Enabling Adaptive Management

integrating ecosystems into the Master Planning process

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Mainstreaming Natural Infrastructure in Water Projects

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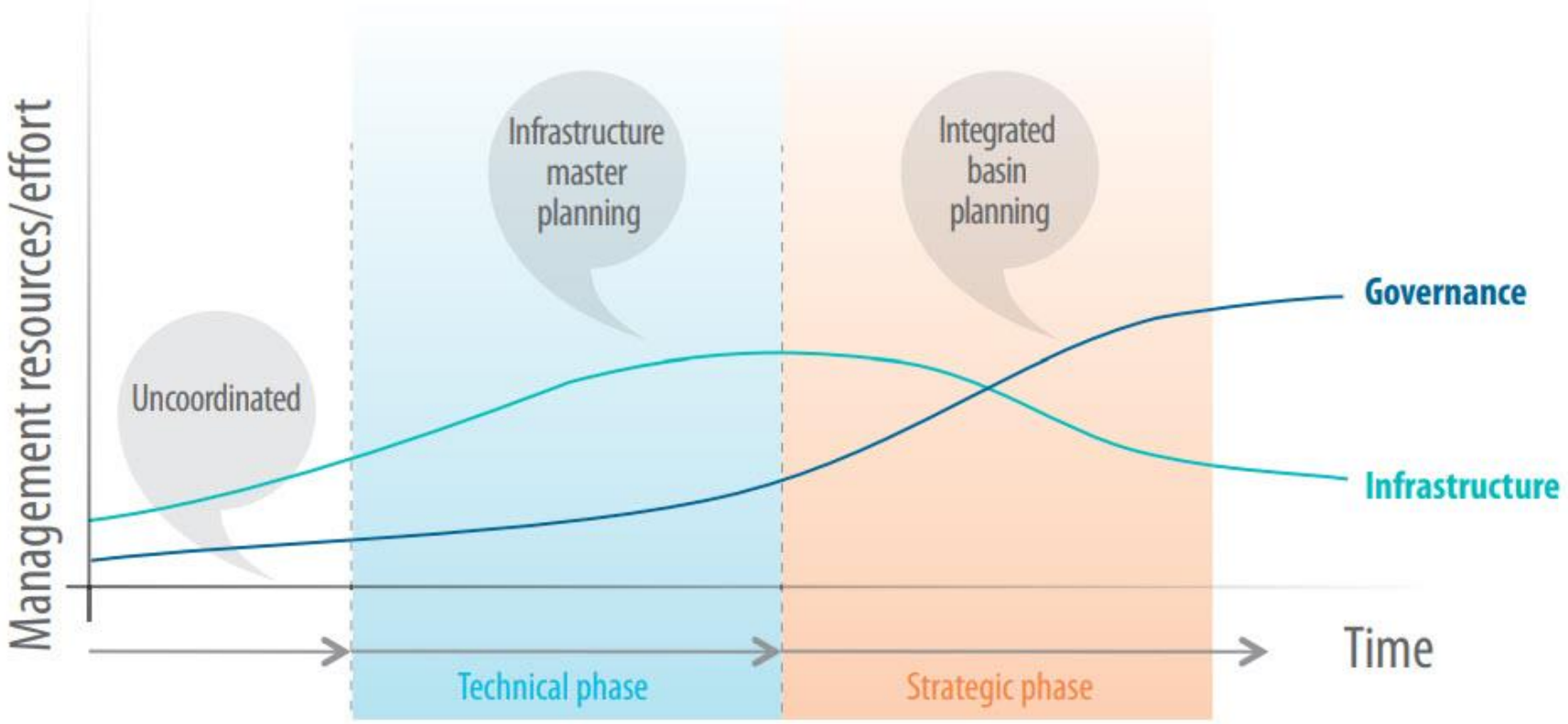
Water Resources and Delta Management

