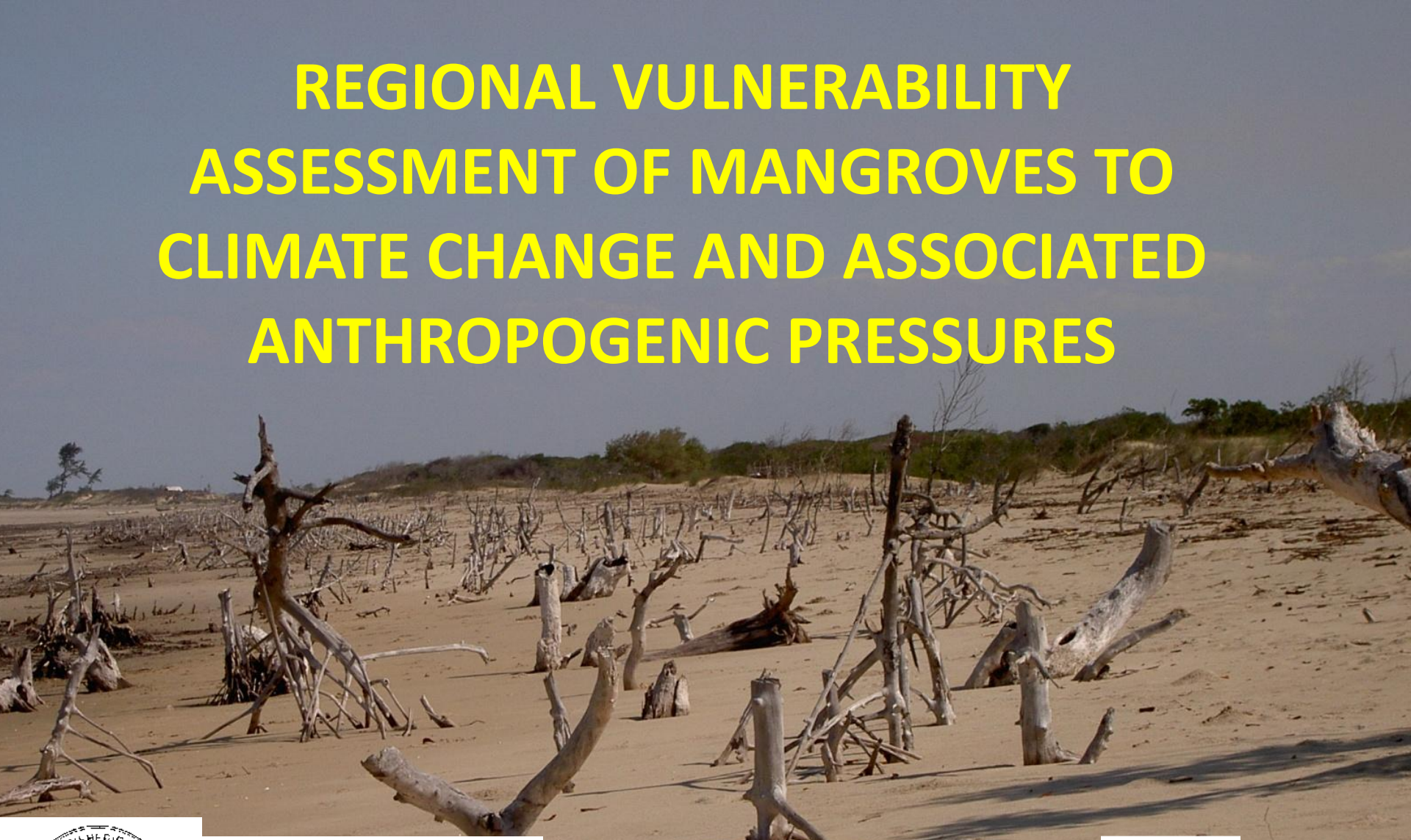
REGIONAL VULNERABILITY ASSESSMENT OF MANGROVES TO CLIMATE CHANGE AND ASSOCIATED ANTHROPOGENIC PRESSURES



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WWF

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ADVANCING KNOWLEDGE, CREATING FUTURES
1961 50th Anniversary 2011
KUKUZA MAARIFA, KUJENGA MUSTAKABALI
CHUO KIKUU CHA DAR ES SALAAM

SCIENTIFIC TEAM

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OUTLINE

- *Regional perspective*
- *Management challenges*
- *Climate change and mangroves*
- *Expert process*
- *Sectors*
- *Variables/Conceptual model*
- *Vulnerability outputs*

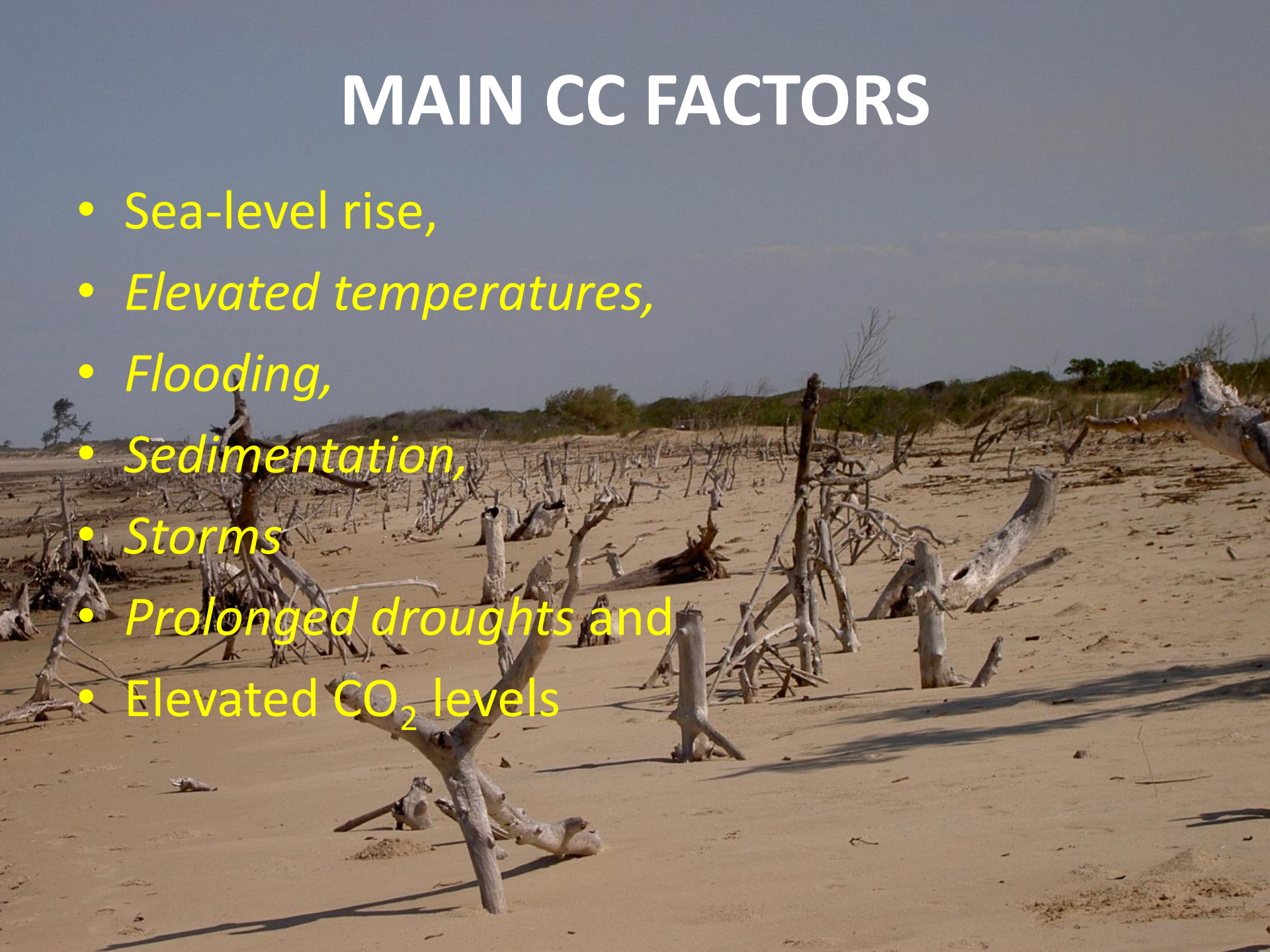
Regional perspective

- 5% of global mangrove
  - R. Rufiji (Tz)
  - Lamu (Ke)
  - Zambezi & Limpopo (MZ)
  - the West coast of Madagascar at Mahajanga, Nosy be and Hahavavy
- 9 species, (Rhizophora, Ceriops and Avicennia dominant)

Regional Mangrove Management Challenges

MAIN CC FACTORS

- Sea-level rise,
- *Elevated temperatures,*
- *Flooding,*
- *Sedimentation,*
- *Storms*
- *Prolonged droughts* and
- Elevated CO_2 levels



