



NetZero Emissions and Climate-Smart WWTWs for Coastal Resilience (in SA)

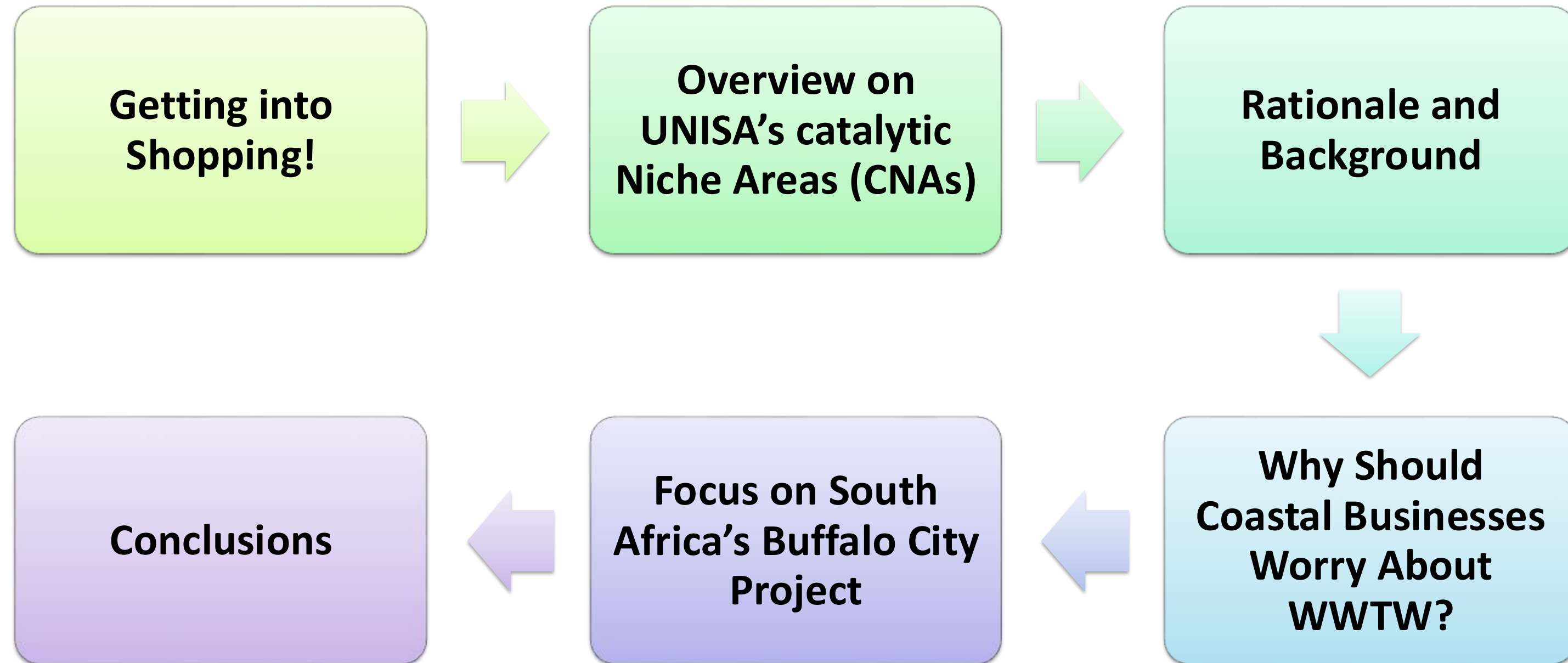
Presenter: Prof Godwell Nhamo (PhD), UNISA, SA

Period: 4 February 2025

Nature of Delivery: Webinar



Presentation Outline



Getting into Shopping!



Call for Book Chapters 2025

Climate Change and Coastal Resilience in Africa

Dr. Lazarus Chapungu & Professor Godwell Nhamo
Institute for Corporate Citizenship, University of South Africa

1.0 Background

Africa's coastal areas play a pivotal role in the lives of millions of people, offering crucial resources, economic prospects, and ecological benefits (Knight 2024). Stretching over 30,000 kilometers, the continent's coastline features some of the most productive marine ecosystems globally, which support fisheries, tourism, agriculture, and trade (USEPA 2017). Coastal communities rely significantly on these ecosystems for their livelihoods and economic activities, making them essential to both local and national economies. However, these regions are becoming more susceptible to the negative impacts of climate change (IPCC 2021).

The effects of climate change on Africa's coastline are complex. Rising sea levels pose a risk of flooding in low-lying regions, forcing people to relocate and threatening agricultural land and food production (Nicholls et al. 2011). Ocean acidification and warmer waters are affecting marine ecosystems, resulting in a decrease in fish populations that are essential for food security and local economies (Cheung et al. 2013). Extreme weather events, including cyclones and floods, are occurring more often and with greater intensity, causing damage to infrastructure, disrupting economic activities, and putting lives at risk (Mafoko et al. 2021). The proliferation of climate-induced disasters is also contributing to the deterioration of vital ecosystems such as mangroves and coral reefs that act as natural defences which shield coastal areas from storm surges and erosion.

