



FUZZY COGNITIVE MAPPING: PROPOSED ASSESSMENT FRAMEWORK FOR COASTAL RISK MANAGEMENT PROJECT PROCESSES

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Research Context

- Coastal risks are increasing over time, and many have identified gaps in study of the transdisciplinary environment in which projects exist.
- Despite significant planning and engineering design efforts, there is a pronounced lack of uptake in risk reduction systems.
- This disparity between proposed and executed projects can be termed *the implementation gap*.

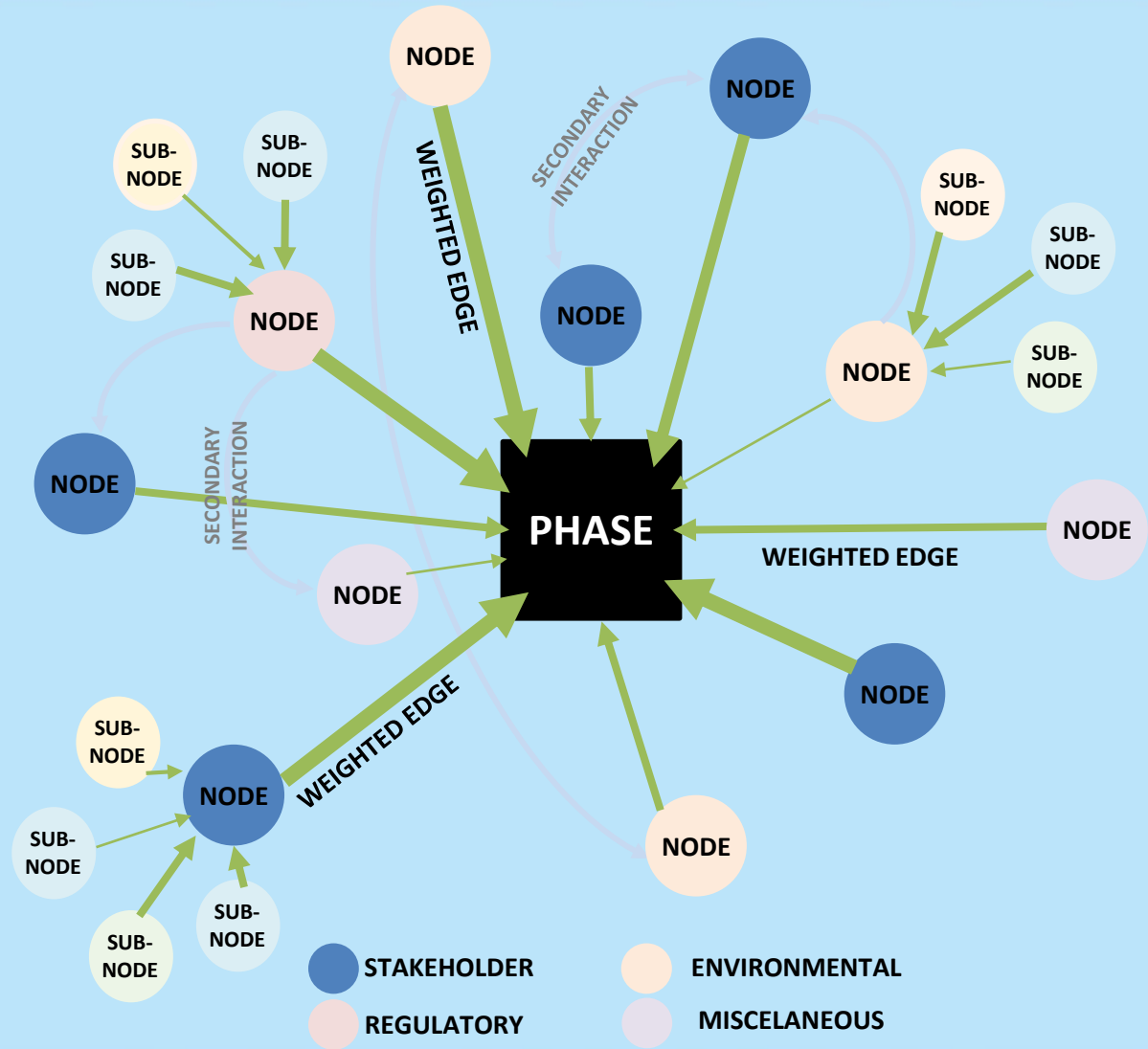
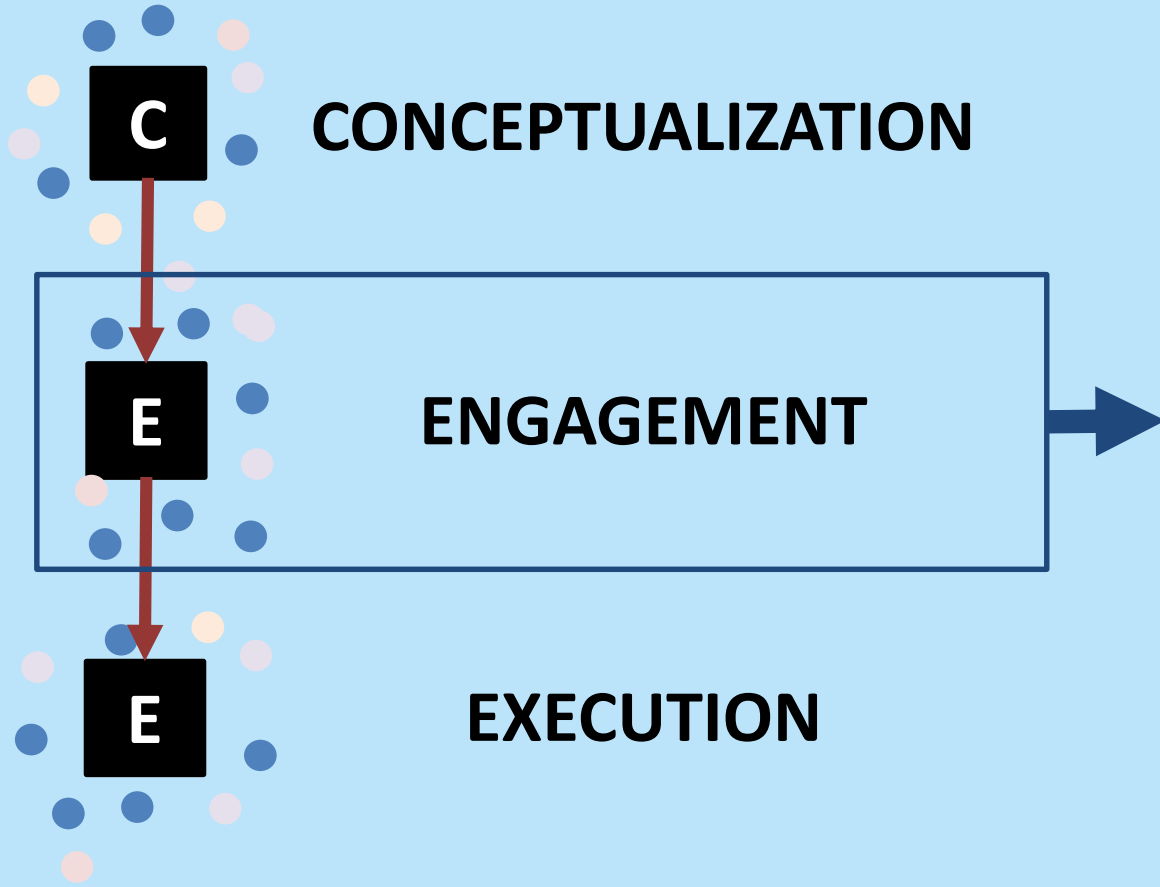


