From Science to Coastal Policy: Data and Emerging Technologies

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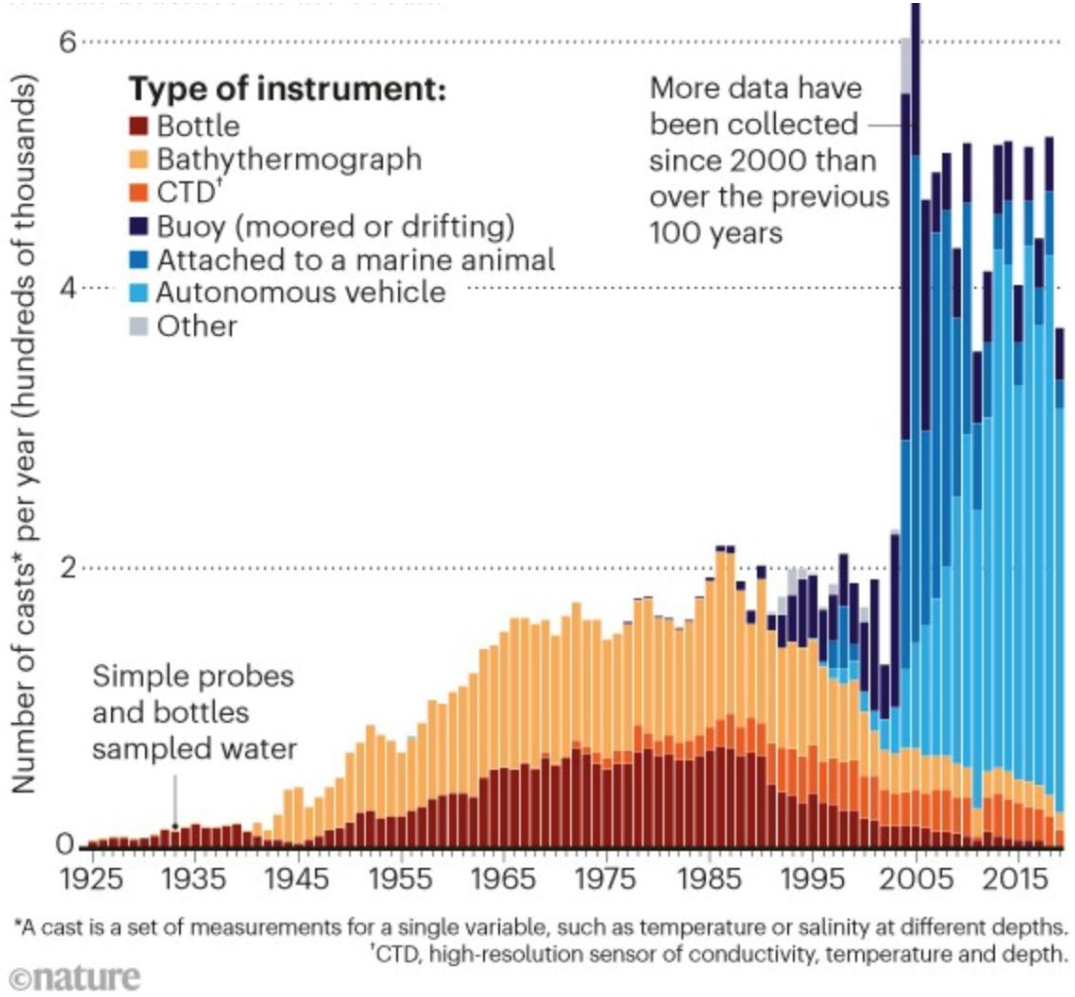
Baseline data gaps

	Rivers and Streams (miles)	Lakes and Ponds (acres)
1998		
Impaired	**291,000**	**7,900,000**
Total assessed	842,000	17,390,000
Percent impaired	**34.7**	**41**
Percent assessed	23	42
2002		
Impaired	**309,000**	**6,947,000**
Total assessed	694,000	14,832,000
Percent impaired	**44.5**	**46.8**
Percent assessed	19.6	36.0
2008		
Impaired	**463,000**	**11,602,000**
Total assessed	934,000	17,576,000
Percent impaired	**49.2**	**65.2**
Percent assessed	26.4	42.2

