Accounting for ecological condition:
experience and proposed way forward

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Biodiversity Planning Forum
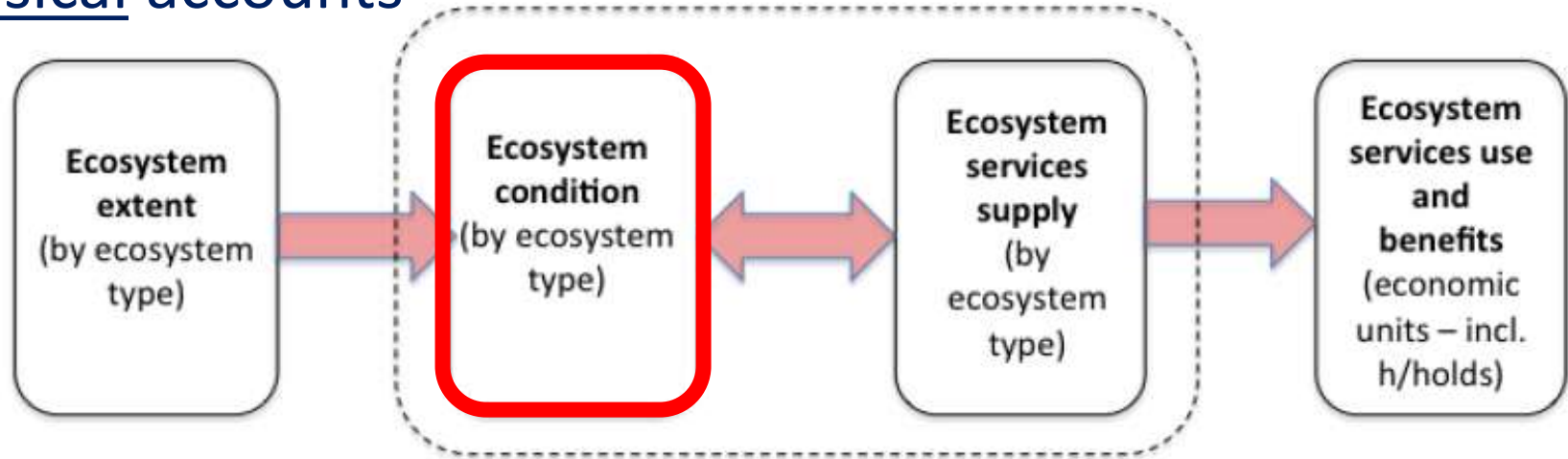Wilderness
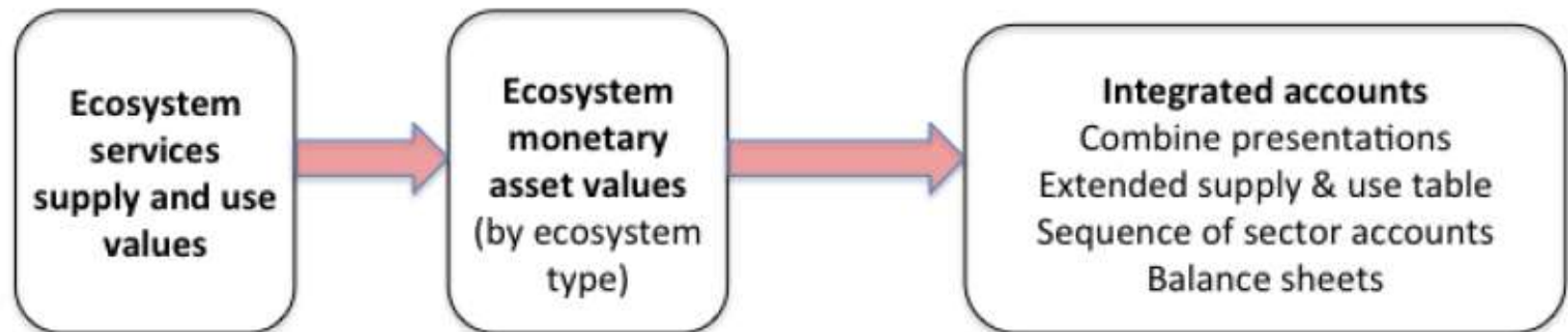7-10 June 2016

