Background to and overview of Guidelines on EFlows for the WIO Region

Cate Brown

Honorary Professor
Institute for Water Studies
University of the Western Cape
cate@southernwaters.co.za

WIO EFlows Guidelines
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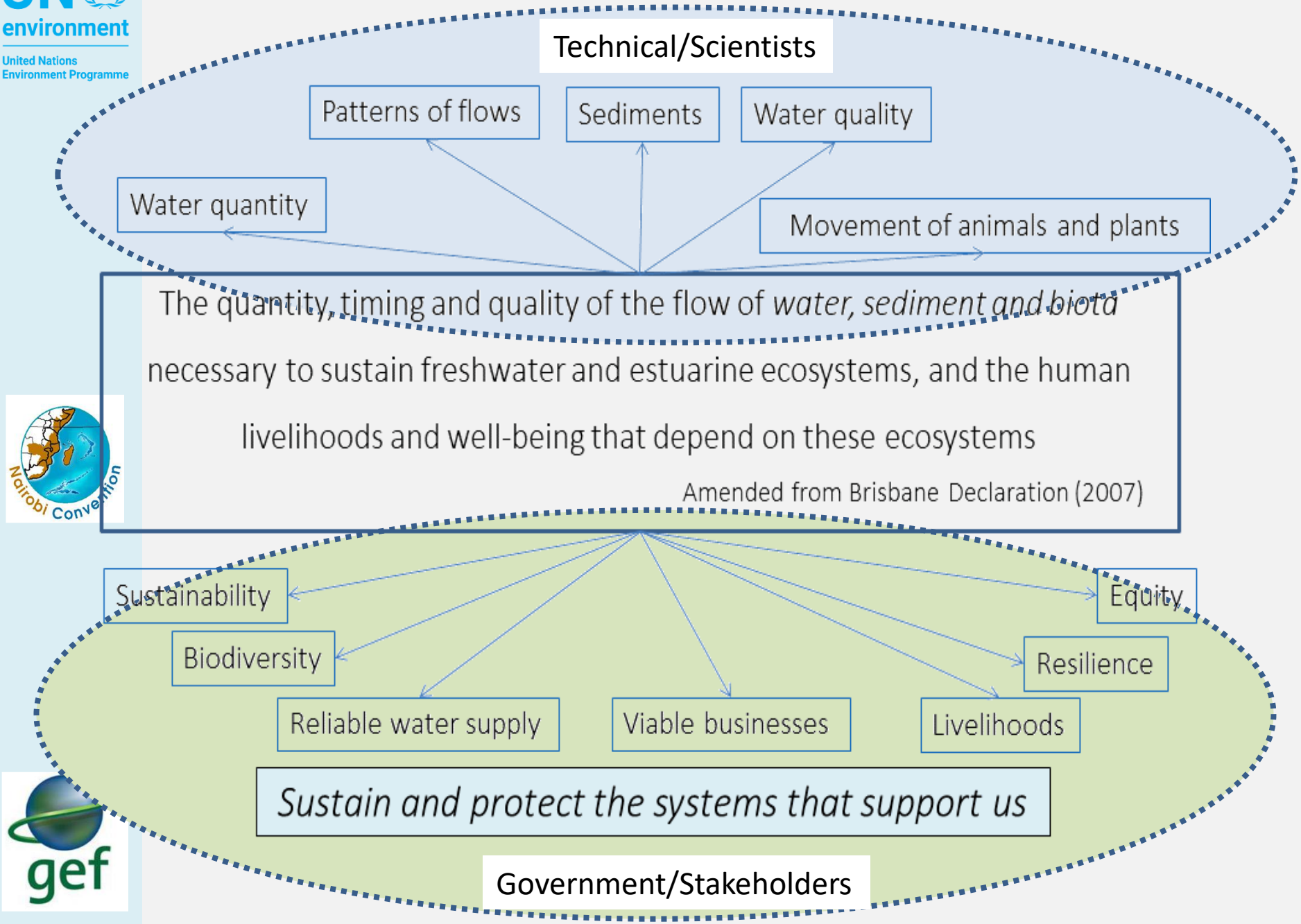
Guideline Contents

1. Background
2. Environmental Flows
3. EFlows Assessment Methods
4. Steps in an EFlows Assessment
5. Managing data limitations
6. Mainstreaming the uptake of EFlows Assessments
7. References

Objective

To provide guidance on EFlows Assessments for rivers and estuaries with a view to enabling a harmonized approach to such assessments across the region in order to enhance protection of the WIO.

