

Situating Green Infrastructure in Context: Adaptive Socio-Hydrology for Sustainable Cities

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Green Infrastructure Implementation – Four Archetypes

- **Green infrastructure (GI)** in urban systems primarily acts as stormwater control measure, however the one-size-fits-all approach is not appropriate in most cases and additional ecosystem services (ES) can be generated [1].
- Moving from a purely-hydrology driven perspective we propose an integrated **socio-hydrological approach** in which multi-stakeholder networks guide the decision making process.
- We propose the **Framework for Adaptive Socio-Hydrology (FrASH)** in which an iterative, multifaceted decision-making process enables a network of stakeholders to collaboratively set a dynamic, context-guided trajectory for GI installation.
- FrASH relies on the concept of **Situating GI**, a new archetype of GI implementation strategy defined here:



An individual motivated to reduce their environmental impact on a parcel level or small scale.



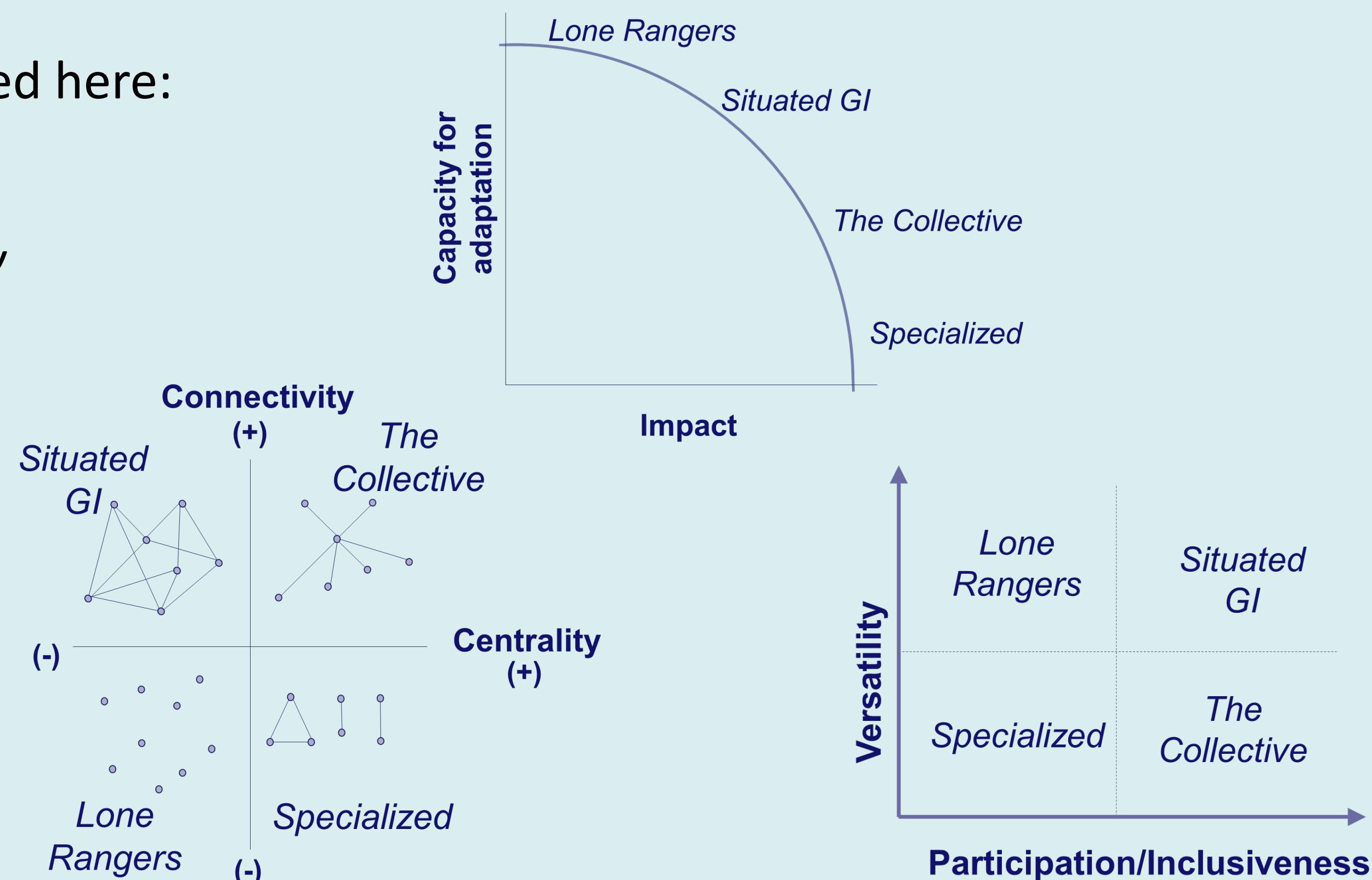
A group of individuals or organizations has capital in a joint environmental project with each group's interests represented.



A group of individuals or organizations connected by a main organization that fosters environmental stewardship.



A self-guided organization that has a single objective and approach to GI installations.