Research Context

- Evaluation of the implementation gap has largely been limited to:
 - Singular case study analysis
 - Broad conceptual models
- Models should be **process based** but **actor centric** and be able to incorporate diverse factors to represent **different management strategies**.
- There is potential for **fuzzy cognitive mapping** techniques to be utilized to better resolve understanding of relative influence of social, institutional, and financial factors during coastal risk management decision making processes.

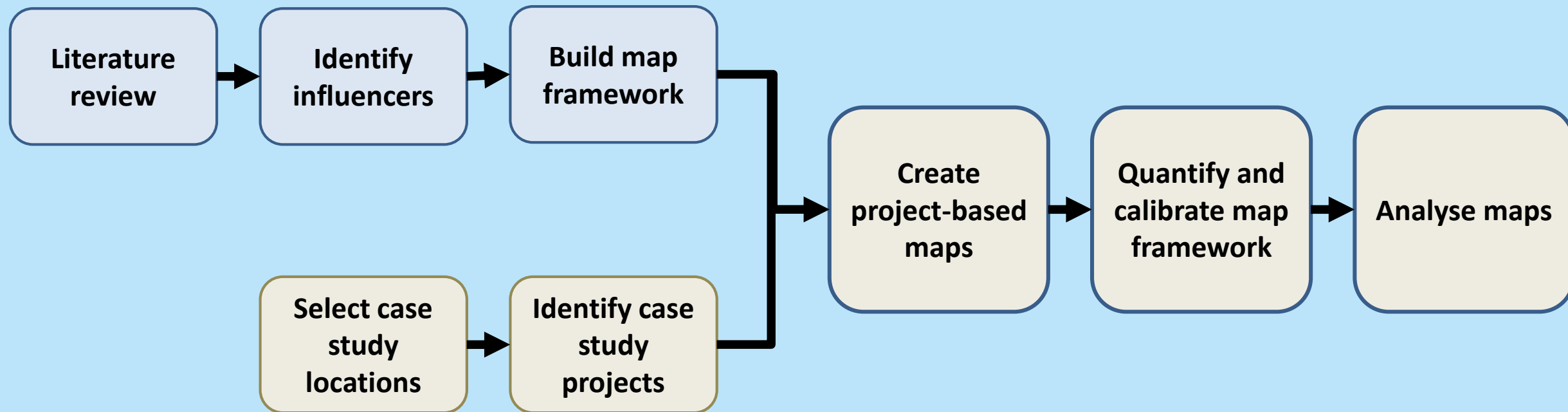


Modelled Phases





Methods



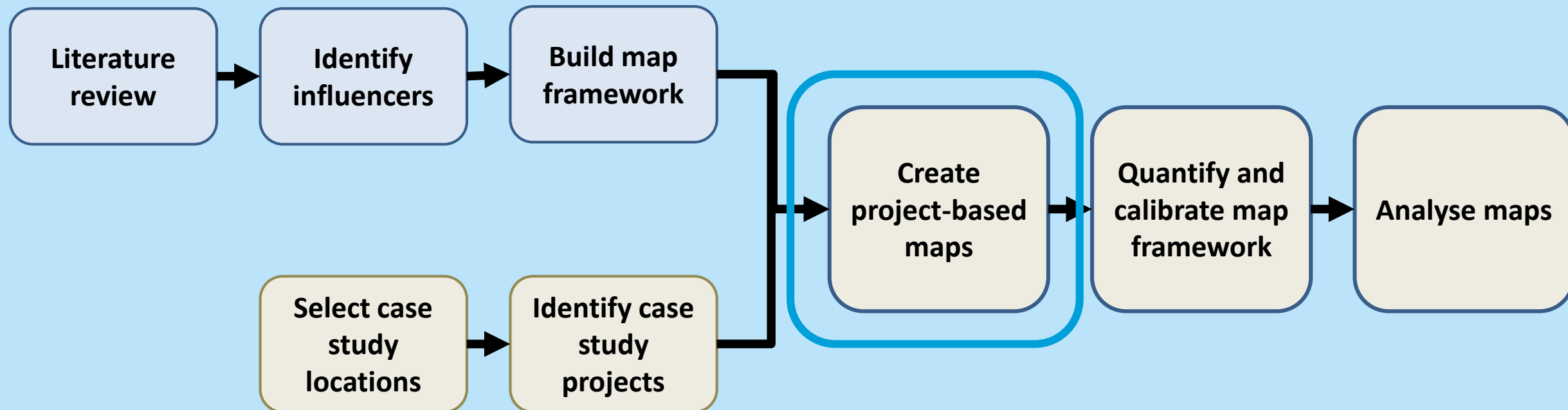


Methods

Level of importance				No degree of influence mentioned	Sources
High	Medium	Low			
General Ideas		Nodes			
Leadership	Motivation/Vision/Guidance provided				Ayeman, Devine-Wright & Prange, 2009
	Boundary between technician and community				Alexander, Ryan & Measham, 2012
	Reputation / Association				Arnstein, 1998
Public perception	Context given existing values				Auermuller et al., 2013
	Previous projects/studies				Ballinger et al., 2010
	Existing/historic use of project location				Barnett et al., 2015
	Place attachment				Becker, Huitema & Aerts, 2015
Trust	Risk perception				Borberg et al., 2013
	Potential for outrage / lawsuits due to mandate				Bosomworth et al., 2017
	In project owner/driver				Brennan & Valcic, 2012
Project characteristics	In process (transparent vs predetermined/gaming)				Burley et al., 2007
	Engagement on previous projects/studies				Cooper & McKenna, 2007
Project-related communication	Project benefits / consequences				Costas, Ferreira & Martinez, 2015
	Distribution of outcomes				Davidson et al., 2007
Institutional Frameworks	Who pays				Davidson et al., 2016
	Communication, Advertising & Framing				Ditchmont et al., 2016
Resources	Media or internet-driven conversation				Dempsey, 2010
	Distribution of knowledge/understanding				Ehler, 2003
Engaged Actors	Cohesion among project drivers				Eversole, 2011
	Management responsibility				Few, Brown & Tompkins, 2007