Overview of ecosystem accounts
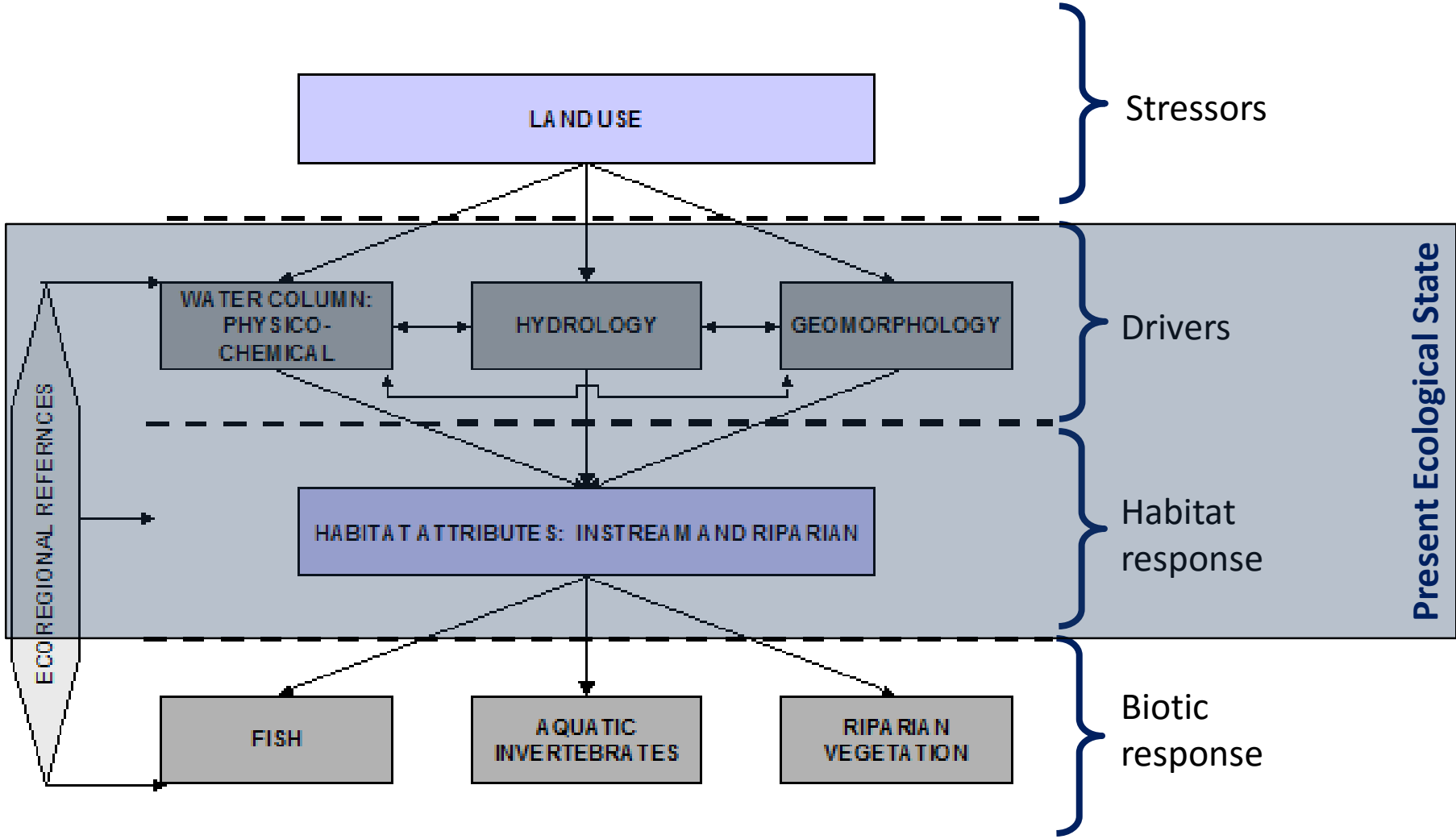
Physical accounts

Monetary accounts

Source: UNSD 2015. Technical Recommendations for Experimental Ecosystem Accounting, Consultation Draft, December 2015.
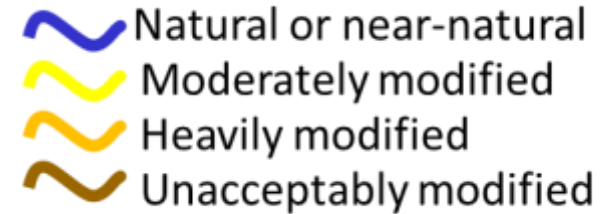
Conceptual framework for assessing river ecological condition

Categories of river ecological condition

- 6 categories; grouped to 4 for our needs
- Assessed according to reference condition

Natural or near-natural
Moderately modified
Heavily modified
Unacceptably modified

Ecological category	Description	
A	Unmodified, natural	Unmodified
B	Largely natural, few modifications	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged
C	Moderately-modified	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged
D	Largely-modified	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred
E	Seriously-modified	Loss of natural habitat, biota and basic ecosystem functions is extensive
F	Critically/Extremely-modified	System has been modified completely with an almost complete loss of natural habitat and biota.