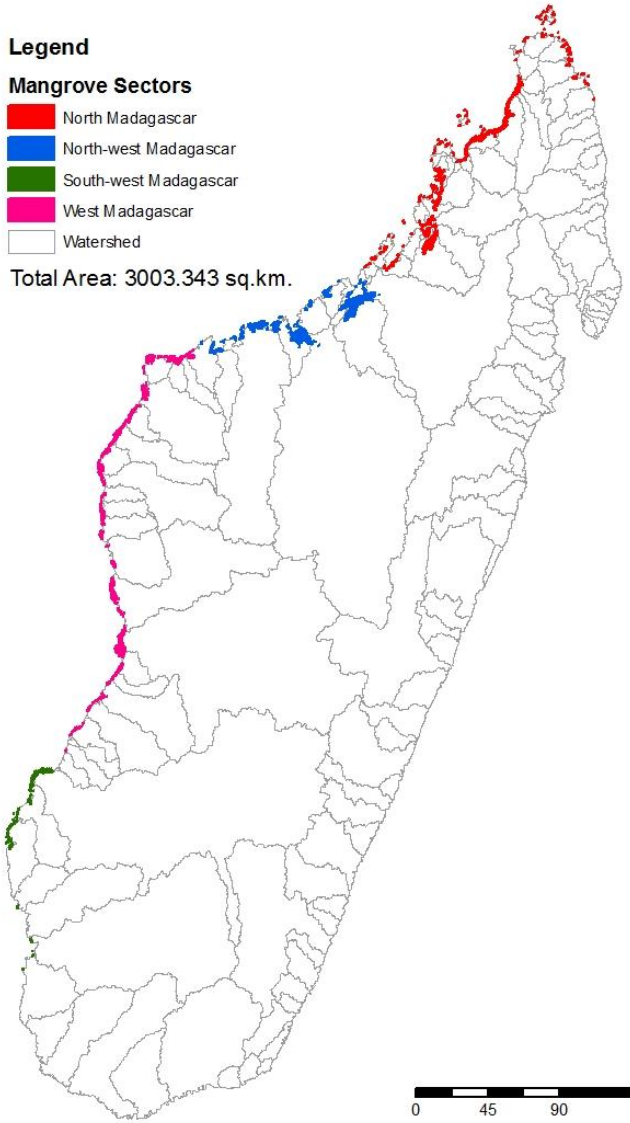
ECOSYSTEM IMPACTS

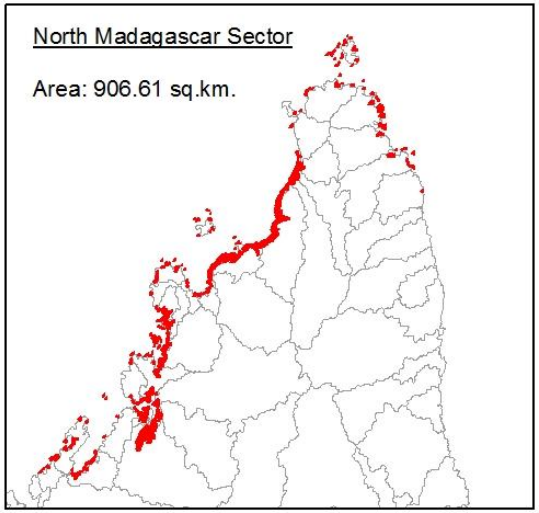
- ***Single factor impact unrealistic***
- ***Climate change factors will interact with associated anthropogenic pressures to influence health of mangroves***

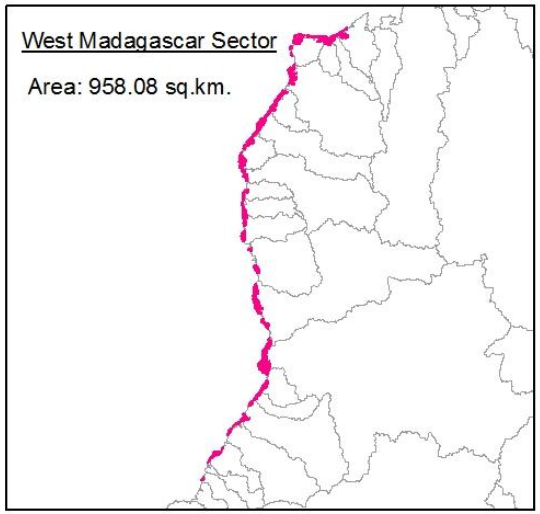
Variable roles in an ecosystem

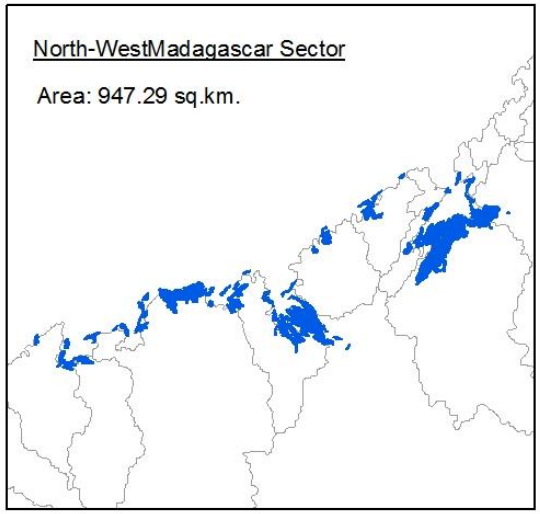
- Reinforce
- Balance/reduce
- Synergistic and antagonistic

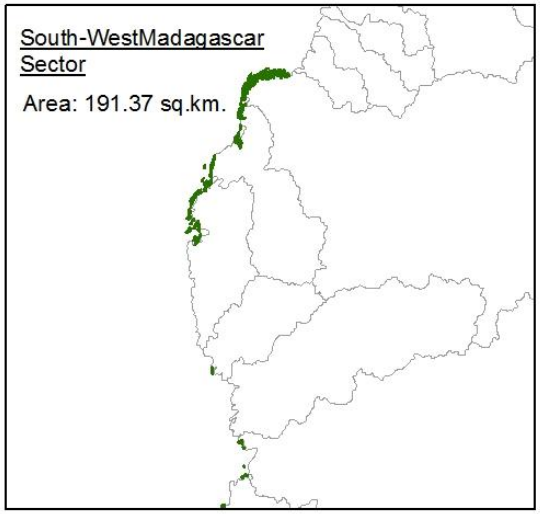
Madagascar: Mangrove Distribution by Sector

