The presentation in this PDF was created using the application “Prezi”, which is freely accessible over the web and runs on most browsers.

This static version loses a lot of the contextual information useful to better understand the concepts herein.

To fully experience the contents, this presentation is publicly accessible at:

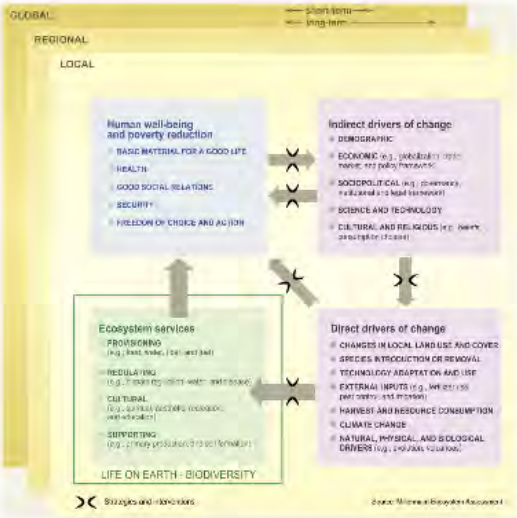
https://prezi.com/taqc-dgwngtv/

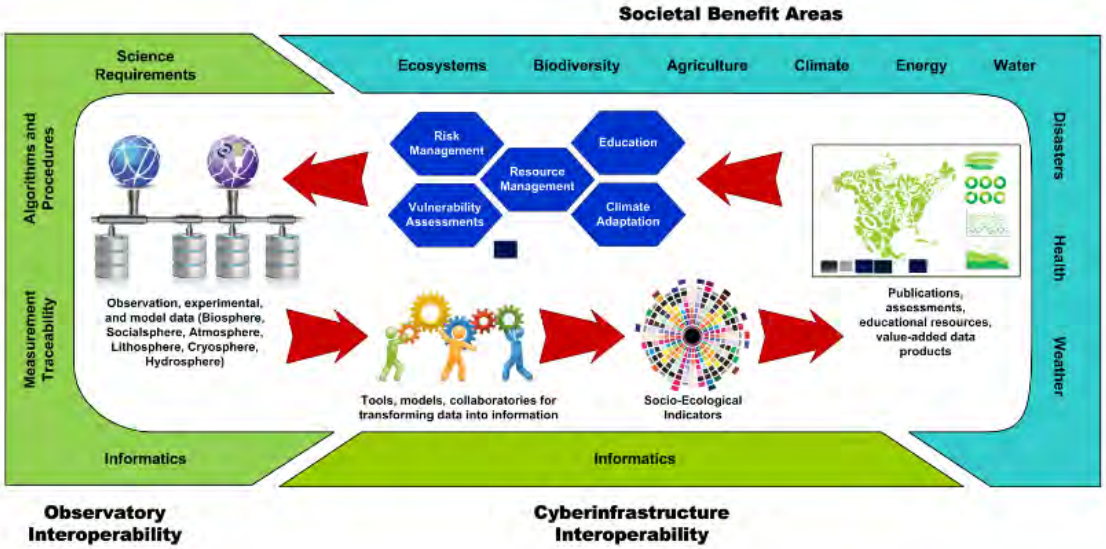
From OpenData to OpenKnowledge:

Generating Open Knowledge from Information and Data

Brian Wee, Ph.D.
Chief of Strategic Alliances
U.S. National Ecological Observatory Network (NEON), Inc.

2015-03-26
GEOSS S&T Stakeholder Workshop (Norfolk, VA)





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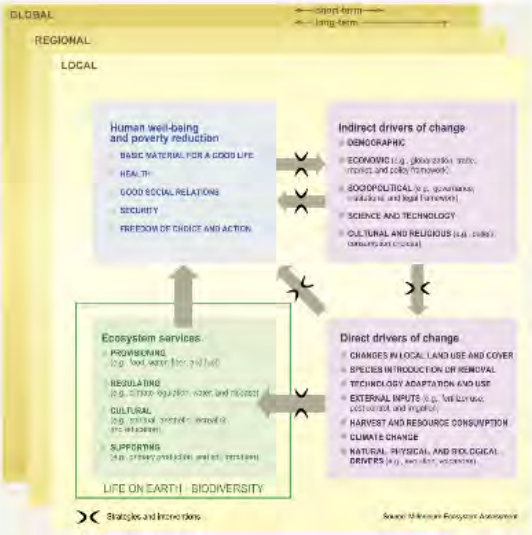

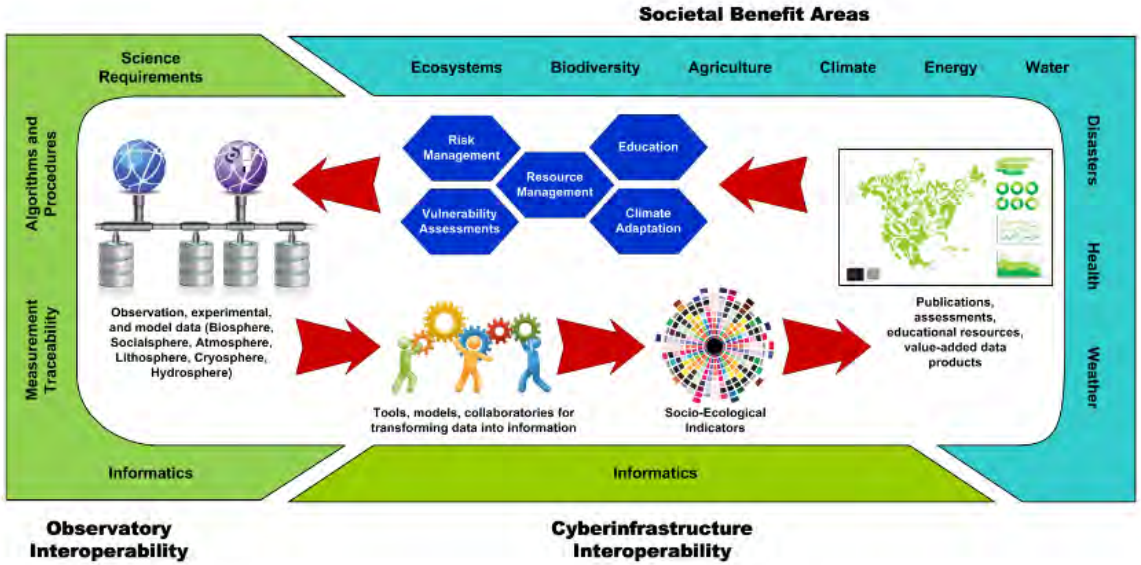

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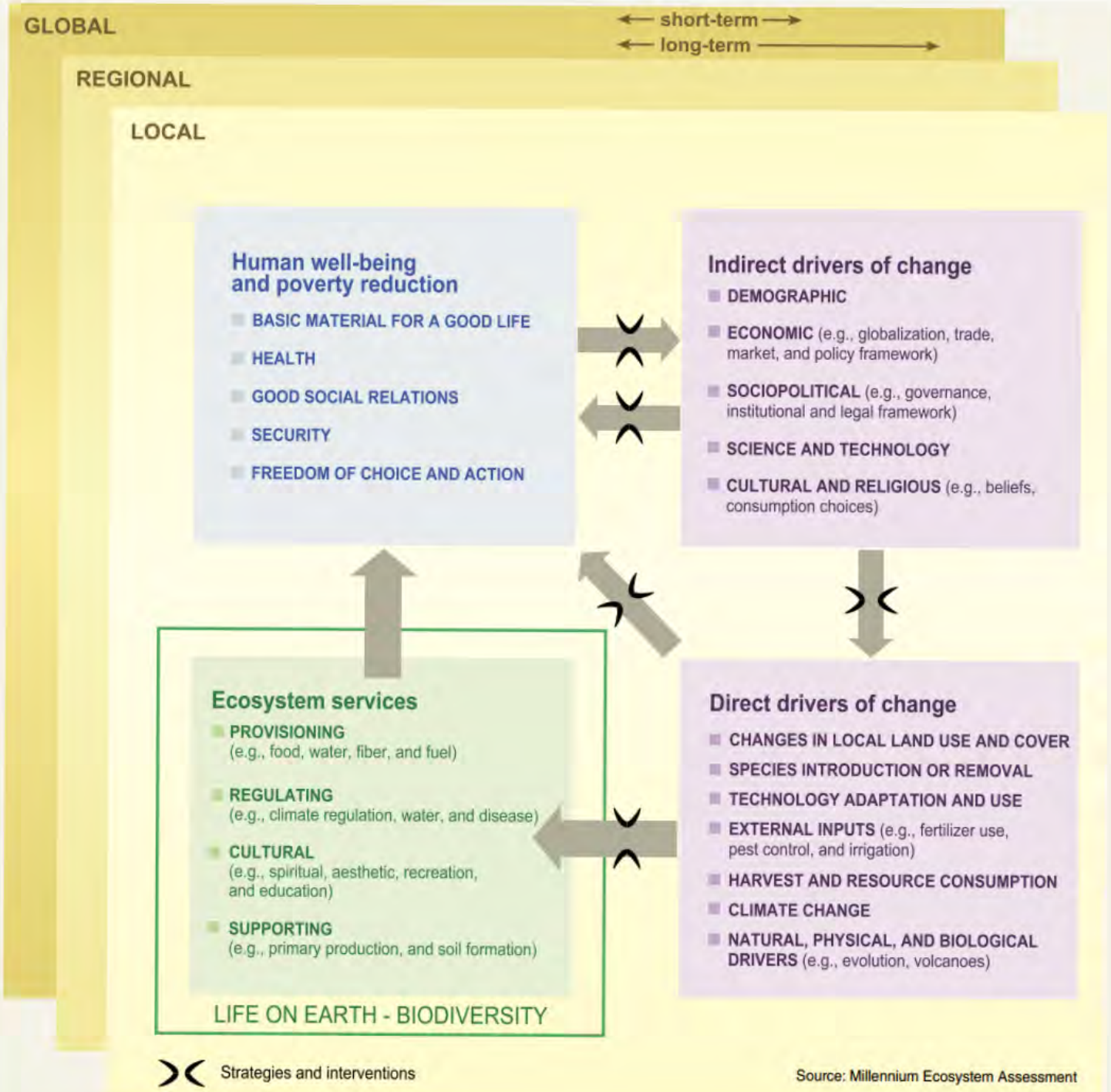