Intended for use by government agencies, national research institutions, regional organizations and civil society organizations playing a role in the management of water resources.


Technical/Scientists
Patterns of flows
Sediments
Water quality
Water quantity
Movement of animals and plants
The quantity, timing and quality of the flow of water, sediment and biota necessary to sustain freshwater and estuarine ecosystems, and the human livelihoods and well-being that depend on these ecosystems
Amended from Brisbane Declaration (2007)
Sustainability
Biodiversity
Reliable water supply
Viable businesses
Livelihoods
Resilience
Equity
Sustain and protect the systems that support us
Government/Stakeholders

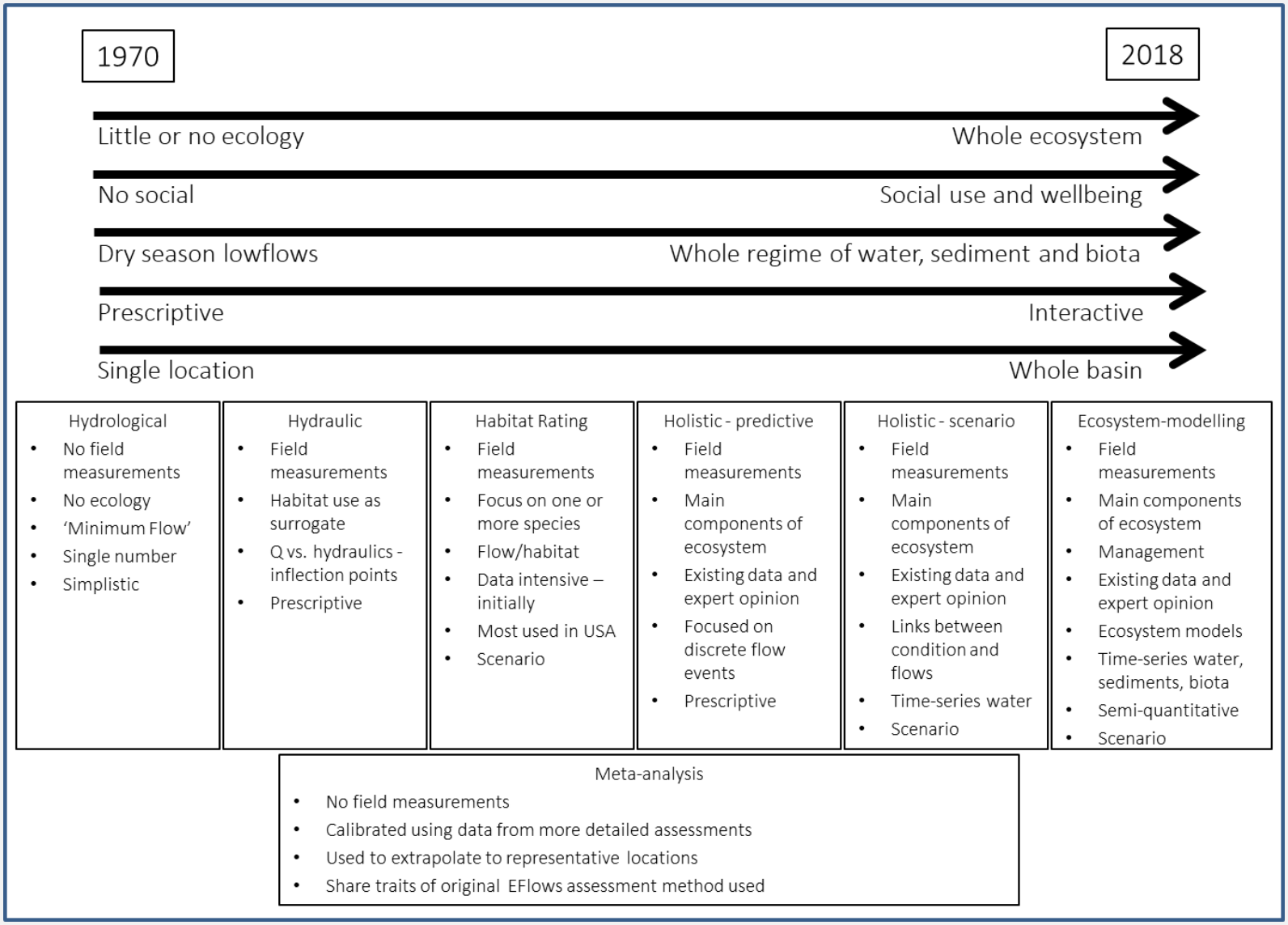
EFlows Assessment

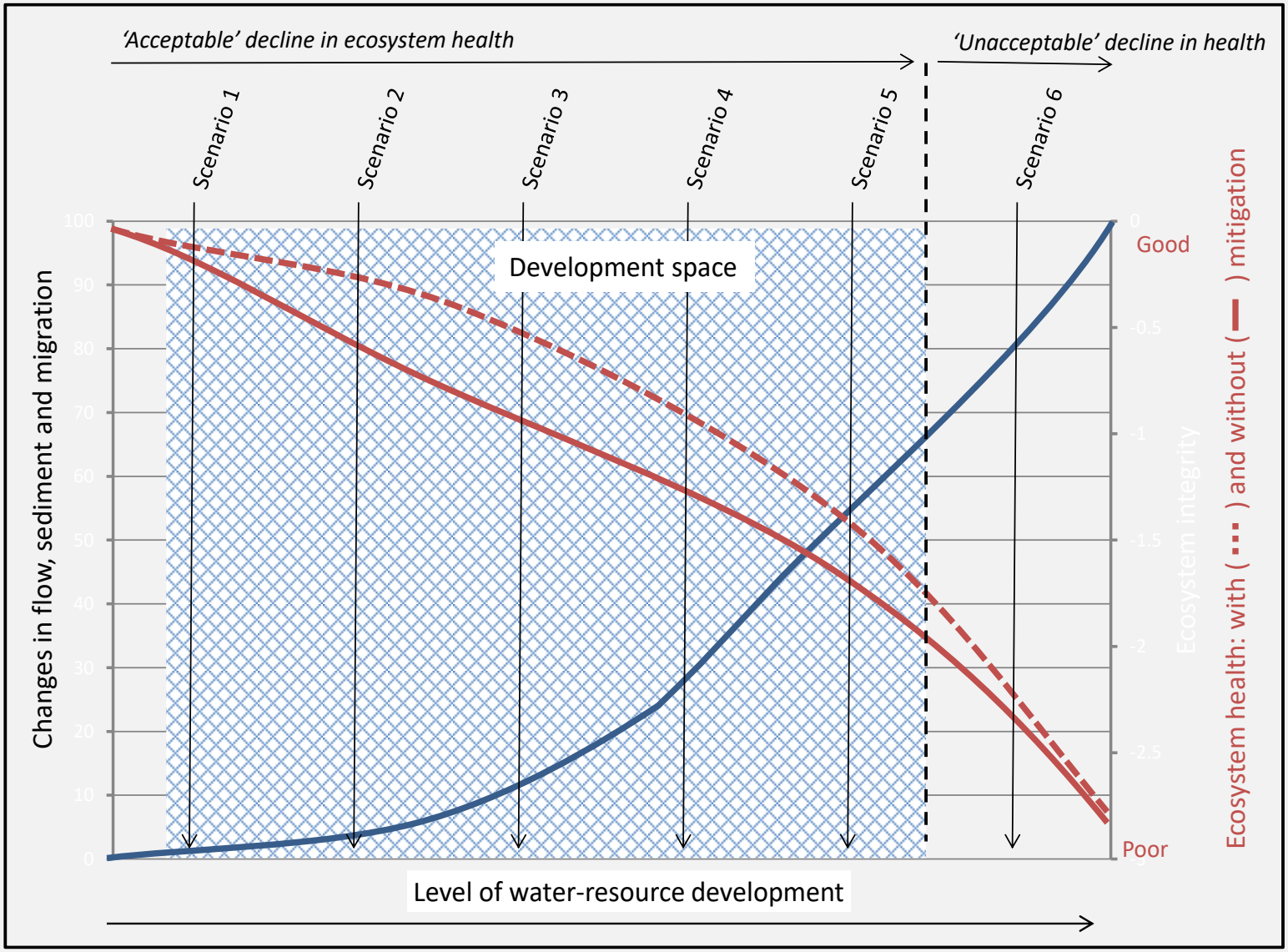
- Current health of ecosystem
- Implications of change in flows for health of river and estuary ecosystems:
  - Ecosystem services
  - Downstream implications
  - Sustainability targets
  - Biodiversity targets
- Societal decision on desired health – and EFlows to support