Accounting for ecosystem condition

Based on DWS data on Present Ecological State for 1999 and 2011

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

- ## Three ways to assess condition

ECOLOGICAL CONDITION INDICATORS
e.g.
Drivers
- Flow
- Water quality

Responses
- Instream habitat
- Riparian habitat

AGGREGATED ECOLOGICAL CONDITION CATEGORY

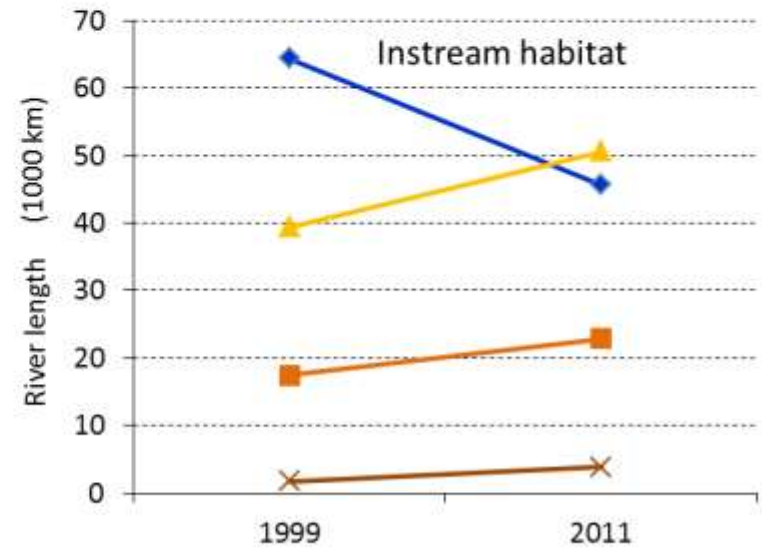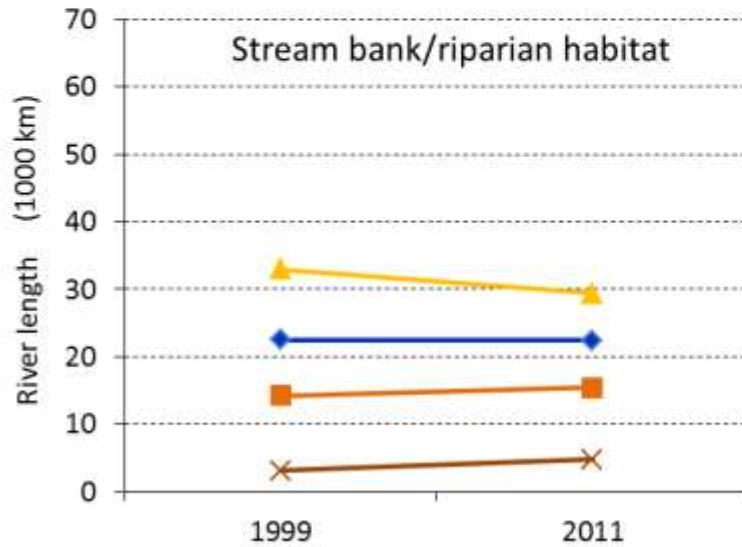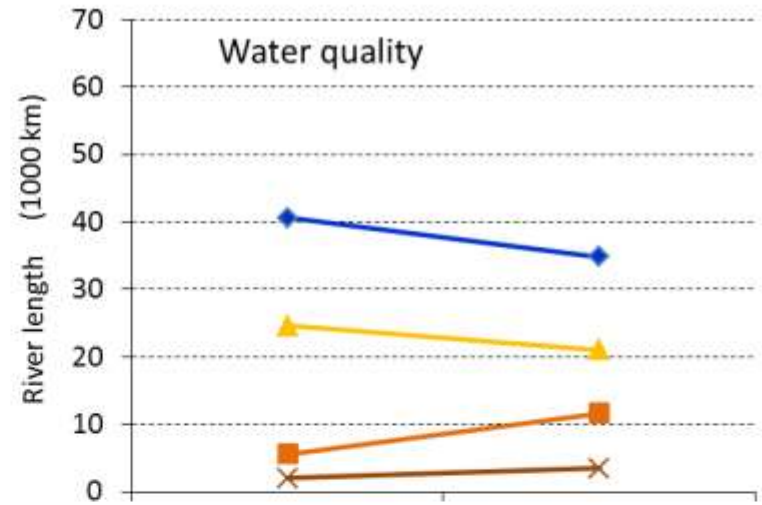→ **ECOLOGICAL CONDITION INDEX**

