

Experimental ecosystem accounting for South Africa's estuaries:

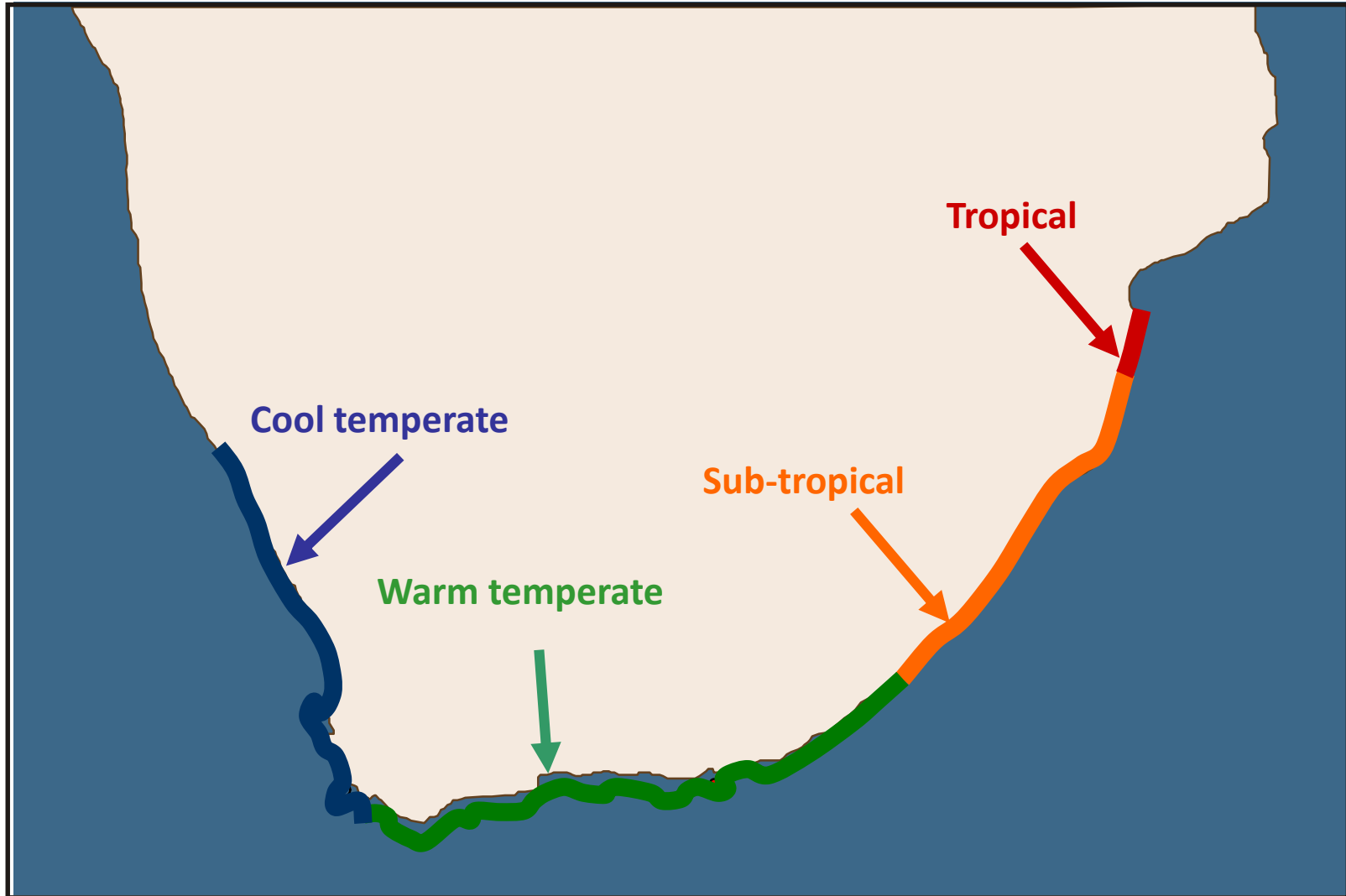
Extent and Condition Accounts (Physical)