The environmental challenges in coastal areas are compounded by socioeconomic vulnerabilities that exist in these areas (Chowdhury et al. 2024; Dama et al. 2022). In fact, there is a nexus between environmental challenges and socio-economic vulnerabilities. Most of the coastal communities in African coasts are impoverished with little capacity to adapt to climate change. The existing literature indicates that the impacts associated with climate-induced challenges and socio-economic vulnerabilities disproportionately affect women, children, indigenous communities, and people living with disabilities (Barua et al. 2024; Oo et al. 2024). These groups have fewer opportunities to diversify their livelihoods and/or access resources that enable them to adapt to climatic vagaries. Migration and displacement instigated by sea level rise, flooding, droughts, and dwindling resources are emerging as critical issues in coastal areas, forcing communities to abandon their homes (Codjoe et al. 2017; Jennath and Paul 2022). It is therefore evident that the global climate crisis is at the interface of the rights of coastal communities.



Call for chapter abstracts 2025

Book Title: Perspectives in Ocean, Marine and Coastal Governance

Prof Godwell Nhamo (PhD) Editor-in-Chief

Institute for Corporate Citizenship,
University of South Africa
P O Box 392, UNISA, 0003
email: nhamog@unisa.ac.za or
Tel: +27(0) 12- 433-4725
Cell: +27 (0) 73-163-1114

Dr Gideon Walter Mutanda (PhD) Editor

Institute for Corporate Citizenship,
University of South Africa
P O Box 392, UNISA, 0003
email: mutangw@unisa.ac.za

and

Dr Olubunmi Ayodele Afinowi (PhD) Editor

Institute for Corporate Citizenship
University of South Africa
P O Box 392, UNISA, 0003
email: afinooa@unisa.ac.za

UNISA's Catalytic Niche Areas



Marine Studies



Aviation and
Aeronautical Studies



Automotive



Energy



Space Study and
Square Kilometer Array



Fourth Industrial
Revolution and
Digitalisation



Natural Sciences
(Biotechnological
studies)



Health Studies/
Medicine



Feminist, Womanist,
Bosadi Theorisations



Student Support and
Co-Curricular Activities

Rationale and Background: Wastewater & Coastal Pollution

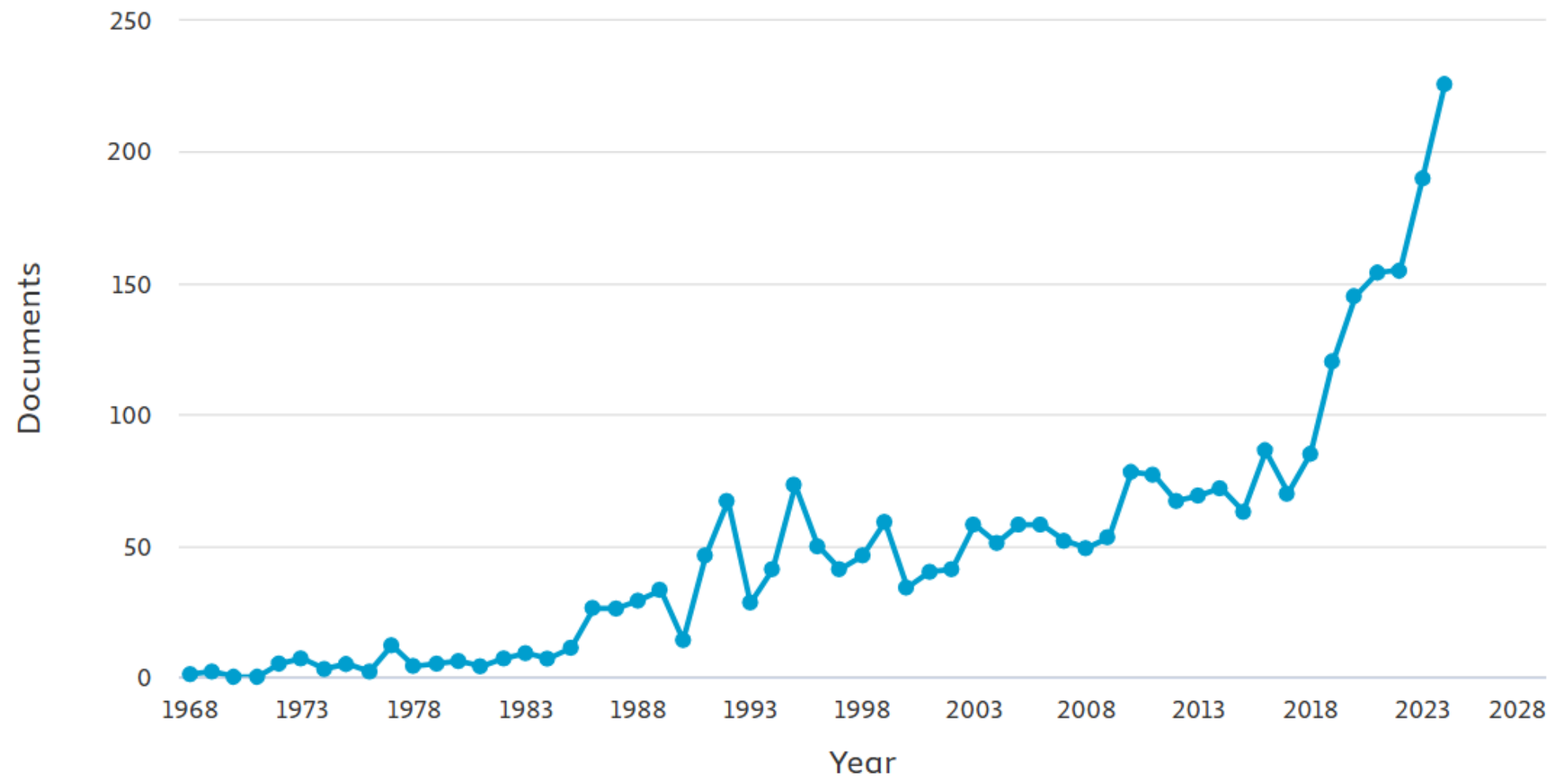
TITLE-ABS-KEY (wastewater OR sewage OR sludge AND "coastal w/6 pollution" OR "ocean pollution" OR "sea pollution" OR "marine pollution" OR "estuaries pollution") AND PUBYEAR > 1967 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "bk")) AND (LIMIT-TO (LANGUAGE, "English"))