Indigenous Factors	Political Capital				Frey & Spoellerberg, 2011
	Expertise				Geenets et al., 2012
Engagement Logistics	Funding				Hage, Leroy & Petersen, 2010
	Time				Hall & Lazarus, 2015
Engagement Results	Representative groups of stakeholders				Hayward, 2008
	Active community participation				Jones & Clark, 2014
Engagement Results	Context setters (vs member of the crowd)				Kamphuis, 2011
	Involvement of interest groups				Kochmover, Reddy & Flick, 2015
Engagement Results	Indigenous perceptions of project/process				Kousky, 2014
	Legacy affects of indigenous treatment				Lazarus et al., 2016
Engagement Results	Meeting frequency / quantity / duration				Mann de Toledo et al., 2017
	Engagement type & location				McKenna & Cooper, 2006
Engagement Results	Clear goals and role of stakeholders				Michel-Guilhou, Krien & Meur-Ferec, 2016
	Level of consensus / respect for dissensus				Midgley & McGlashan, 2004
Engagement Results	Potential for stakeholder comment & impact				Moser, 2008
	Distribution of results of engagement				Moser & Dilling, 2004
Engagement Results	Empowerment of stakeholders				Moser & Eskrom, 2010
					Moser & Stein, 2011
					Niebet, 2009
					O'Riordan, Nicholson-Cole & Milligan, 2008
					O'Riordan & Ward, 1997
					Olsen, 2003
					Olsen & Christie, 2000
					Pilkey & Wright, 1988
					Pilkey & Young, 2005
					Preston, Westaway & Yuen, 2010
					Reed et al., 2009
					Roca, Gamboa & Tabara, 2008
					Rockloff & Lockie, 2006
					Rosenzweig et al., 2011
					Rulleau & Rey-Valette, 2017
					Ruth & Coelho, 2007
					Sala, Curfio & Nijkamp, 2015
					Simms, 2017
					Singleton, 2009
					Smith et al., 2005
					Smith et al., 2009
					Surman, 2001
					Susser, 2016
					Tabara & Fraix-Worell, 2007
					Thia Eng, 1993
					Thomsen et al., 2009
					Tobin, 1995
					Turner, 2000
					Udall Foundation, 2011
					Wadey et al., 2015
					Weisner & Schernewski, 2013
					Wilcock, 2013
					van Koningsveld, Davidson & Huntley, 2005
					Vancley, 2012
					Young et al., 2014