Approach to EFlows Assessment depends on

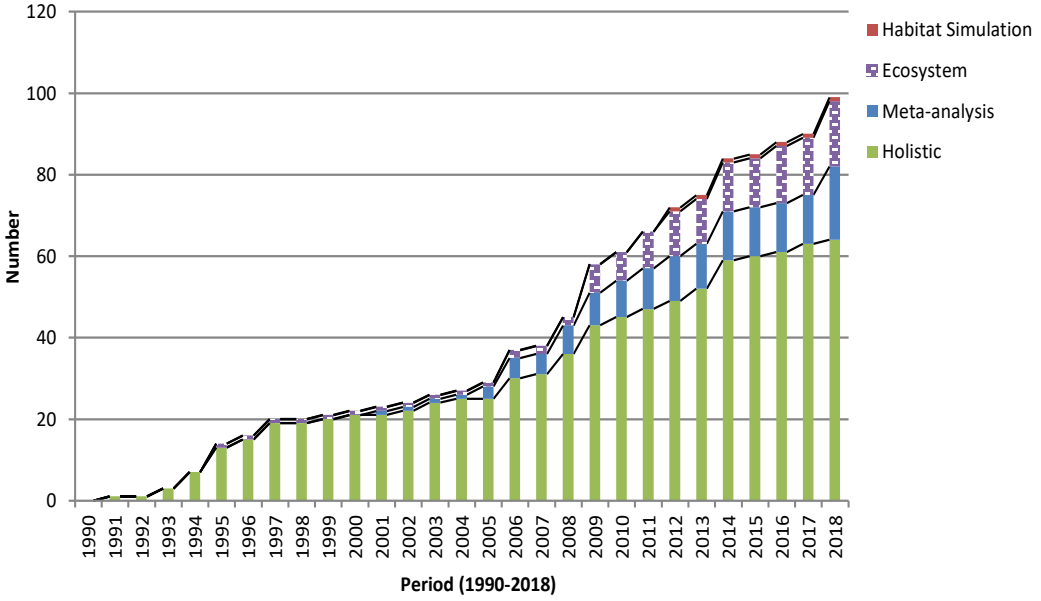
- questions being asked
- ecosystem type:
  - River channel
  - Floodplains
  - Wetlands
  - Estuaries
- data availability and capacity
- management considerations of resource use, such as:
  - land-use changes
  - sediment mining or fishing
- use of outputs:
  - inform social processes (ecosystem services)
  - inform impacts on marine ecosystems
  - Impact and sustainability assessments