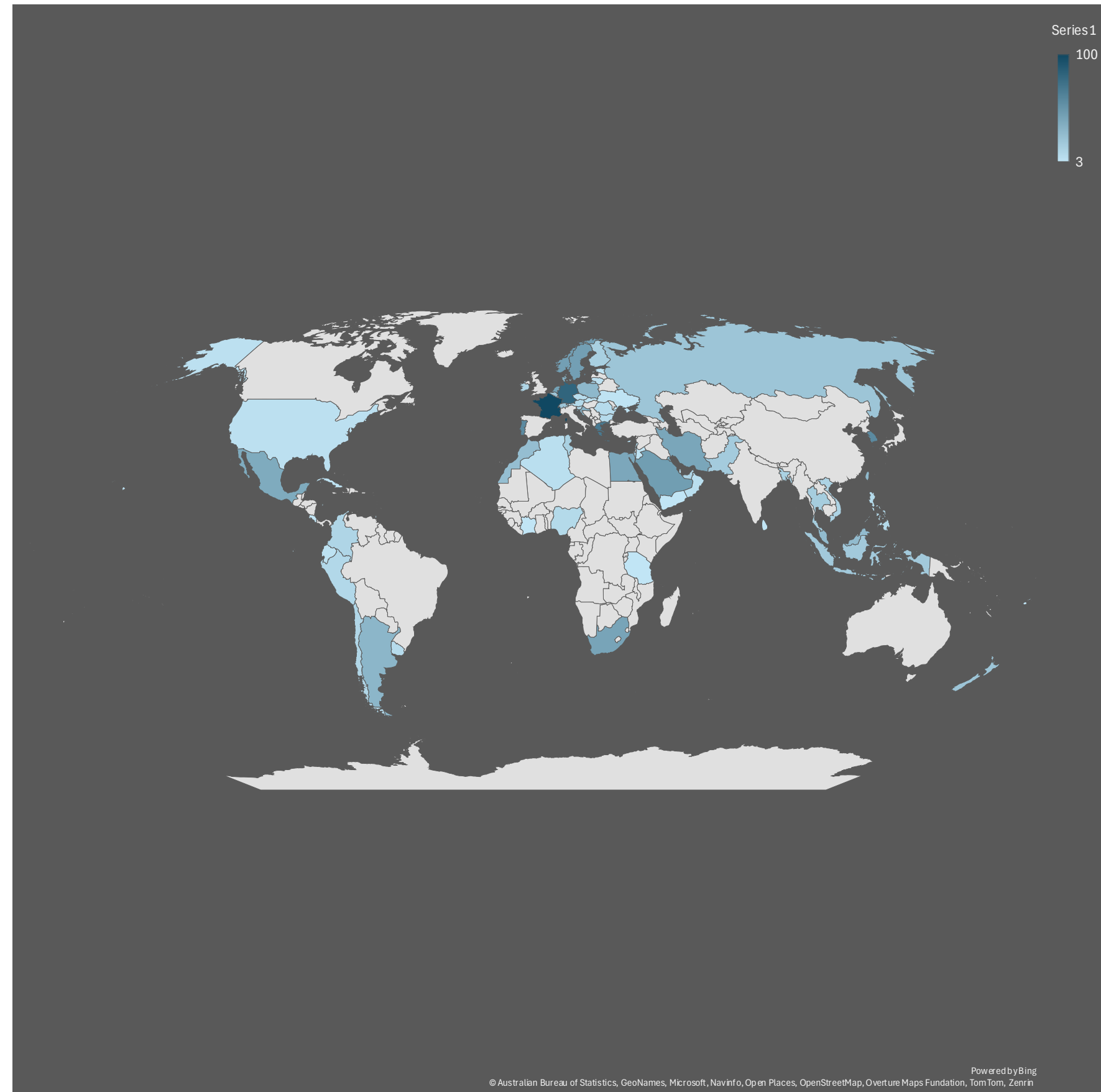
2,820 document results

Select year range to analyze: 1968 to 2024 Analyze

Year ↓	Documents ↑
2024	226
2023	190
2022	155
2021	154
2020	145
2019	120
2018	85
2017	70

Documents by year





Rationale and Background:

Wastewater & Coastal Pollution

Rationale and Background: Wastewater & Coastal Pollution