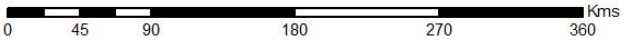




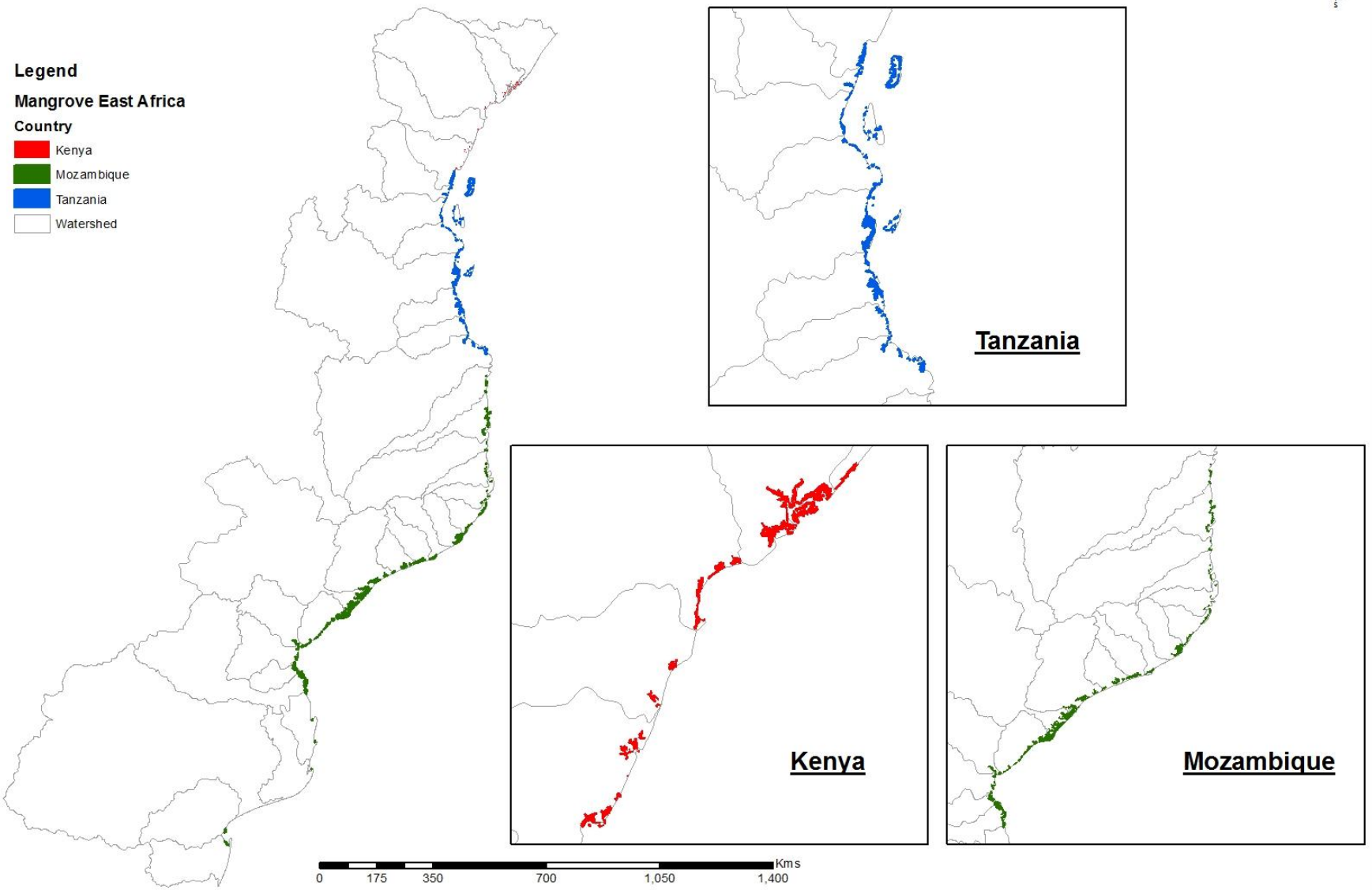




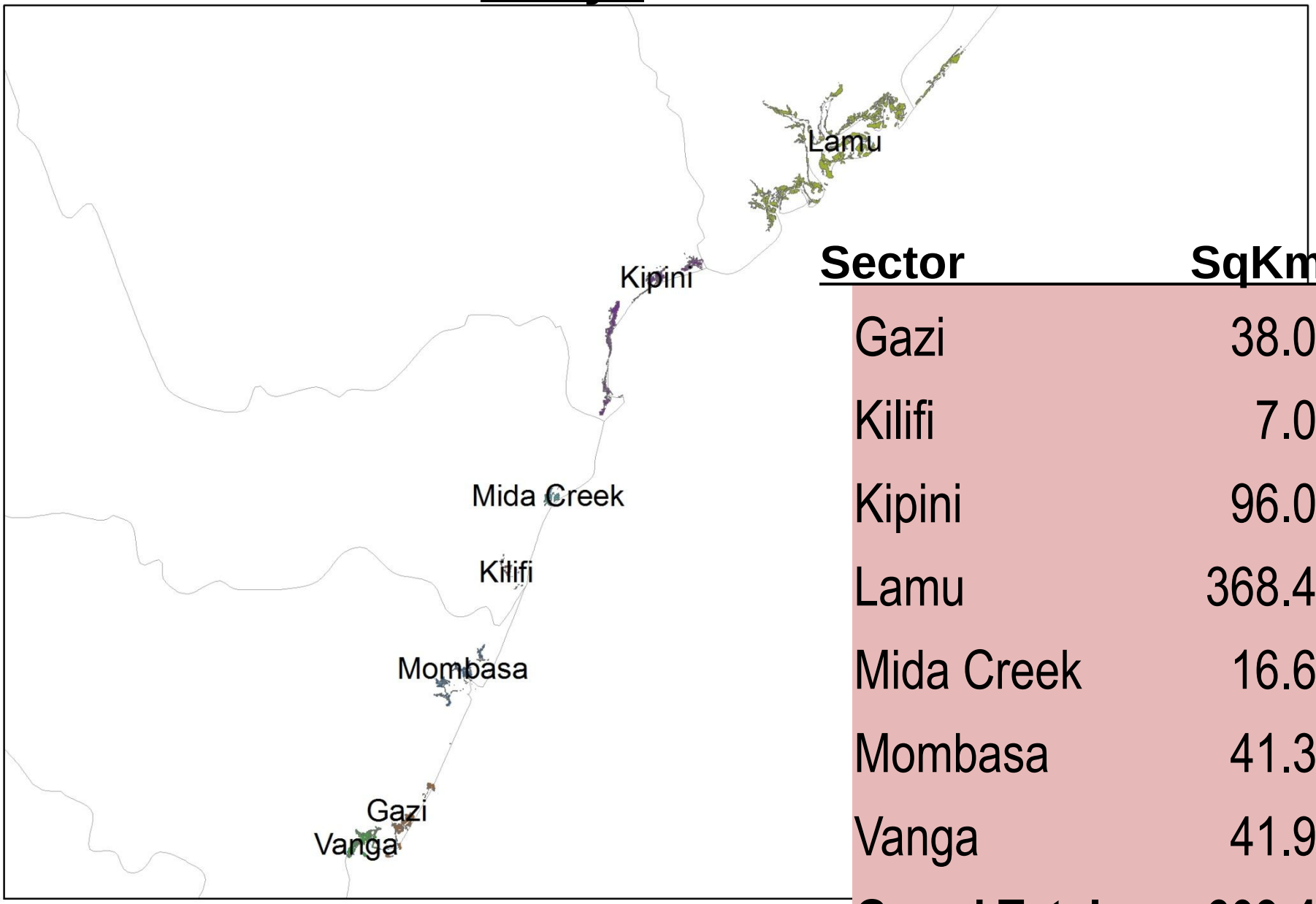




East Africa: Mangrove Distribution by Sector

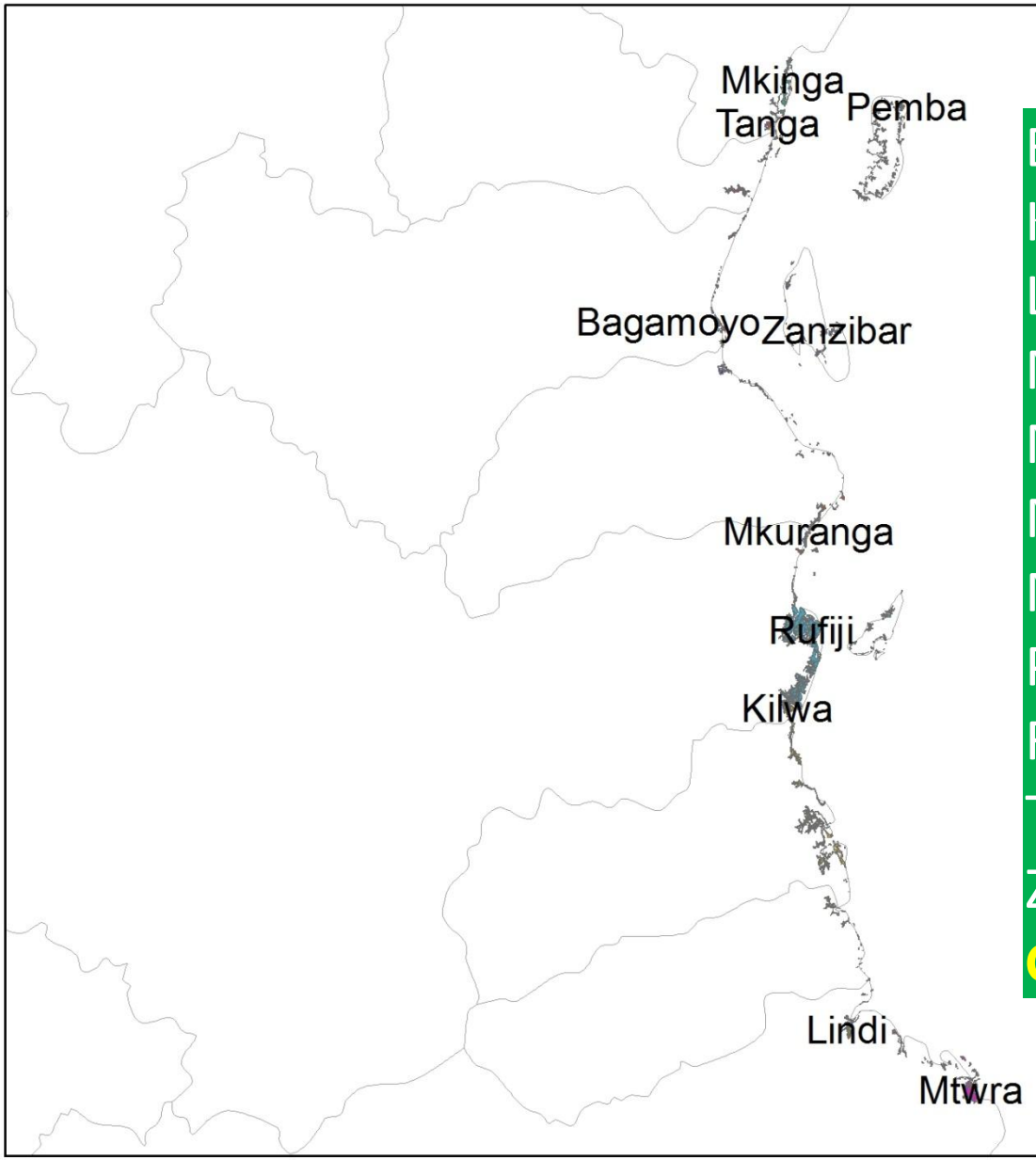


Kenya



Sector	SqKm
Gazi	38.04
Kilifi	7.07
Kipini	96.01
Lamu	368.40
Mida Creek	16.65
Mombasa	41.39
Vanga	41.91
Grand Total	**609.46**