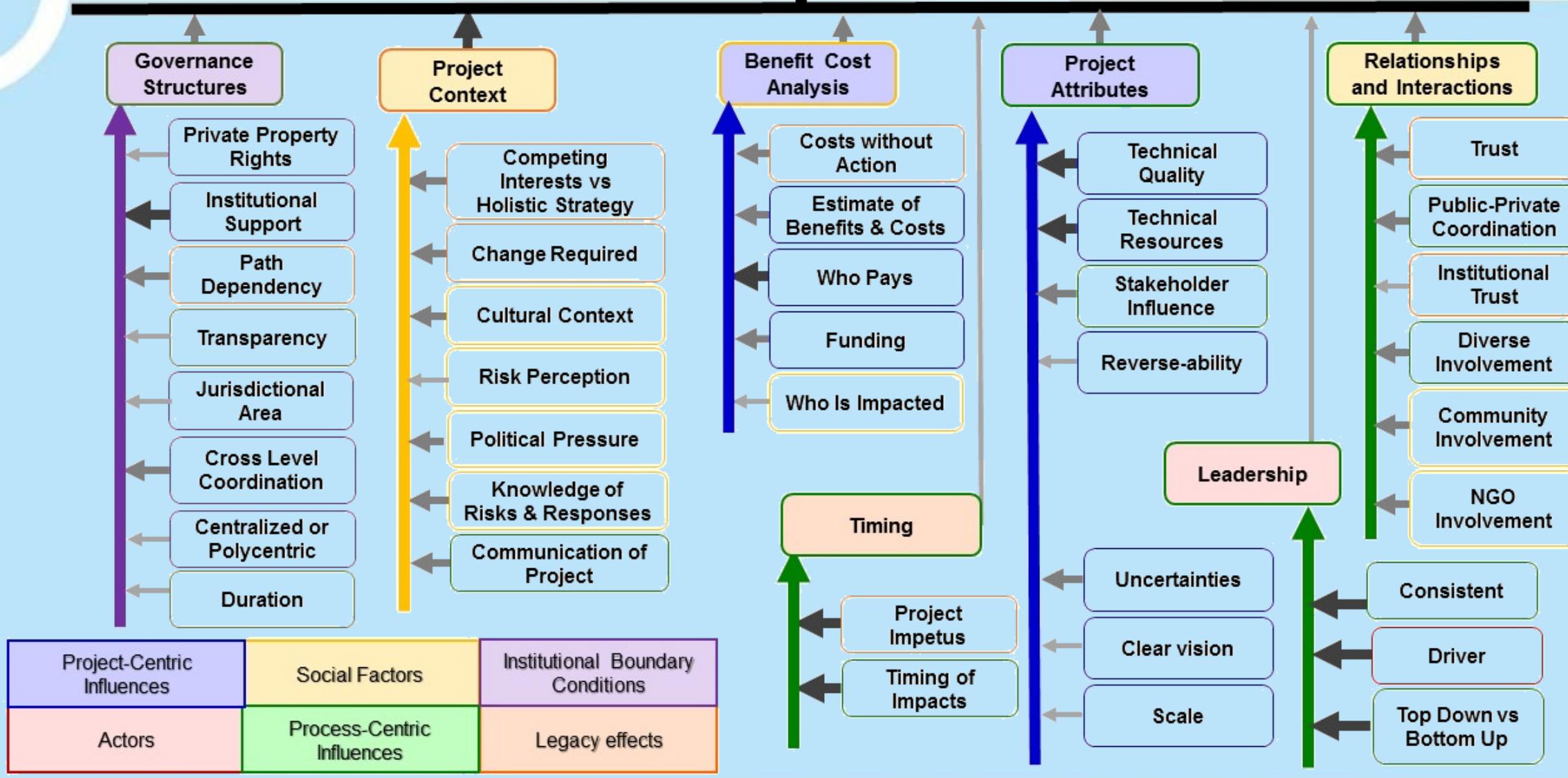


Methods

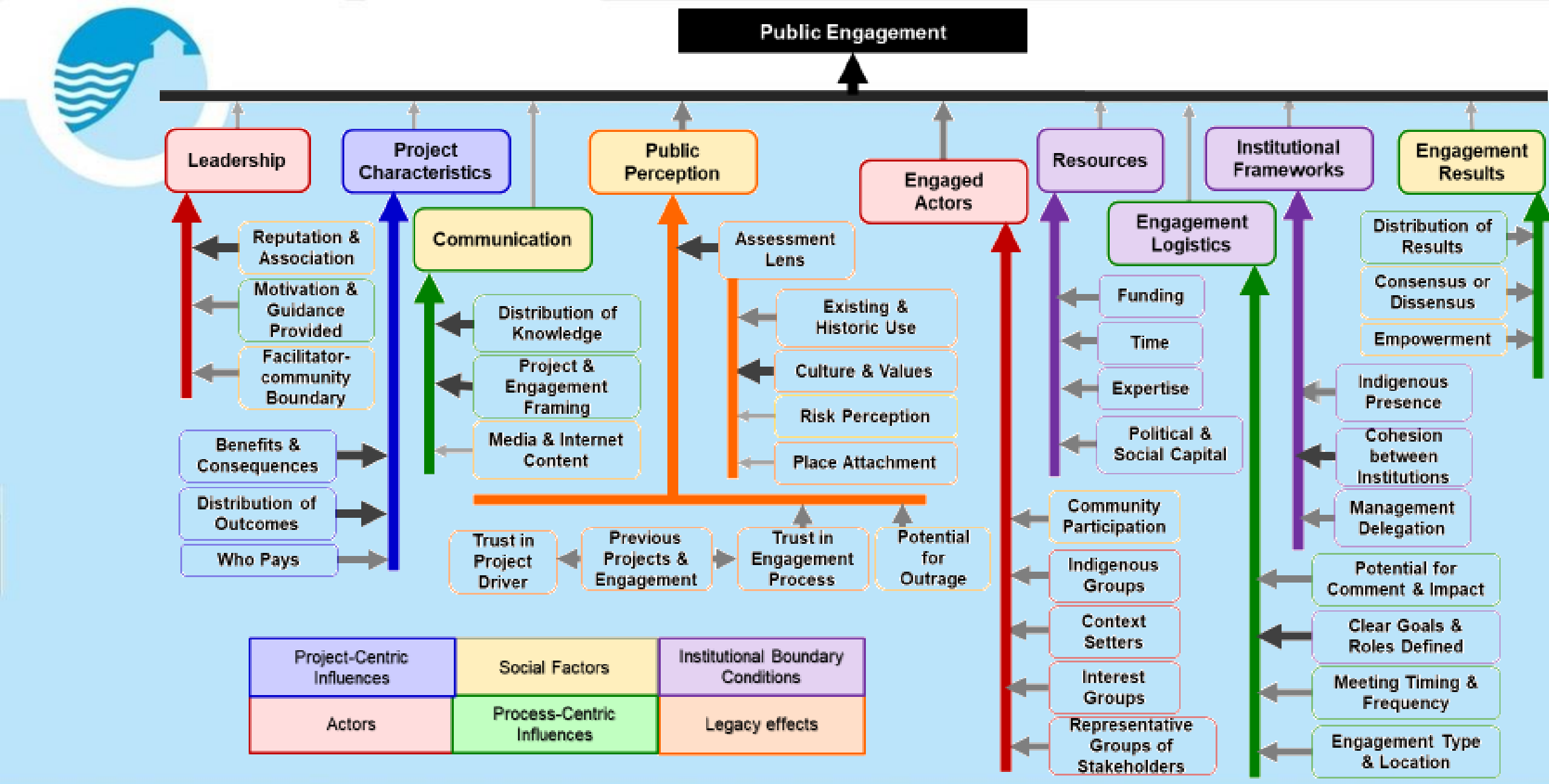




Conceptualization



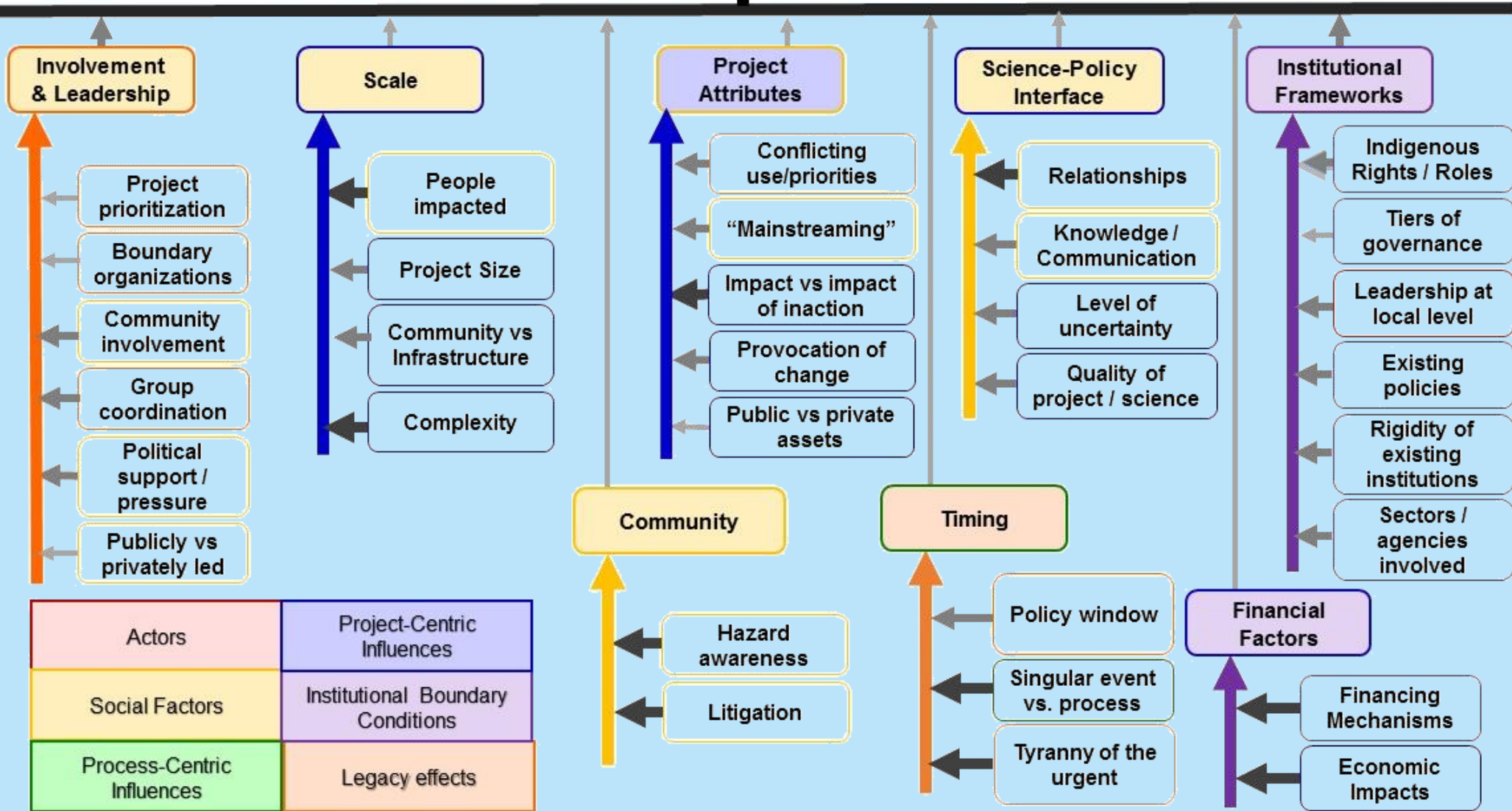
Mapping Framework



Mapping Framework



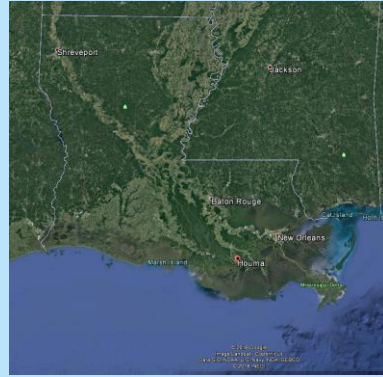
Execution



Mapping Framework



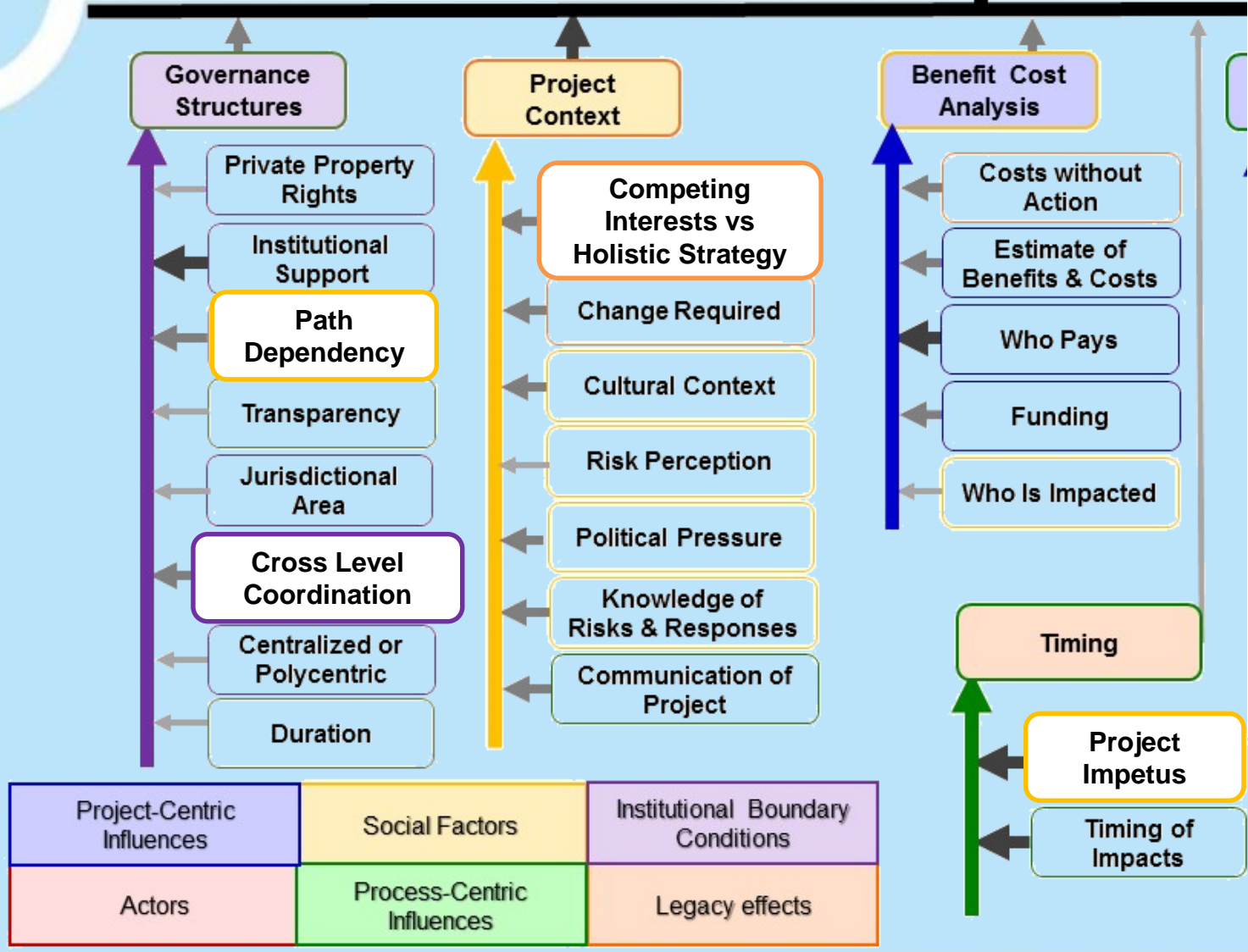
Pilot – Bubba Dove Floodgate



- Design
 - NTP in 2009
 - Approx. \$4M
- Construction
 - Substantial Completion in 2013
 - Approx. \$48M
- Interim Barge Gate to close Morganza to the Gulf System until lock complex is completed



Conceptualization



Morganza to the Gulf

Updated February 2015

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG

Project Purpose

The primary purpose of the Morganza to the Gulf of Mexico, Louisiana project is hurricane and storm damage risk reduction. The area is significantly affected by tides emanating from the Gulf of Mexico. Deterioration of coastal marshes as a result of saltwater intrusion, land subsidence and the lack of interchanges from the Mississippi River have steadily increased storm surge inundation over time.