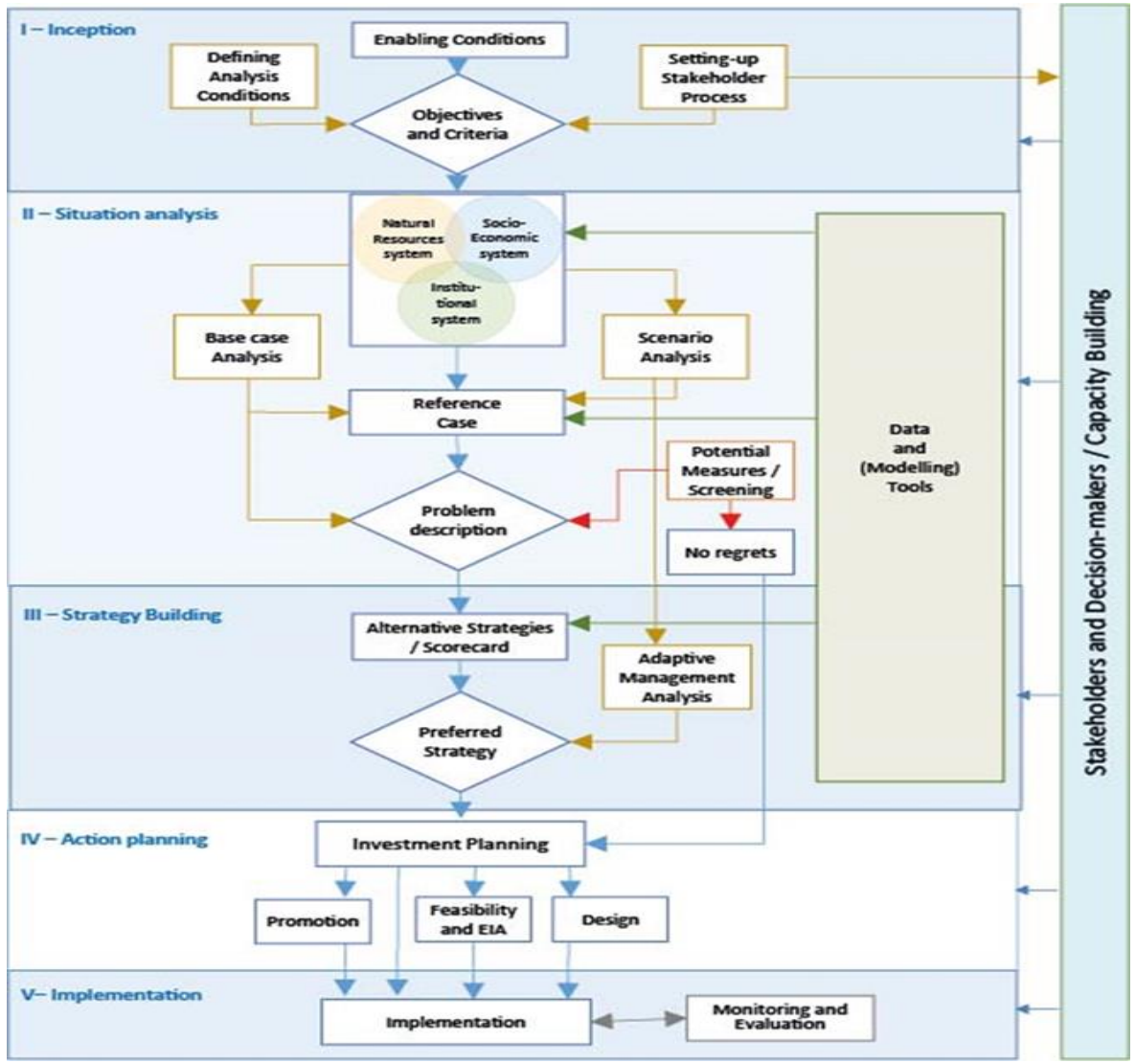
From infrastructure development planning to Strategic River Basin Planning