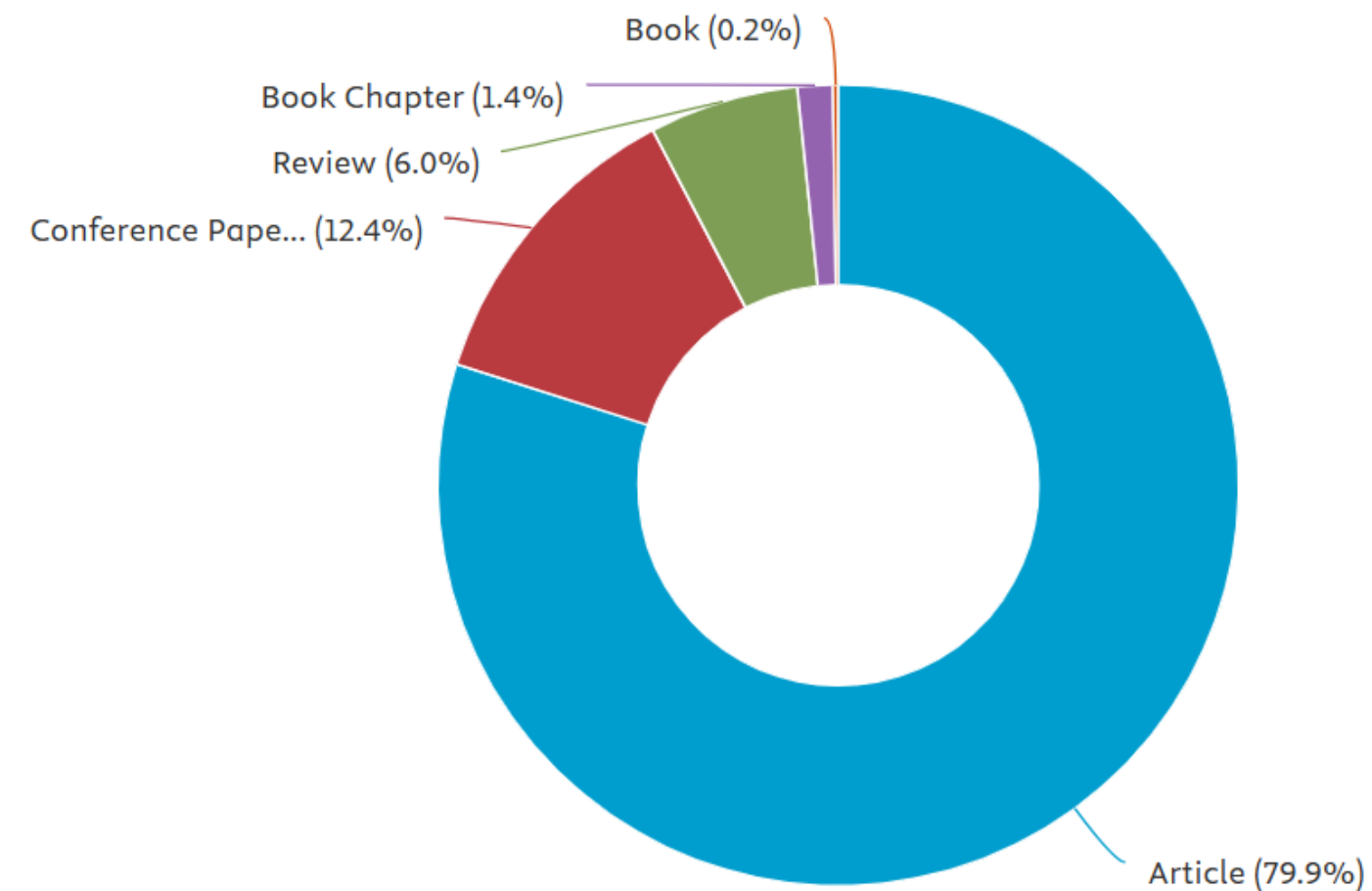
TITLE-ABS-KEY (wastewater OR sewage OR sludge AND "coastal w/6 pollution" OR "ocean pollution" OR "sea pollution" OR "marine pollution" OR "estuaries pollution") AND PUBYEAR > 1967 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "bk")) AND (LIMIT-TO (LANGUAGE, "English"))