Waters monitored under the Clean Water Act

Ocean data growth



Source: World Ocean Database

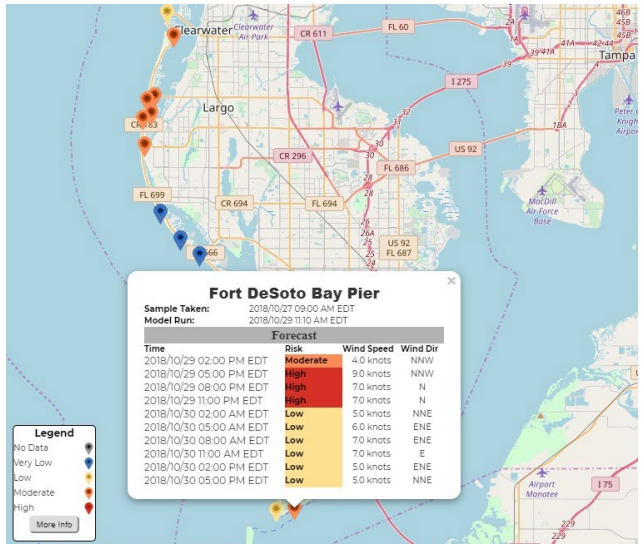
Brett, Leape, and Abbott, *Nature* (2020).

Emerging technologies

Being Explored – Fourth Industrial Revolution technology being explored or in early stages of implementation to address this challenge.

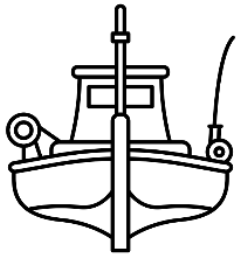
Being Scaled – Fourth Industrial Revolution technology implemented in numerous applications to address this challenge.

Emerging technologies



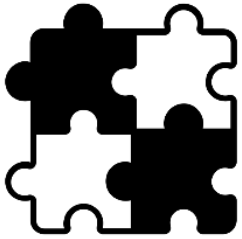
The Current State of Affairs

- Current frameworks do not support emerging technologies and data sources well—there is a mismatch between the speeds of tech vs. policy evolution
- Uptake of technologies and new data products is slow, despite their promise
- We are in a once-in-a-generation opportunity to use data and technology as a catalyst for creating better coastal policy frameworks in the U.S.



What Holds us Back?

- **Constrained time and monetary budgets** and uneven distribution of core competencies across agencies
- **Cultural barriers**
- **Prescriptive regulations** for technology constrain progress and create lock-in
- **Perverse government incentives** can limit market growth and disincentivize scientific advances
- **A patchwork of regulations** spread across different governing agencies and separated by technology type