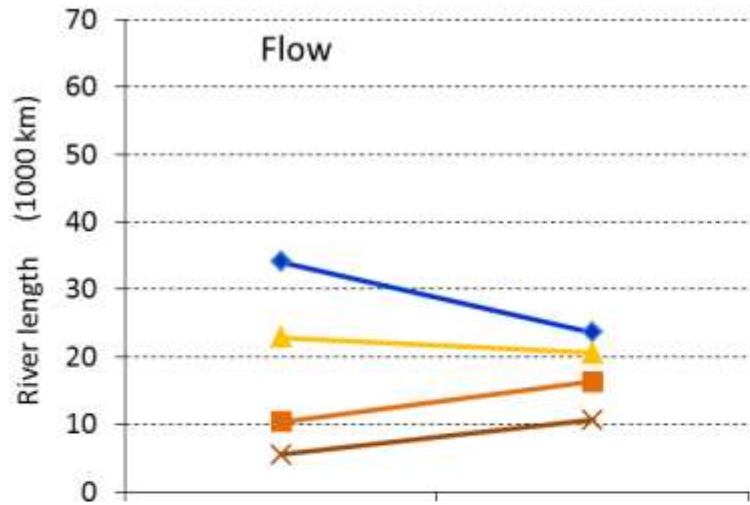(for main rivers only)   (for all rivers)   (for all rivers)
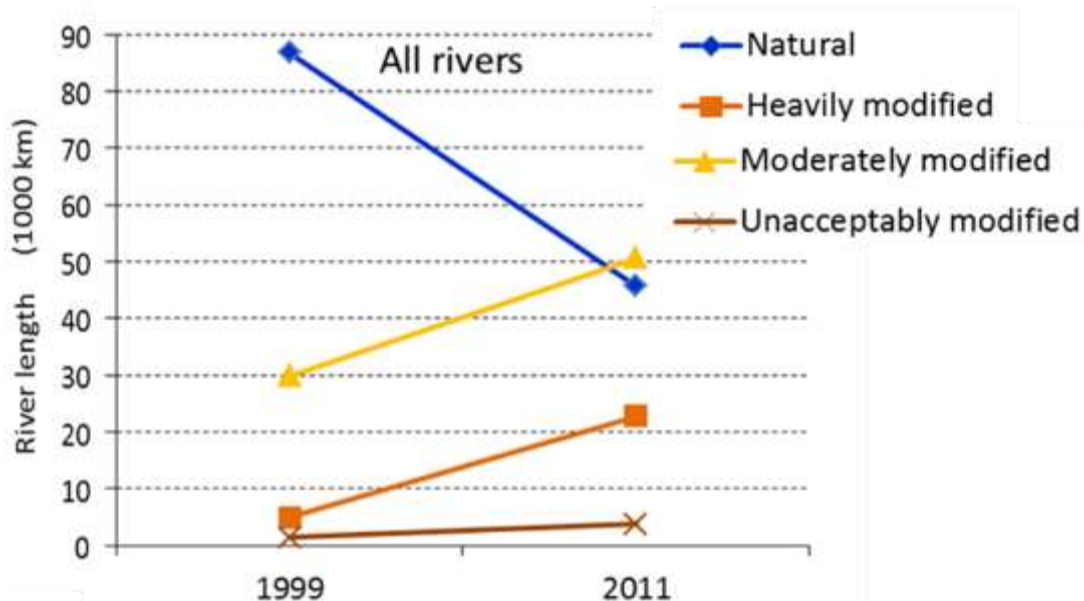
Ecological condition indicators, 1999-2011
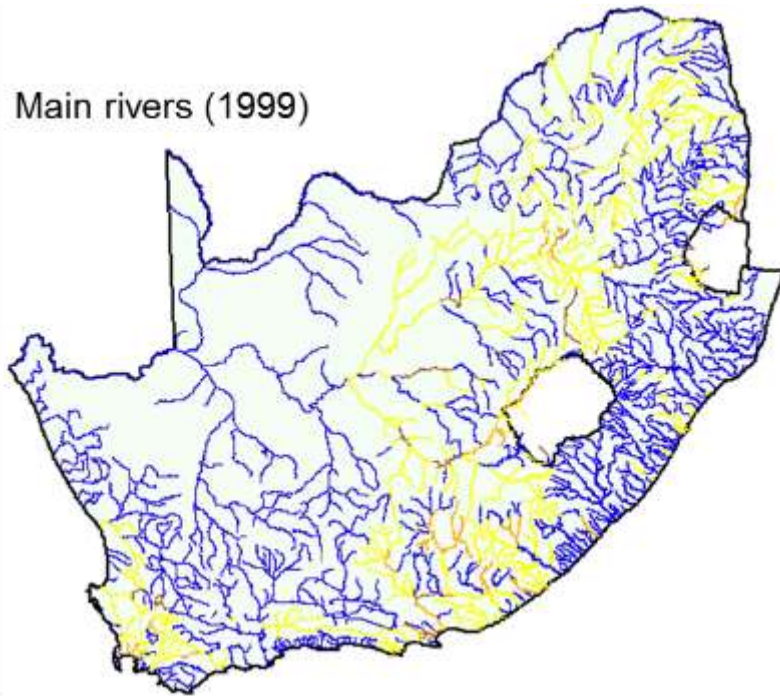