The proposed work is located in coastal Louisiana, approximately 60 miles southwest of New Orleans, and includes portions of Terrebonne and Lafourche parishes. The updated plan is described in the Report of the Chief of Engineers (2013 Chief's Report) dated 8 July 2013, (which approved and adopted the recommendations contained in the 2013 Final Post Authorization Change (FAC) Report). The Plan, as described in the 2013 Chief's Report, is bounded by US 90 near the town of Gibson to the west and LA Hwy 1 near Lockport to the east. The southern boundary is the Gulf of Mexico.



Project Features

The updated plan described in the 2013 Chief's Report is a 98-mile alignment consisting of grass-covered earthen levees, 22 floodgates on navigable waterways, 23 environmental water control structures, nine road gates and fronting protection for four existing pump stations. The major project feature is a lock complex on the Houma Navigation Canal consisting of a lock measuring 110-ft wide by 800-ft long, an adjacent sector gate measuring 250 feet wide and a dam closure.

Project Status

No Federal funds have been appropriated for construction of the Morganza to the Gulf project; however, the non-Federal sponsor is using state and local funds to independently construct interim features along the authorized alignment in advance of the Federal project.

Features under construction by Local Sponsor

- Levee Reach J-1, First Lift, complete
- Levee Reach G-1, First Lift, complete
- Levee Reach H-3, First Lift, complete
- Levee Reach H-2, First Lift, complete
- Levee Reach I, First Lift, complete
- Levee Reach J-2, First Lift, under construction
- Levee Reach F, First Lift, under construction
- Bush Canal Interim Barge Gate, complete
- Placid Canal Interim Barge Gate, complete
- Houma Navigation Canal Interim Barge Gate, complete
- Bayou Grand Cailou Interim Barge Gate, complete
- Bayou Petit Interim Barge Gate, under construction



Levee Reach J-1 Construction



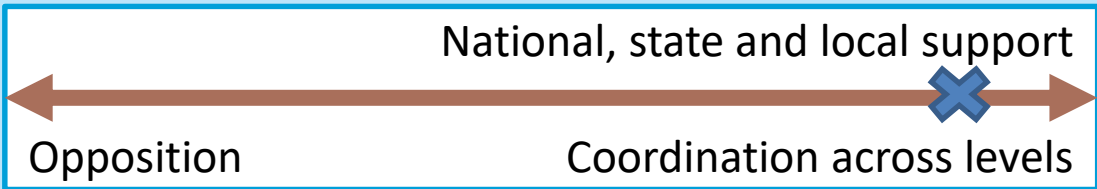
Competing Interests vs Holistic Strategy