Modeling realities

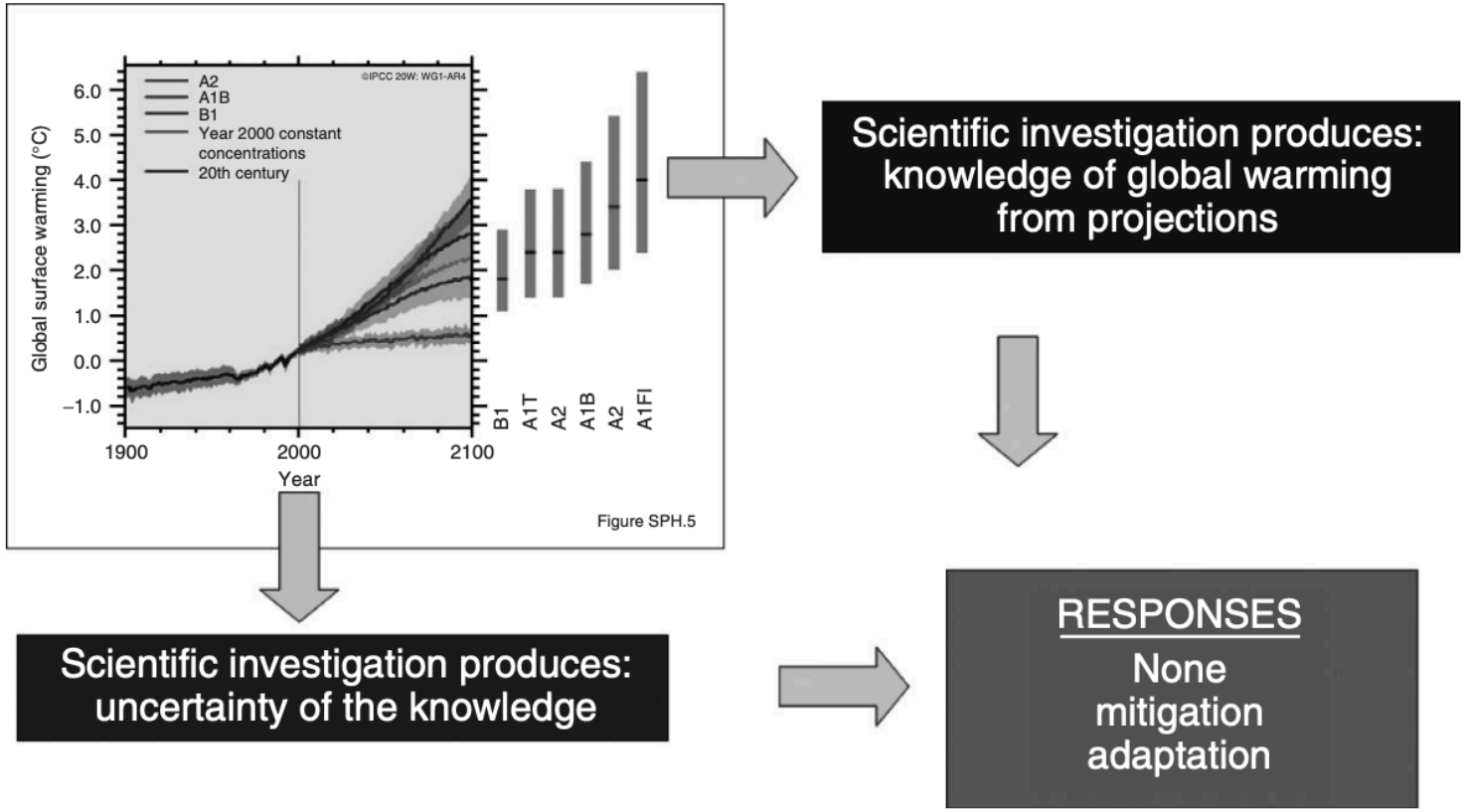
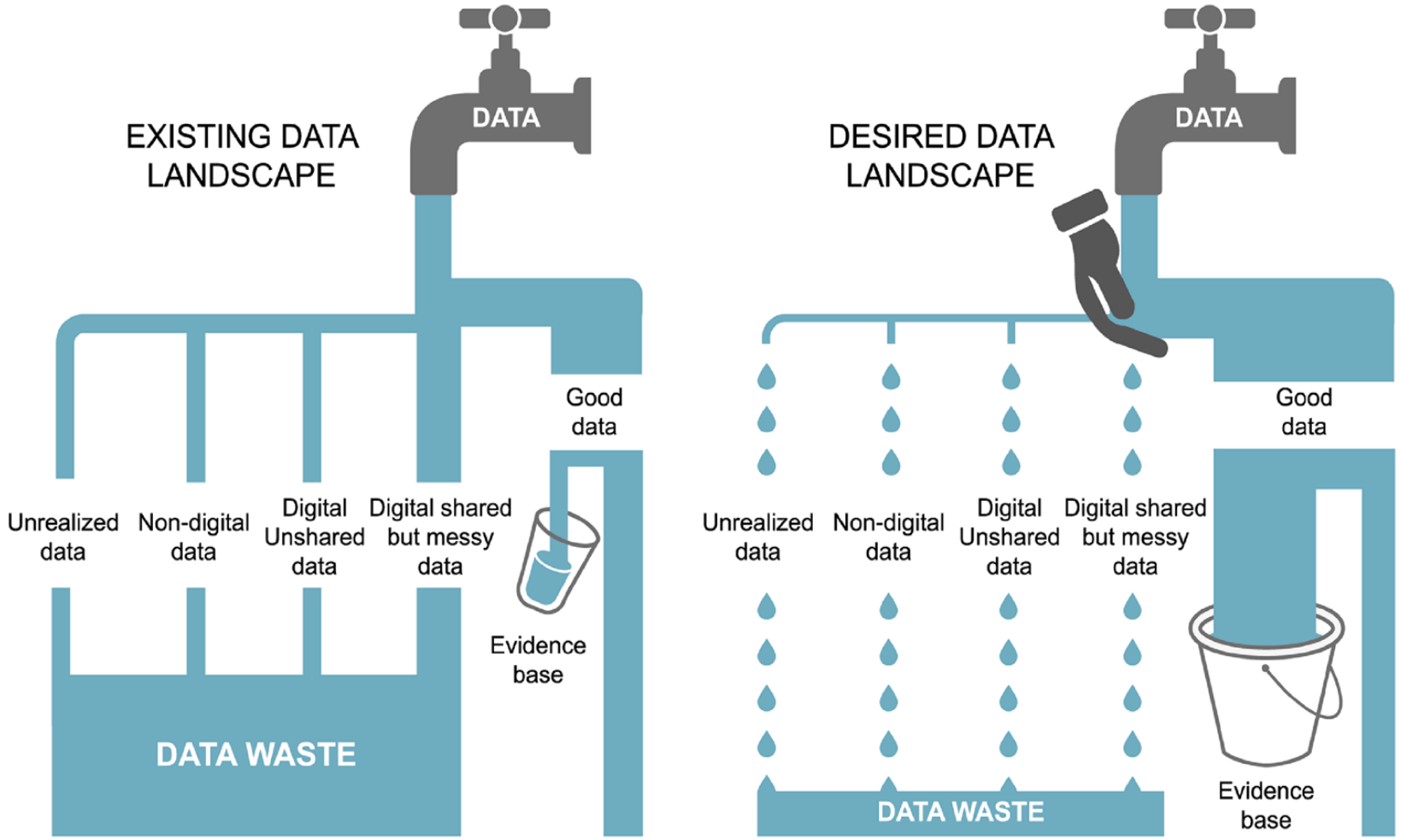