GLOBAL
short-term
long-term
REGIONAL
LOCAL
Human well-being and poverty reduction
BASIC MATERIAL FOR A GOOD LIFE
HEALTH
GOOD SOCIAL RELATIONS
SECURITY
FREEDOM OF CHOICE AND ACTION
Indirect drivers of change
DEMOGRAPHIC
ECONOMIC (e.g., globalization, trade, market, and policy framework)
SOCIOPOLITICAL (e.g., governance, institutional and legal framework)
SCIENCE AND TECHNOLOGY
CULTURAL AND RELIGIOUS (e.g., beliefs, consumption choices)
Ecosystem services
PROVISIONING (e.g., food, water, fiber, and fuel)
REGULATING (e.g., climate regulation, water, and disease)
CULTURAL (e.g., spiritual, aesthetic, recreation, and education)
SUPPORTING (e.g., primary production, and soil formation)
LIFE ON EARTH - BIODIVERSITY
Direct drivers of change
CHANGES IN LOCAL LAND USE AND COVER
SPECIES INTRODUCTION OR REMOVAL
TECHNOLOGY ADAPTATION AND USE
EXTERNAL INPUTS (e.g., fertilizer use, pest control, and irrigation)
HARVEST AND RESOURCE CONSUMPTION
CLIMATE CHANGE
NATURAL, PHYSICAL, AND BIOLOGICAL DRIVERS (e.g., evolution, volcanoes)
Strategies and interventions
Source: Millennium Ecosystem Assessment

Biodiversity and Ecosystems: Planet Under Pressure 2012

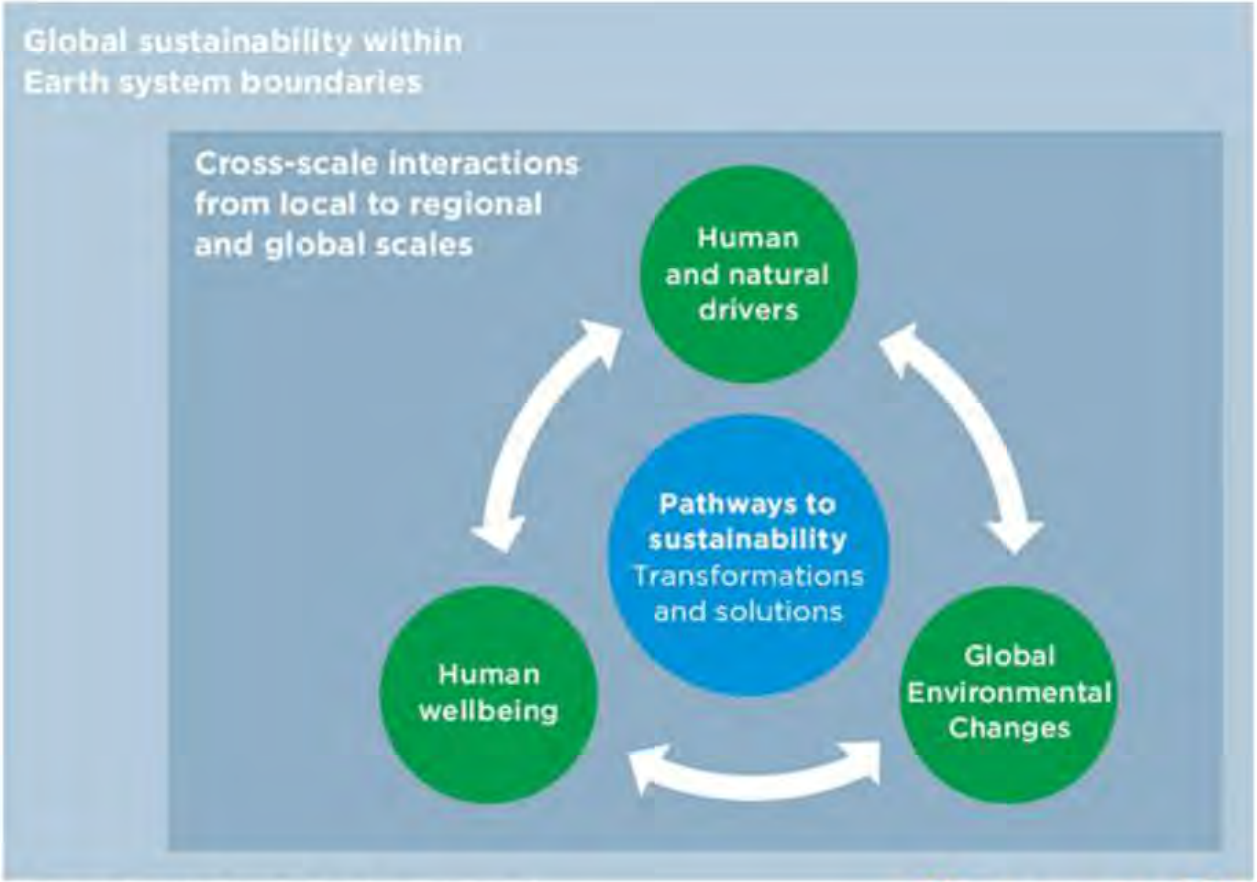
Selected key points:

- Incorporate *biodiversity and ecosystem services* into water- and *land-use* planning at all *scales from local to global.*
- Create green economies that include *natural, social*, human, financial, and manufactured capital.
- Shares areas highlighted in a 2011 US White House report.

Source: Planet Under Pressure 2012 website

Future Earth and global sustainability

- Future Earth is a response to:
  - Planet Under Pressure
  - Rio+20 declaration
  - UN Secretary General's Global Sustainability Panel report.
- Distributed global secretariat in Paris, Montreal, Tokyo, Stockholm, and Colorado.
- Sponsors include the Belmont Forum.



Future Earth Conceptual Framework

futurearth
research for global sustainability

Source: Future Earth Initial Design

Belmont Forum: one of the Future Earth supporters

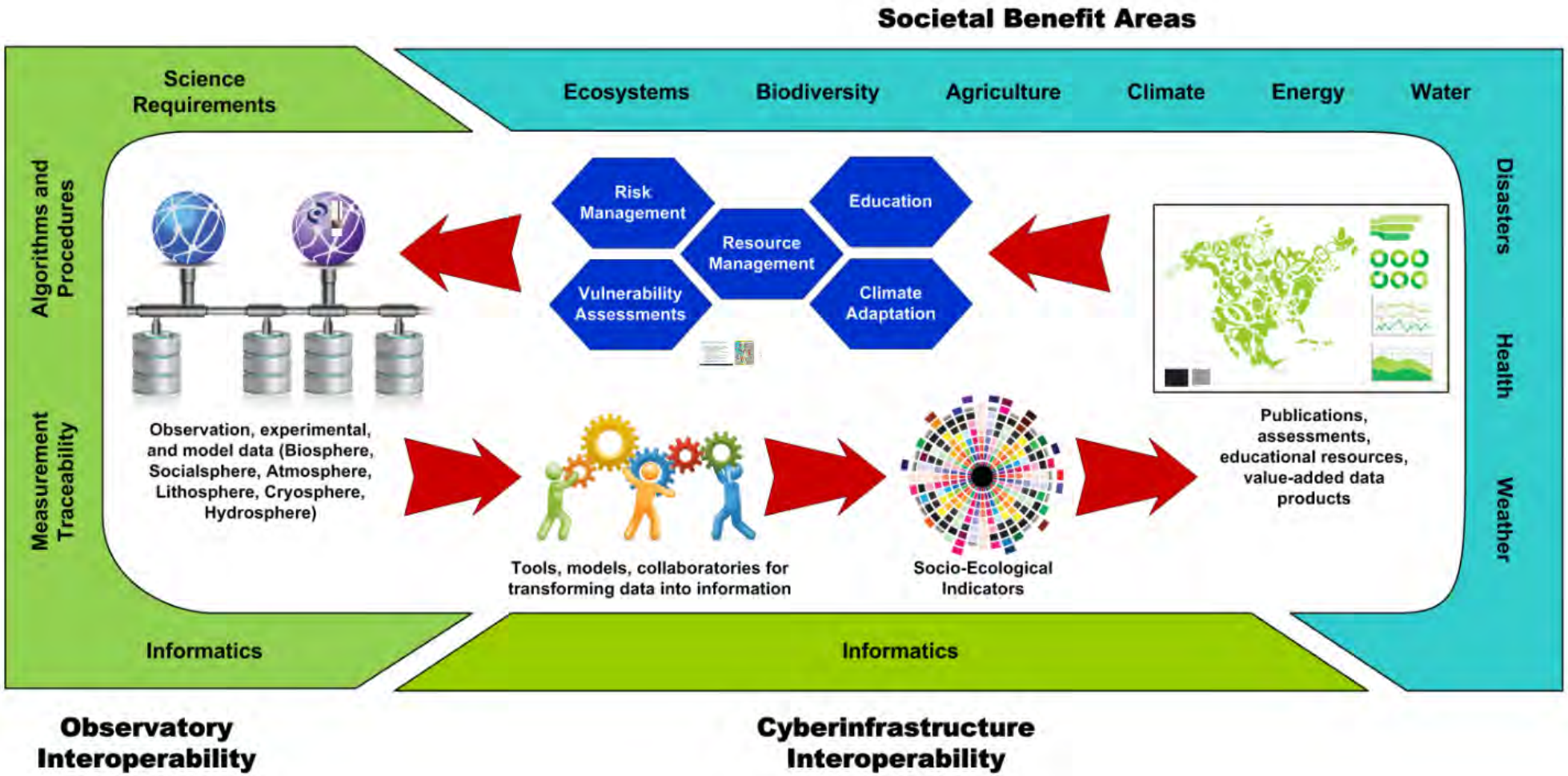
BELMONT FORUM

Co-chairs:

L'Agence nationale de la recherche

Belmont Challenge stipulates:

- Provide observations for early warning to support decision making.
- Enable detection of socio-environmental tipping points.
- Include long-term observing systems that measure key environmental variables to advance science.
- Develop data-information-knowledge platforms to support discovery, access, and use of resources



ns, perform a web-search for "Prezi NEON Brian Wee"


Environmental Stressors
Landscapes
Large-scale environmental stressors like climate-change, land-use change, and invasive species impact the nation's natural, managed, and urban landscapes.
Complex interactions between stressors and impacts
These landscape impacts modify the strength and nature of the stressors through perturbations in land-surface reflectivity, water cycles, nutrient cycles, natural and anthropogenic gaseous emissions, and others.
Measurements of these stressors, their impacts, and the complex interactions between them, are captured by NEON's integrated observing infrastructure.
NEON Site Constellation
NEON Airborne Platform
Existing Satellite Platforms
Site-based measurements are used to calibrate and validate airborne measurements, and to produce regional-scale data.
Site-based and airborne measurements are used to calibrate and validate space-borne measurements, and to produce continental-scale data.
NEON Data Products
Data Products from Credible Sources
INTEROPERABILITY
Data, Tools, Workflows, Documentation
Data to support forecasting and decision making across a number of applications, like those stipulated in the Global Earth Observation System of Systems (GEOSS) Societal Benefit Areas:
Disasters
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Energy
Climate
Water
Weather
Ecosystems
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Biodiversity