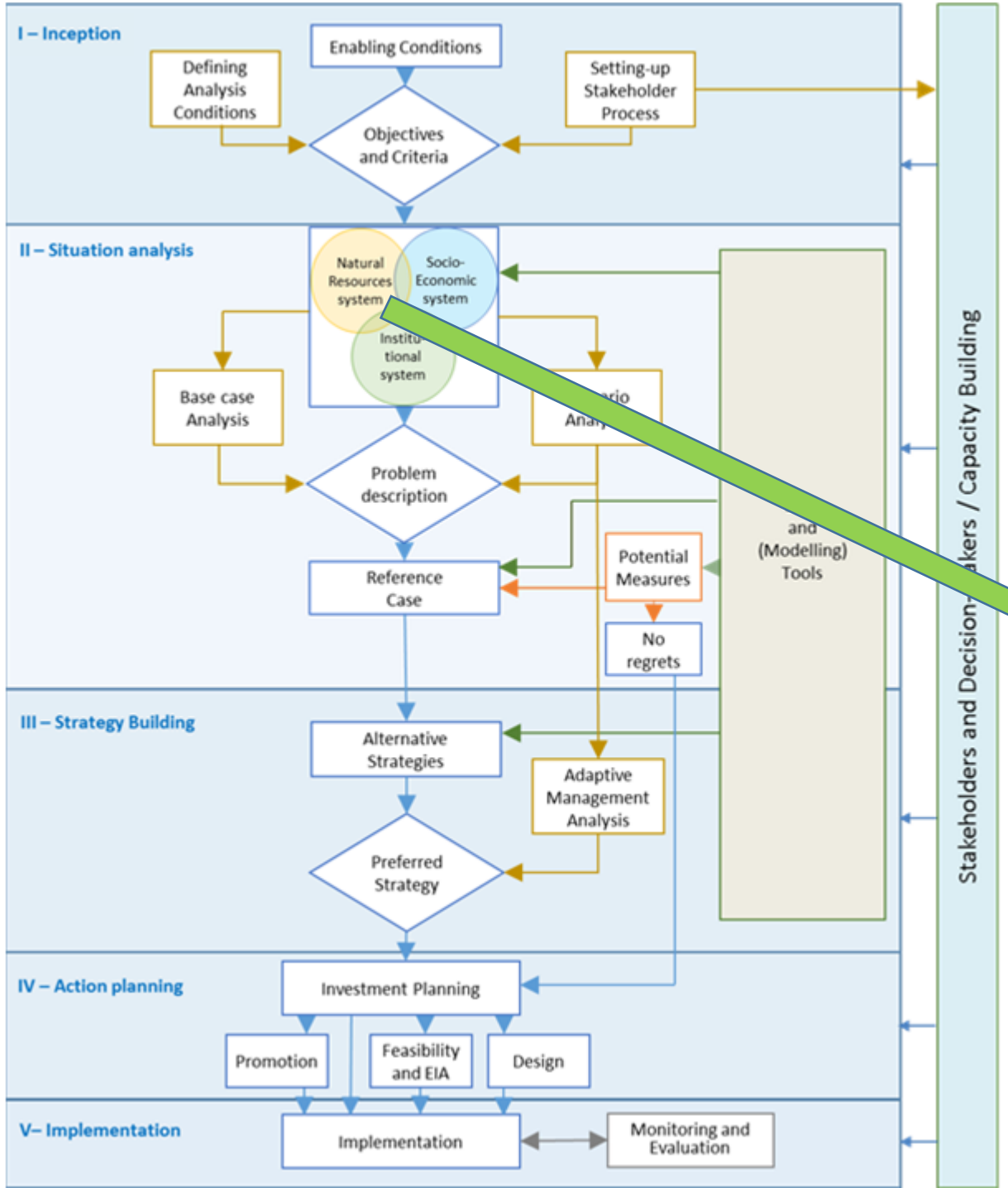
Figure 11: The historic phases of basin planning



Source: River Basin Planning: Principles, Procedures and Approaches for Strategic Basin Planning (ADB 2013)

IWRM/ River Basin Planning Guidelines





5 key differences:

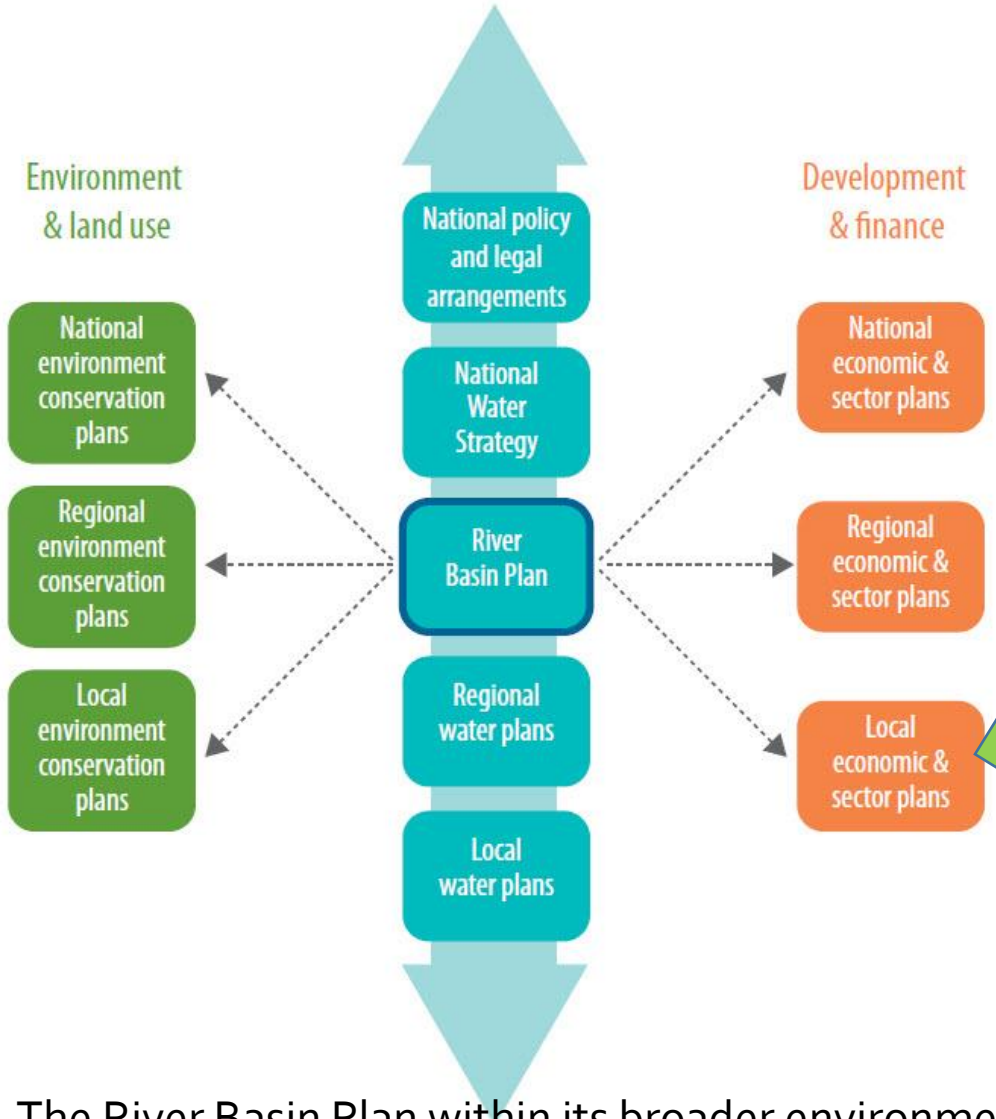
1. Trade-offs : Economic, Social and Environmental objectives
2. Advanced environmental requirements
3. Understanding basin interactions (within)
4. Adaptive: addresses uncertainties
5. Multidisciplinary teams

How is green infra considered?

Abiotic = Physical = e.g. Dams
Biological = Ecology = e.g. Wetlands
Chemical = WQuality = e.g. WWTP's

Preferred Strategy = Hybrid grey + green , Structural + Non-Structural, Supply & Demand

From River Basin Plan to Thematic Investment Plans



The River Basin Plan within its broader environment (Source: ADB 2013)

Green

National Greening Program (DENR)

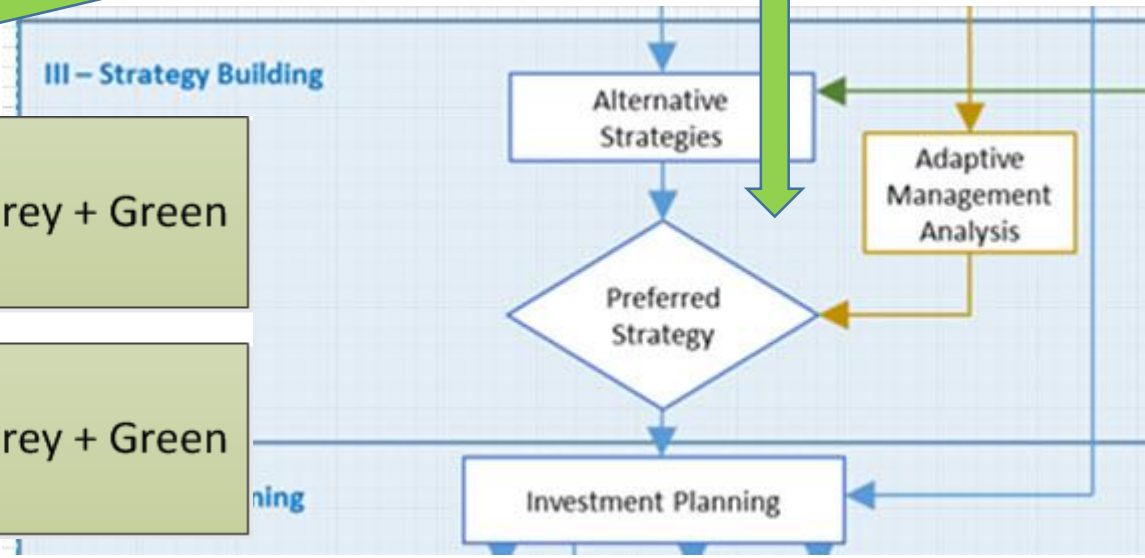
Grey

National Sewerage and Septage Program (LWUA, LGUs)