(main rivers)

Aggregated ecological condition category, 1999-2011

| Kilometres | Degree of modification from natural | | | | | Total |
	Natural	Moderately modified	Heavily modified	Unaccept-ably modified	No Data	
ALL RIVERS						
Opening stock 1999	86 835	29 784	4 875	1 354	40 684	163 533
Opening stock as a % total river length	53	18	3	1	25	100
Increase/decreases	-41 163	20 806	17 935	2 422		
Increases/decreases as % opening stock	-47	70	368	179		
Opening stock 2011	45 673	50 591	22 810	3 776	40 684	163 533
Opening stock as a % total river length	28	31	14	2	25	100

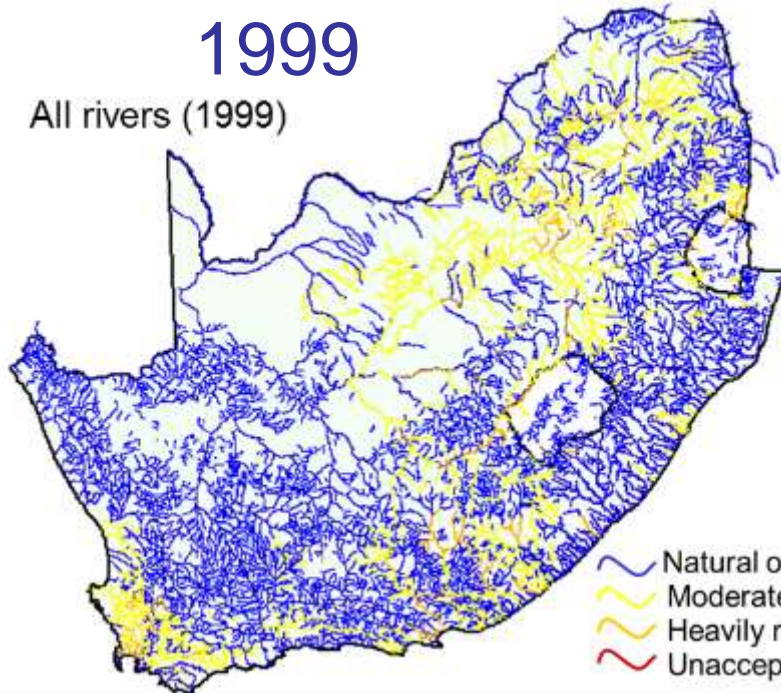Aggregated ecological condition category

Main rivers (1999)