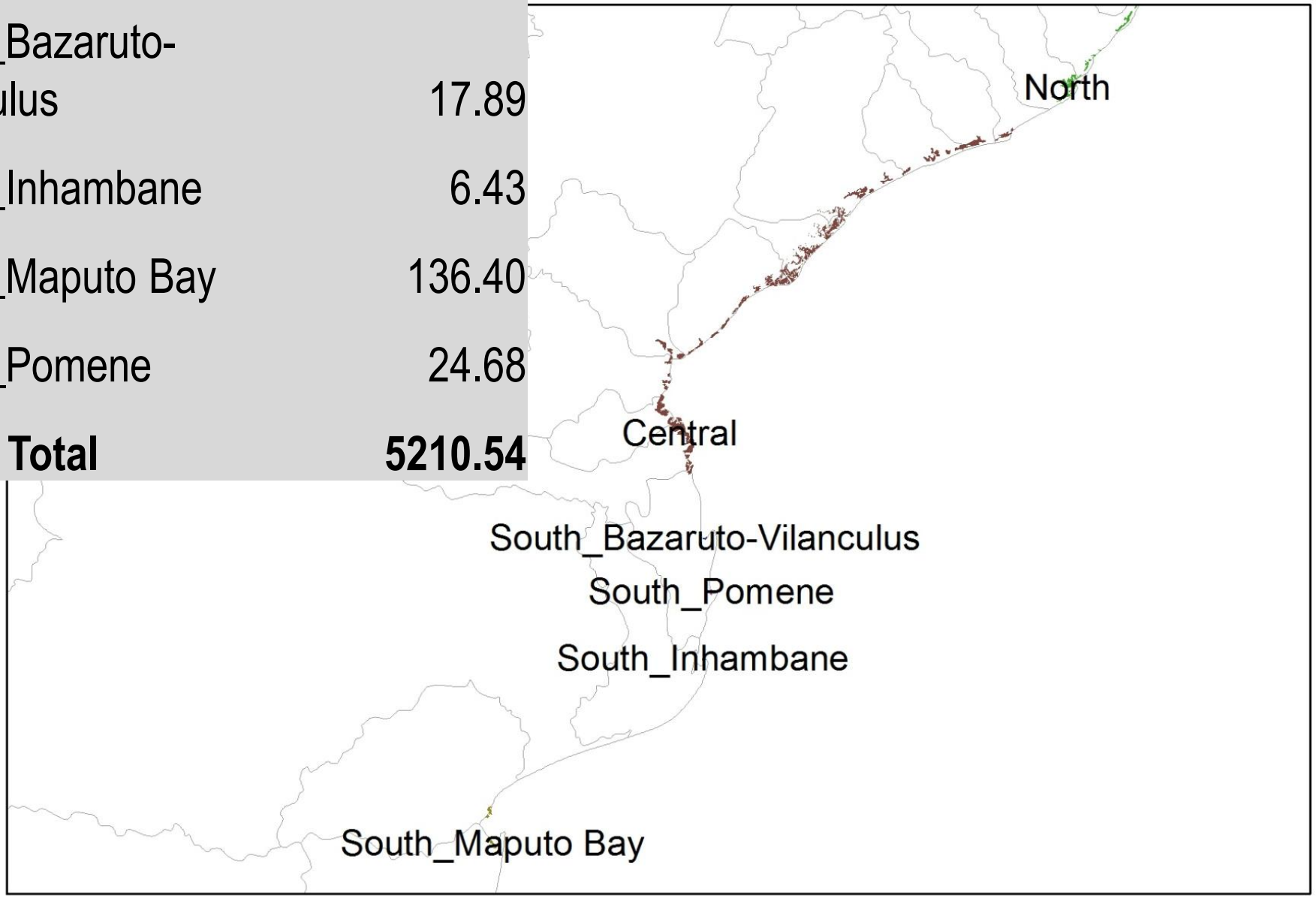
Tanzania



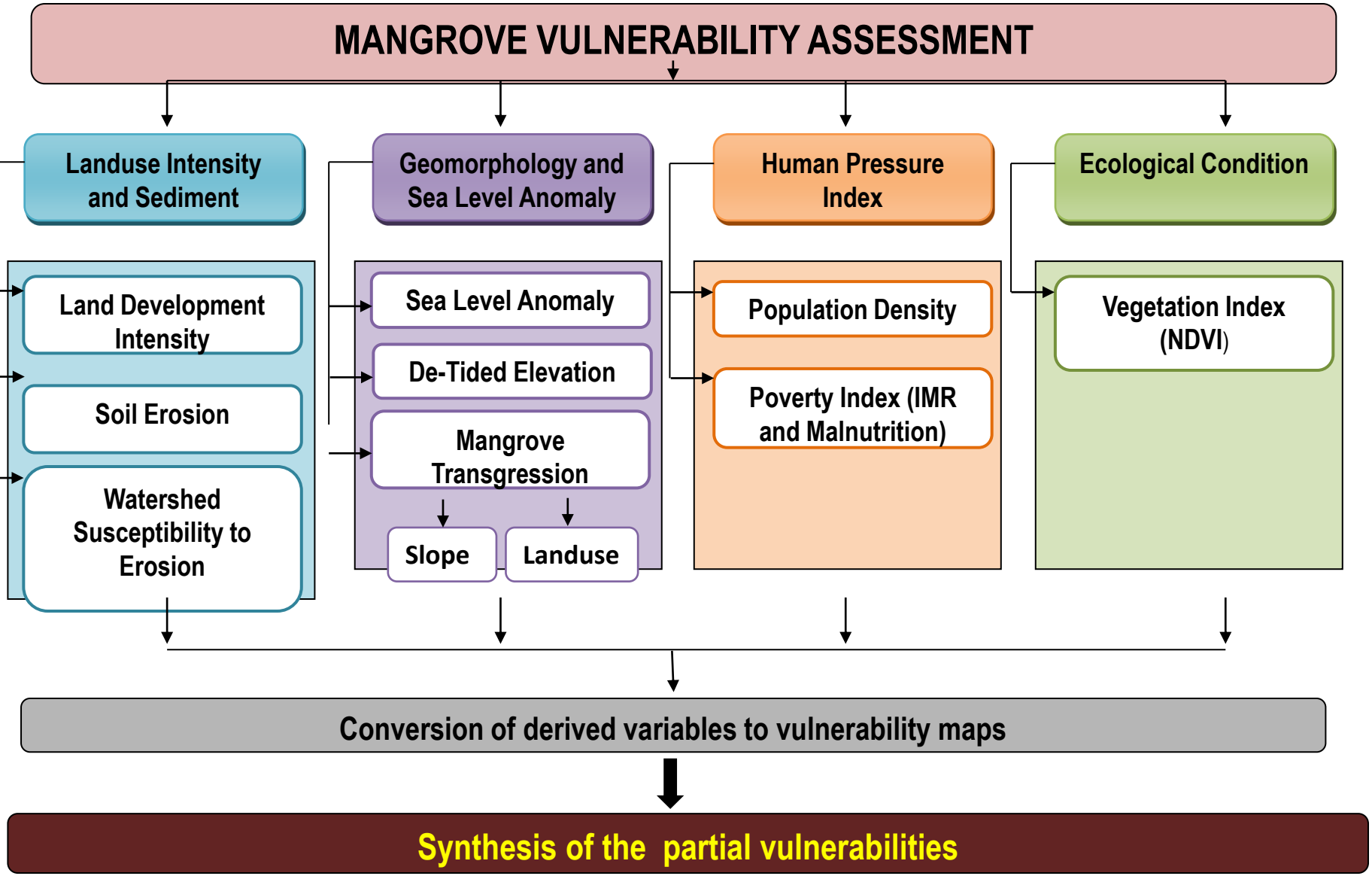
Bagamoyo	61.54
Kilwa	234.87
Lindi	36.30
Mafia Island	37.77
Mkinga	54.22
Mkuranga	55.28
Mtwra	100.73
Pemba	103.79
Rufiji	461.57
Tanga	77.69
Zanzibar	48.04
Grand Total	**1271.79**

Mozambique

Central	3829.13
North	1196.01
South_Bazaruto-Vilanculus	17.89
South_Inhambane	6.43
South_Maputo Bay	136.40
South_Pomene	24.68
Grand Total	**5210.54**



CONCEPTUAL FRAMEWORK

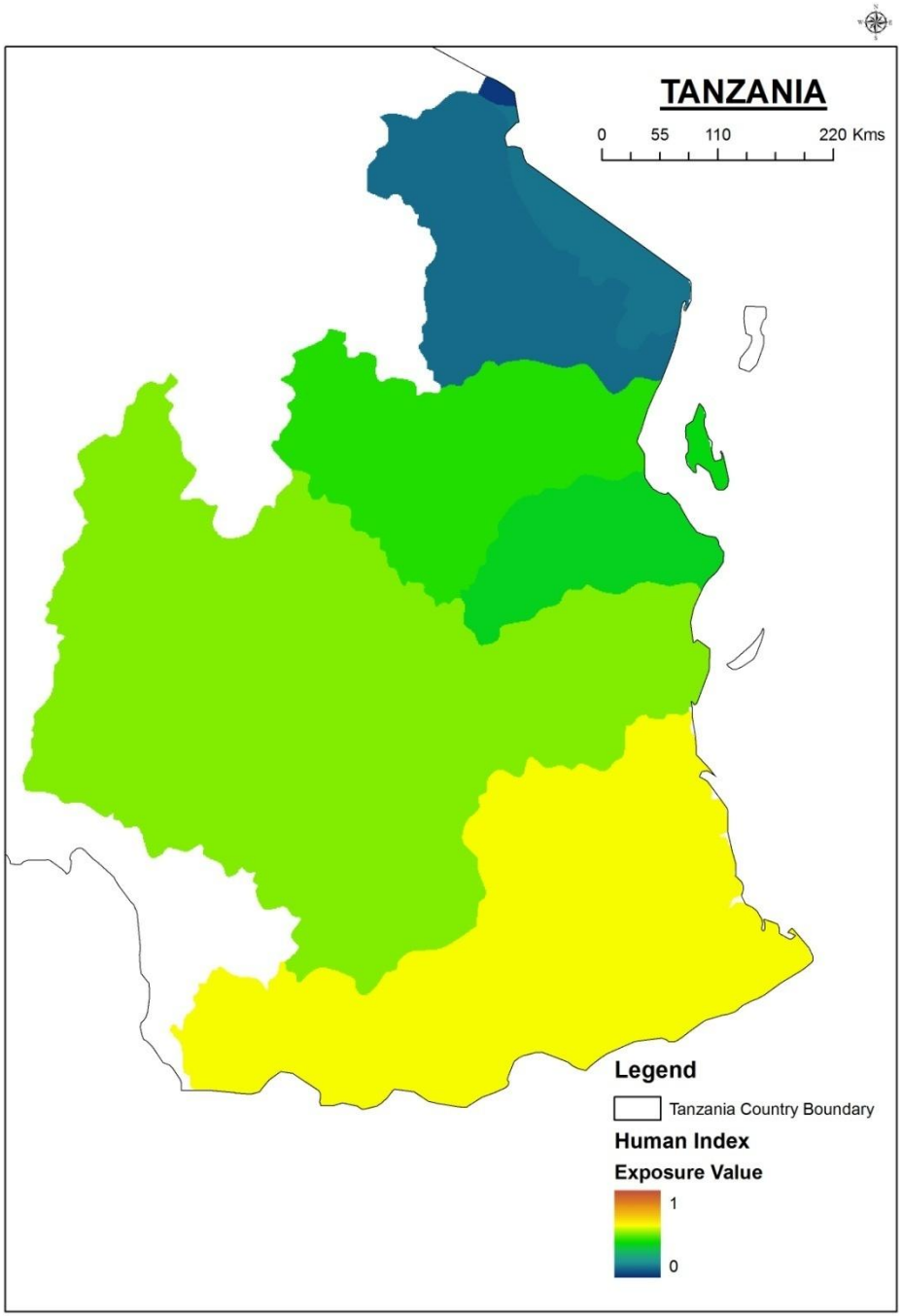


EXPOSURE ANALYSIS

- Variables within the different categories were standardized using a linear increasing or decreasing function depending on how those variables influence mangrove health.