Environmental Stressors

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Landscapes

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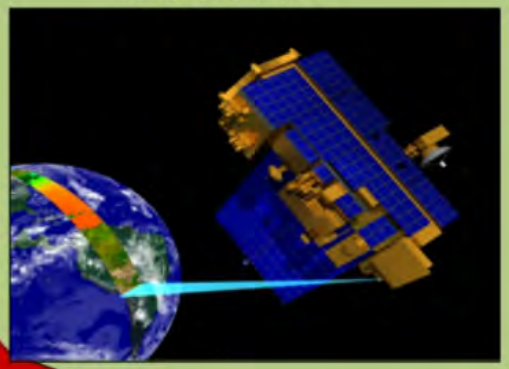

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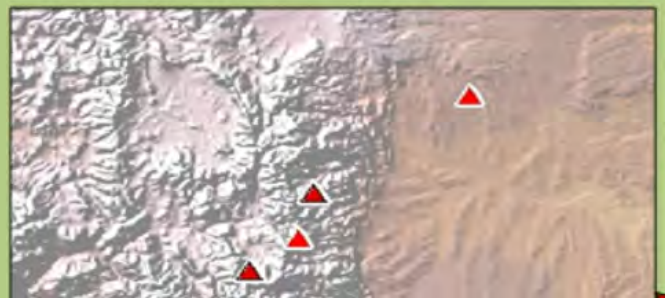


16 - PACIFIC NORTHWEST
12 - NORTHERN ROCKIES
9 - NORTHERN PLAINS
5 - GREAT LAKES
1 - NORTHEAST
15 - GREAT BASIN
6 - PRAIRIE PENINSULA
17 - PACIFIC SOUTHWEST
10 - CENTRAL PLAINS
7 - APPLACHIANS & CUMBERLAND PLATEAU
2- MID ATLANTIC
13 - SOUTHERN ROCKIES & COLORADO PLATEAU
14 - DESERT SOUTHWEST
8 - OZARKS COMPLEX
18 - TUNDRA
11 - SOUTHERN PLAINS
3 - SOUTHEAST
19 - TAIGA
20 - PACIFIC TROPICAL
4 - ATLANTIC NEOTROPICAL

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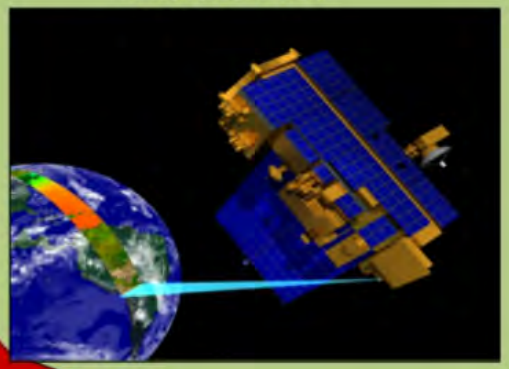

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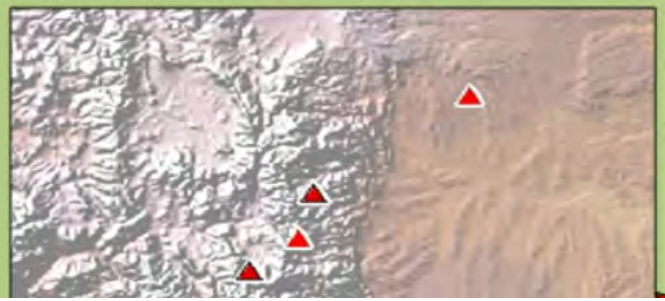
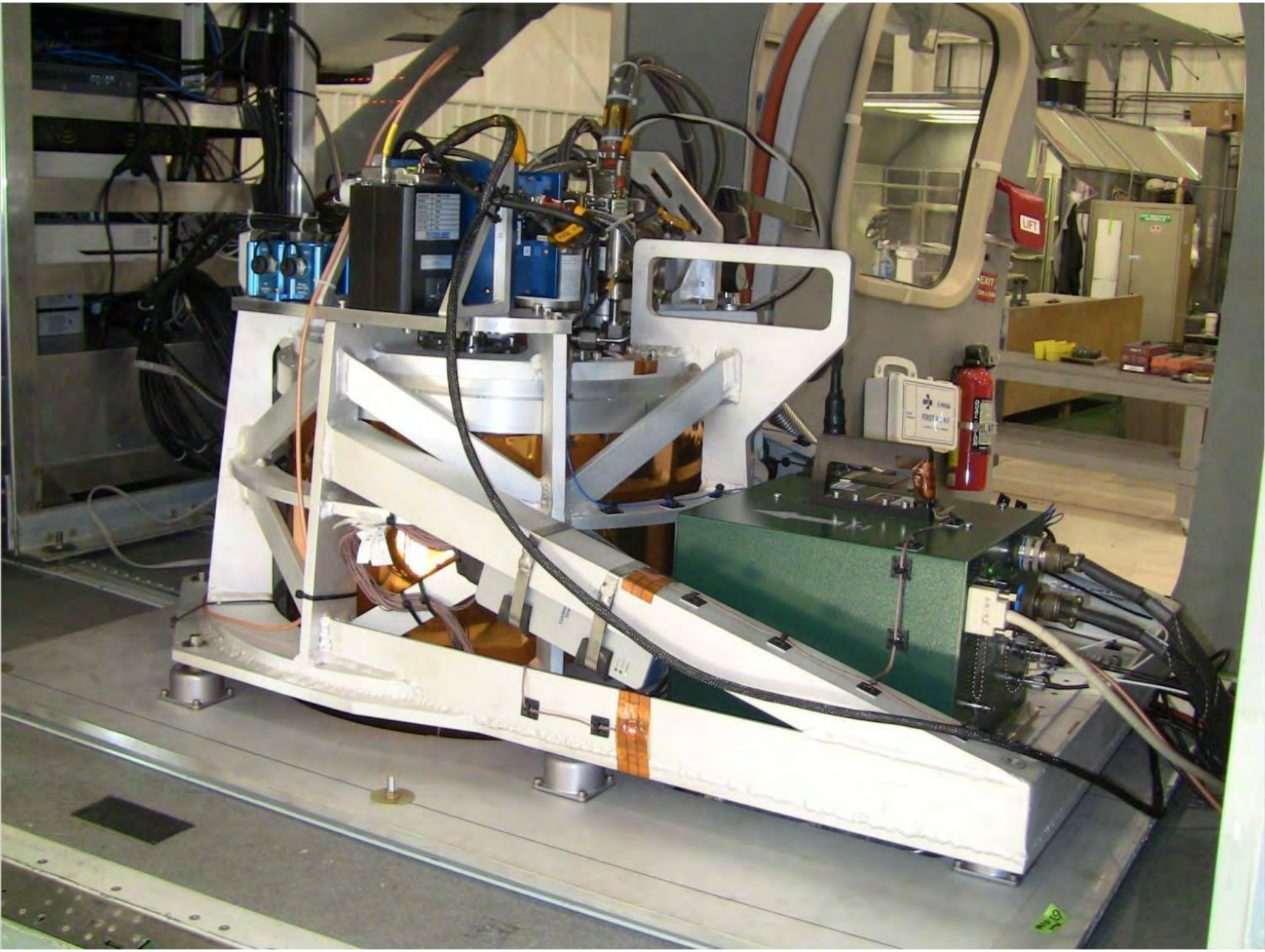
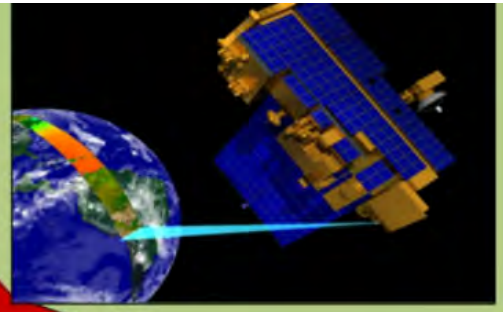



LIFT
EXIT



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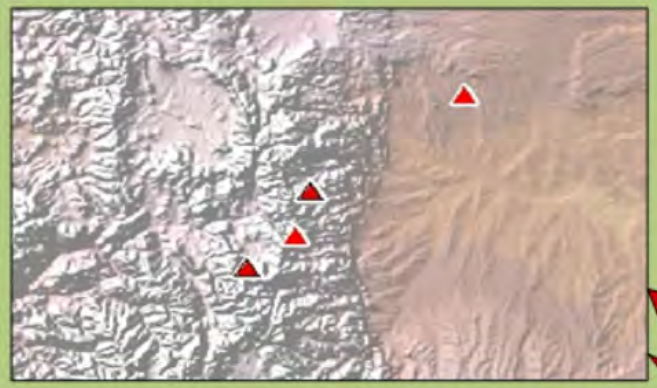
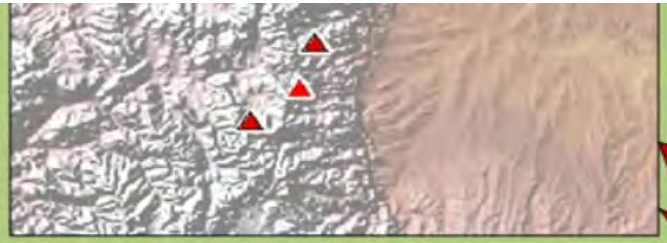


NEON Data Products

Data Products from Credible Sources

INTEROPERABILITY

Data, Tools, Workflows, Documentation



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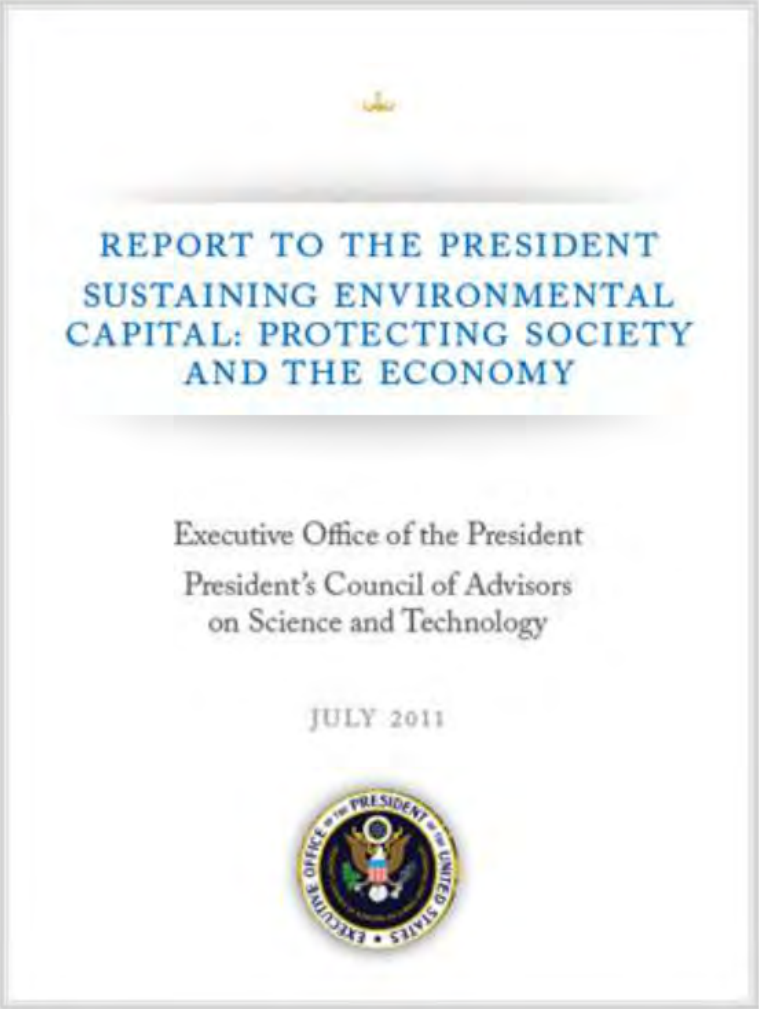
Agriculture
Biodiversity