Financing Request for 5 WWT's

Cluster 1: Grey + Green

Cluster 2: Grey + Green



IWRM Plan

Keeping integrity of the plan, financing per cluster:

- Cluster 1: Water Quality improvements
- Cluster 2…. N

Is this possible?

Recommended Measures			Phase	Institutions involved																					Implementation Info					
				Province of Cebu	City of Cebu	MCWD	DENR, DOH, NWRB, LWUA,..	City of Mandaue	City of Lapu-Lapu	City of Talisay	City of Toledo	City of Danao	Municipality of Naga	Municipality of Minglanilla	Municipality of Liloan	Municipality of Consolacion	Municipality of Balamban	Municipality of Pinamungahan	Municipality of Asturias	Municipality of Carmen	Municipality of Cordova	Municipality of Compostella	Private investment	NGO's, academe, church, etc.	No. of the measure	Type of measure	Phase I only: Total investment (in MPesos)	Phase I only: Recurrent costs (MPesos/yr)	Starting year effective operation	Needed lead time (preparation + construction)
Develop more resources	West	Groundwater wells West	I				x				●						●	●	●				●	o	9	invest.	849	38	2006	-
	Uplands	Spring boxes + small impoundments + trucking for drought periods	I		●	o	x			●	●	●	●	●	●	●	●	●	●	●		●		o	8	invest.	737	126	2006	-
	East, non-MCWD area	Groundwater wells East	I				x					o	o	o						o		o	●	o	9	invest.	639	28	2006	-
	East-MCWD area, excl. Mactan	Groundwater production wells by MCWD	I		o	●	x	o		o					o	o						o			9	invest.	588	26	2006	-
		Groundwater wells MCWD area by private initiatives	I		●		x	●		●					●	●						●	●		9	invest.			2006	-
		Luyang-Carmen weir	I	o	x	●	o	x				x			x	x				o		x	●		4	invest.	3.169	124	2016	2+2
		Northern well fields: Liloan, Compostella, Kotkot, Danao, Carmen, Luyang (excl. Luyang weir)	I	o		●	x					o			o	o				o		o	?		9	invest.			2006	2+2
		Lusaran Dam P	I	o	o	●	o					o					o					o	?		2	invest.	2.536	77	2027	6+2
		Kokot Dam P	I	o	o	●	o								o							o	?		3	invest.	905	59	2022	6+2
		Southern well fields: Napo/Carcar river, Pangdan, Minglanilla	I	o		●	x			x			o	o									?		10	invest.	2.490	86	2014	2+2
	Mactan	Horizontal wells	I			●	x		x																11	invest.	51	5	2006	-
		Shallow fresh water wells	I			●	x		x															o	11	invest.	276	56	2008	-
		Shallow brackish water wells + reverse osmosis P+Ch	I			●	x		x																13	invest.	80	42	2006	-
		Desalination by MCWD for industry Ch	I			●	x		x														?		13	invest.	297	55	2010	2+2
		Desalination by MCWD for domestic use	I			●	x		x														?		13	invest.	1.393	167	2012	2+2
		Desalinaton by industry (private initiative) Ch	I				x		x														●		13	invest.	297	55	2010	2+2
Water demand reduction	Reducing losses	Rainfall harvesting: urban, rural, industry	I	o	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	o	o	12	invest.	515	-	2006	-
		Leakage reduction / rehabilitation distribution system MCWD	I		o	●		o	o	o					o	o					o	o			14	invest.	820	41	2007	-
		Adequate and differentiated water pricing	I/II			●	x																		20	study	pm	pm	2007	1
		Promotion of water saving equipment and less consuming production	II			●	●																o	o	21	man.	-	-	-	-
	Awareness	Awareness raising high demand Cebu neighbourhoods	I		●	●		●	●	●														o	22	man.	0	2,6	2006	-
		Awareness raising - general	I	●	●	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		o	23	man.	0	6,9	2006	-
Protection resources	Watershed management	Land use practices / watershed management B	I/II		o		●			o	o	o	o	o	o	o	o	o	o	o		o	o	o	30	reg.	-	-	-	-
		Gabion dams P	III		●		o			●	●	●	●	●	●	●	●	●	●	●		●		o	31	invest.	-	-	-	-
	Water quality improvement	Improve solid waste management	II		●		o	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		o	34	man.	-	-	-	-
		Well head protection - spatial planning recharge areas B	II	o	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		o	35	reg.	-	-	-	-
		Prevent sand and gravel mining in rivers (enforcement)	II	●	●		●	●		●	●	●	●	●		●	●	●	●	●		●	o		36	reg.	-	-	-	-
		Implement strict effluent permitting (EMB)	II		o	x	●	o	o	o					o	o					o	o	o		37	reg.	-	-	-	-
		Urban sewage systems in building requirements	I		●			●	●	●													o		38	reg.	0	0	2007	1
		Development of urban sewage systems and treatment Ch	II		●	●	o	●	●	●													o		39	invest.	-	-	2010	3
		Sanitary programs in uplands	III		●		o			●	●	●	●	●	●	●	●	●	●	●		●		o	40	invest.	-	-	-	-
Water governance	Organi-sational	Development institutional setting for IWRM (integration and coordination - Board, TS etc.)	I	●	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	50	instit.	pm	pm	2006	0
	Regulation and control	Family planning and migration control (env. related)	I	●	●		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		●	54	man.	pm	pm	-	-
		Water withdrawal quantity and quality control	II				●																o		52	man.	pm	pm	2007	0
		Implement and enforce spatial planning (urban, industrial, etc.)	I	●	●		●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			55	man.	pm	pm	-	-
		Priority rules (allocation) during dry periods	I	o	o	●	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		56	reg.	pm	pm	-	-
Research and development		Improve data collection, analysis and presentation,improve decision support tools	II	●	●	●	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	61	capac.	pm	pm	2007	-