- Sector summary of variable conditions where mangroves exist (i.e mean and SD)

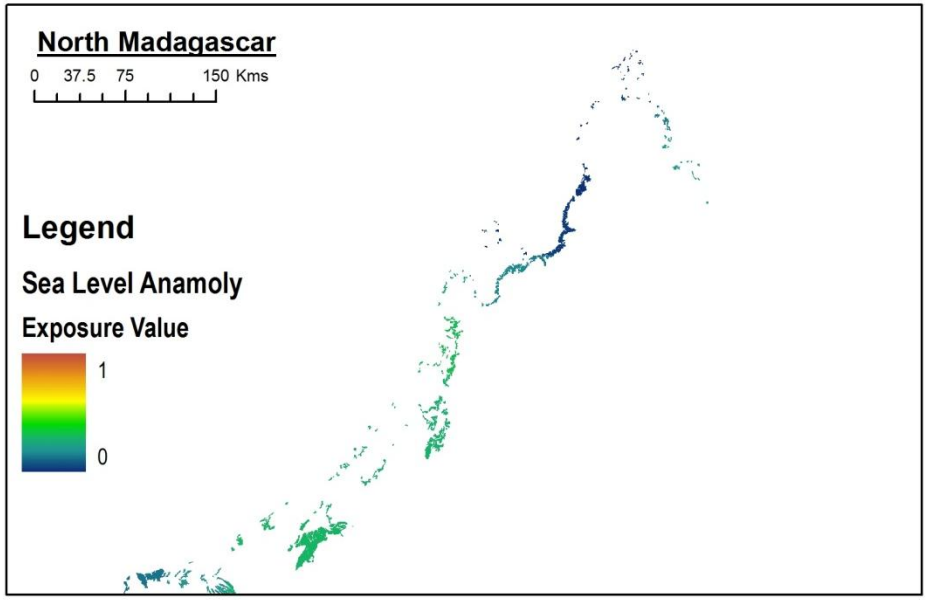
VULNERABILITY OUTPUTS

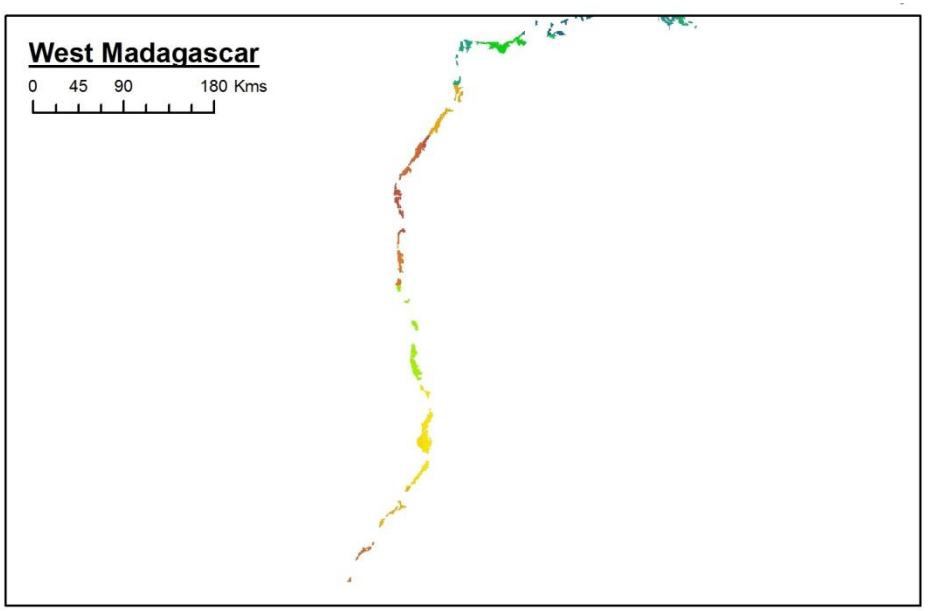


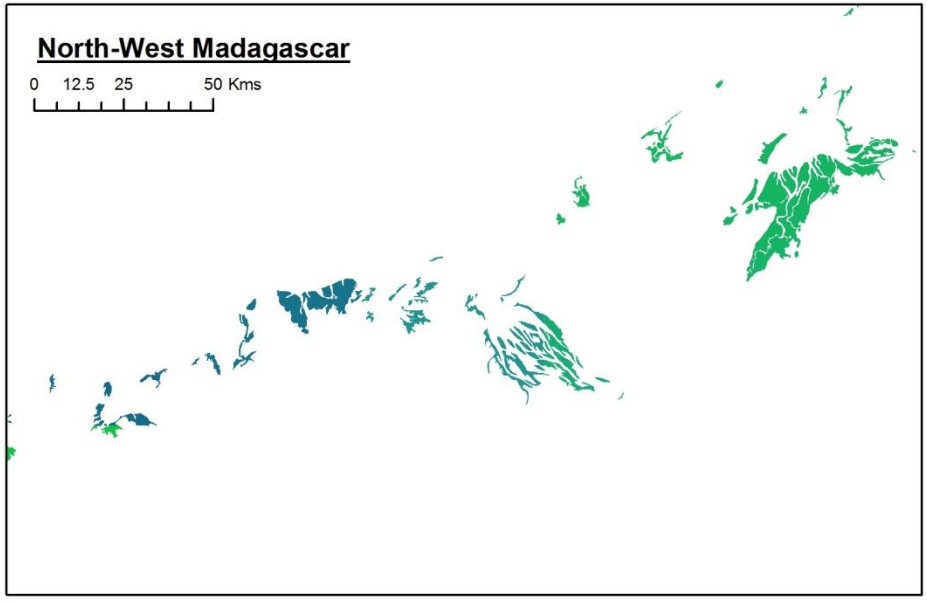
HUMAN PRESSURE INDEX

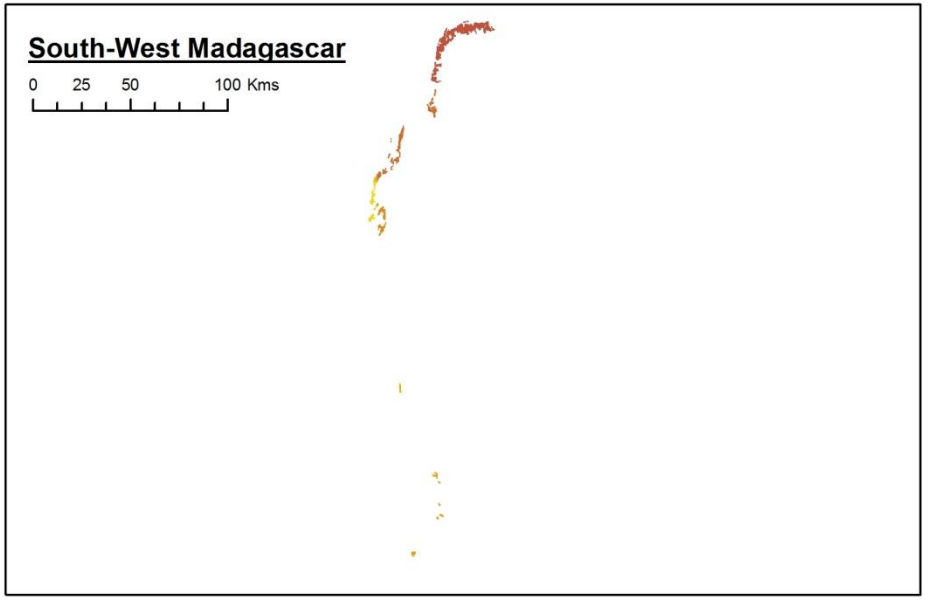
Seems to have a north south gradient in human pressure