Data from observations for biodiversity and ecosystem service assessments

"… **collaboration in monitoring** could rapidly improve the information base available for assessment and management…. recommendations should be developed for **integrating** the existing monitoring networks with the help of state-of-the art **informatics**"



REPORT TO THE PRESIDENT

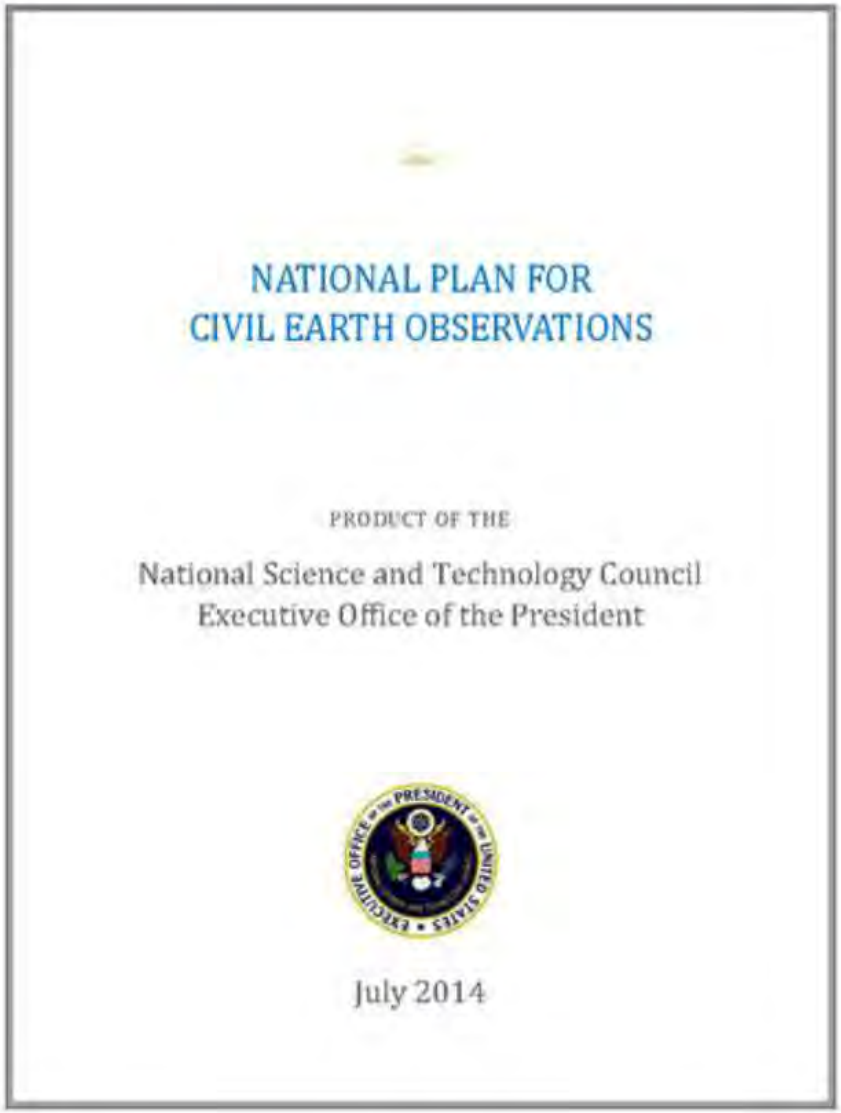
SUSTAINING ENVIRONMENTAL CAPITAL: PROTECTING SOCIETY AND THE ECONOMY

Executive Office of the President

President's Council of Advisors on Science and Technology

JULY 2011

Observatory Interoperability: National Plan



NATIONAL PLAN FOR
CIVIL EARTH OBSERVATIONS

PRODUCT OF THE

National Science and Technology Council
Executive Office of the President

July 2014

- Blueprint for future Federal investments in and **strategic partnerships** to advance Earth observing systems.
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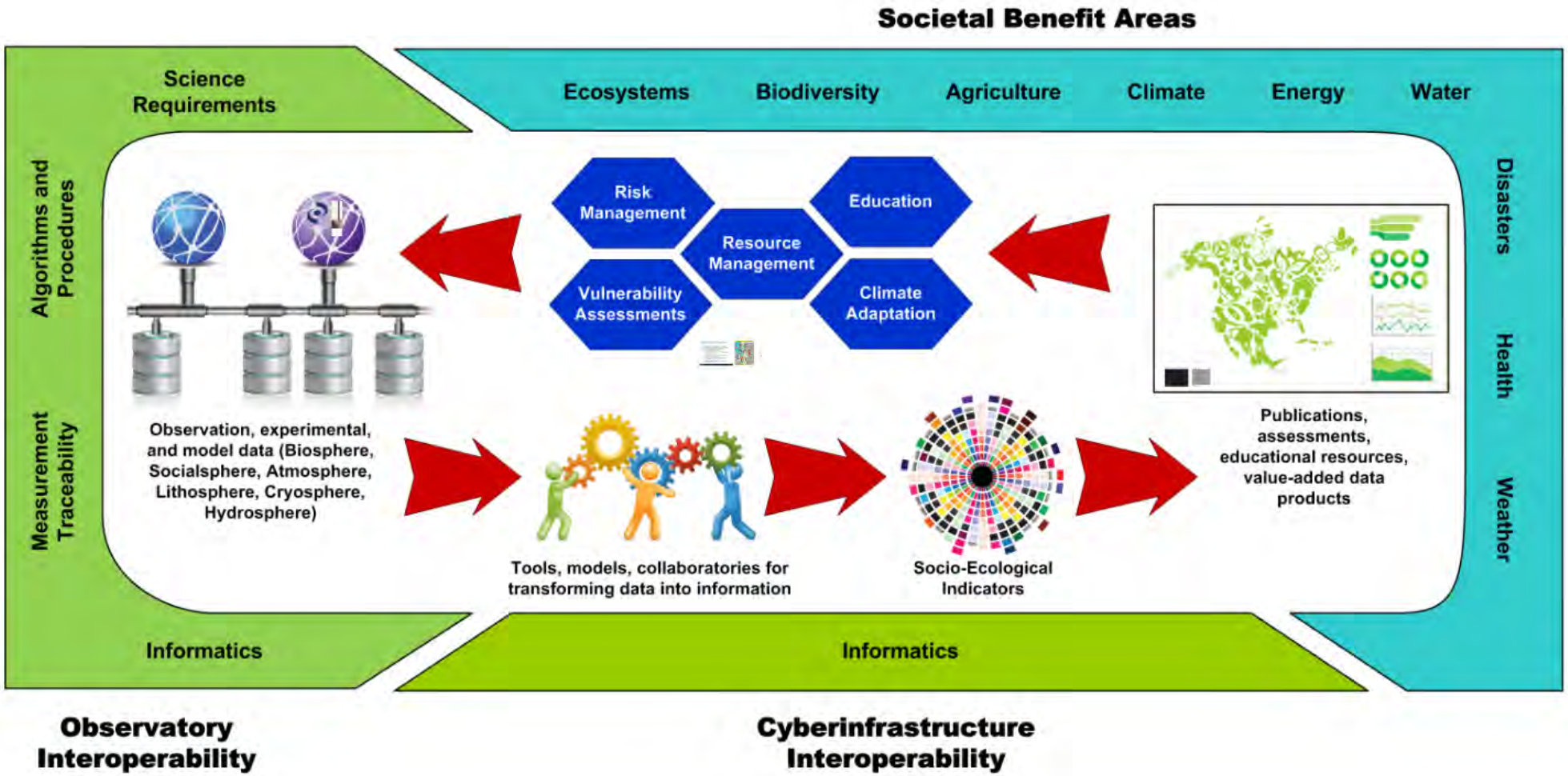

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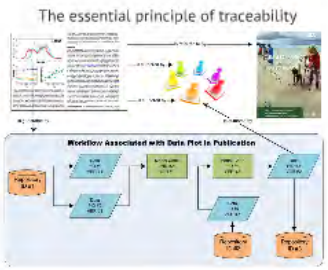
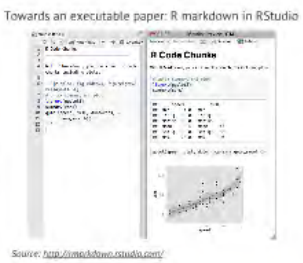
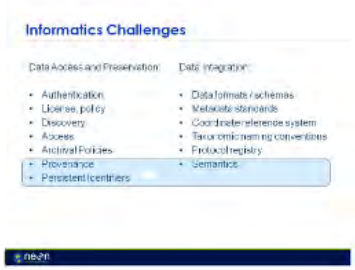
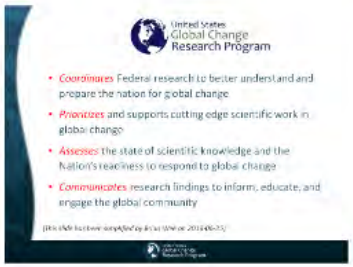
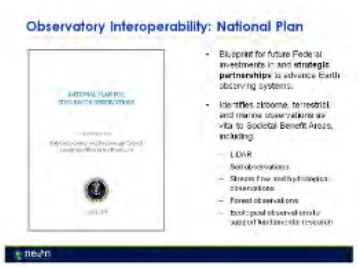