2,820 document results

Select year range to analyze: 1968 to 2024 [Analyze](#)

Document type ↑	Documents ↓
Article	2253
Conference Paper	351
Review	170
Book Chapter	40
Book	6

Documents by type



Rationale and Background: Wastewater & Coastal Pollution

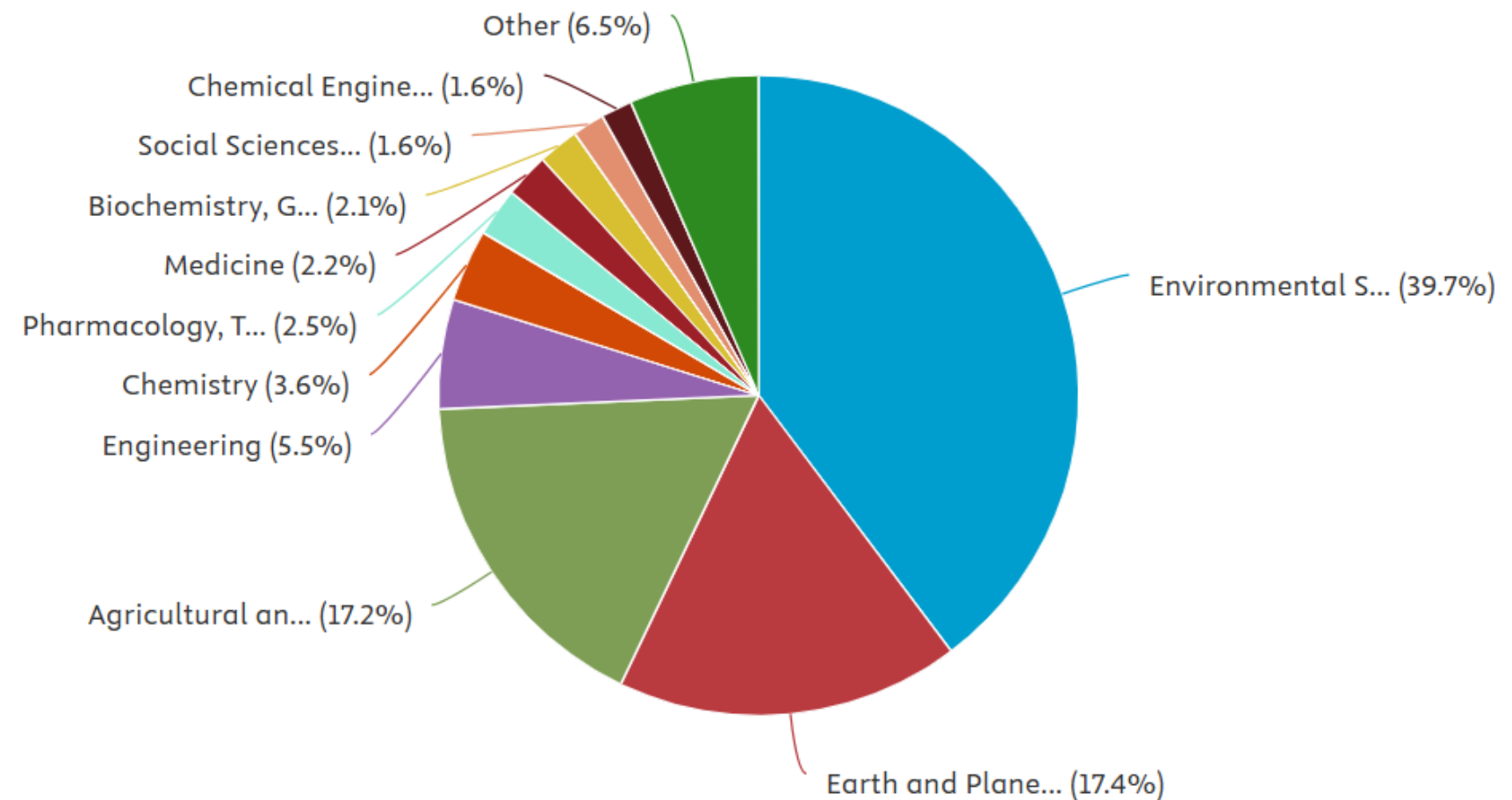
TITLE-ABS-KEY (wastewater OR sewage OR sludge AND "coastal w/6 pollution" OR "ocean pollution" OR "sea pollution" OR "marine pollution" OR "estuaries pollution") AND PUBYEAR > 1967 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "bk")) AND (LIMIT-TO (LANGUAGE, "English"))

2,820 document results

Select year range to analyze: 1968 to 2024 Analyze

Subject area ↓	Documents ↓
Environmental Science	2303
Earth and Planetary Sciences	1006
Agricultural and Biological Sciences	998
Engineering	320
Chemistry	211
Pharmacology, Toxicology and Pharmaceutics	143
Medicine	130