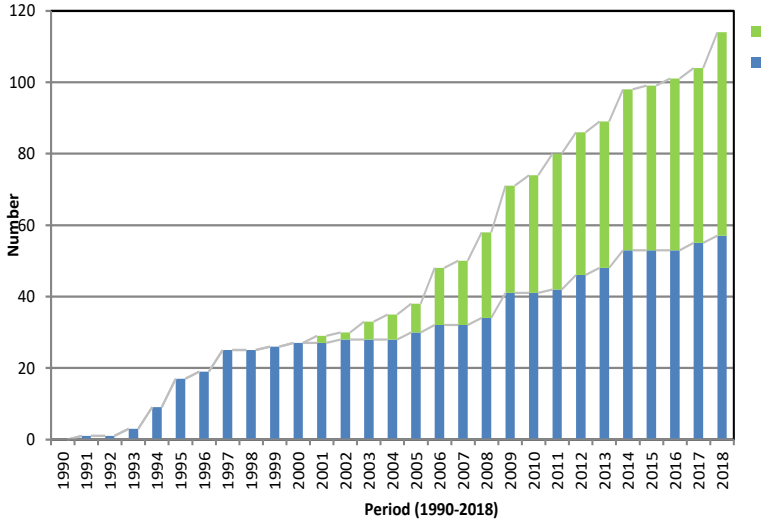
EFlows assessment methods

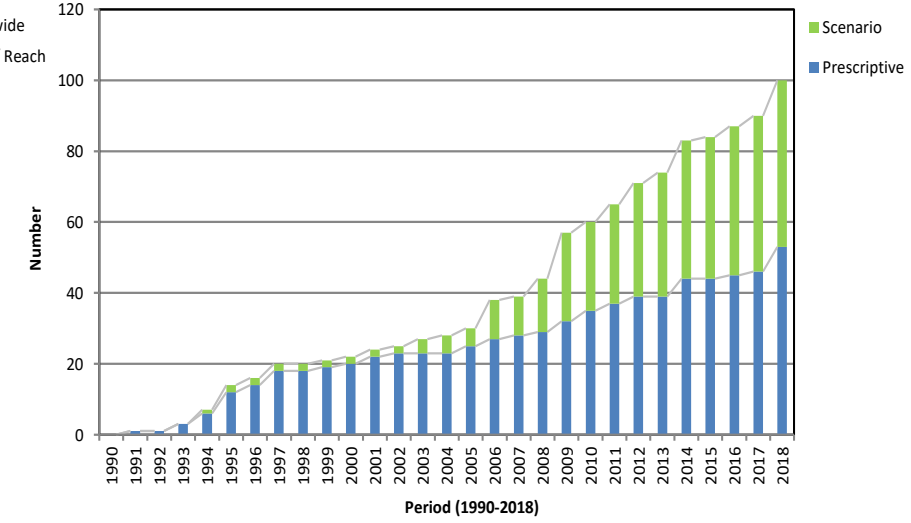



'Acceptable' decline in ecosystem health
'Unacceptable' decline in health
Scenario 1
Scenario 2
Scenario 3
Scenario 4
Scenario 5
Scenario 6
Development space
Changes in flow, sediment and migration
100
90
80
70
60
50
40
30
20
10
0
Good
-0.5
-1
-1.5
-2
-2.5
Poor
Ecosystem integrity
Ecosystem health: with (▪▪▪) and without (▬) mitigation
Level of water-resource development

Trends in WIO region







Basic steps in an EFlows Assessment

1. Nature of the assessment
2. Select an EFlows Assessment method
3. EFlows Assessment team
4. Spatial and temporal units of assessment
5. Stakeholder engagement
6. Scenarios
7. Indicators
8. Set-up and calibrate EFlows models
9. Analysis and results

Select a method

Category		Hydrological		Holistic			Ecosystem		Meta-analysis			
Examples		Tennant Method	Percentage of Flow	BBM	HSF	RSA Estuary I/C	Eco-modeller	DRIFT	Desktop Method	ELOHA	DRIFT equations	RSA Estuary DT
Criteria												
Suitability for use												
Ecosystem type	EFlows for rivers											
	EFlows for wetlands, floodplains, lakes											
	EFlows for estuaries											
Calibration	Provides data that can be used to extrapolate to other locations											
	Receives data that can be used for extrapolation											
Minimum data requirements	Monthly hydrological data											
	Daily hydrological data											
	Hydrodynamic modelling											
	Water quality (nutrients and salinity)											
Prescriptive												
Information provided	Can be used at a desktop level to provide coarse level information over large areas											
	Minimum dry season water flows to support ecosystem in a range of conditions											
	Monthly volumes of water to support ecosystem in a range of conditions											
	Relative abundance of specific habitats/species linked to a range of ecosystem conditions											
	Range for other parameters, e.g., WQ and sediments, to meet a to support ecosystem in a range of conditions											
Scenario based												
Information provided	Implication for ecosystem condition for scenarios that include effects on water discharge in specific seasons											
	Implications for ecosystem condition for scenarios that include effects on timing of flows, i.e., onset/duration											
	Implication for ecosystem condition for scenarios that include hydrological events > 1 year return period											
	Implication for ecosystem condition for scenarios that include within day flow variations, e.g., hydropeaking											
	Implication for ecosystem condition for scenarios that include water quality											
	Implication for ecosystem condition for scenarios that include volume and timing of sediment supply											
	Implication for ecosystem condition for scenarios that include barriers to migration of biota											
	Implication for ecosystem condition of revitalization to address water quality, buffer zone, harvesting, etc.											
	Semi-quantitative change in specific habitats/species for the above											

Considerations in method selection

- Cover the WHOLE river basin and outputs to the ocean
- Engage meaningfully with basin complexities
- Involve data and models as appropriate. They should be based on:
  - long-term daily hydrological time and sub-daily hydrology there are peaking HPPs
  - hydraulic and hydrodynamic modelling
  - water-quality and sediment modelling
- Include sediment, nutrient and ecosystem services
- Use either holistic or ecosystem-modelling methods
- Establish data and knowledge management protocols
- Ensure local knowledge captured and content strengthened