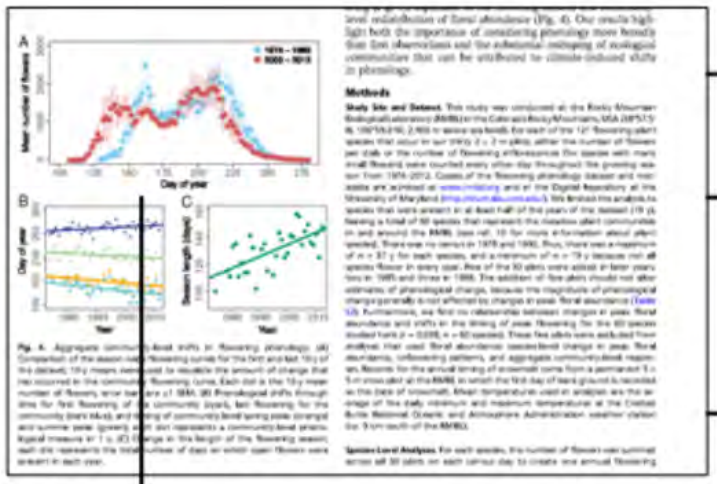




Publica

access

The essential principle of traceability



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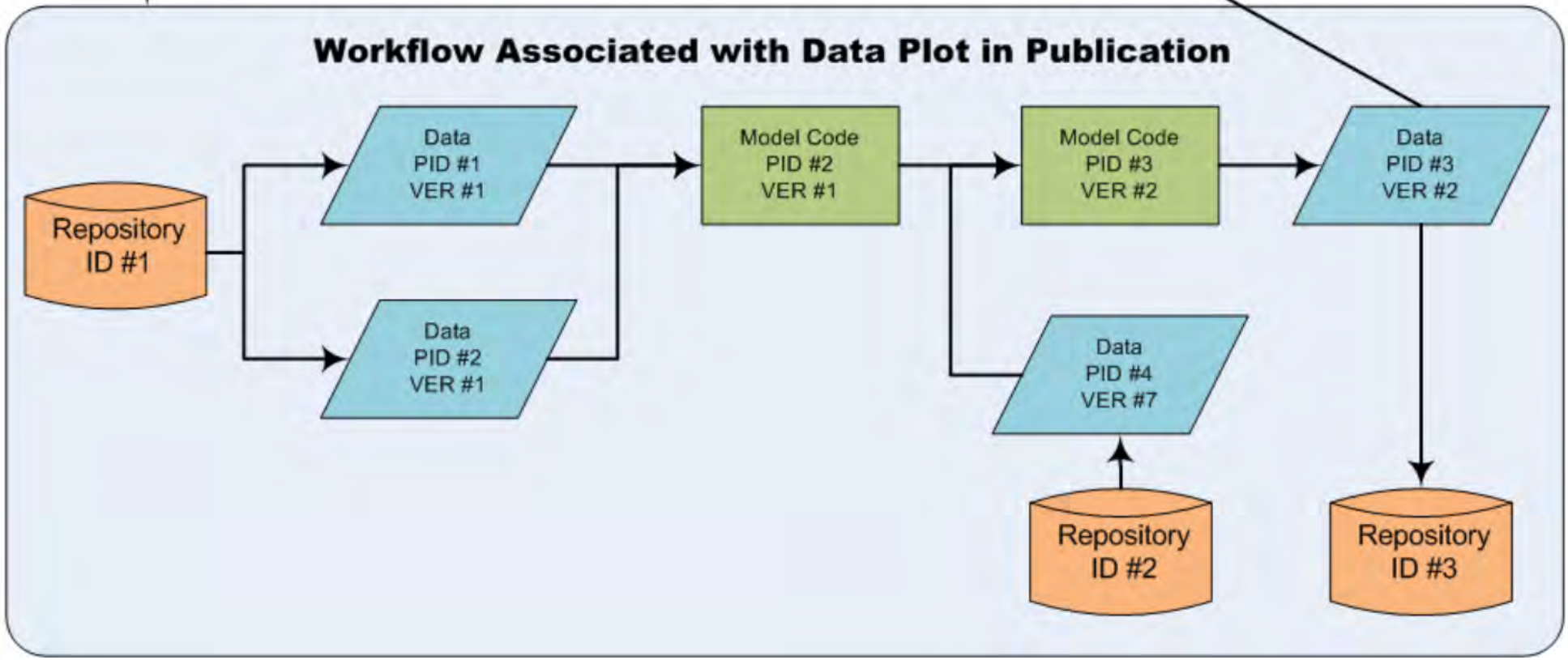


Towards an executable paper: R markdown in RStudio

chunks.Rmd

Knit HTML | Chunks

```
R Code Chunks
==================================

With R Markdown, you can insert R code
chunks including plots:

```{r qplot, fig.width=4, fig.height=3,
message=FALSE}
# quick summary and plot
library(ggplot2)
summary(cars)
qplot(speed, dist, data=cars) +
      geom_smooth()
```
```

RStudio: Preview HTML

Preview: ~/chunks.html | Save As | Publish

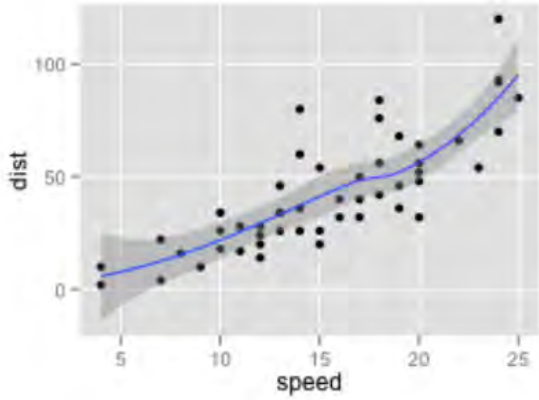
R Code Chunks

With R Markdown, you can insert R code chunks including plots:

```
# quick summary and plot
library(ggplot2)
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2
##  1st Qu.:12.0   1st Qu.: 26
##  Median :15.0   Median : 36
##  Mean   :15.4   Mean   : 43
##  3rd Qu.:19.0   3rd Qu.: 56
##  Max.   :25.0   Max.   :120
```

```
qplot(speed, dist, data = cars) + geom_smooth()
```



Source: http://rmarkdown.rstudio.com/

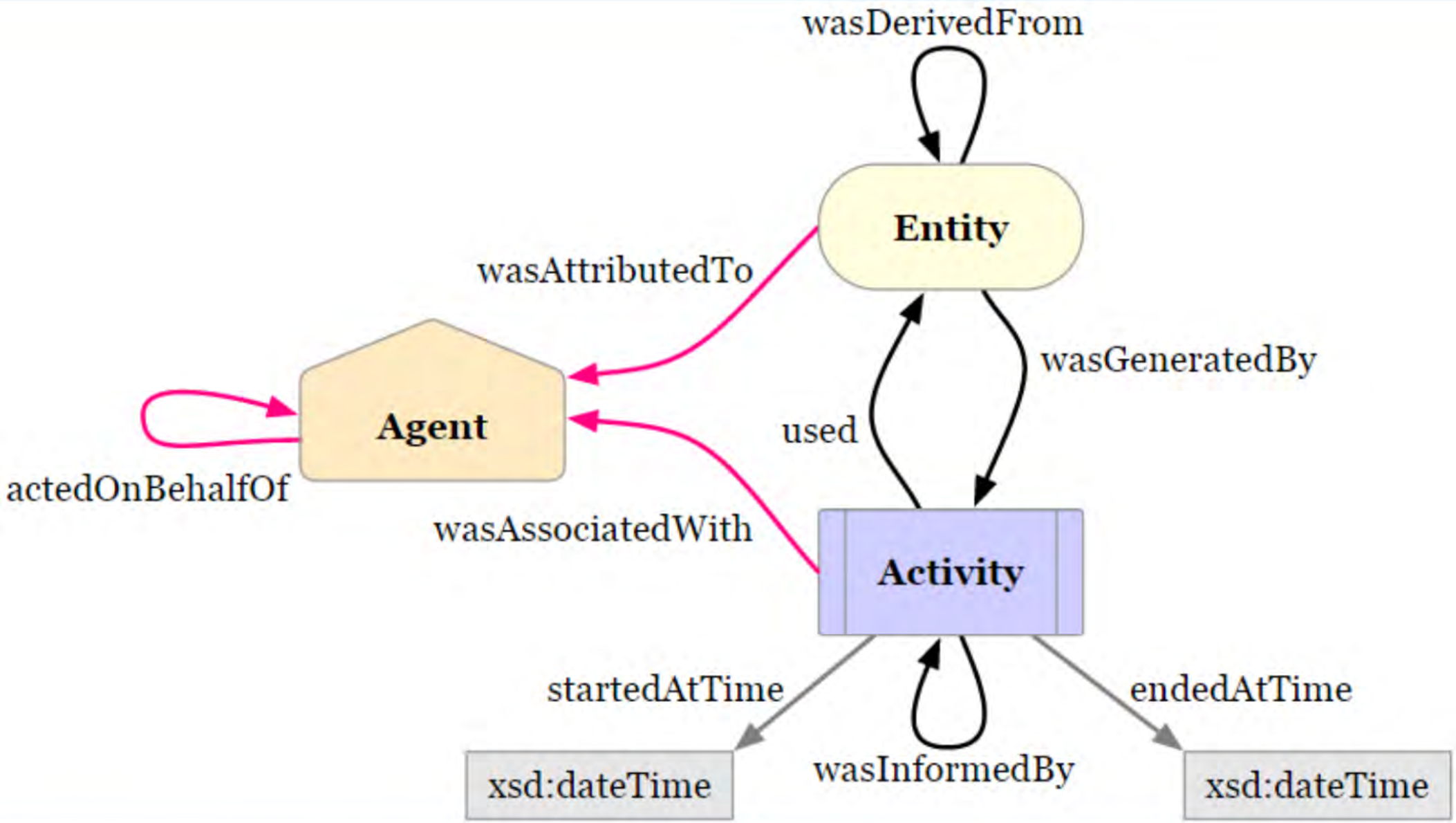
Informatics Challenges

Data Access and Preservation:

- Authentication
- License, policy
- Discovery
- Access
- Archival Policies
- Provenance
- Persistent Identifiers

Data Integration:

- Data formats / schemas
- Metadata standards
- Coordinate reference system
- Taxonomic naming conventions
- Protocol registry
- Semantics



Source: W3C PROV-Overview

Why important:

- Reproducability
- Workflow mashups
- Visualize processes (not just data)!
- Trust (but verify) building
- Relevance (sustainability issues)