SEA LEVEL RISE

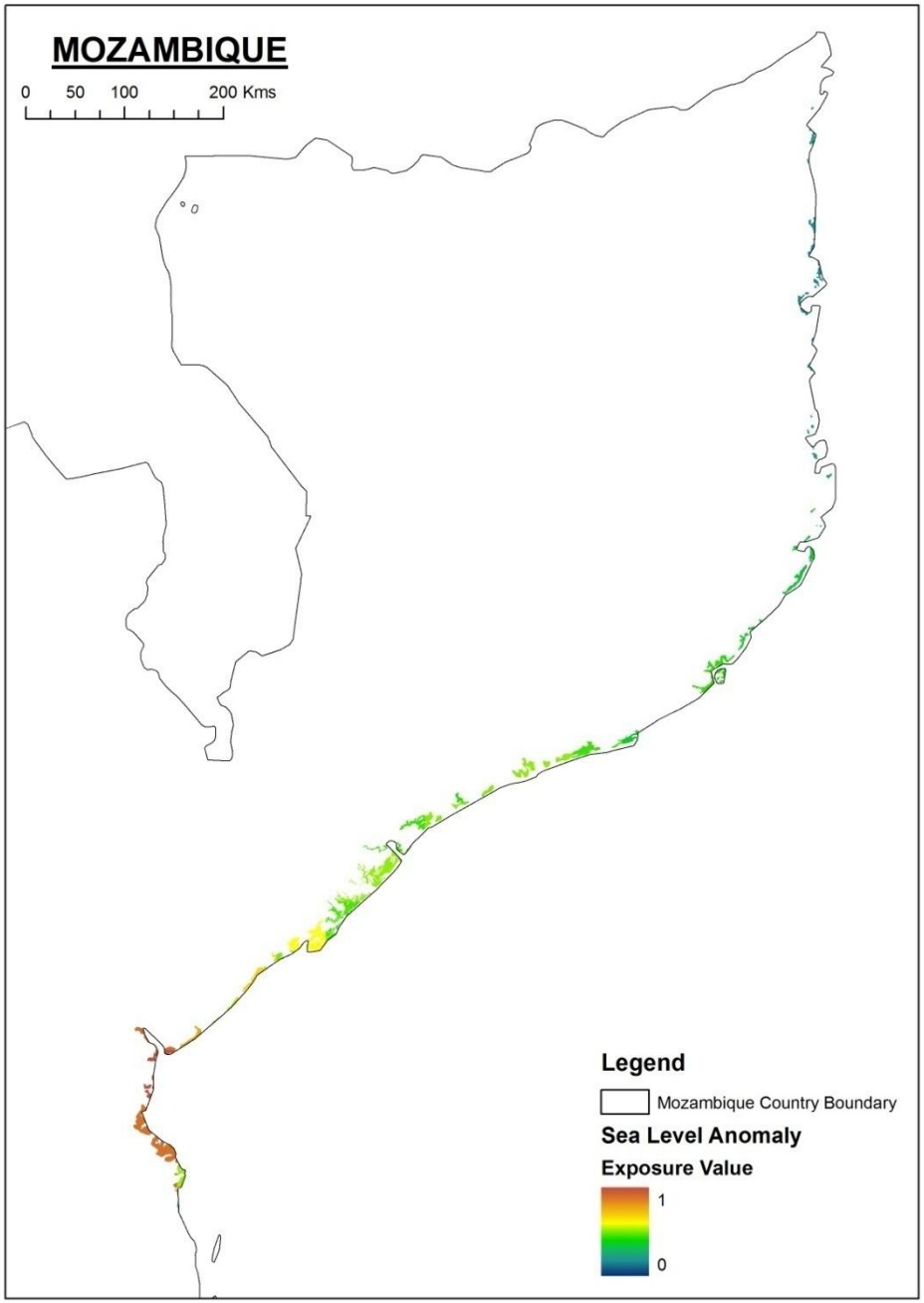








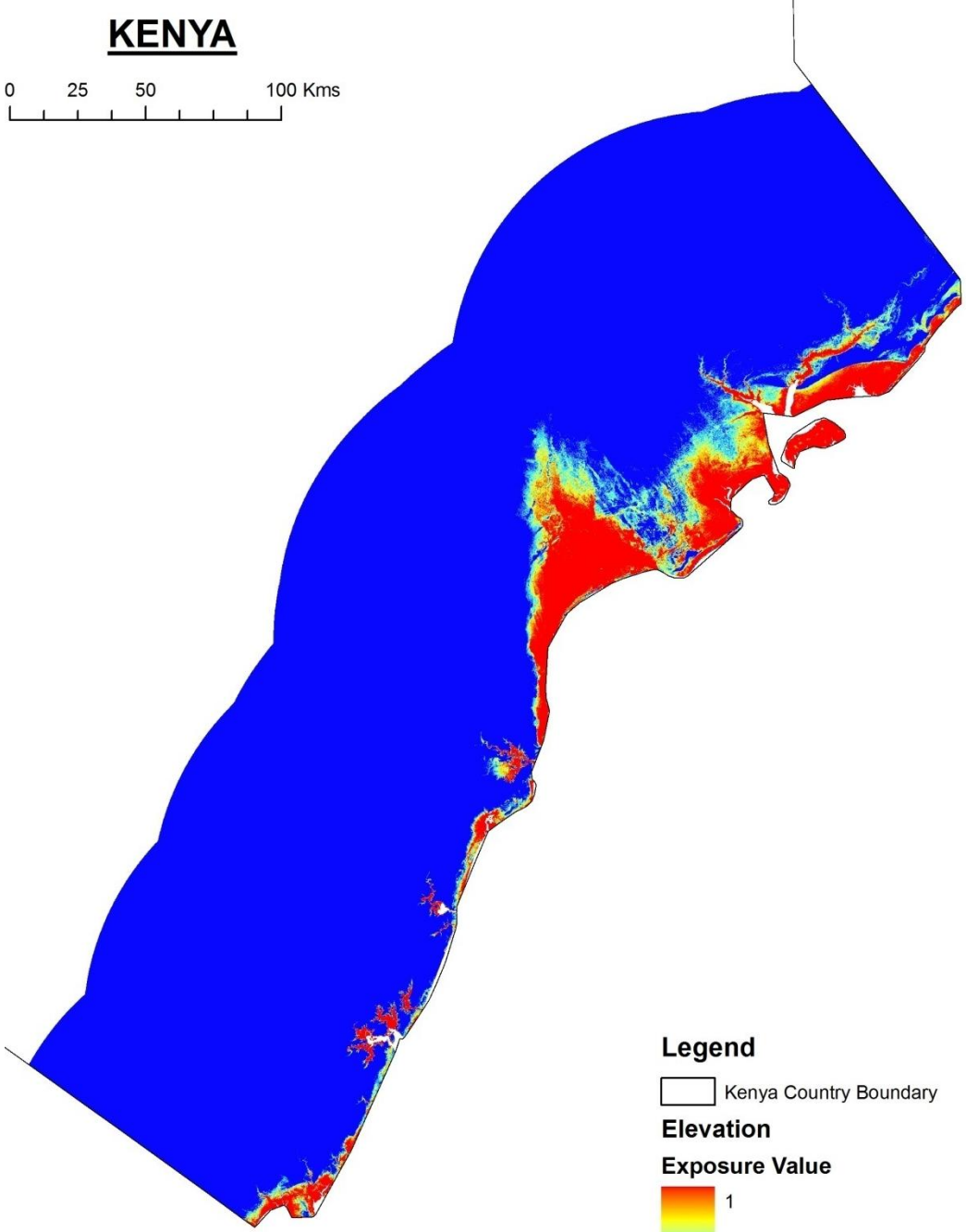
SLR- MQ



North south Gradient in vulnerability to SLR

KENYA

0 25 50 100 Kms



Legend

Kenya Country Boundary

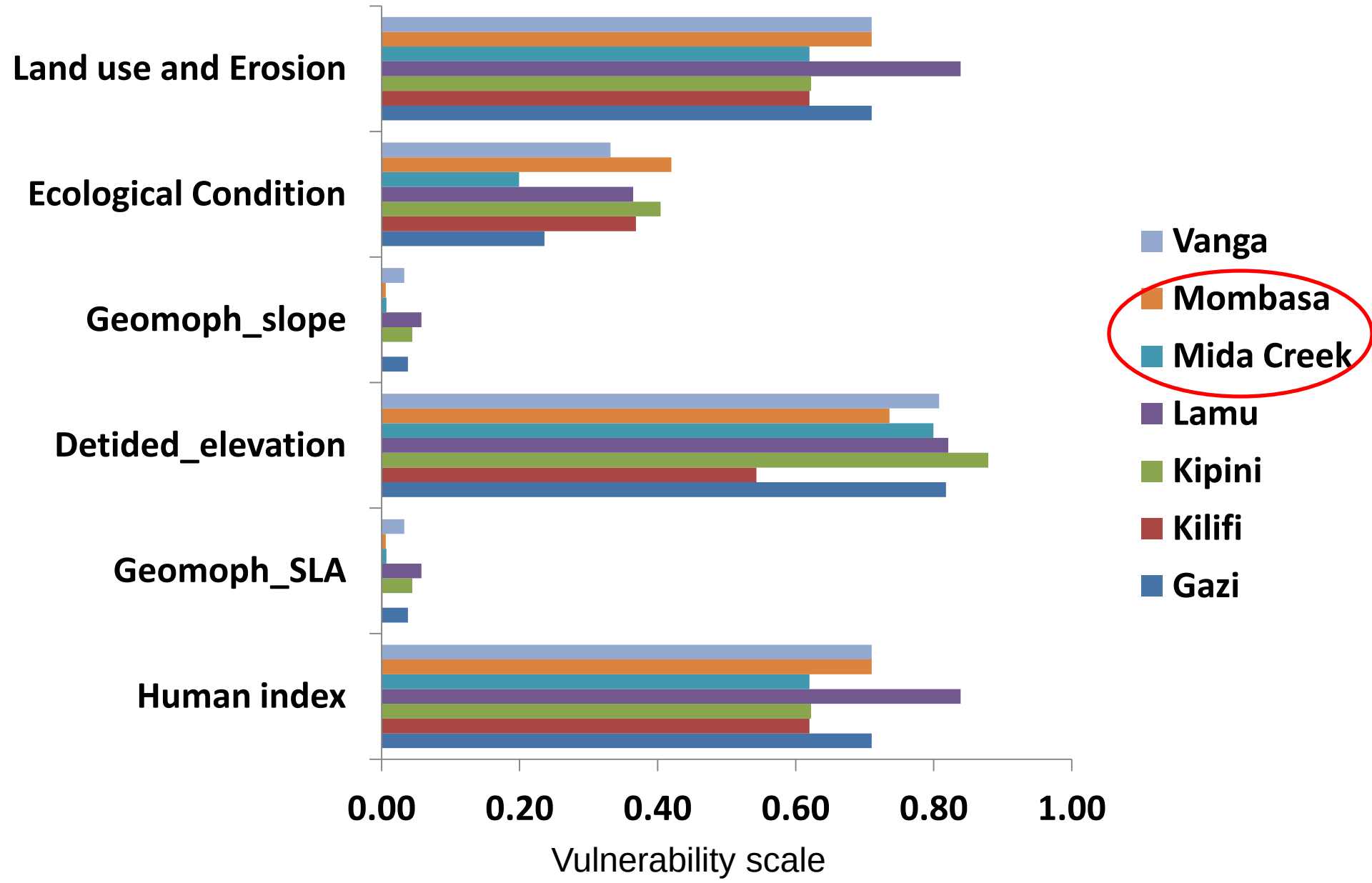
Elevation

Exposure Value

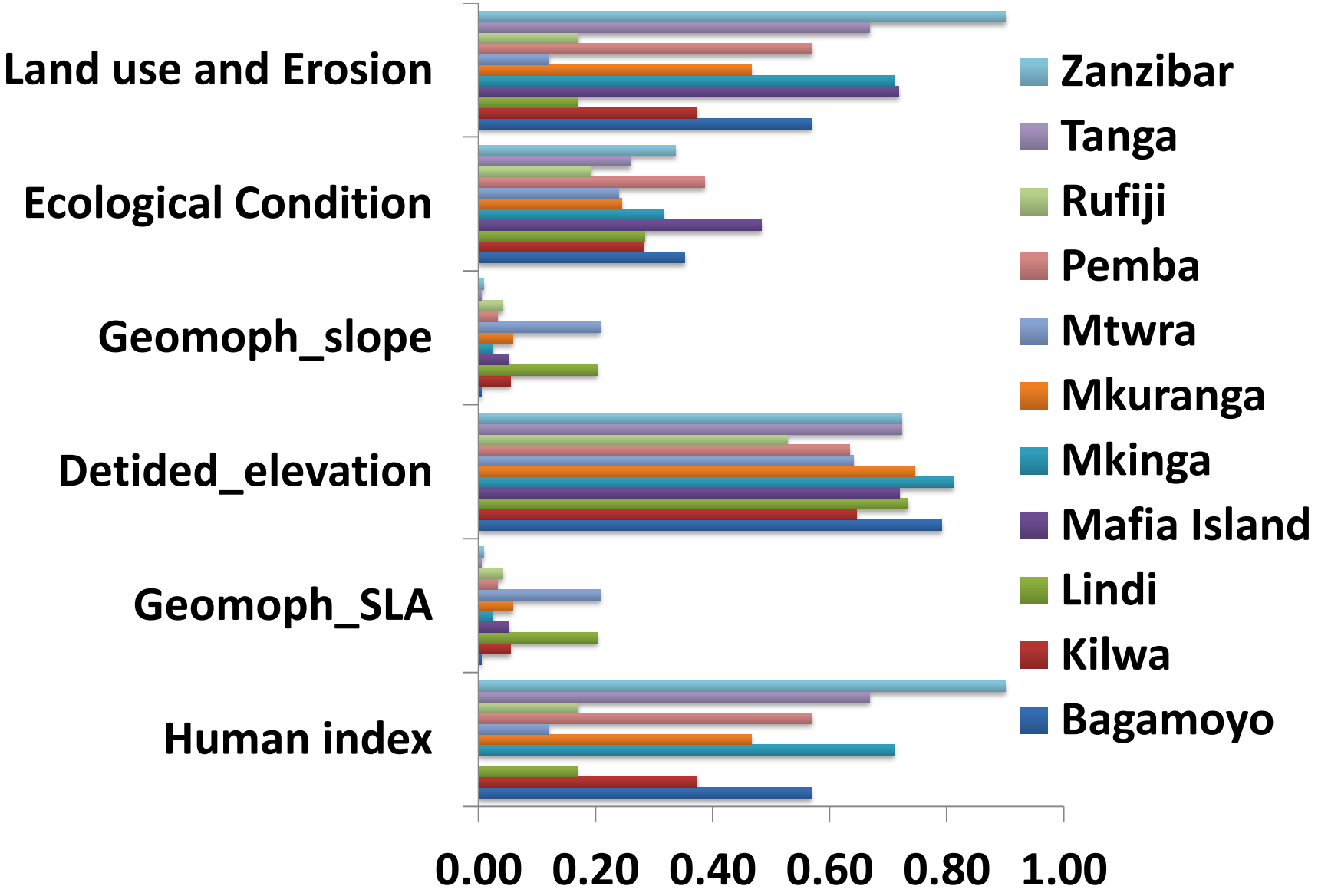
1

0

KENYA


Land use and Erosion
Ecological Condition
Geomoph_slope