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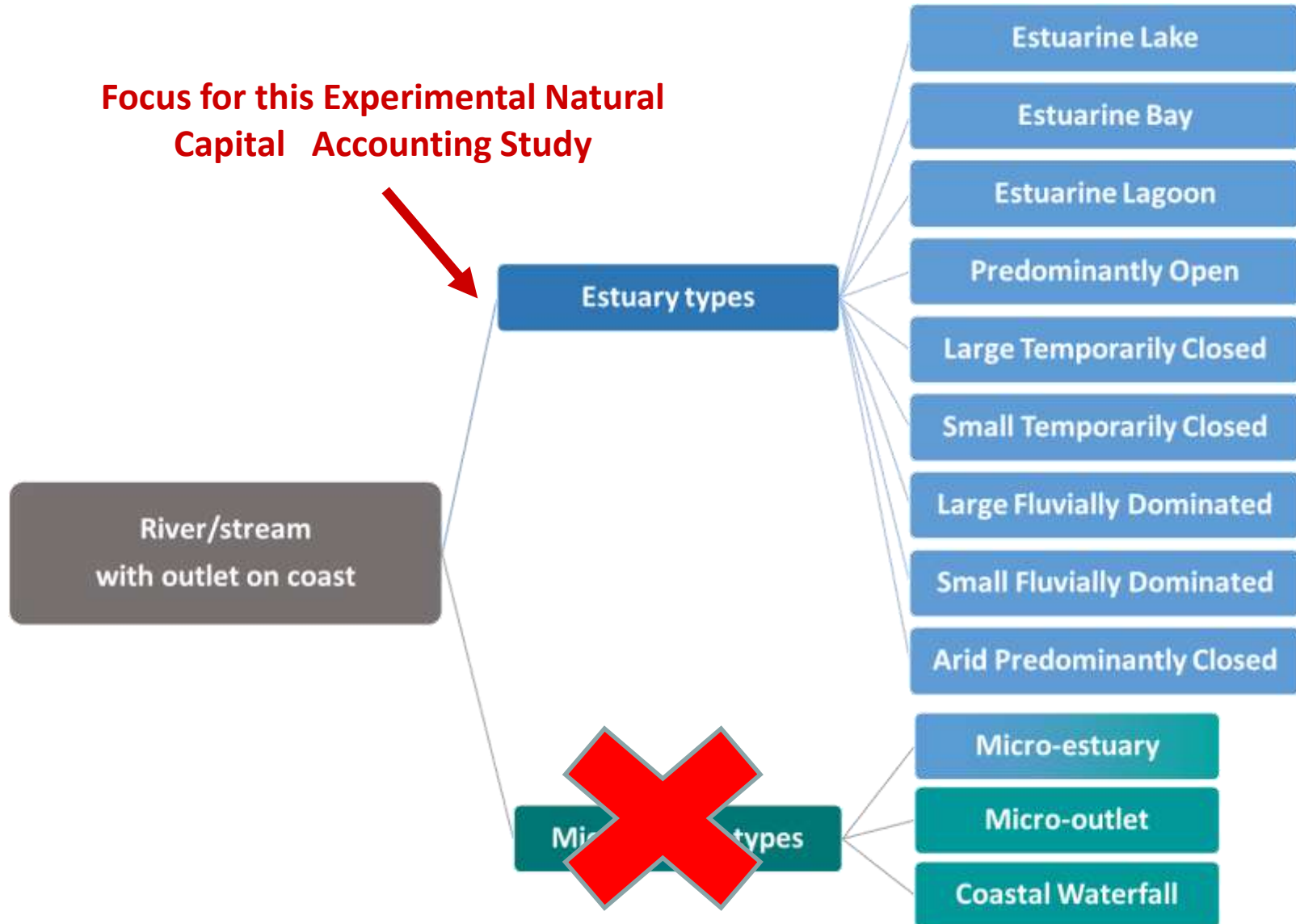
Overview of South Africa's Estuaries