Main rivers (2011)
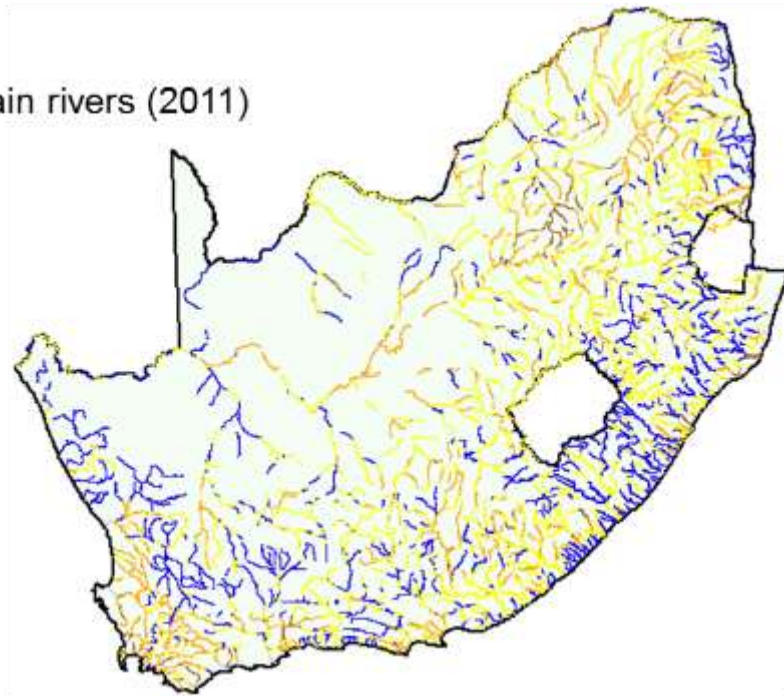
1999

2011

All rivers (1999)

All rivers (2011)
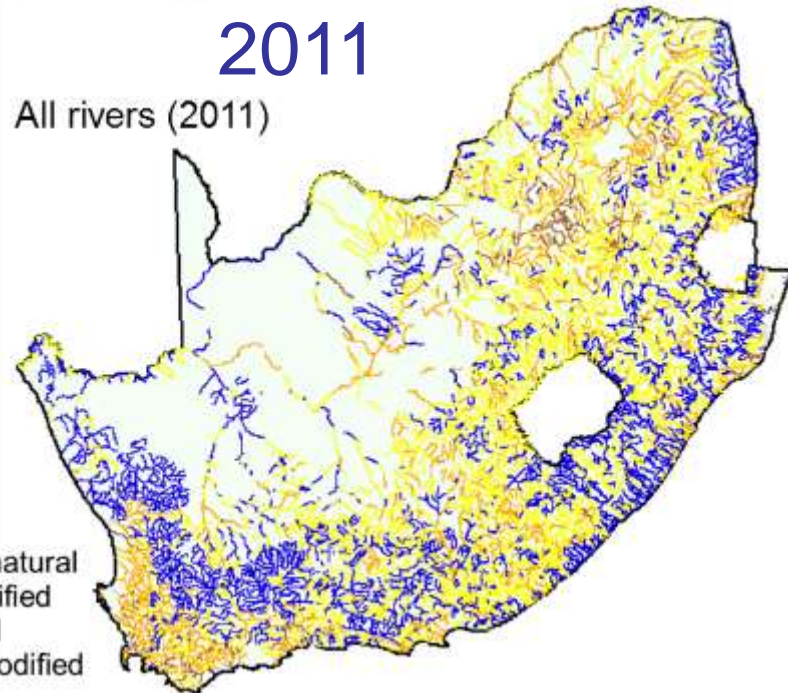
Natural or near-natural
Moderately modified
Heavily modified
Unacceptably modified

From aggregated ecological condition category to **Ecological Condition Index**

Express aggregated ecological condition as a number between 0-100

Calculate % river length in each aggregated ecological condition category

Multiply

Length-weighted score for rivers in each aggregated ecological condition category