Detided_elevation
Geomoph_SLA
Human index
0.00
0.20
0.40
0.60
0.80
1.00
Vulnerability scale
Vanga
Mombasa
Mida Creek
Lamu
Kipini
Kilifi
Gazi

TANZANIA


Land use and Erosion
Ecological Condition
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Tanga
Rufiji
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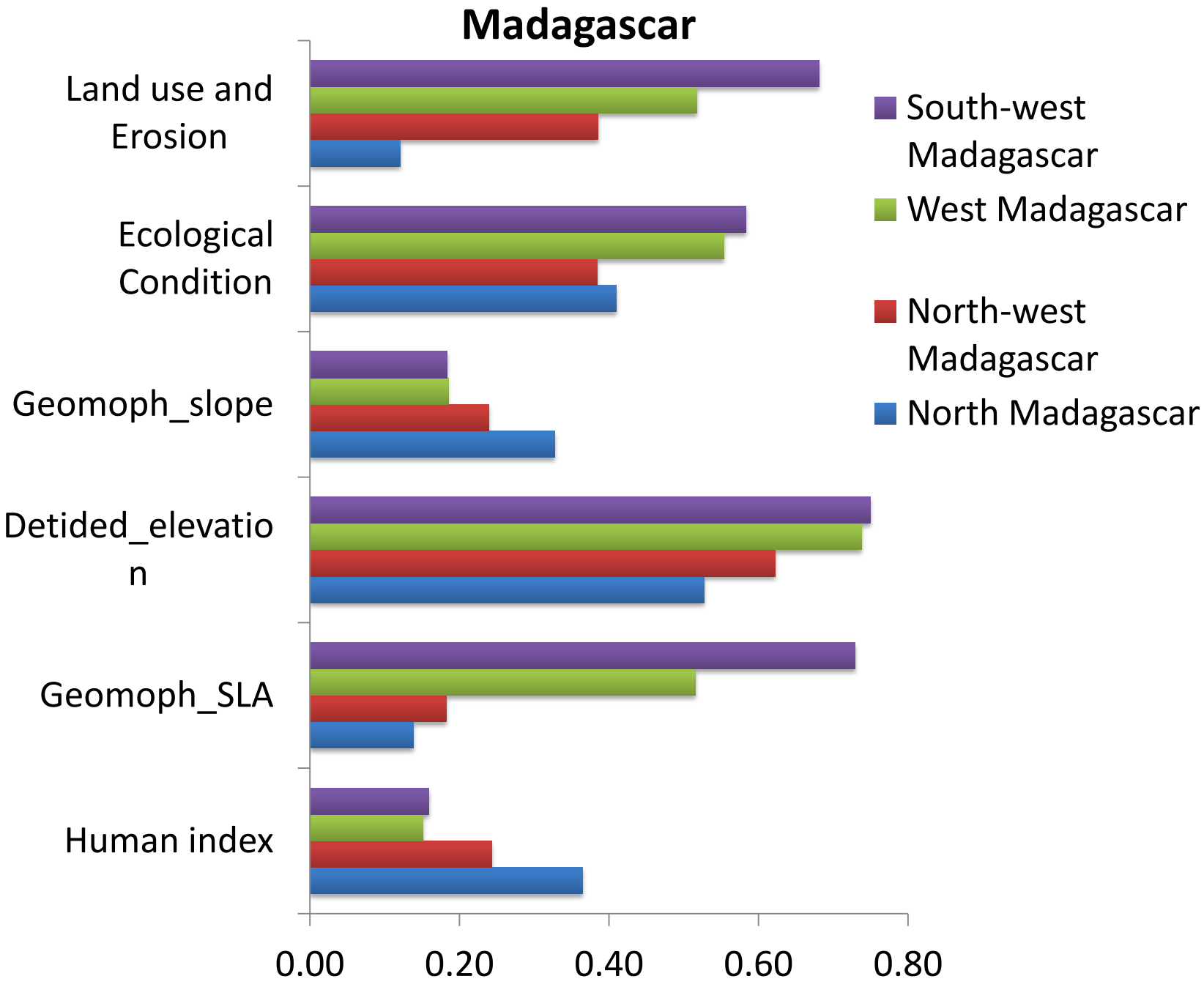
Mkuranga
Mkinga
Mafia Island
Lindi
Kilwa
Bagamoyo