- South Africa's coastal zone comprises 4 biogeographical regions



Overview of South Africa's Estuaries *continued...*

- Supports ~290 functional estuaries and ~42 micro-tidal systems



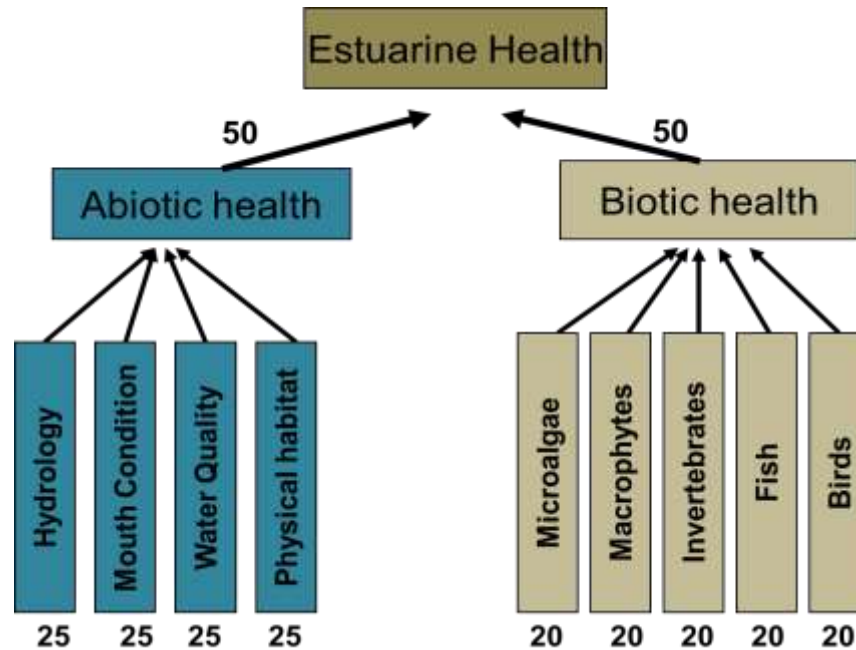
Overview of South Africa's Estuaries *continued...*

- Boundaries demarcated by **Estuarine Functional Zone** (expressed in ha)



Overview of South Africa's Estuaries *continued...*

- Identified 4 abiotic and 5 biotic **estuarine indicators** to express estuarine condition (as applied in resource classification and NBA assessment)



- Using an **Estuarine Health Index scoring system**

Similarity to Natural	≥91%	90-75	75 - 61	60 - 41	40-21	≤20
Condition Category	A	B	C	D	E	F
State	Natural	Near Natural	Moderately modified	Severely modified	Seriously/critically modified	

Experimental Accounting for Estuaries

- **Ecosystem Pressure Accounts (measure of sources of change)**
 - Human activities
 - Alien invasions
- **Ecosystem-scale Extent Accounts (use EFZ as currency)**
- **Ecosystem-scale Condition Accounts (% of EFZ)**
 - Biogeographical region
 - Ecosystem types
 - Ecological indicators
- **Estuarine Habitat Accounts (extent and condition)**
 - Botanical habitat
- **Estuarine Species Accounts (extent and condition)**
 - Important fisheries species



Estuarine Pressure Account

Pressure	Extent	# Estuaries Affected	Condition resulting from pressure (# of estuaries)			
			L	M	H	VH
<u>Opening (Reference ~1750):</u>						
Water Resource Development (x10 ⁶ m ³ /a)	0	0	0	0	0	0
Fishing (t/a)	0	0	0	0	0	0
Wastewater (m ³ /day)	0	0	0	0	0	0
Artificial breaching	0	0	0	0	0	0
<u>Increase/Decrease:</u>						
<i>Water Resource Development (x10⁶ m³/a)</i>	<i>12 064</i>	<i>290</i>	<i>195</i>	<i>40</i>	<i>31</i>	<i>24</i>
<i> Fishing (t/a)</i>	<i>2 770</i>	<i>290</i>	<i>176</i>	<i>53</i>	<i>44</i>	<i>17</i>
<i> Wastewater (m³/day)</i>	<i>839 837</i>	<i>42</i>	<i>7</i>	<i>4</i>	<i>9</i>	<i>22</i>
<i> Artificial breaching</i>	<i>-</i>	<i>45</i>	<i>14</i>	<i>14</i>	<i>8</i>	<i>9</i>
<u>Closing (2018):</u>						
Water Resource Development (x10 ⁶ m ³ /a)	12 064	290	195	40	31	24
Fishing (t/a)	2 770	290	176	53	44	17
Wastewater (m ³ /day)	839 837	42	7	4	9	22
Artificial breaching	-	45	14	14	8	9