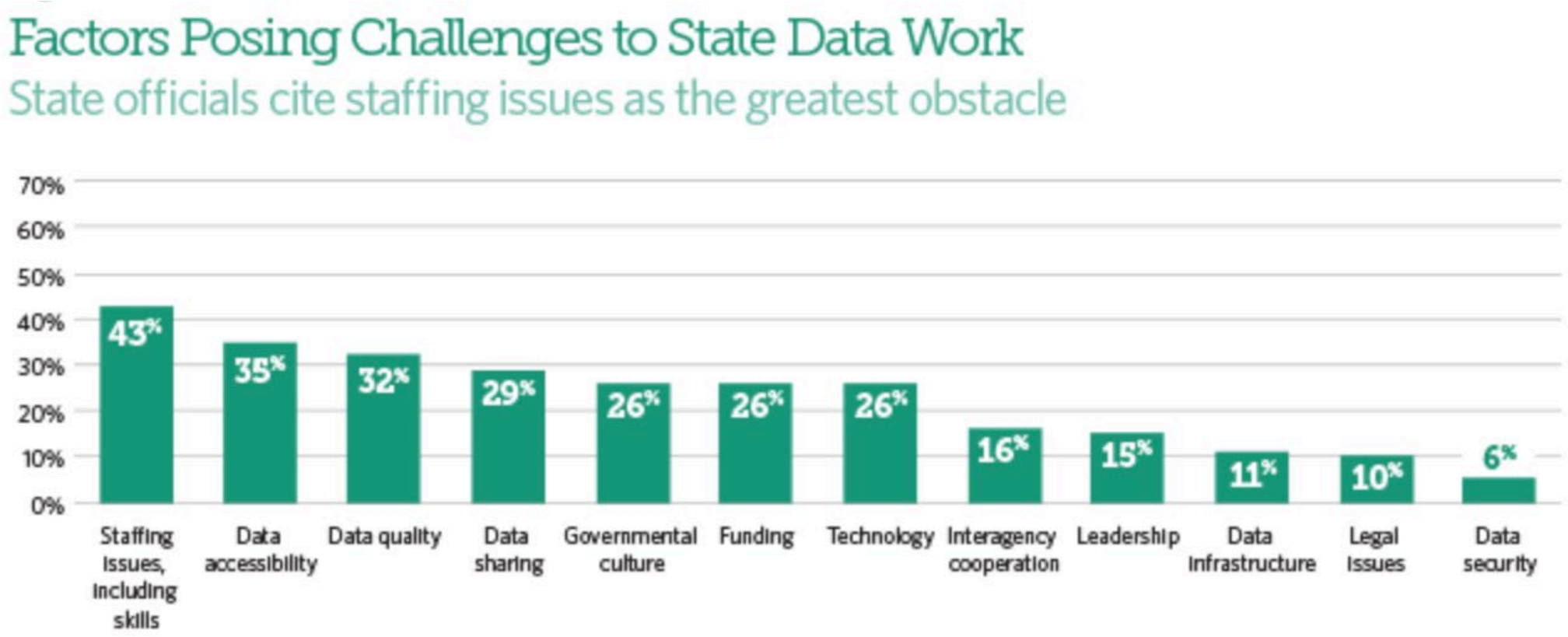
FIGURE 1 | Knowledge and uncertainty of that knowledge are both products of scientific investigation. Knowledge and uncertainty combine with values and political will to influence responses. Uncertainty always exists, and in complex problems, new investigation reveals new sources of uncertainty. Uncertainty reduction is uncommon. Uncertainty can always be used, politically, to fuel selective doubt to disrupt the development of knowledge-based responses.