Working with Nature vs. Traditional Infra

Green Infrastructure

- Scale: River Basin
- Multifunctional/ co-benefits # scales
- Open systems – large areas
- Construction: longer, nature dependent
- Performance: adaptive & cyclical
- (+) System resilience – BUT vulnerable

Traditional Infrastructure

- Scale: demand dependent
- Often monofunctional
- Clear boundaries –lted area
- Construction period: short, PM dependent
- Performance: eroding

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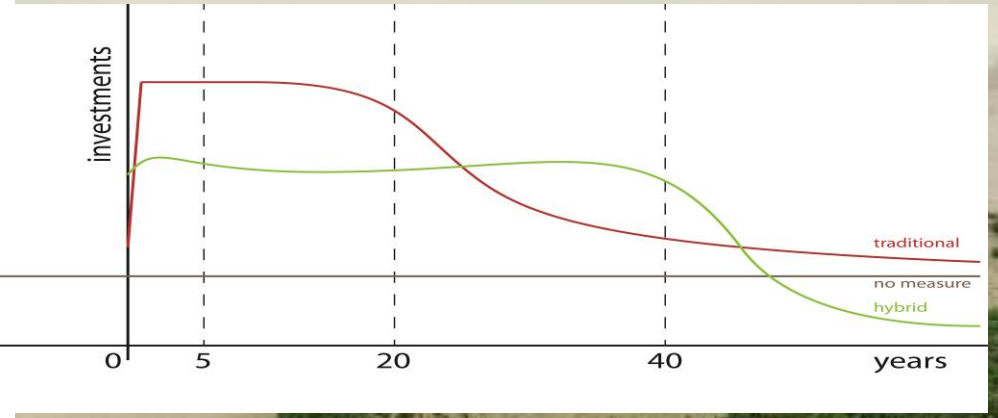
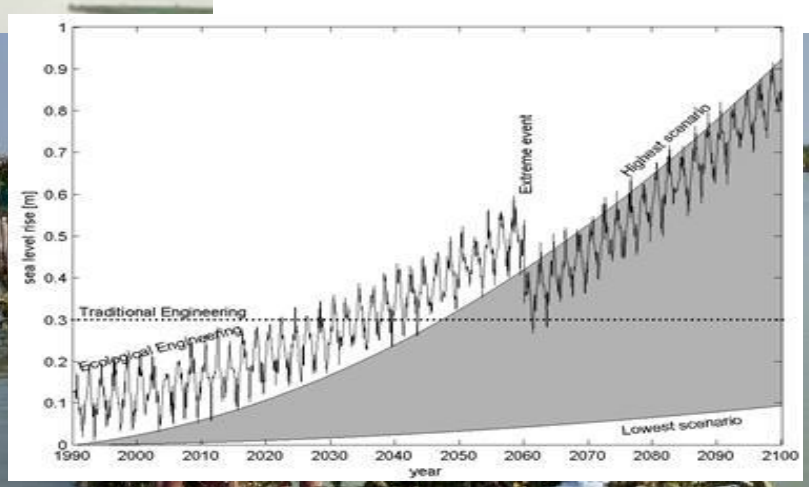
Enabling Delta Life