Ecosystem-scale Extent Account

Ecosystem Type	EFZ (x ha)	Extent across Biogeographical Regions (Estuarine Functional Zone [ha])			
		Cool Temperate	Warm Temperate	Sub-tropical	Tropical
Opening (Reference ~1750):	200 736	37 677	44 501	110 392	8 166
Estuarine Lake	111 657	7 238	14 389	81 864	8 166
Estuarine Bay	5 826	0	3 011	2 815	0
Estuarine Lagoon	6 016	6 016	0	0	0
Predominantly Open	40 924	15 455	17 782	7 687	0
.....					
<i>Anthro. expansion/regression:</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
<i>Estuarine Lake</i>	<i>-11 996</i>	<i>0</i>	<i>0</i>	<i>-11 996</i>	<i>0</i>
<i>Estuarine Bay</i>	<i>+6 354</i>	<i>0</i>	<i>0</i>	<i>+6 354</i>	<i>0</i>
<i>Estuarine Lagoon</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
<i>Predominantly Open</i>	<i>+5 642</i>	<i>0</i>	<i>0</i>	<i>+5 642</i>	<i>0</i>
.....	<i>0</i>	<i>0</i>	<i>0</i>	<i>-11 996</i>	<i>0</i>
Closing (2018):	200 736	37 677	44 501	110 392	8 166
Estuarine Lake	99 661	7 238	14 389	69 868	8 166
Estuarine Bay	12 180	0	3 011	9 169	0
Estuarine Lagoon	6 016	6 016	0	0	0
.....					

Estuarine Condition Account – Biogeographical Region

Bioregion	EFZ (x ha)	Condition Distribution (% as EFZ area in region)				
		Natural	Near-Natural	Moderate modified	Heavily modified	Critically modified
Opening (Reference ~1750):	200 736	100	0	0	0	0
Cool Temperate	37 677	100	0	0	0	0
Warm Temperate	44 501	100	0	0	0	0
Subtropical	110 392	100	0	0	0	0
Tropical	8 166	100	0	0	0	0
<i>Increase/Decrease:</i>		<i>-94.7</i>	<i>+17.3</i>	<i>+15.2</i>	<i>+57.6</i>	<i>+4.5</i>
<i>Cool Temperate</i>		<i>-99.6</i>	<i>+17.1</i>	<i>+50.7</i>	<i>+25.5</i>	<i>+6.3</i>
<i>Warm Temperate</i>		<i>-96.1</i>	<i>+41.2</i>	<i>+17.9</i>	<i>+35.7</i>	<i>+1.3</i>
<i>Subtropical</i>		<i>-98.7</i>	<i>+8.3</i>	<i>+3.1</i>	<i>+81.7</i>	<i>+5.5</i>
<i>Tropical</i>		<i>-10.2</i>	<i>+10.2</i>	<i>0</i>	<i>0</i>	<i>0</i>
Closing (2018):	200 736	5.3	17.3	15.2	57.6	4.5
Cool Temperate	37 677	0.4	17.1	50.7	25.5	6.3
Warm Temperate	44 501	3.9	41.2	17.9	35.7	1.3
Subtropical	110 392	1.3	8.3	3.1	81.7	5.5
Tropical	8 166	89.8	10.2	0.0	0.0	0.0

Estuarine Condition Account – Ecosystem Type

Ecosystem Type	EFZ (x 10 ⁶ ha)	Condition Distribution (% EFZ are in Type)				
		Natural	Near-Natural	Moderate modified	Heavily modified	Critically modified
Opening (Reference ~1750):	200 736	200 736	0	0	0	0
Estuarine Lake	111 657	111 657	0	0	0	0
Estuarine Bay	5 826	5 826	0	0	0	0
Estuarine Lagoon	6 016	6 016	0	0	0	0
Predominantly Open	40 924	40 924	0	0	0	0
...						
<i>Increase/Decrease:</i>		<i>-94.7</i>	<i>+17.3</i>	<i>+15.2</i>	<i>+57.6</i>	<i>+4</i>
<i>Estuarine Lake</i>		<i>-93.4</i>	<i>+2.7</i>	<i>+5.1</i>	<i>+83.6</i>	<i>+2</i>
<i>Estuarine Bay</i>		<i>-100</i>	<i>+51.7</i>	<i>0</i>	<i>0</i>	<i>+48.3</i>
<i>Estuarine Lagoon</i>		<i>-100</i>	<i>+100</i>	<i>0</i>	<i>0</i>	<i>0</i>
<i>Predominantly Open</i>		<i>-98.2</i>	<i>+35.1</i>	<i>+48.9</i>	<i>+11.5</i>	<i>+2.7</i>
...						
Closing (2018):	200 736	5.3	17.3	15.2	57.6	4
Estuarine Lake	111 657	6.6	2.7	5.1	83.6	2.0
Estuarine Bay	5 826	0.0	51.7	0.0	0.0	48.3
Estuarine Lagoon	6 016	0.0	100.0	0.0	0.0	0.0
Predominantly Open	40 924	1.8	35.1	48.9	11.5	2.7
...						