Sites

- River:
  - river sites as focus the social, hydrological, sedimentological, hydraulic, chemical and biological information;
    - representativity;
    - hydrological data at the required resolution;
    - location and levels of impact of developments or management interventions.
  - detailed assessment at few sites – information extrapolated using meta-analysis methods
- Estuary:
  - encompass the whole estuarine ecosystem estuaries:
    - sub-divisions, such as units of representative salinity regimes.
  - suites of estuaries along a coastline
  - detailed assessment at few estuaries – information extrapolated using meta-analysis methods
- Marine:
  - areas of river influence
  - suites of rivers and estuaries along a coastline
  - detailed assessment at few – information extrapolated

Indicators

Biophysical

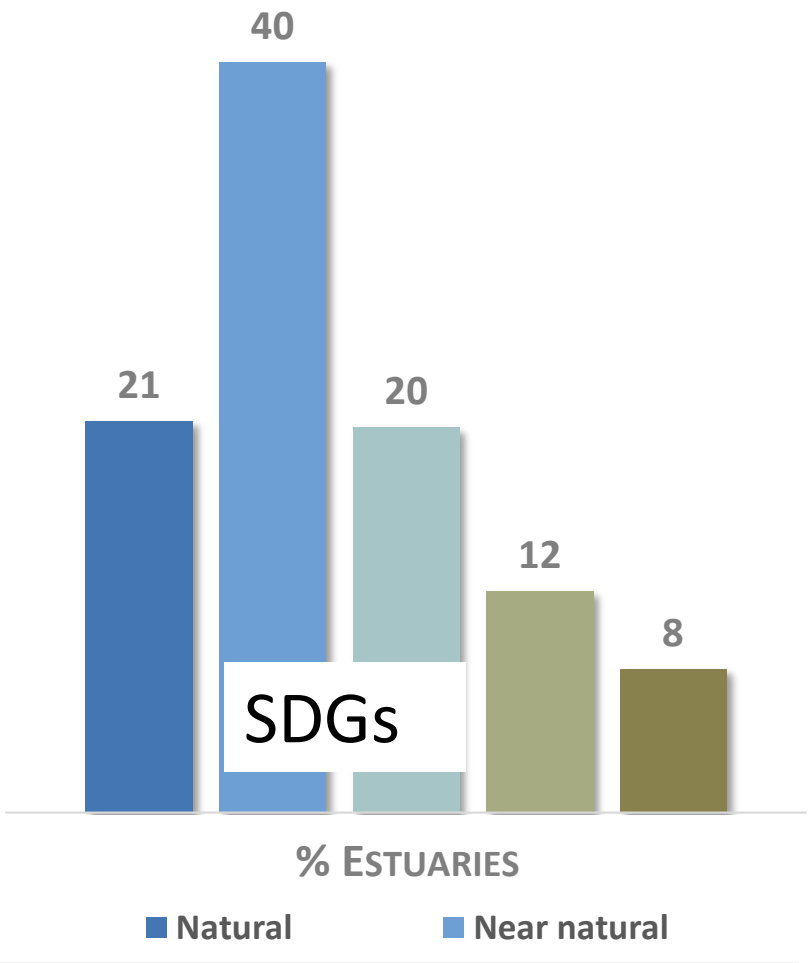
- Hydrology
- Hydraulics /Hydrodynamics
- Sediments
- Habitat
- Water quality
- Plants
- Macroinvertebrates
- Fish
- Frogs and snakes
- Crocodiles
- Hippos
- Birds