Documents by subject area



Rationale and Background: Wastewater & Coastal Pollution

TITLE-ABS-KEY (wastewater OR sewage OR sludge AND "coastal w/6 pollution" OR "ocean pollution" OR "sea pollution" OR "marine pollution" OR "estuaries pollution") AND PUBYEAR > 1967 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "bk")) AND (LIMIT-TO (LANGUAGE, "English"))

2,820 document results Select year range to analyze: 1968 to 2024 [Analyze](#)

Country/Territory ↑	Documents ↓
<input checked="" type="checkbox"/> Japan	68
<input type="checkbox"/> Portugal	59
<input type="checkbox"/> South Korea	59
<input type="checkbox"/> Norway	47
<input type="checkbox"/> Saudi Arabia	47
<input type="checkbox"/> Sweden	46
<input type="checkbox"/> Netherlands	45
<input type="checkbox"/> South Africa	43

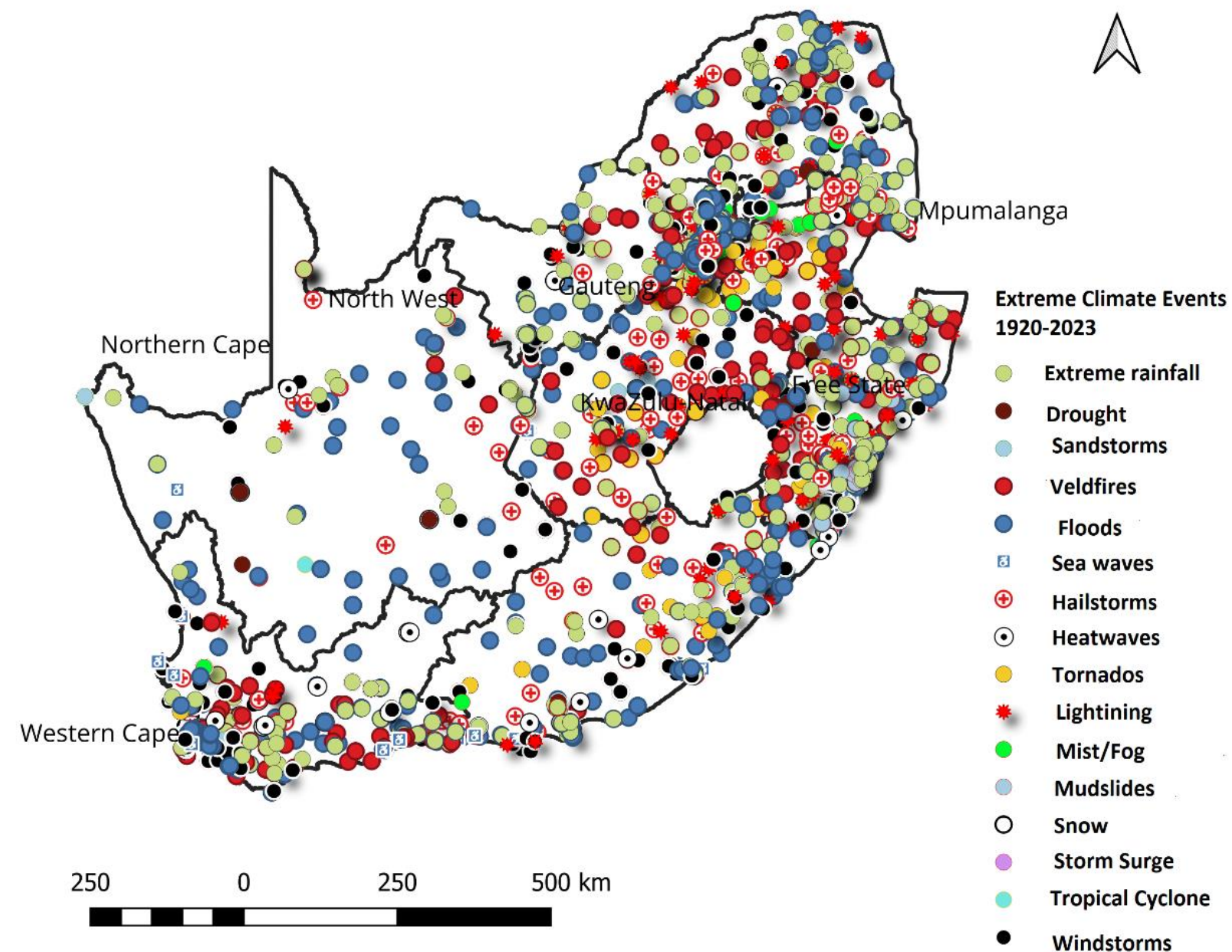
22nd

Documents by country or territory

Compare the document counts for up to 15 countries/territories.