United States
Global Change
Research Program

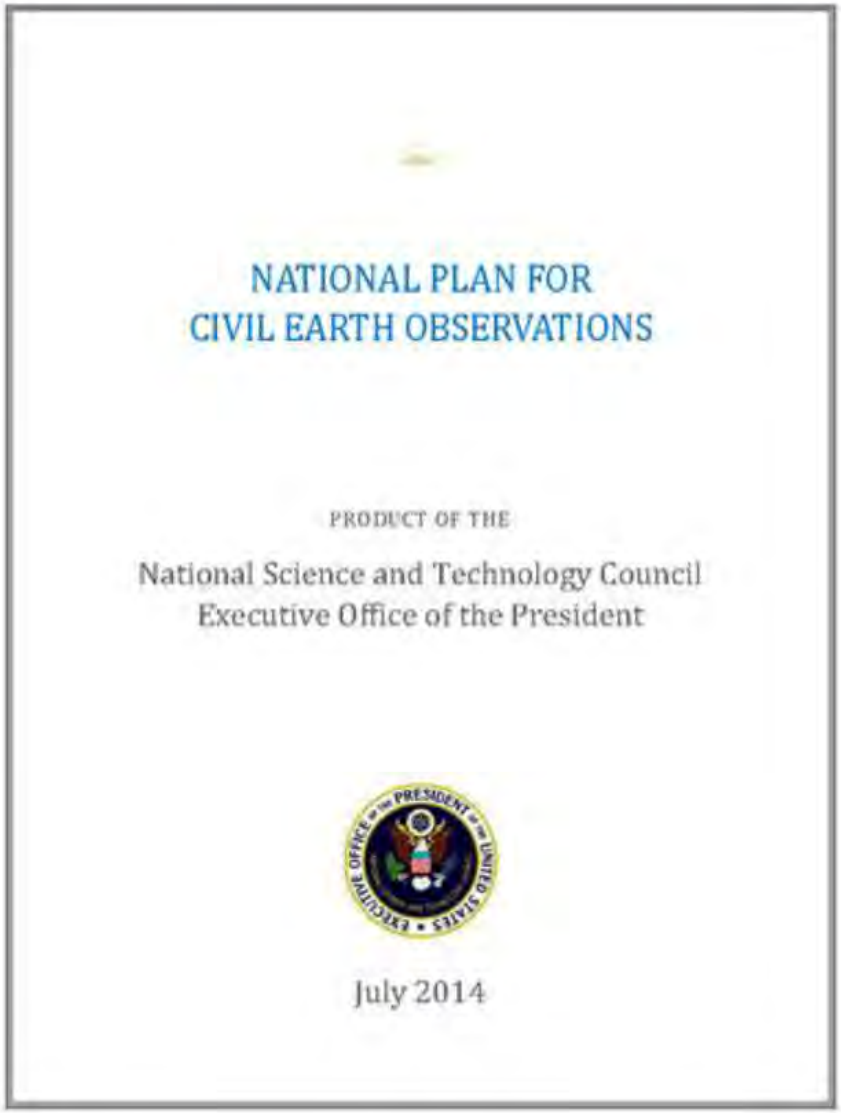
- *Coordinates* Federal research to better understand and prepare the nation for global change
- *Prioritizes* and supports cutting edge scientific work in global change
- *Assesses* the state of scientific knowledge and the Nation's readiness to respond to global change
- *Communicates* research findings to inform, educate, and engage the global community

(This slide has been simplified by Brian Wee on 2013-06-25)

USGCRP Global Change Information System (GCIS)

- Web-based resource for traceable, sound global change data, information, and products.
- Designed for use by scientists, decision makers, and the public.

Observatory Interoperability: National Plan



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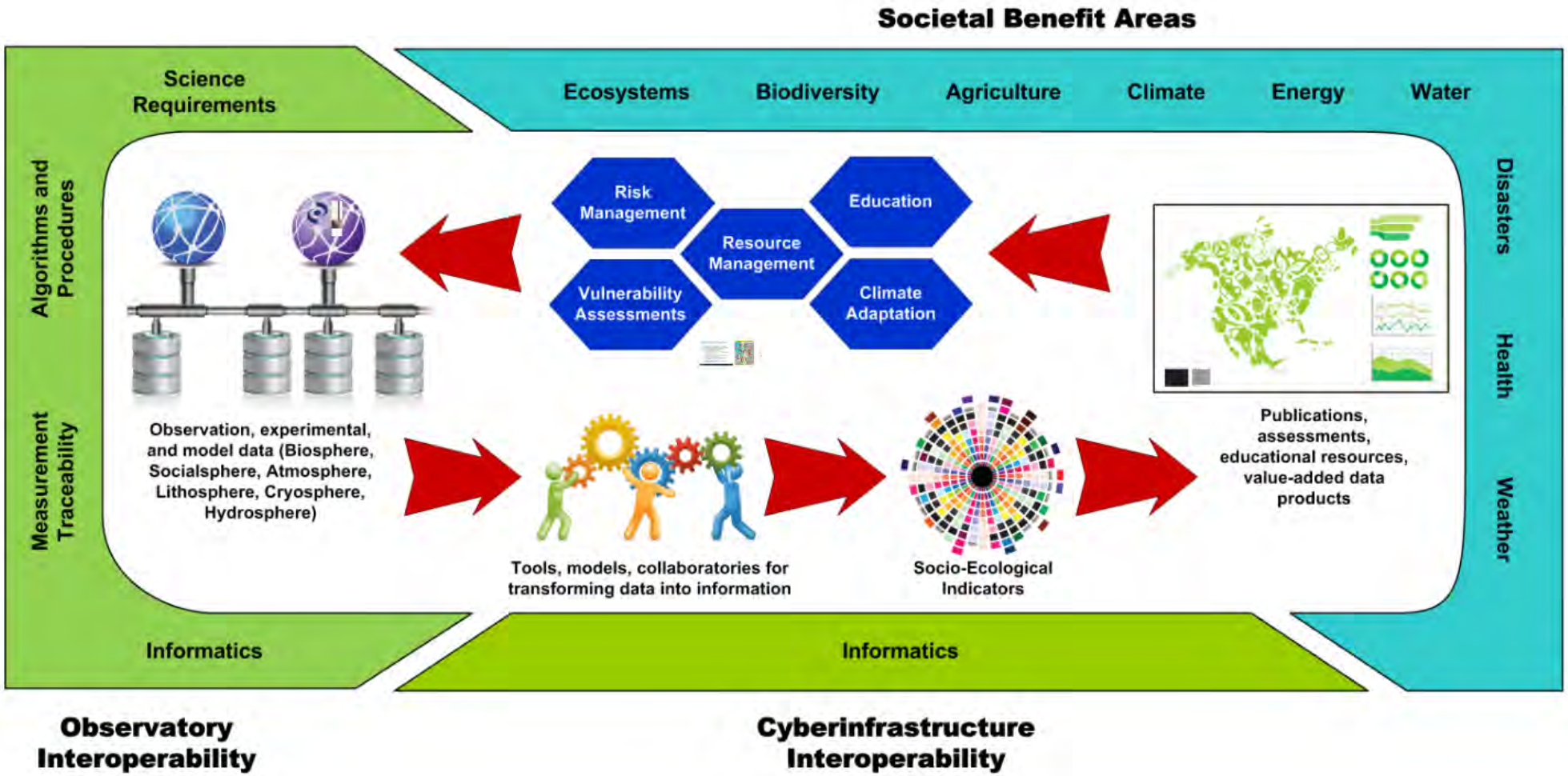

ns, perform a web-search for "Prezi NEON Brian Wee"

Esri-NEON Tribal Lands Collaboratory

- "*…using ArcGIS Online as the platform for geospatial content management, science communication, and citizen science.*" – Dawn Wright (Esri Chief Scientist)
- Techno-socio collaborative platform built on:
  - Interdisciplinary, systems-approach for understanding and managing coupled human-natural systems.
  - Transforming data on coupled human-natural systems into information for decision-support.
  - Utilizing technology to link data, science, and information so that resource-management actions are ultimately traceable to data.
  - Addressing environmental challenges at the relevant temporal, spatial, and social scales.

en

aging

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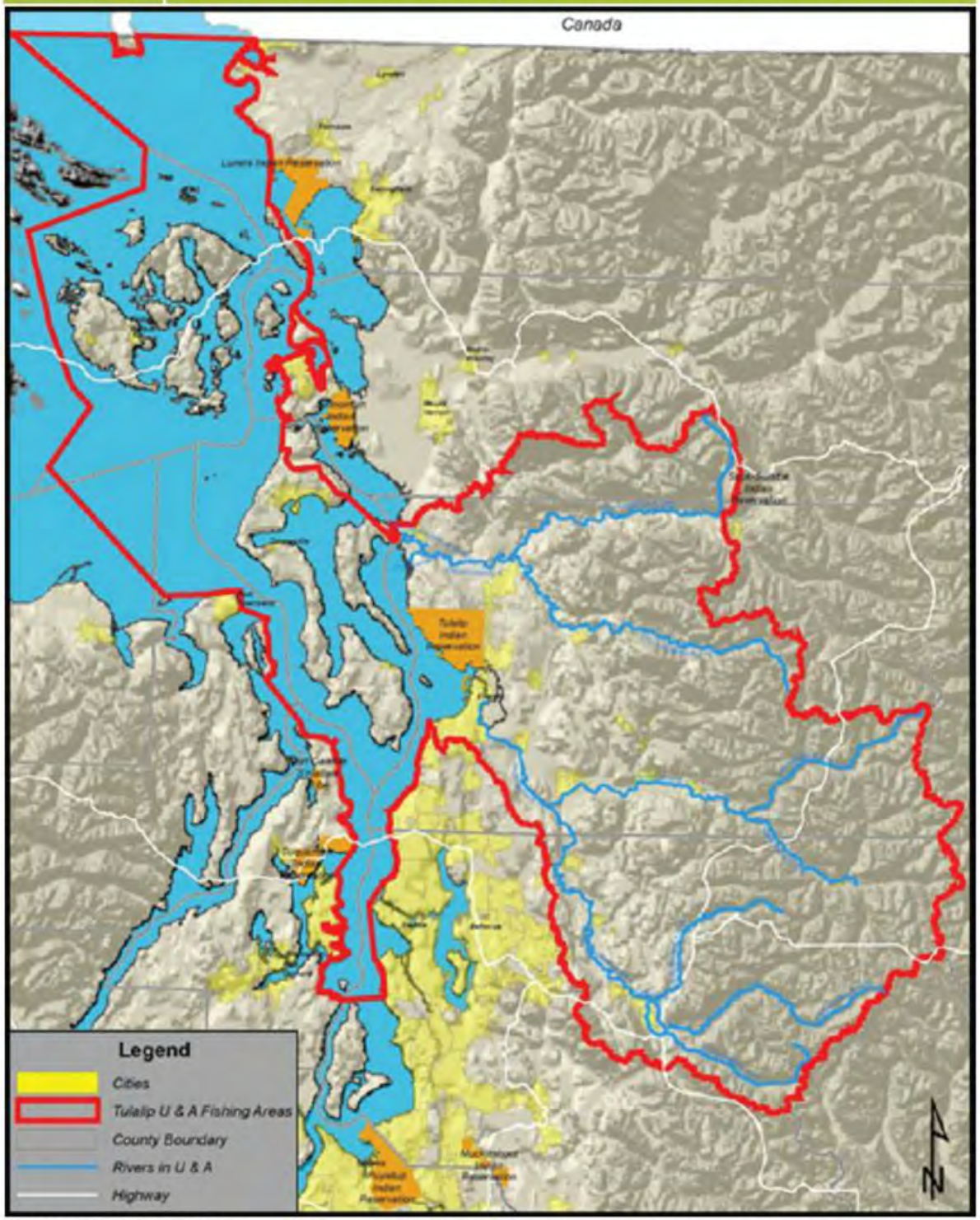
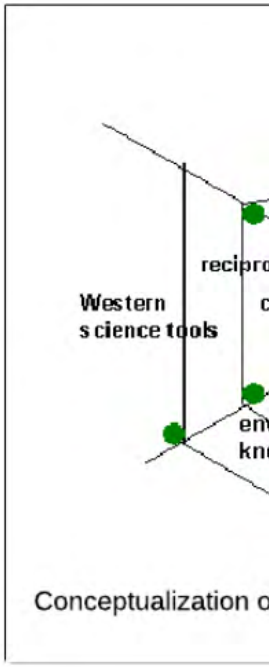
FIGURE 2 | MAP OF THE TULALIP INDIAN RESERVATION AND FISHING AREAS