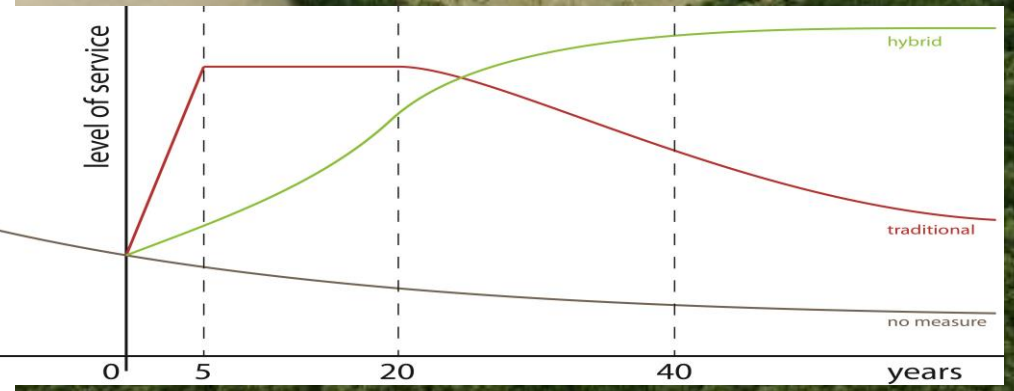
Hybrid versus Grey Coastal Protection

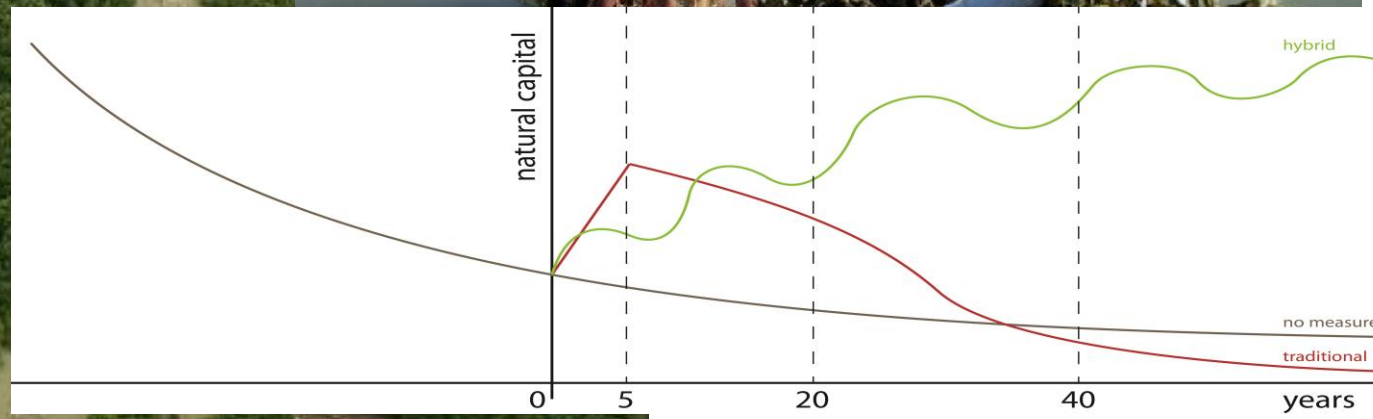
Demak, Northern Java

Borsje et al., 2011 Ecological Engineering









Source: Denjean, B., Altamirano, M. A., Graveline, N., Bresch, D., Van der Keur, P., Moncoulon, D., ... & Pengal, P. (2017). Natural Assurance Scheme: A level playing field framework for Green-Grey infrastructure development. *Environmental research*, *159*, 24-38.