Social

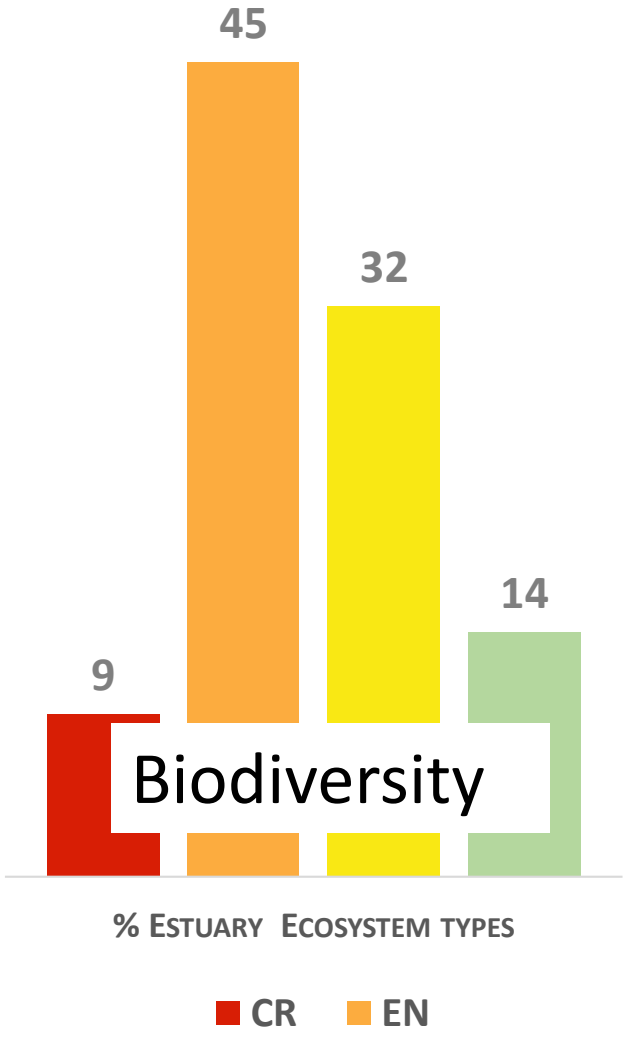
- Subsistence uses:
  - Water
  - Sediment (sand)
  - Plants
  - Animals (fish)
- Public health
- Livestock health
- Culture and recreation
- Management:
  - Harvesting pressure (fishing/sediment mining)
  - Restoration initiatives
  - Pollution

Determine condition relative to natural for all estuaries using EFlows method

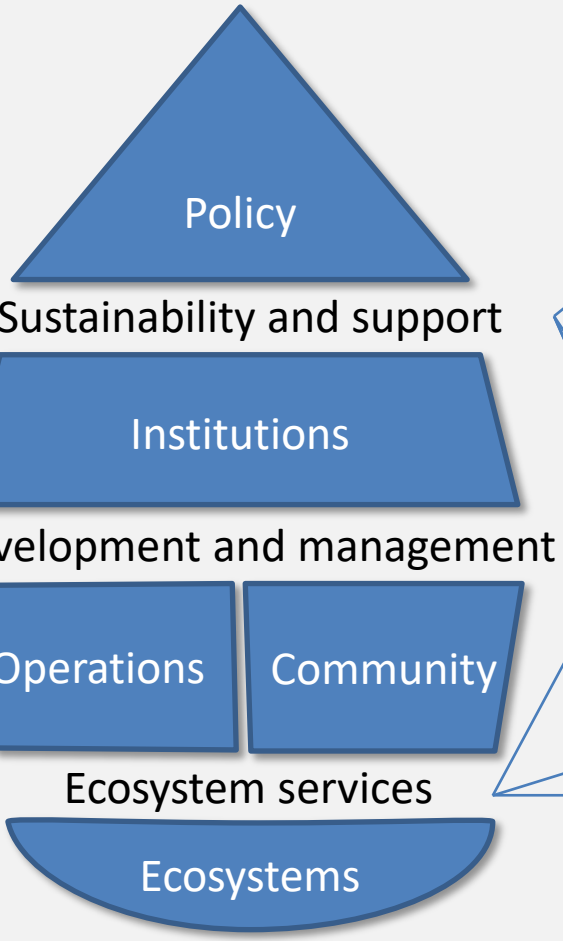
SOUTH AFRICAN ESTUARY CONDITION



IUCN RED LISTING: SA ESTUARINE ECOSYSTEM THREAT STATUS



Mainstreaming the uptake of EFlows Assessments



What flows/WQ are needed to protect?

Water available for other needs/uses?

What will happen if?

What are the trade-offs?

Tipping points?

Adaptive management options?

What services are at risk?

Catch per unit effort?

Are we meeting SDGs?

Ensuring EFlows science provides information that is USEFUL in real world

Mainstreaming …

- Identify questions and include in EFlows assessment ToR
- Allocate sufficient time for engaging AFTER technical studies
- Demonstrate valued added by EFlows Assessments
  - Mentoring
  - Cross-cutting studies to illustrate application of EFlows-related information
  - Champions to demonstrate usefulness of EFlows information (in-country)
  - Financial support mechanisms (e.g., WRC)
- Ensure technical studies generate tools for multiple uses after assessment (EFlows information systems)

UN environment
United Nations Environment Programme

THANK YOU