Map provided by Tulalip Tribes

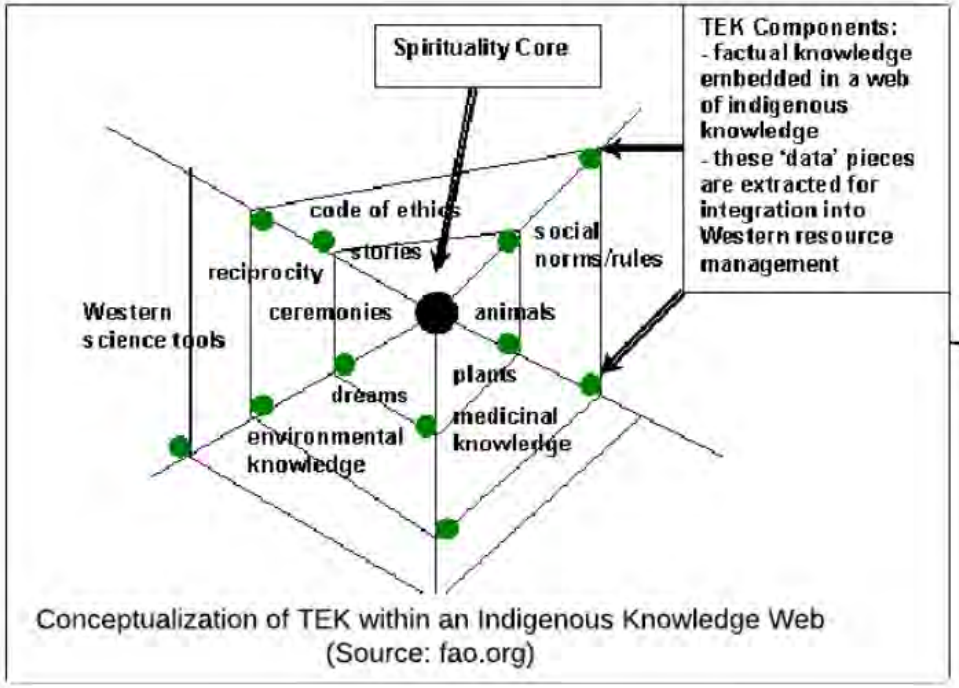


Questions we are

- Can we deploy "non-speci
the term: Peter Fox, RPI)
tribal areas to observe ph
fauna and flora?
- What science, resource-m
questions can we answer
observations?
- Opportunities for capacity
- Can we scale?
- How can we integrate wit
like NEON?

Questions we are asking

- Can we deploy "non-specialist" (credit for the term: Peter Fox, RPI) observers in tribal areas to observe phenology of focal fauna and flora?
- What science, resource-management questions can we answer with these observations?
- Opportunities for capacity building?
- Can we scale?
- How can we integrate with observatories like NEON?



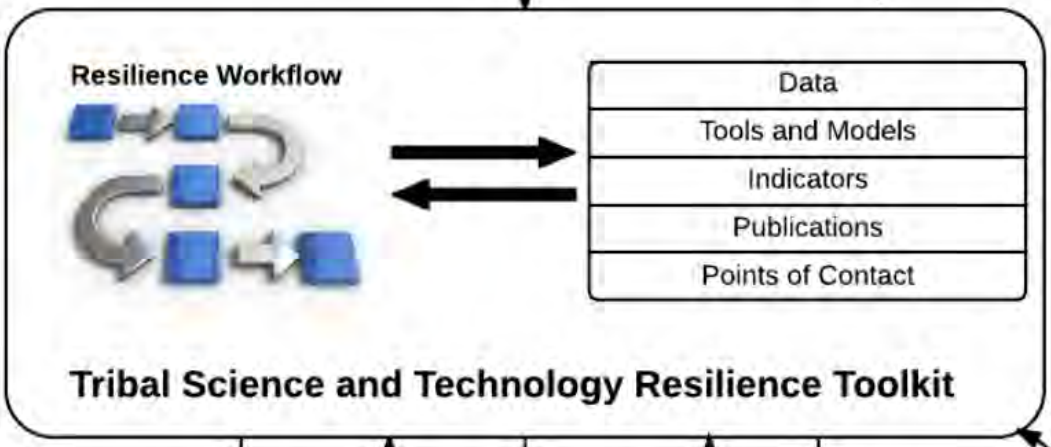
Conceptualization of TEK within an Indigenous Knowledge Web
(Source: fao.org)

US Climate Resilience Toolkit (Part of President Obama's Climate Action Plan)

U. of Notre Dame's Climate Adaptation Collaboratory

Focus on the 'outer' edges of the knowledge web

Inspired the conceptualization of the Toolkit

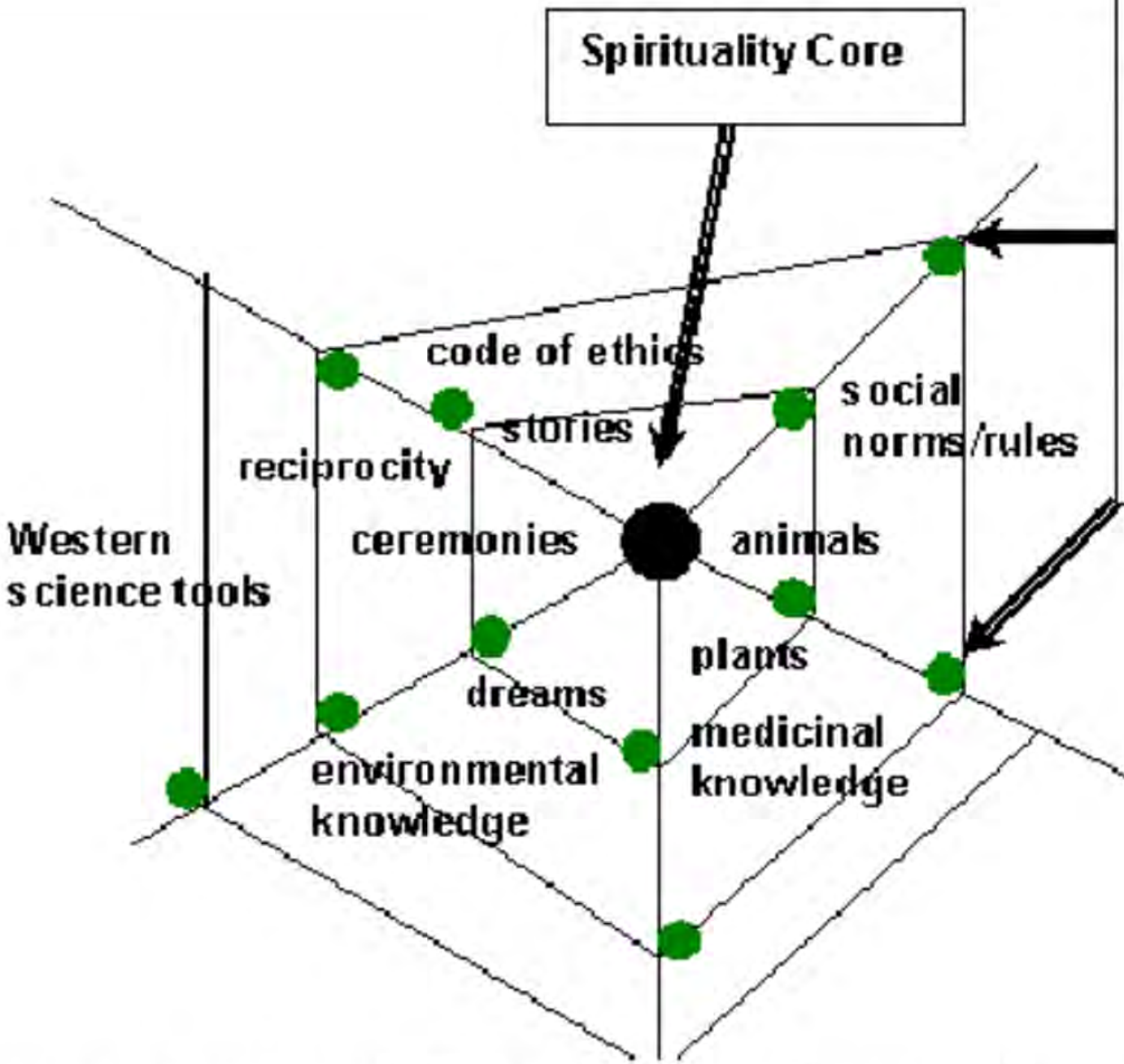


Each tribal entity in the partnership contributes to the knowledge commons that is the Toolkit

Tribal Entity #1

Tribal Entity #2

Tribal Entity #3



Conceptualization of TEK within an Indigenous Knowledge Web
(Source: fao.org)