Technical barriers



Pendleton et al., *ICES J Mar Sci* (2019)

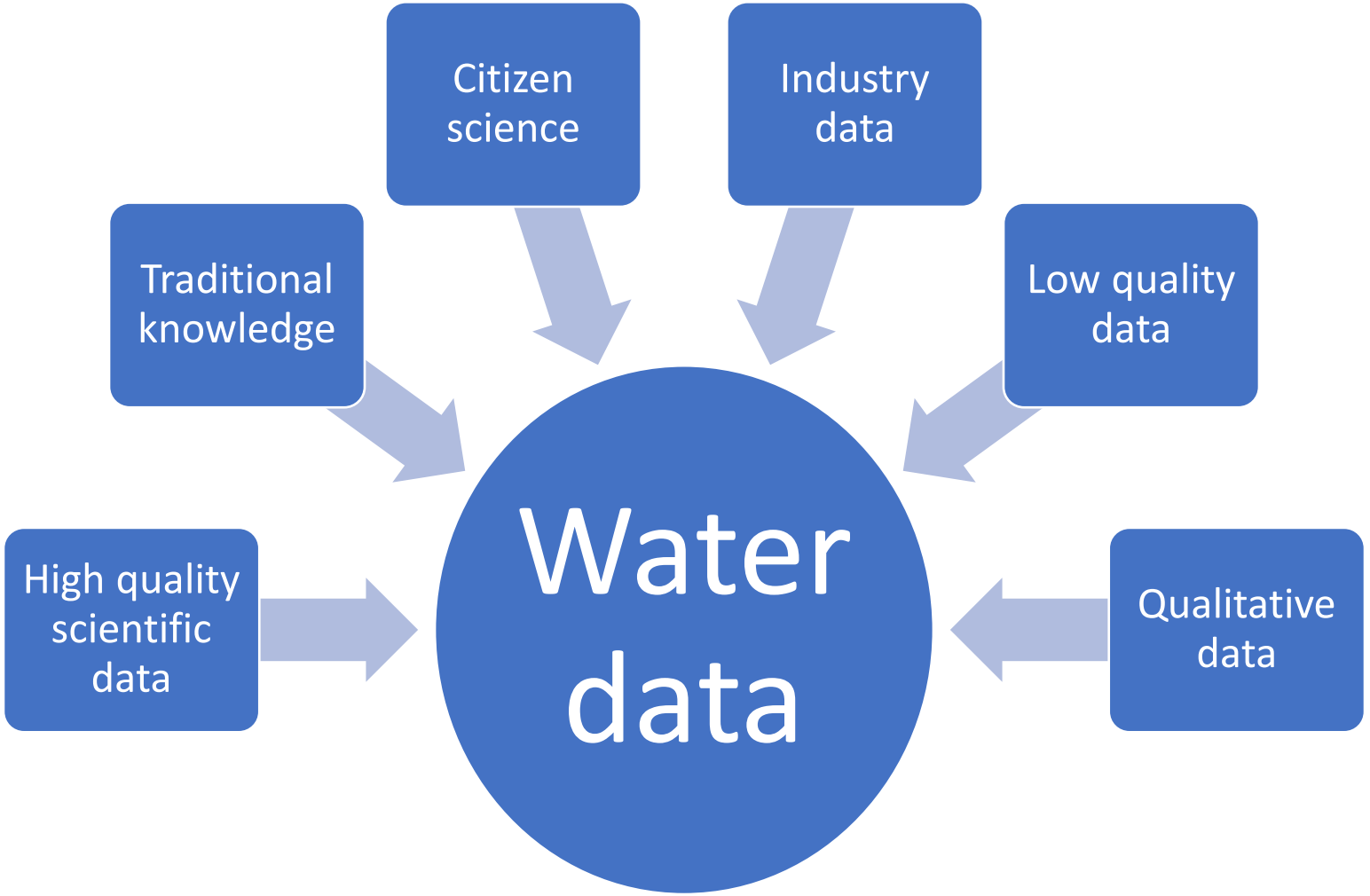
Resource barriers