Towards Hybrid Master Planning & BC's

(+) CoP's:
Conservation &
Water Infra

Co-creation: Stakeholders = partners
BC of Hybrid clusters & phasing
Green Infra functional requirements
≠ CBA & LCC techniques

Complete BC of Hybrid Clusters
Blended & multisector Finance
New Implementation Arrangements
(Inc. procurement)

decision

decision

decision

decision

I. Inception

II. Situation analysis

III. Strategy building

IV. Action planning

V. Implemen-tation

start

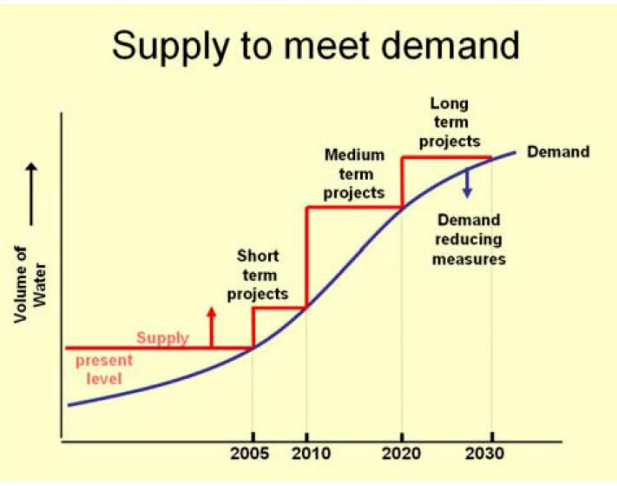
Historic performance Green & Hybrid

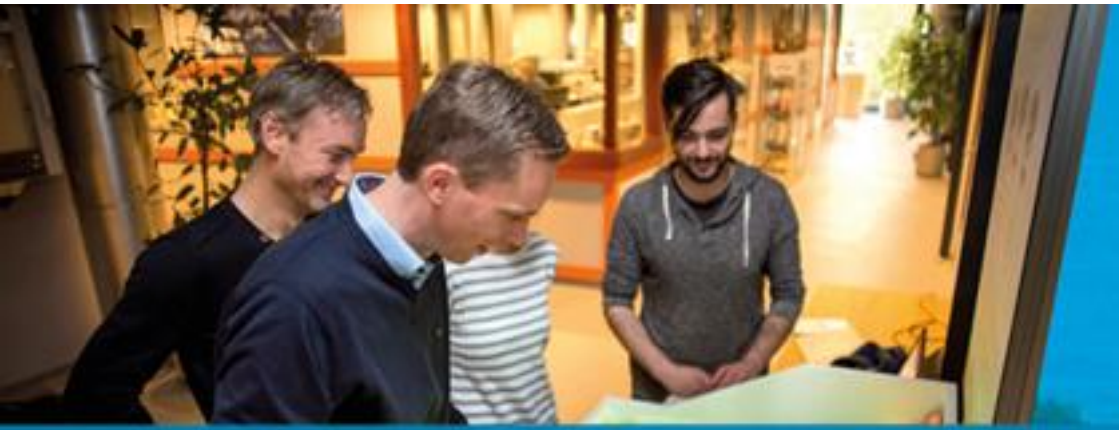
Creation of common level of knowledge

Convergence
Selection of main issues and creat

Divergence
Identification of issues and views

Agree Long Term vision – negotiate "coping" strategy





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The Challenge ahead

Developing together an Implementation Strategy for Hybrid Water Security Strategies

28 augustus 2018

Green infra through two lenses

Eco-engineers

- Risk reduction potential
- Scale: watershed & society
- Stock: natural capital

- Multiple functions =
  - co-benefits &
  - co-funding

Financers & Project developers

- New technology → risk increase
- Scale: project contractual boundaries
- Stock: cash balance – debt servicing capacity

- Multiple functions =
  - multiple principals = (+)contractual risks
  - (+) Construction & Operation risk

Closing together the financial viability gap

MDB's & Climate Funds

- Financial instruments shoulder "technology" risks
- Promote cross-sectoral infra delivery
- Climate and DRR rationale → blended finance
- Evidence of "paradigm shifting" potential of GI

NGO's and Green Infra community

- Performance evidence: monitoring & modelling
- Risk management Hybrid clusters
- DBM guidelines for the industry

- Pilot "blueprints" of implementation arrangements
- Market creation: development of hybrid service providers

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Thank you for our attention
Questions?

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