U.S. Climate Resilience Toolkit

Get Started | Taking Action | Tools | Topics | Expertise

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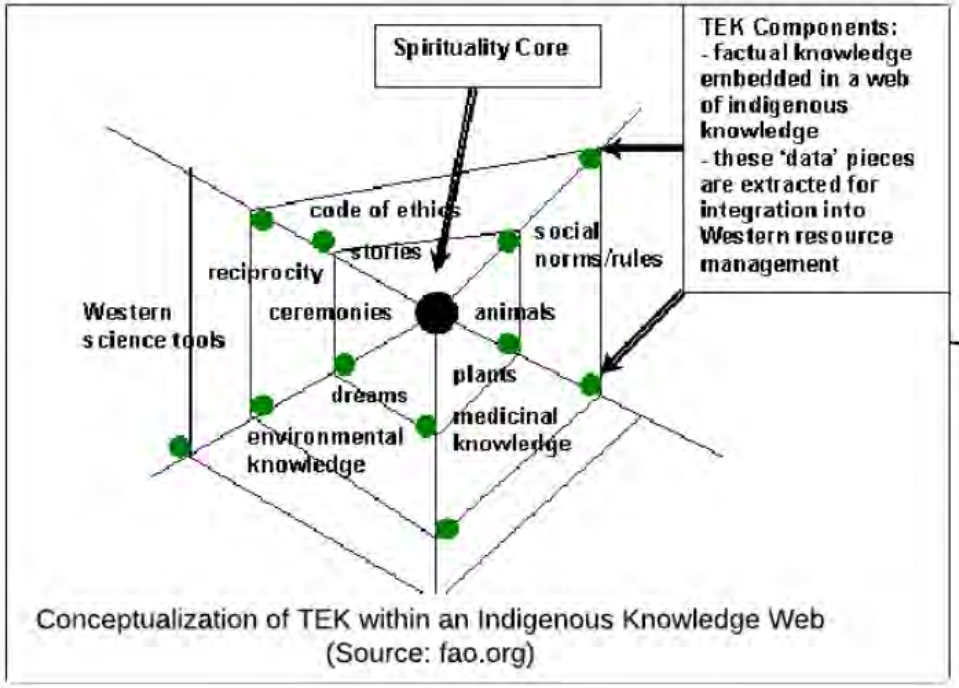
Meet the Challenges of a Changing Climate

The Climate Resilience Toolkit provides resources and a framework for understanding and addressing the climate issues that impact people and their communities.

1. Identify the Problem
2. Determine Vulnerabilities
3. Investigate Options
4. Evaluate Risks & Costs
5. Take Action



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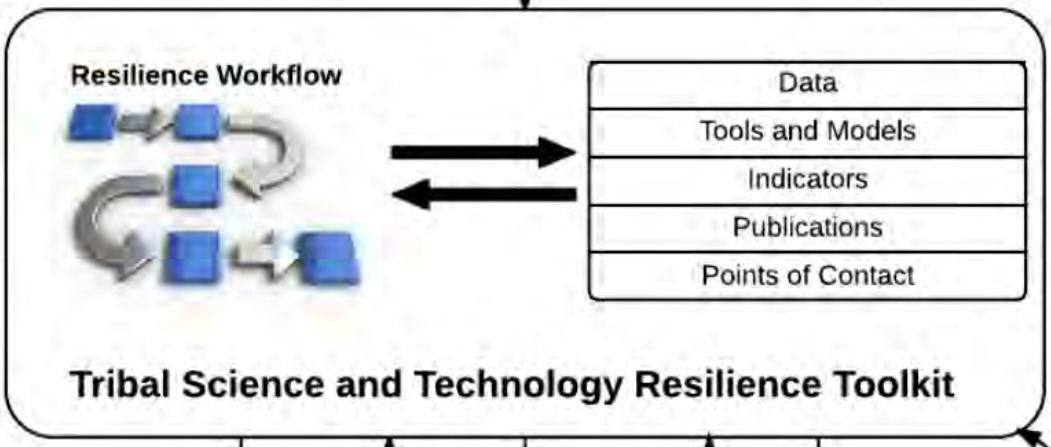

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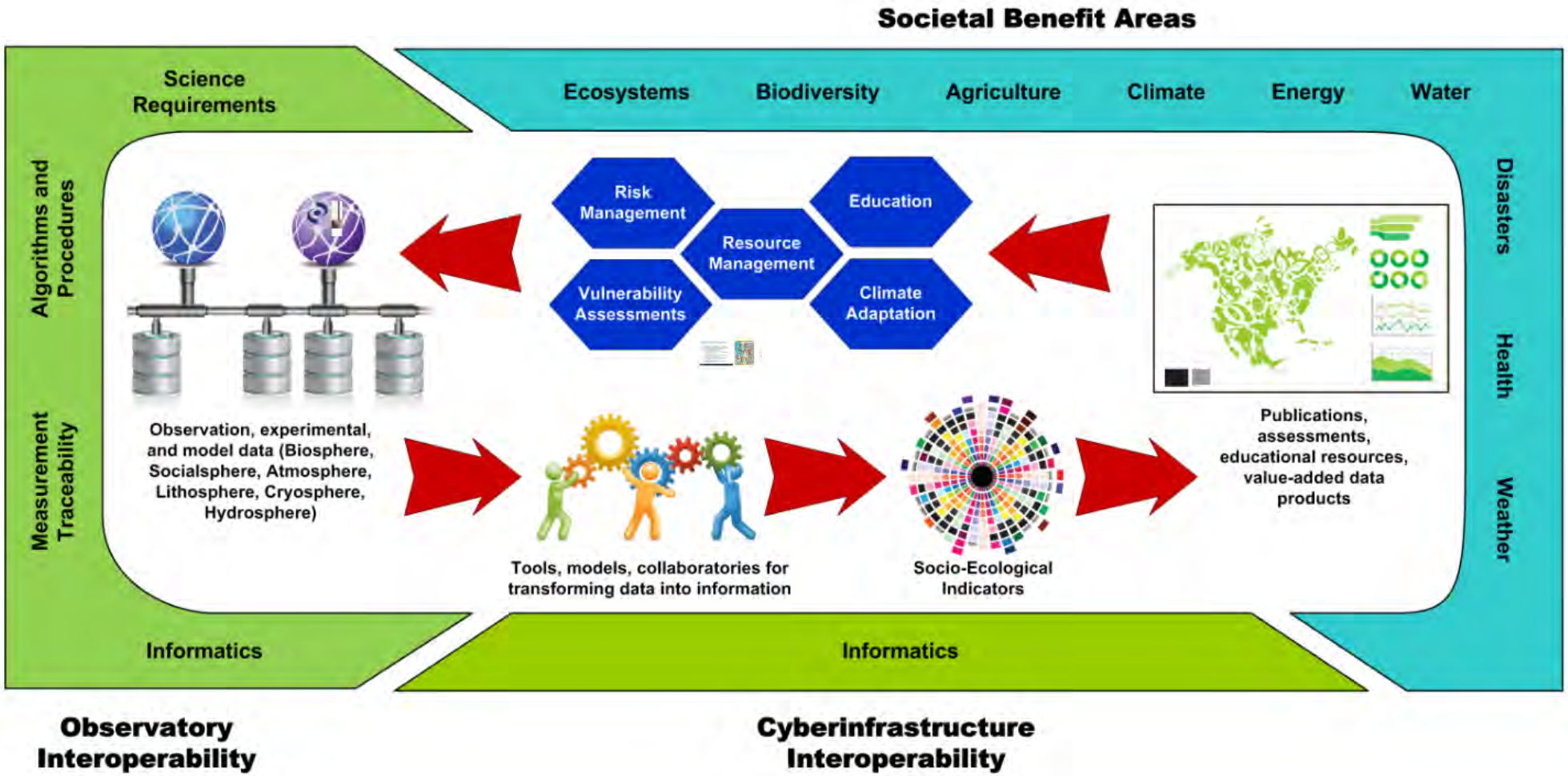


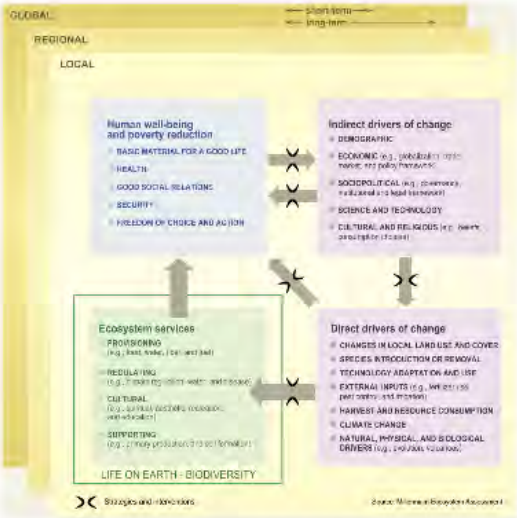
ns, perform a web-search for "Prezi NEON Brian Wee"

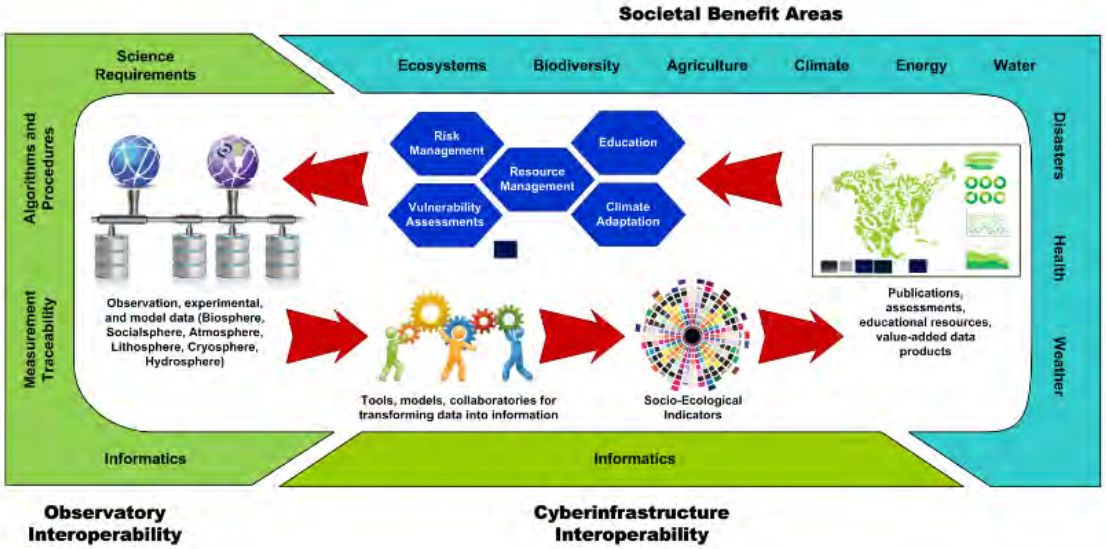
From OpenData to OpenKnowledge:

Generating Open Knowledge from Information and Data

Brian Wee, Ph.D.
Chief of Strategic Alliances
U.S. National Ecological Observatory Network (NEON), Inc.

2015-03-26
GEOSS S&T Stakeholder Workshop (Norfolk, VA)





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