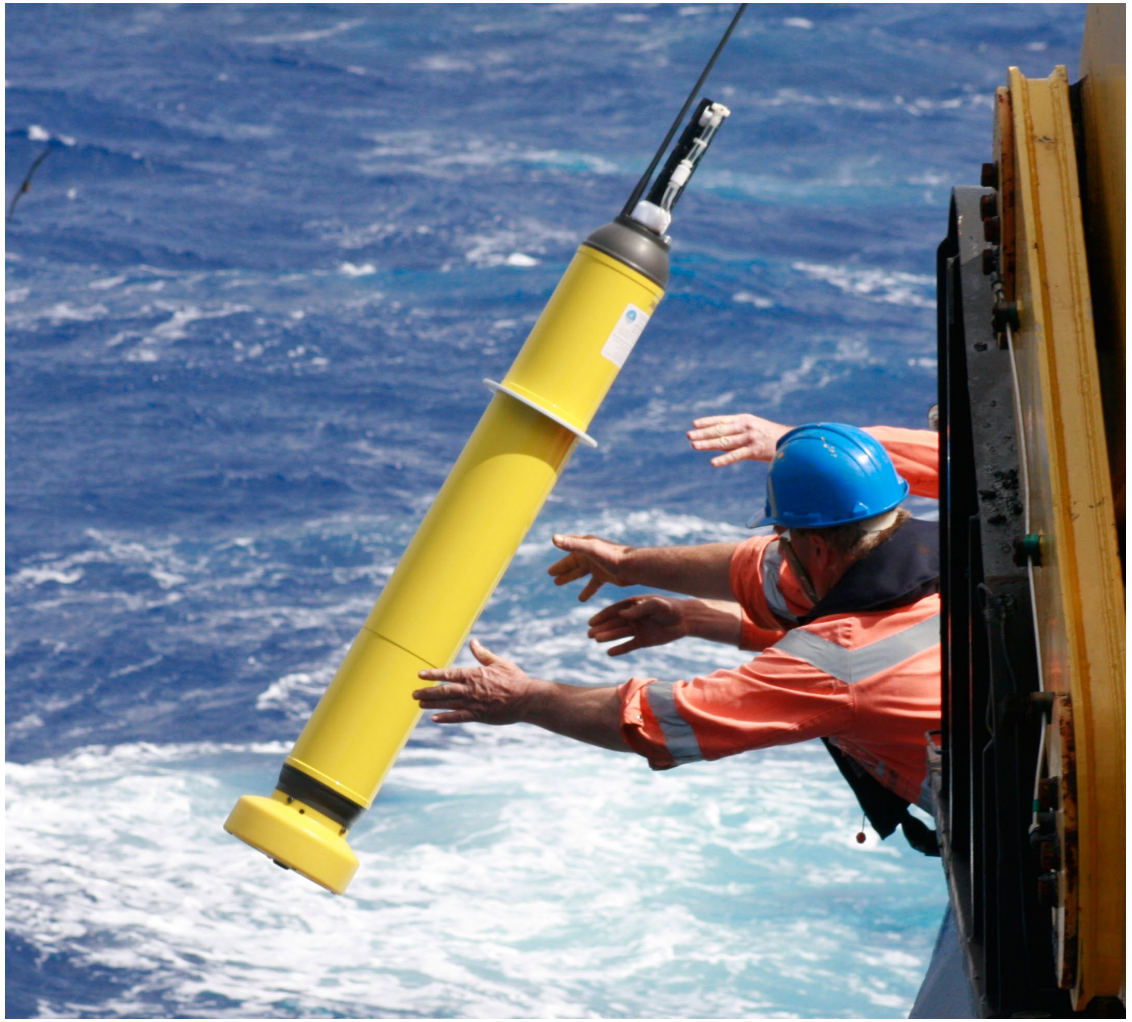
Note: Because officials were able to select more than one data point, totals do not equal 100.