Estuarine Condition Account – Ecological Indicators

Indicator	EFZ (x 10 ⁶ ha)	Condition Distribution (% EFZ area)				
		Natural	Near-Natural	Moderately modified	Heavily modified	Critically modified
Opening (Reference ~1750):						
Abiotic Components	200 736	100	0	0	0	0
Microalgae	200 736	100	0	0	0	0
Macrophytes	200 736	100	0	0	0	0
Invertebrates	200 736	100	0	0	0	0
Fish	200 736	100	0	0	0	0
Birds	200 736	100	0	0	0	0
<i>Increase/Decrease:</i>						
Abiotic Components		-90	+15	+25	+45	+5
Microalgae		-95	+15	+25	+14	+41
Macrophytes		-99	+18	+42	+21	+18
Invertebrates		-98	+14	+13	+26	+46
Fish		-100	+4	+13	+61	+21
Birds		-93	+19	+16	+44	+15
Closing (2018):						
Abiotic Components	200 736	10	15	25	45	5
Microalgae	200 736	5	15	25	14	41
Macrophytes	200 736	1	18	42	21	18
Invertebrates	200 736	2	14	13	26	46
Fish	200 736	0	4	13	61	21
Birds	200 736	7	19	16	44	15

Habitat Extent Accounts: Botanical Habitat

Habitat	Total Area (ha)	Habitat Extent per Region (ha)			
		Cool Temperate	Warm temperate	Sub-tropical	Tropical
Opening (1930/40s):	24 496				
Mangroves	1 576				
Intertidal saltmarsh	5 354				
Supratidal saltmarsh	15 051	No data to populate per region			
Submerged macrophytes	2 515				
Reeds & sedges	-				
<i>Anthro. expansion/regression</i>	-5 631				
<i>Mangroves</i>	+ 96				
<i>Intertidal saltmarsh</i>	- 568				
<i>Supratidal saltmarsh</i>	- 4 979				
<i>Submerged macrophytes</i>	- 180				
<i>Reeds & sedges</i>	-				
Closing (2018):	36 409	9 463	6 329	13 268	7 350
Mangroves	1 672	0	25	1 577	71
Intertidal saltmarsh	4 786	2 339	1 887	502	58
Supratidal saltmarsh	10 072	2 704	837	229	6 302
Submerged macrophytes	2 695	593	939	488	675
Reeds & sedges	17 184	3 827	2 641	10 472	244

Species Accounts: Fisheries species

Stock Status	Important Fish Species			
	Grunter	Dusky kob	Steenbras	Mullet
<u>Distribution range (extent):</u>	CT/WT/ST/T	CT/WT/ST/T	CT/WT/ST/T	CT/WT/ST/T
Opening (Reference ~1750):				
Functional nursery area (%)	100	100	100	100
Recruitment signal (%)	100	100	100	100
High fishing pressure (estuarine) (%)	0	0	0	0
National stock status	-	-	-	-
IUCN threat status	Least Concern	Least Concern	Least Concern	Least Concern
Closing (2018):				
Functional nursery area (%)	24	22	80	32
Recruitment signal (% MAR)	80	66	54	66
High fishing pressure (nursery area) (%)	94	92	70	91
National stock status	Collapsed	Critical	Collapsed	Over-exploit
IUCN threat status	Vulnerable	Crit. Endanger	Endangered	Least Concern
<i>Increase/Decrease:</i>				
Functional nursery area (%)	-76	-78	-20	-68
Recruitment signal (%)	-20	-34	-46	-34
High fishing pressure (% estuarine area)	+94	+92	+70	+91
National threat status	↓	↓	↓	↓
IUCN threat status	↓	↓	↓	→

Stephen Lamberth, DEFF

Way Forward

- Collaborate with NMU (Janine Adams) on refining habitat /carbon account, e.g. working in SA carbon sequestration values
- DEFF (Stephen Lamberth) on Fish Species Account
- Strengthen links to Monetary Accounts
- Learn from Marine & Coastal Ecosystem Accounts
- We developed **South African Estuarine Ecosystem Condition Index to track overarching change:**

South African Estuarine Ecosystem Index = 59

South African Estuarine Ecosystem Index = 65 (without St Lucia)

South African Estuarine Ecosystem Index = 63 (weight by type)

- Protected Areas Account & Look at links to Climate Change?

Thank you

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