familiar	Frequency, body condition (e.g., lesions), behaviors
	Fauna – unfamiliar	Occurrence, distribution
	Flora – familiar	Frequency, productivity (e.g., berries, rhizomes, roots), condition
	Flora –unfamiliar	Occurrence, distribution
	Phenology	Increased uncoupling
	Human activity – desired	TBD
	Coastlines	Erosion (rates & patterns), proximity to habitat, proximity to infrastructure, sedimentation

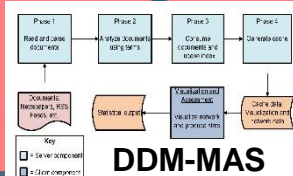


CBONS and Early Warning Systems



CBONS

Retrospective Analyses



Indicators and Rule Sets

Hydrological

Land Use
Maritime

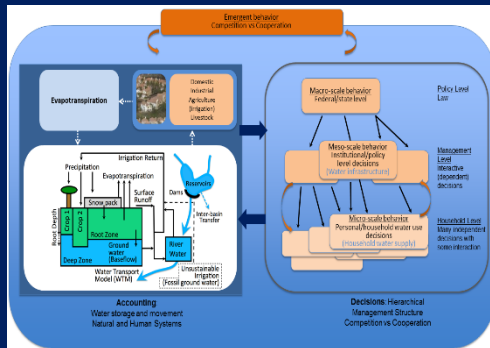
Ecological states

Climate

WBM-SWIM

Coupled:
Hydrologic Processes
Human Responses
Feedbacks

- Improvisation
- Resource Competition
- Trade-offs
- Conflict versus Cooperation



Micro-scale
Human
Behaviors

Macro-scale
Human
Behaviors

Infrastructure

Policies

Agents



National
Infrastructure
(USACE
Dataset)



Aim #2

FUTURES

Informed by Retrospective DDM

Climate Scenarios:

- 1) Historical (1979-2010)
- 2) Downscaled CMIP5 (2011-2100)
- 3) Resource supply futures
- 4) Infrastructure for supply
- 5) Socioeconomic strategies

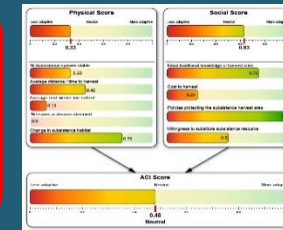
Changing Landscape Scenarios:

1. Dryer West/Wetter East; Low Infrastructure; H/L Social Cooperation
2. Dryer West/Wetter East; High Infrastructure; H/L Social Cooperation
3. Grey and Black Swan Events

Aim #1

Model Outputs Refine Indicators

Biophysical and
Hydrological
Indicators
Weighted



Sociocultural and
Economic
Indicators
Weighted

Aim #3

Conflict Cooperation Early Warning System (CCEWS) Prototype Augmented Adaptive Capacity Index

- 1) Web-based interactive indicators definition/exploration
- 2) Mapping of social ecological technological system hotspots
- 3) Direct engagement with strategic advisory group and other stakeholder/user groups.

INCORPORATING COMMUNITY-BASED OBSERVING NETWORKS AND SYSTEMS: TO ENHANCED COMMUNITY PREPAREDNESS AND RESPONSES TO MARINE ARCTIC CRITICAL EVENTS

Lilian Alessa, Arctic Domain Awareness Center

Paula Williams, Alaska Experimental Program to Stimulate Competitive Research

Andrew Kliskey, Center for Resilient Communities

Grace Beaujean, Aleut International Association

INTRODUCTION

II. WHY A SYSTEMS APPROACH?

Using Community Based Observing Networks to Better Enable Local Responses to Marine Arctic Critical Events

III. FORECASTING MARINE ARCTIC CRITICAL EVENTS: WHAT IS A REGIONAL EARLY WARNING SYSTEM?

Forecasting Marine Arctic Critical Events: An Arctic Early Warning System
MACE and Incidents of National Significance

IV. TOWARD AN INTEGRATED RESPONSE FRAMEWORK

Incorporating CBONS into the National Response Framework

INTRODUCTION

On May 10, 2013 President Barack Obama announced the *National Strategy for the Arctic Region* (NSAR)¹. The document describes foci of the policy, which include: improving our awareness of

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The White House

Office of the Press Secretary

For Immediate Release

September 15, 2015

Executive Order -- Using Behavioral Science Insights to Better Serve the American People

EXECUTIVE ORDER

AMERICA'S FUTURE

ENVIRONMENTAL RESEARCH
AND EDUCATION FOR A THRIVING CENTURY

A 10 YEAR OUTLOOK

A REPORT BY THE
NSF ADVISORY COMMITTEE
FOR ENVIRONMENTAL RESEARCH & EDUCATION

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Find Out How People Are Building Resilience



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Adapting to Climate Change: A
Water Utility's Approach (1:27)
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Climate Outlooks Inform Water
Management (0:53)
[Watch video >](#)



Building Smart in the Floodplain
(1:14)
[Watch video >](#)

Climate Explorer



Site Overview



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adaptation across the Arctic region. Explore an
interactive map by theme and...

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