Add

Ecological Condition Index
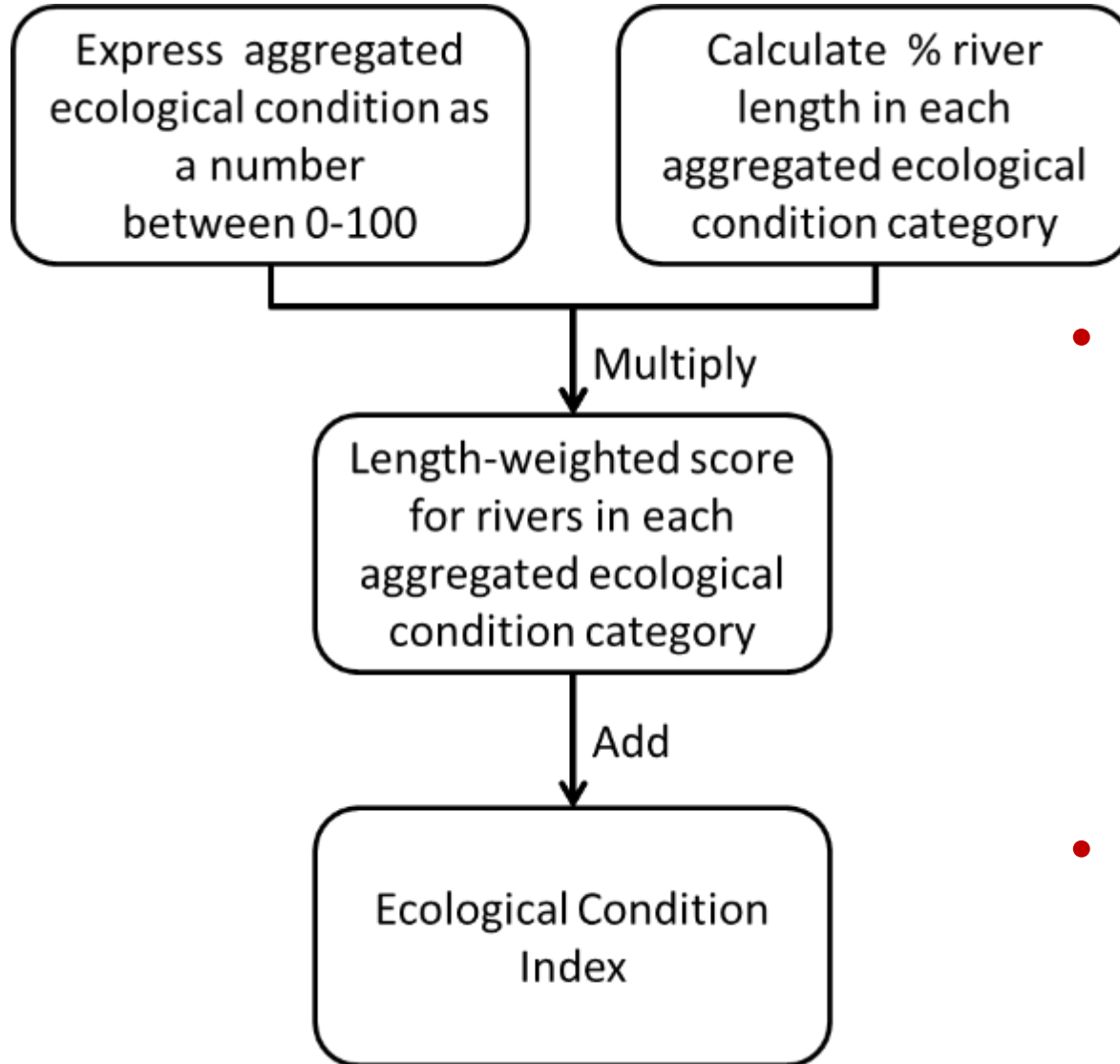
- A single integrated index to indicate ecological condition in a simple but ecologically relevant way

- Scaleable
  - can do for any particular area

Ecological Condition Index

	Main rivers	Tributaries	All rivers
1999	81.3	84.9	82.8
2011	70.1	75.2	72.2
Change between 1999 and 2011	-11.2	-9.7	-10.6
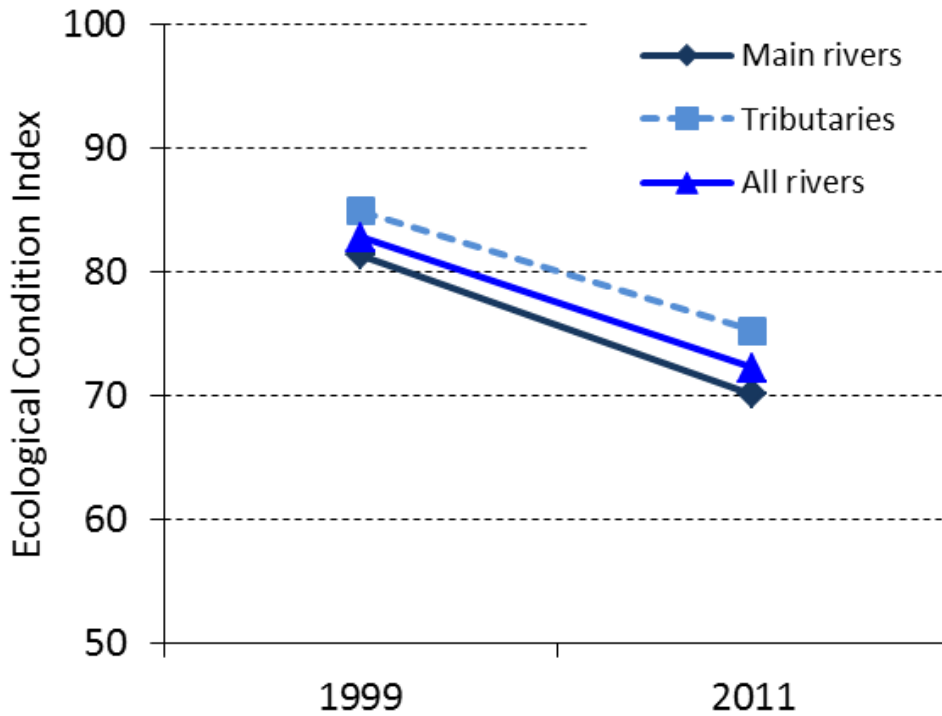
Overall **10% decline** in ecological condition of rivers 1999 - 2011