Country/Territory	Documents
United States	480
China	390
United Kingdom	250
India	160
Spain	150
Australia	140
Italy	130
Brazil	120
Canada	110
France	100
Germany	80
Turkey	70
Hong Kong	70
Greece	70
Japan	70

Why Should Coastal Businesses Worry About WWTW?



- Climate change-induce extreme weather events (both slow onsets, as well as sudden and rapid) are evident in many countries.
- Such extreme events are spread across countries and the world, including in coastal areas, where these negatively impact on sewer reticulations and WWTWs.
- The map comes from our paper under review on climate extremes in South Africa (1920-2023)


Why Should Coastal Businesses Worry About Poor WWTW?

22:22 14%

Durban coastline: sewage polluted beaches pose threat to holiday makers and the environment

Published: December 11, 2022 10.07am SAST

Anja du Plessis, University of South Africa



Thousands of New Year party revellers and holidaymakers on North Pier Beach in 2016. Rajesh Janttilal/AFP via Getty Images

<https://theconversation.co...> Share article

Large numbers of businesses in eThekweni on South Africa's eastern seaboard – which includes the port city of Durban – rely heavily on tourism. It's a popular holiday destination, only six hours by road from Johannesburg. Millions of people living inland head to the warm coastline over the

22:38 11%


GroundUp

LINKS ABOUT DONATE

Umgeni: A river of sewage flowing through Durban

The municipal sewage works is one of the main pollution sources

18 July 2024 | By Nokulunga Majola
Feature | Durban



The Umgeni River mouth is a popular recreation area in Durban, but is chronically polluted by sewage. Photo: Nokulunga Majola


22:31 12%

DAILY MAVERICK

OUR BURNING PLANET

MARINE CONTAMINATION

Cape Town fights uphill battle against ocean and waterway sewage spills



Camps Bay Beach]. Photographer: [Chris von Ulmenstein].


By Kristin Engel
15 Oct 2024

22:34 11%

DAILY MAVERICK

Is the public being warned and informed appropriately?

While any signage is appreciated, Barnes said that the single small warning sign at Green Point in September was totally inadequate for warning the public who were swimming or paddling even just 20m away.



Green Point marine outfall pump failure notice on 27 September 2024. (Photo: Supplied / City of Cape Town)

Emeritus Professor Leslie Petrik, from the Department of Chemistry at the University of the Western Cape, added that temporary beach closures were always belatedly made as it took about a week at best to turn around testing of water samples.

TimesLIVE

wn by Burundi and DRC, claims Holomisa #3 SPOTLIGHT

ADVERTISEMENT

SOUTH AFRICA

Alarm as more dead fish discovered in Durban's Umgeni River, beaches closed

22 August 2022 - 17:19



Suthentira Govender
Senior reporter

Facebook, X, Pinterest, Email, WhatsApp

Why Should Coastal Businesses Worry About WWTW?

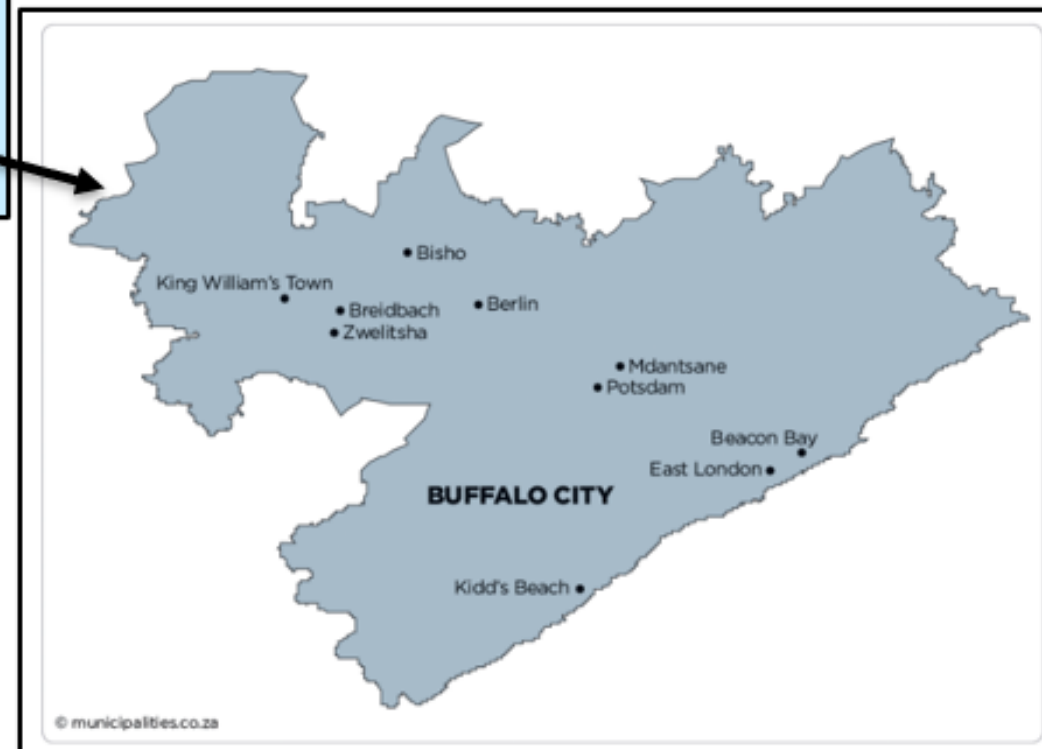


- Naidoo et al. (2024) investigated socioeconomic impacts of the 2022 sewage spillages along the Umhlanga Rocks coastline and beach area on businesses.
- The findings revealed significant negative impacts on difference sizes of businesses, from reduced number of tourist, total closures, and staff layoffs.