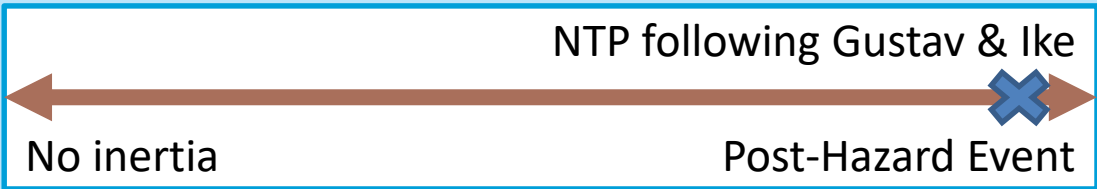
Path Dependency



Cross Level Coordination



Project Impetus



Morganza to the Gulf

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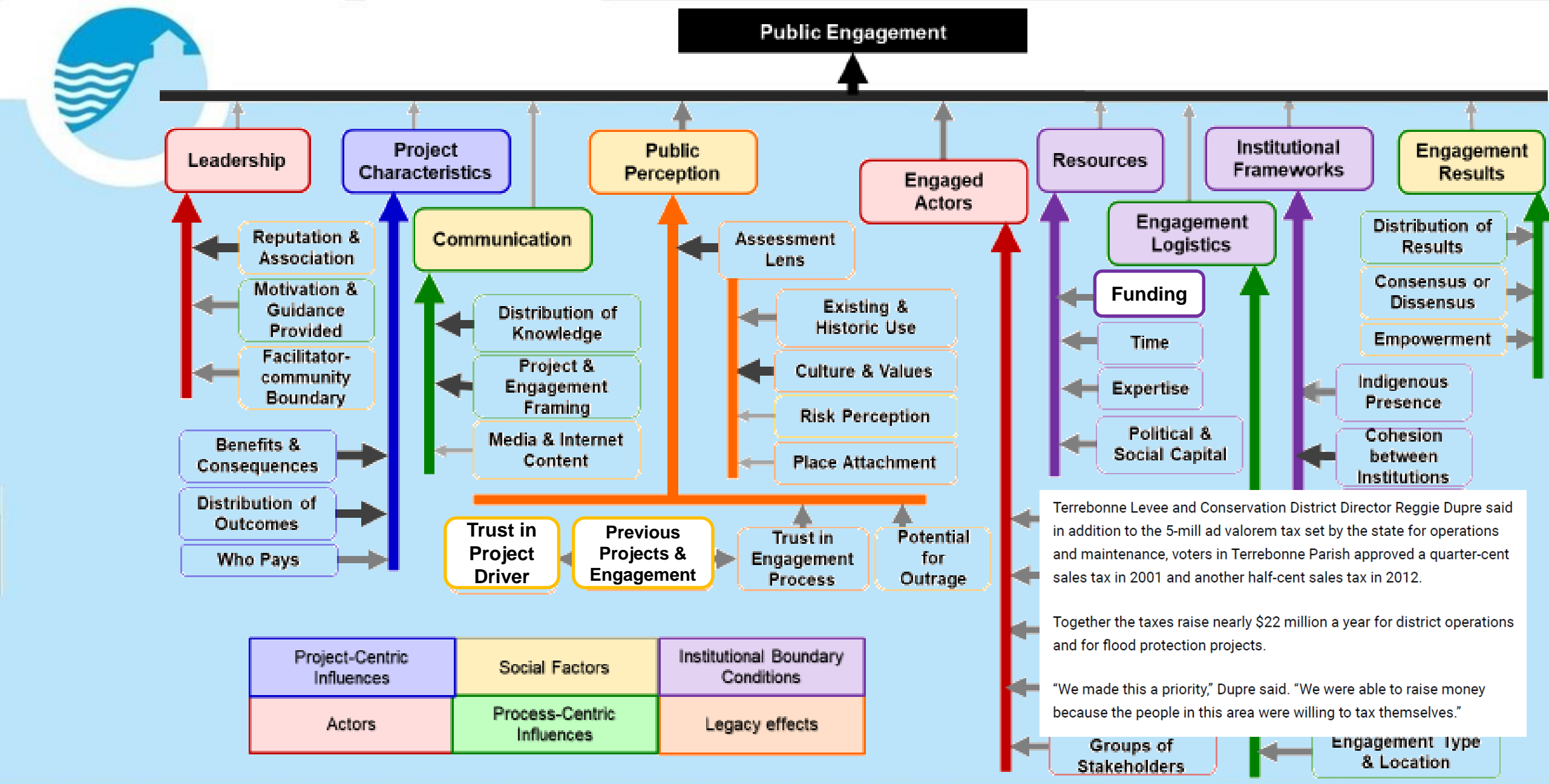
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Levee Reach J-1 Construction