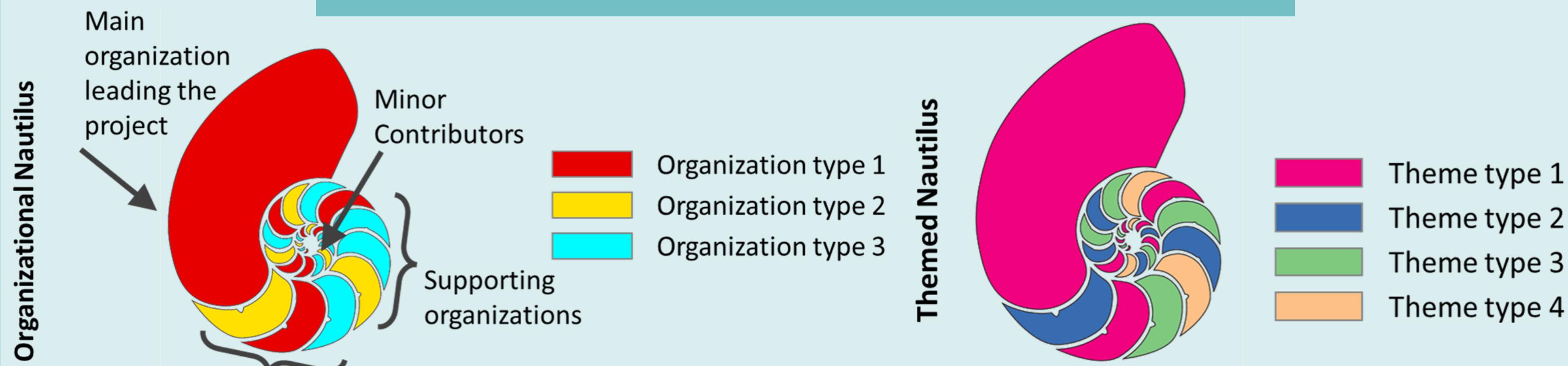


The Chambered Nautilus Heuristic

FrASH is intended for GI projects where:

- 1) **versatility** is introduced by the range of ecosystem structures and functions,
- 2) **Adaptive Governance and Participation and Inclusion** are integral.

The Chambered Nautilus is a visualization of FrASH



In the **organizational nautilus**, chambers represent the involved organizations.

- Ordering represents the relative contribution to, or role in the project.

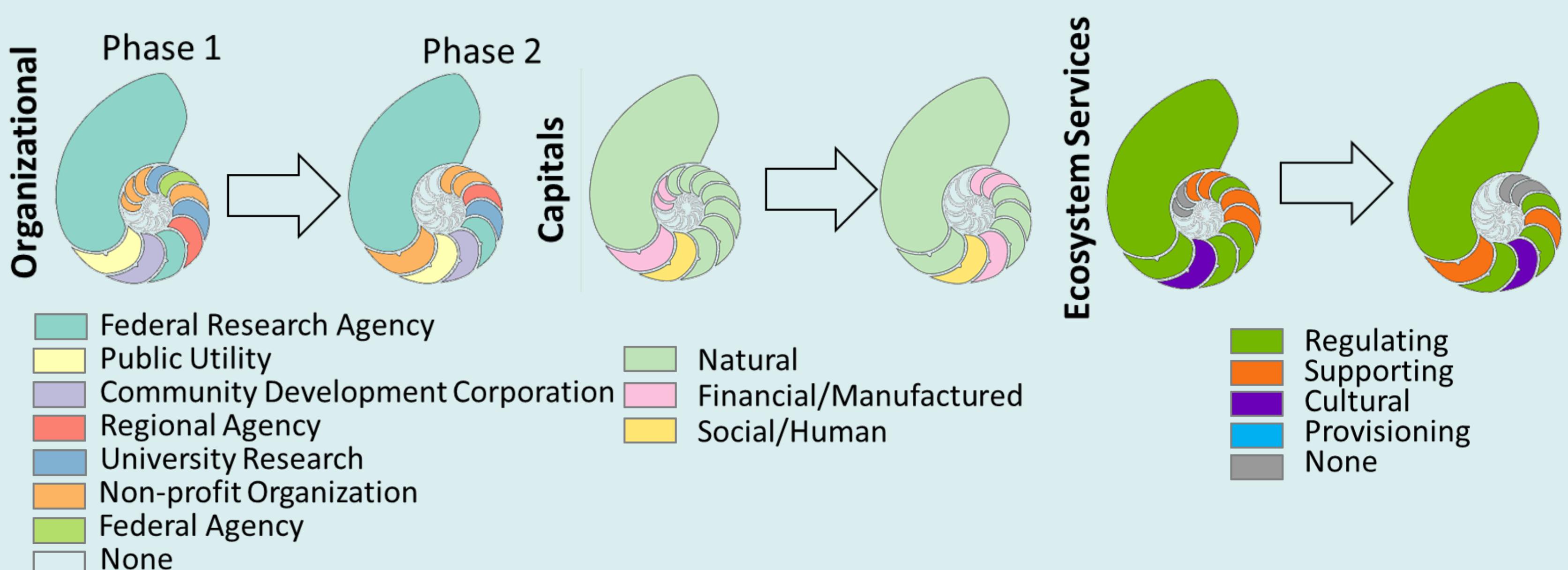
In the **themed nautilus**, the chambers are colored based on their attributes

- Themes can relate to ecosystem services generated or capitals invested.

FrASH and the Chambered Nautilus are **sensitive to the changes** (e.g., governance, new information) **over time and scale** (e.g., addition of collaborating organization). It presents a complete accounting of global influences on the definition and relationship between situating and siting GI where the results guide social-hydrological interaction.

A case of adaptive governance using FrASH

- In Cleveland, OH, USA a multi-stakeholder project was involved in installing several highly-landscaped rain gardens with a focus on stormwater runoff regulation in response to a consent decree involving the US Clean Water Act.
- Project development appeared straightforward, however social and economic barriers developed, changing the project objective and outcome.
- Organizational redundancy, adaptive, and transformative governance allowed the project to continue with alternative priorities, leading to the installation of both, expensive, highly-landscaped and inexpensive, low-tech rain gardens.



- In a typical scenario of highly-centralized and hierarchical organization that does not accommodate capacity for adaptation, a shift in organizational structure could have led to project failure.