Source: Pew interviews of state officials

Legal constraints



Legal constraints



Data + Emerging Technologies

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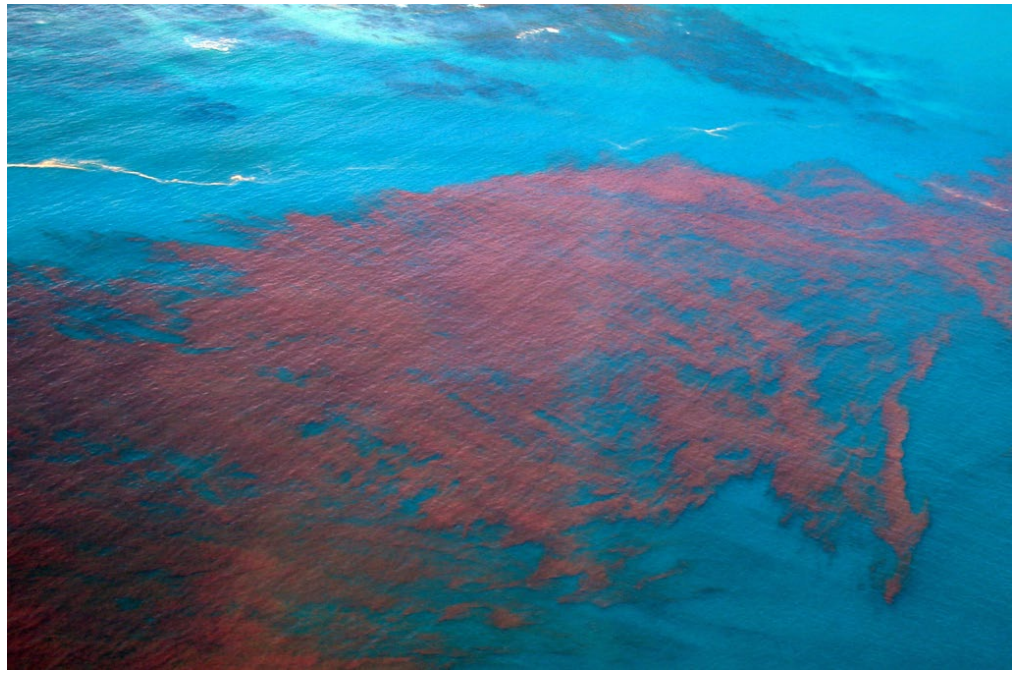
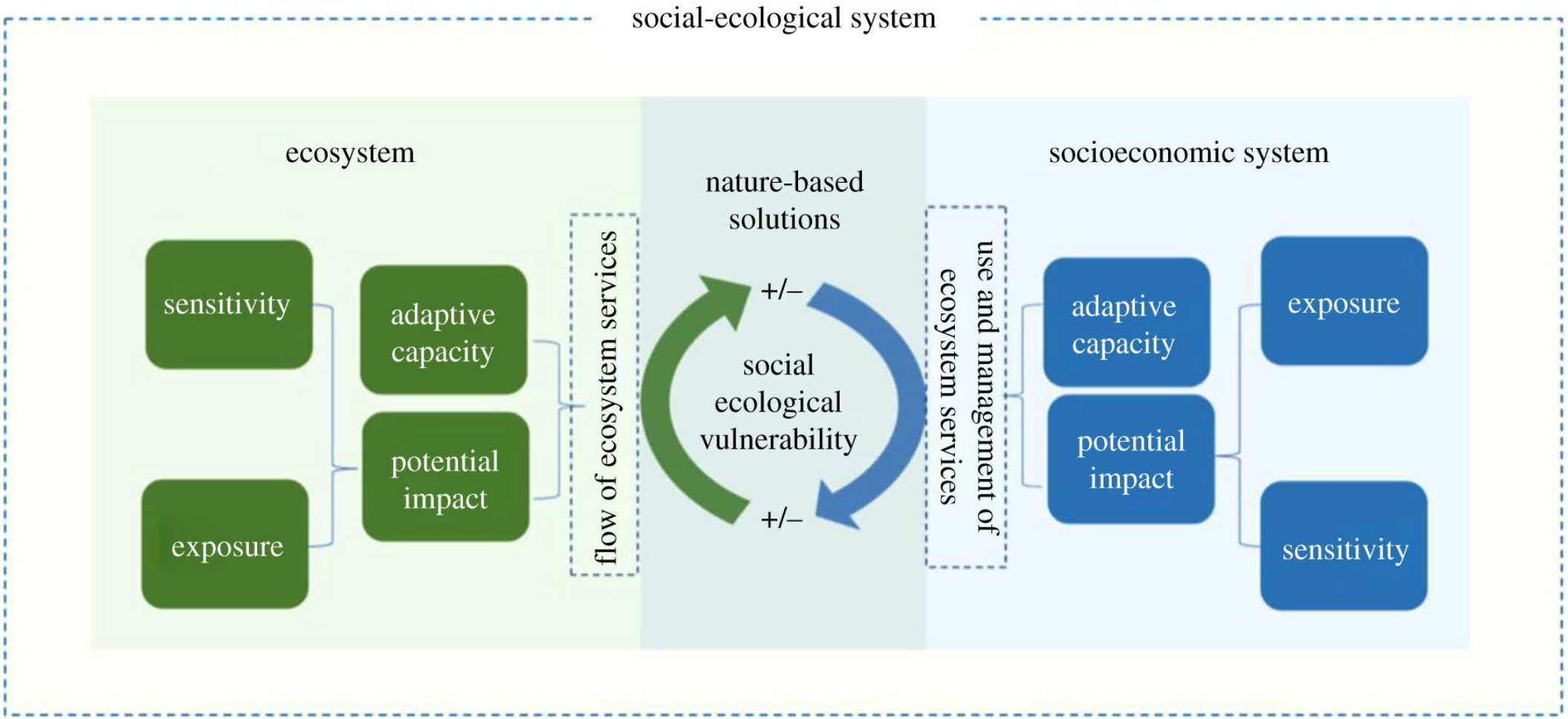
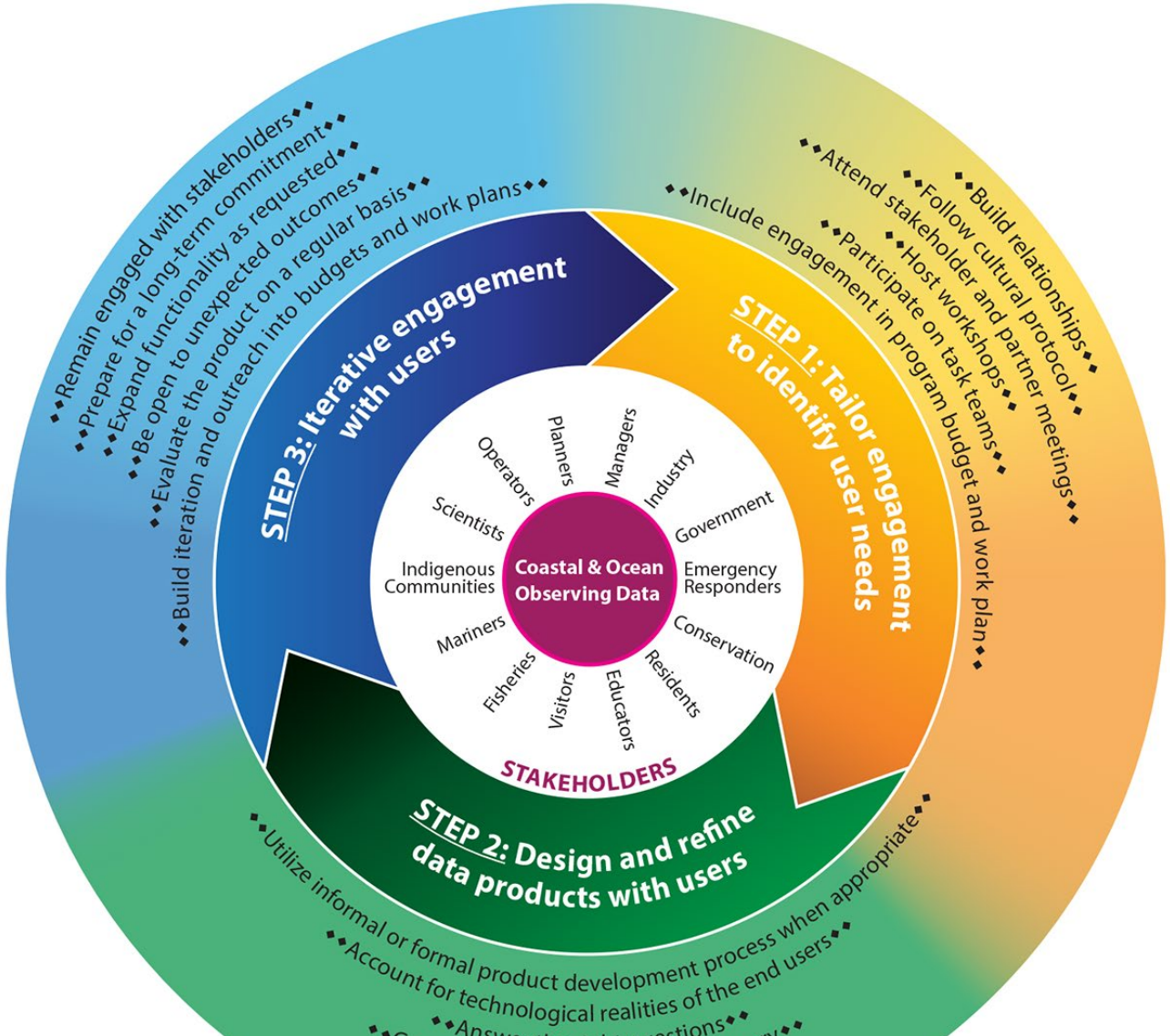


Enabling nature-based solutions



Enabling stakeholder engagement



Moving forward

- The necessary legal structures to support innovation and regulatory changes largely already exist
- Shifts in regulatory frameworks (e.g. from technical standards towards performance-focused standards)
- Resource committments
- New approaches are needed to provide sufficient unity, guidance, and predictability to build a robust ecosystem of coastal science and technology that supports local flexibility and recognizes regulatory constraints