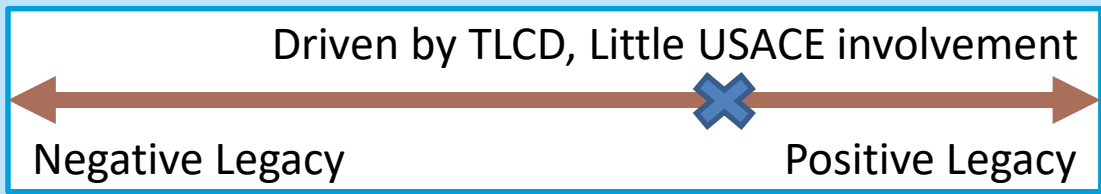




Funding



Previous Projects & Engagement



Trust in Project Driver



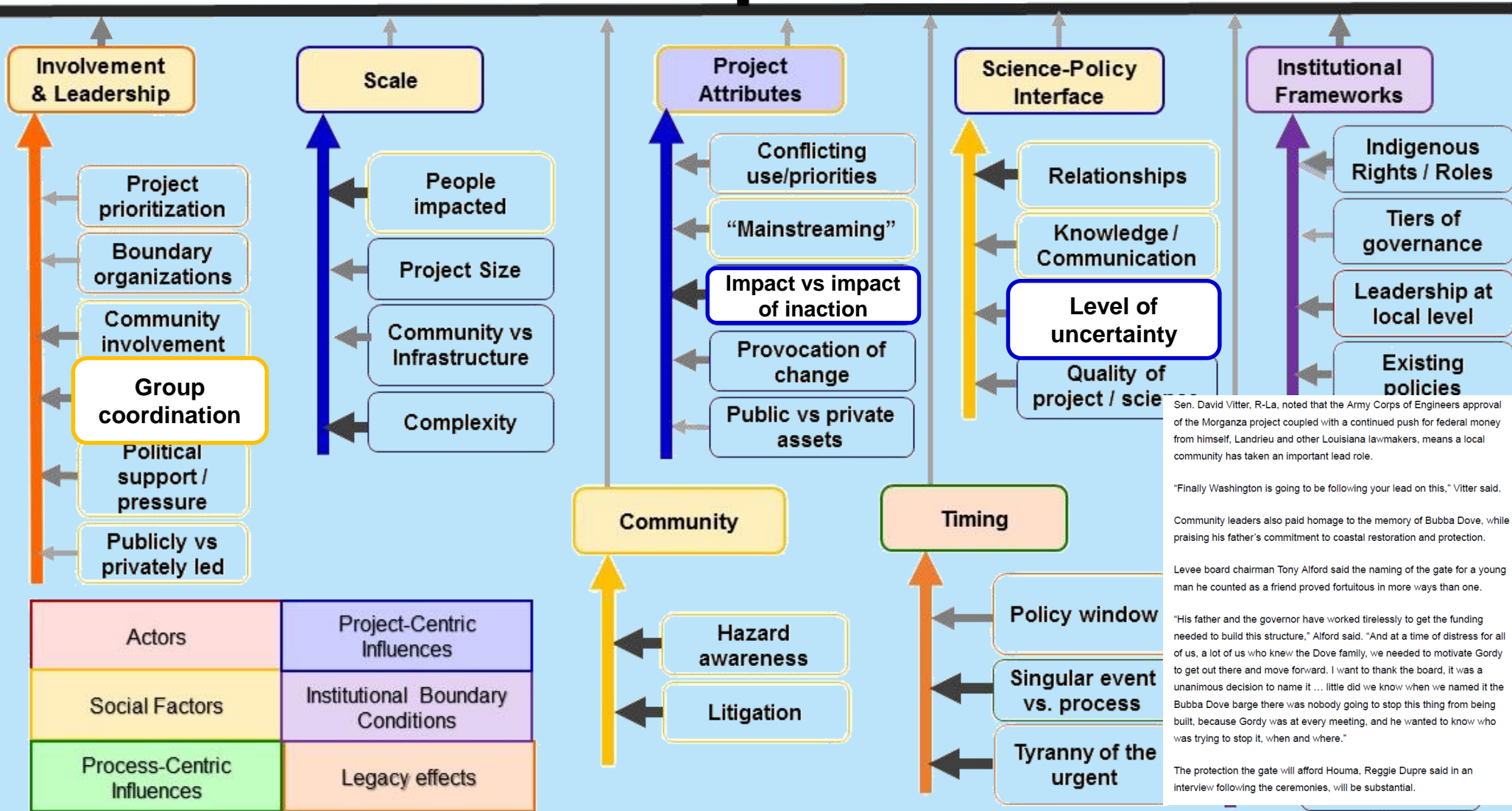
Terrebonne Levee and Conservation District Director Reggie Dupre said in addition to the 5-mill ad valorem tax set by the state for operations and maintenance, voters in Terrebonne Parish approved a quarter-cent sales tax in 2001 and another half-cent sales tax in 2012.

Together the taxes raise nearly \$22 million a year for district operations and for flood protection projects.

“We made this a priority,” Dupre said. “We were able to raise money because the people in this area were willing to tax themselves.”



Execution

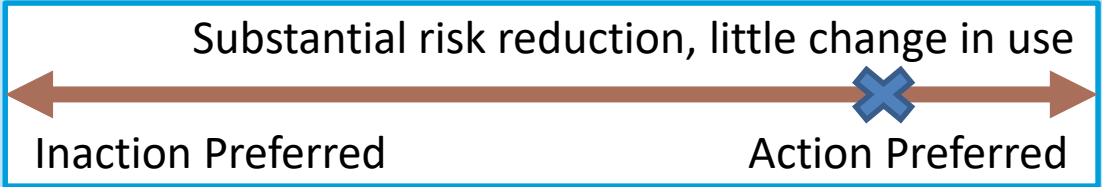




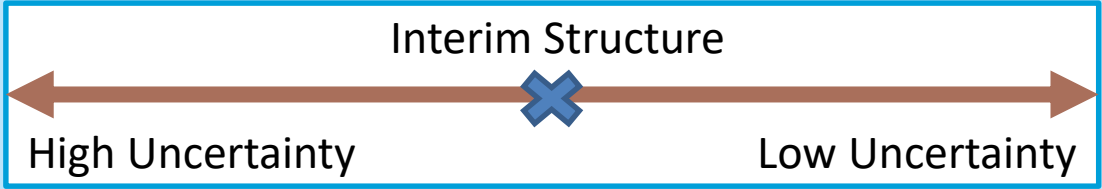
Group coordination



Impact vs impact of inaction



Level of uncertainty



Sen. David Vitter, R-La, noted that the Army Corps of Engineers approval of the Morganza project coupled with a continued push for federal money from himself, Landrieu and other Louisiana lawmakers, means a local community has taken an important lead role.

"Finally Washington is going to be following your lead on this," Vitter said.

Community leaders also paid homage to the memory of Bubba Dove, while praising his father's commitment to coastal restoration and protection.

Levee board chairman Tony Alford said the naming of the gate for a young man he counted as a friend proved fortuitous in more ways than one.

"His father and the governor have worked tirelessly to get the funding needed to build this structure," Alford said. "And at a time of distress for all of us, a lot of us who knew the Dove family, we needed to motivate Gordy to get out there and move forward. I want to thank the board, it was a unanimous decision to name it ... little did we know when we named it the Bubba Dove barge there was nobody going to stop this thing from being built, because Gordy was at every meeting, and he wanted to know who was trying to stop it, when and where."

The protection the gate will afford Houma, Reggie Dupre said in an interview following the ceremonies, will be substantial.



Future Work

- Collect case study data for projects in Terrebonne Parish, USA and Hawke's Bay, New Zealand.
- Quantify nodal valuation spectrums.
- Calibrate influence weightings using FCMing techniques.
- Evaluate uncertainties and tipping points using Bayesian distributions.
- Analyse broader lessons learned for project progression or abandonment.