Madagascar
Land use and Erosion
Ecological Condition
Geomoph_slope
Detided_elevation
Geomoph_SLA
Human index
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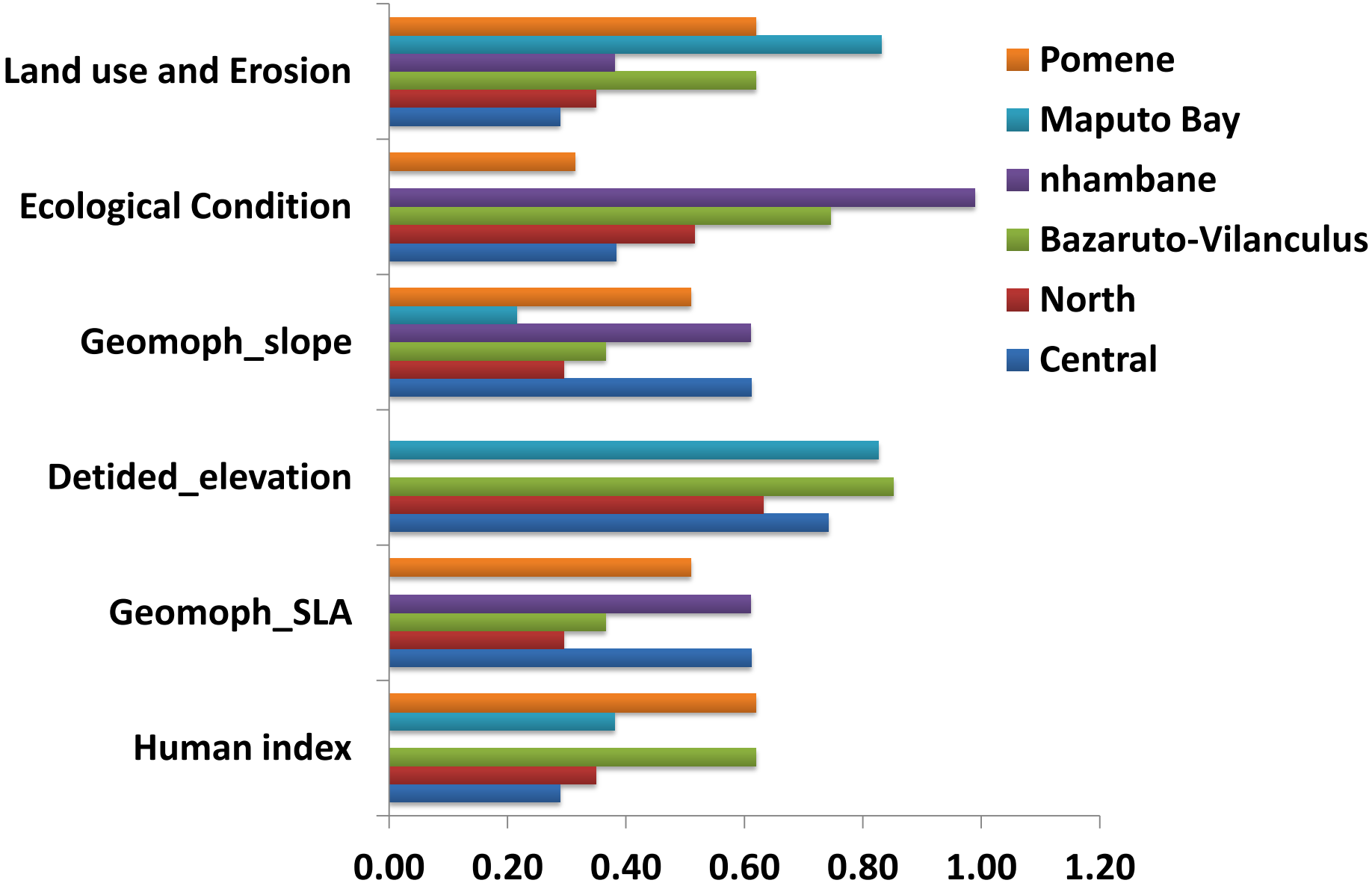
0.20
0.40
0.60
0.80
South-west Madagascar
West Madagascar
North-west Madagascar
North Madagascar

MOZAMBIQUE


Land use and Erosion
Ecological Condition
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Geomoph_SLA
Human index
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Bazaruto-Vilanculus
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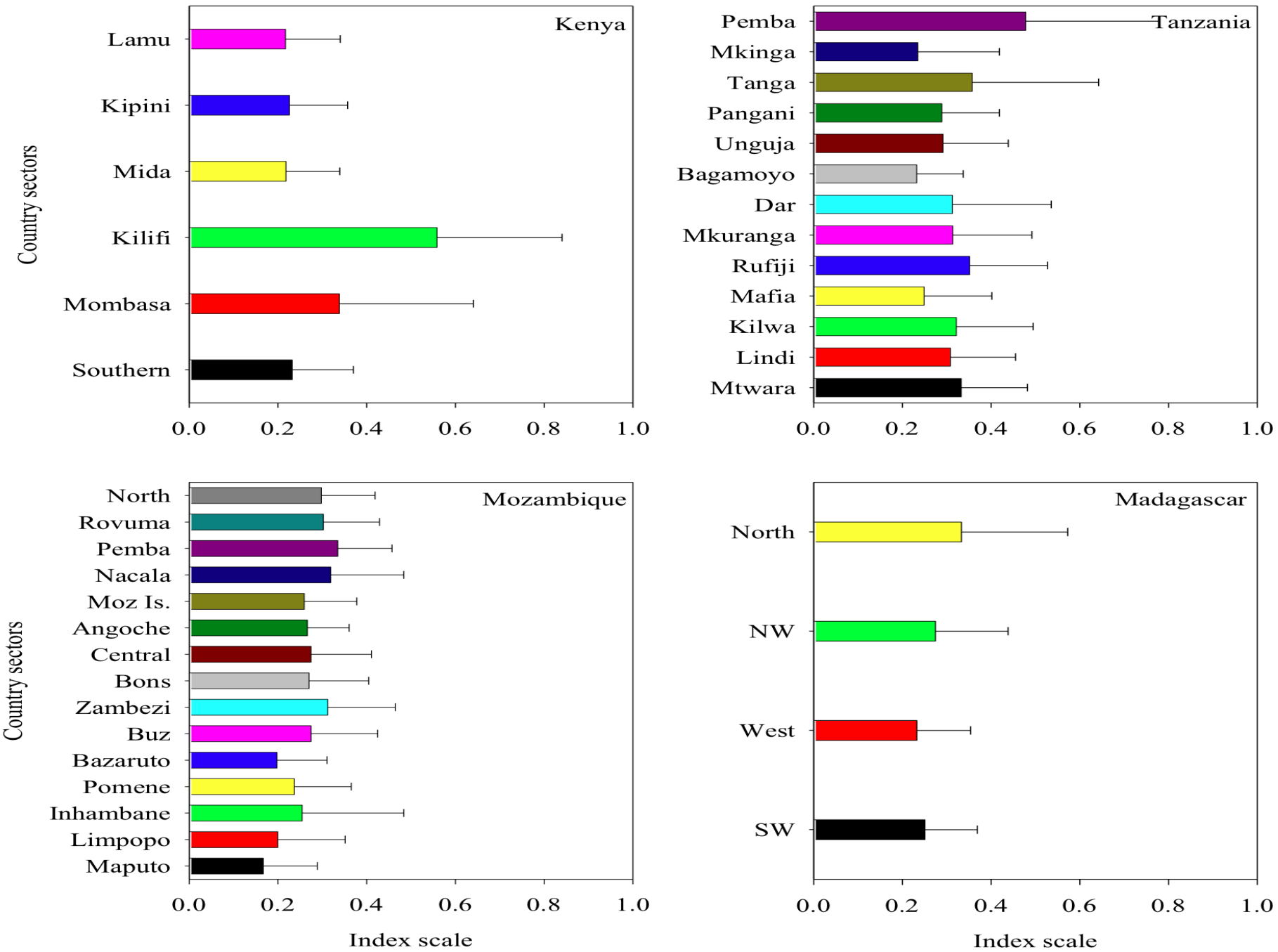

Kenya
Lamu
Kipini
Mida
Kilifi
Mombasa
Southern
Country sectors
0.0
0.2
0.4
0.6
0.8
1.0
Tanzania
Pemba
Mkinga
Tanga
Pangani
Unguja
Bagamoyo
Dar
Mkuranga
Rufiji
Mafia
Kilwa
Lindi
Mtwara
Mozambique
North
Rovuma
Pemba
Nacala
Moz Is.
Angoche
Central
Bons
Zambezi
Buz
Bazaruto
Pomene
Inhambane
Limpopo
Maputo
Country sectors
Index scale
Madagascar
North
NW
West
SW
Index scale

SUMMARY

- Human pressure index seem to be strongly correlated with Land-use and soil erosion
- There is a SLA gradient north to south with the southern regions being most vulnerable to SLR
- Madagascar seems to have a fairly consistent pattern on all DoC – latitudinal differences
- Slope and SLA are strongly positively correlated

Conclusion

- The main DOCs are anthropogenic and this gives hope…
- Human pressure can be moderated through sound management planning, enforcement for compliance,
- Enhancement of adaptive capacity of local communities provision of alternatives.

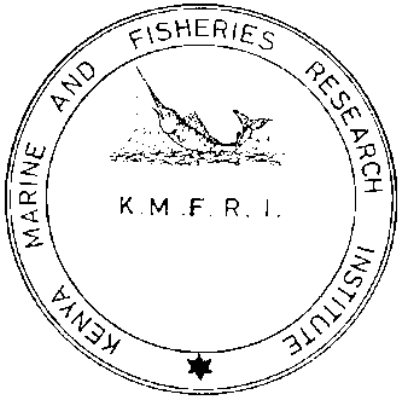
Conclusion

- Ecosystem restoration through community engagement.
- Improvement of land use practices and catchment management.
- Allowance of migration corridors as mitigation of SLR

Establish a regional mangrove network

- Share experiences – similarities in challenges
- Expertise sharing/development
- Standardized methodologies in conducting assessments
- Regional publications on mangrove management and CC and mangroves

THANK YOU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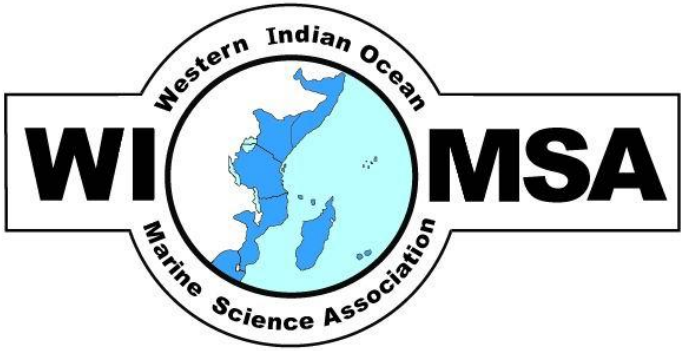
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