Data limitations

- Commitment to time series!

- Expert judgement bias

- Changes in methodology
  - Different thresholds, indicators, methods of assessment

- Non-contiguous condition scores

- Scale of assessing ecological condition
  - Site-based vs catchment impacts

Key recommendations to UNSD

- Select 4-6 indicators of ecological condition for each realm that can be aggregated to an overall index of ecological condition

- Indicators should ideally reflect a combination of:

  - **System drivers** (e.g. land cover, hydrology, harvesting)

  - **Habitat attributes** (e.g. fragmentation, instream siltation)

  - **Biological responses** (e.g. species population level, species richness)

- Assess according to a reference condition, or at least a baseline condition, preferably on a contiguous scoring system (0-100)

- Indicator selection may eventually depend partly on data availability, but this should not be driven by it

- No single set of indicators for *all* realms

  - But may have some common indicators

Examples of ecosystem condition tables.....

Terrestrial

Ecosystem type	Indicators of ecological condition – possible examples				Overall index of ecological condition
	Habitat modification/ intensity of land-use indicator(s) (e.g. loss of natural vegetation, density of invasive species, quantity of irrigation, quantity of fertilizer, density of livestock)	Fragmentation-related indictor(s) (there are many possible ways to measure fragmentation)	Soil-related indicator(s) (e.g extent of erosion gullies and rills, sediment loss or accumulation, soil chemistry (pH, salinization), extent of tillage)	Species-related indicator(s) (e.g. loss of keystone species, loss of palatable species, reduced populations of harvested species, loss of species richness)	
e.g. Grassland					
Savannah					
Forest					
Desert					
…					

Rivers

Ecosystem type	Indicators of ecological condition – possible examples					Overall index of ecological condition
	Hydrological modification Indicators (e.g. quantity, timing, velocity of flow)	Water quality indicator(s) (e.g. pH, turbidity, electrical conductivity levels of phosphate/ nitrogen/ oxygen)	Instream habitat modification indicator(s) (e.g. sediment overload, channelisa-tion, temperature changes)	Riparian habitat modification indicator(s) (e.g. bank stability, loss of natural vegetation in riparian buffer, density invasive alien plants in riparian buffer)	Species-related indicator(s) (e.g. loss of sensitive species, loss of species richness, reduced populations of harvested species)	
e.g. Mountain streams						
Foothill streams						
Lowland rivers						
…						

Wetlands

Ecosystem type	Indicators of ecological condition – possible examples					Overall index of ecological condition
	Hydrological modification indicators (quantity, timing velocity)	Water quality indicator(s)	Habitat modification land-use intensity indicator(s)	Species-related indicator(s)	…	
e.g. Lakes						
Seeps						
Floodplain wetlands						
Valley-bottom wetlands						
…						

Coastal ecosystems

Ecosystem type	Indicators of ecological condition – possible examples					Overall index of ecological condition
	Habitat modification/ land-use intensity indicator(s)	Harvesting pressure indicator(s)	Freshwater inputs	Species-related indicator(s)	…	
e.g. Estuaries and lagoons						
Sandy beaches						
Rocky shores						
Coastal dunes						
…						

Marine ecosystems

Ecosystem type	Indicators of ecological condition – possible examples					Overall index of ecological condition
	Harvesting pressure indicator(s)	Habitat modification indicator(s)	Species-related indicator(s)	…	…	
e.g. Reefs						
Soft shelf						
Rocky shelf						
Deep-sea sediment						
Sea mounts						
Pelagic ecosystems						
…						

may need different indicators for inshore and offshore ecosystems, and for pelagic and benthic ecosystems

Thank you!