Focus on South Africa's Buffalo City NetZero Emissions WWTW Project



**Project Site Location:
Buffalo City, Eastern Cape
Province, South Africa**

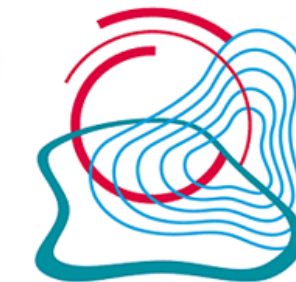


Our research site is part of the bigger programme focusing on “A Smart and Resilient Buffalo City Metropolitan Municipality”, which has been set up as a **Living Lab**.

The project is also part of the endorsed **Decade Action No.42.5: Global Coastal Ocean Restoration & Resilience (Restore Our Coasts)**



university
of south africa



Helmholtz-Zentrum
hereon



cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici



IGP Instituto
Geofísico
del Perú

PLOCAN Plataforma Oceánica
de Canarias

Partner Institution Countries: South Africa, Italy, Germany, Peru, and Spain

Buffalo City NetZero and Climate Resilient WWTW Living Lab

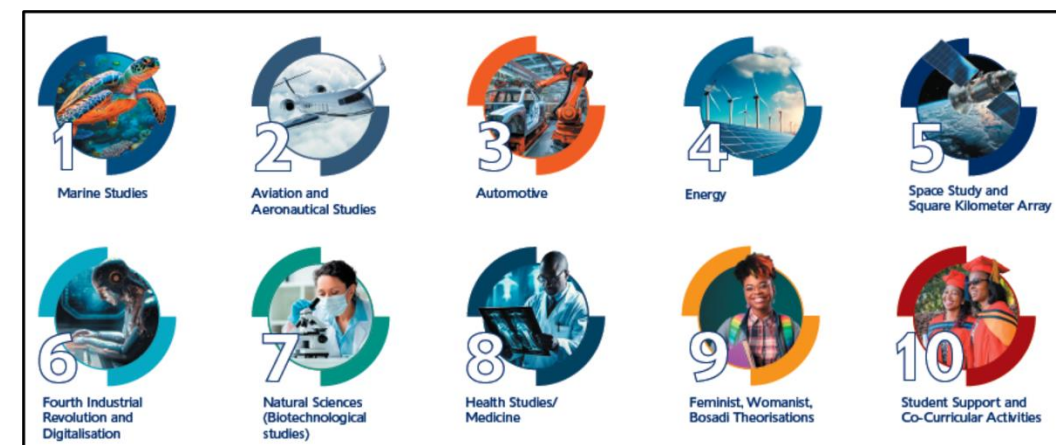
The selected cite for implementing the NetZero/Near Zero Emissions and Climate Resilient Wastewater Treatment Works.



Buffalo City NetZero and Climate Resilient WWTW Living Lab ...

When fully commissioned, the **NWWTW Living Lab** will build coastal resilience and climate mitigation through **8 key** elements aligned to the attainment of the SDGs by 2030:

1. Full automation of the selected WWTW
2. Installation and generation of renewable energy (solar, mini-hydro and biogas)
3. Effluent recycling for industrial and/or domestic use
4. Climate Risk and Vulnerability Assessment leading to climate resilient systems (including baselines for Loss and Damage)
5. Harmonisation of scientific, traditional, local, indigenous and other forms of knowledge systems and knowing
6. Explore Digital Twinning possibilities
7. Investigate potential for carbon credits and trading
8. Addresses the circular economy movement



Conclusions and Way Forward

- **Wastewater pollution diminishes coastal resilience and impacts negatively on livelihoods, and the problem across the world, especially in the global south is huge.**
- **Key impacts include reduced tourism activities (polluted beaches, etc), reduced fishing activities and ill-health for both human and aquatic environments.**
- **To this end, the Buffalo City NetZero/Near Zero Emissions and Climate Resilience WWTW project remains a must do intervention measure presenting a prototype for other regions.**
- **However, the main challenge in realising the plan is that the **Project/Living Lab** requires significant funding.**
- **The University of South Africa (UNISA) is the youngest implementing partner for Restore Our Coast, and as such the researchers will continue learning more from established partners.**



THANK YOU!

Email: Nhamog@unisa.ac.za

Mobile: +27731631114 (on WhatsApp)