

Plastic pollution on the beaches of Cape Town

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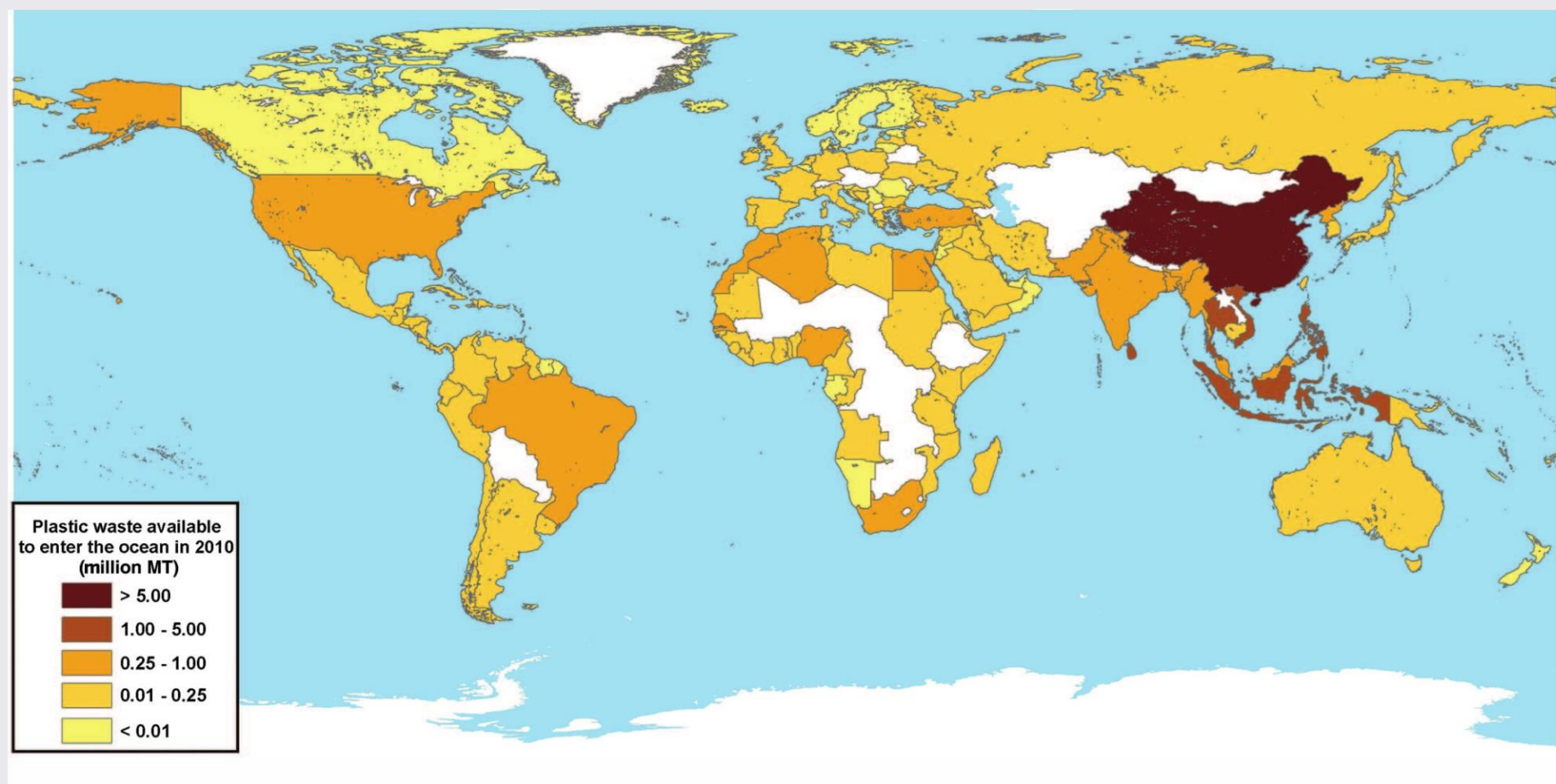
**Waste
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Presentation Outline

- Introduction
- Sources of plastic pollution
- Beach litter monitoring
- Litter abundance on Cape Town beaches

Plastic waste inputs from land into the ocean

Jambeck et al., 2015, Science

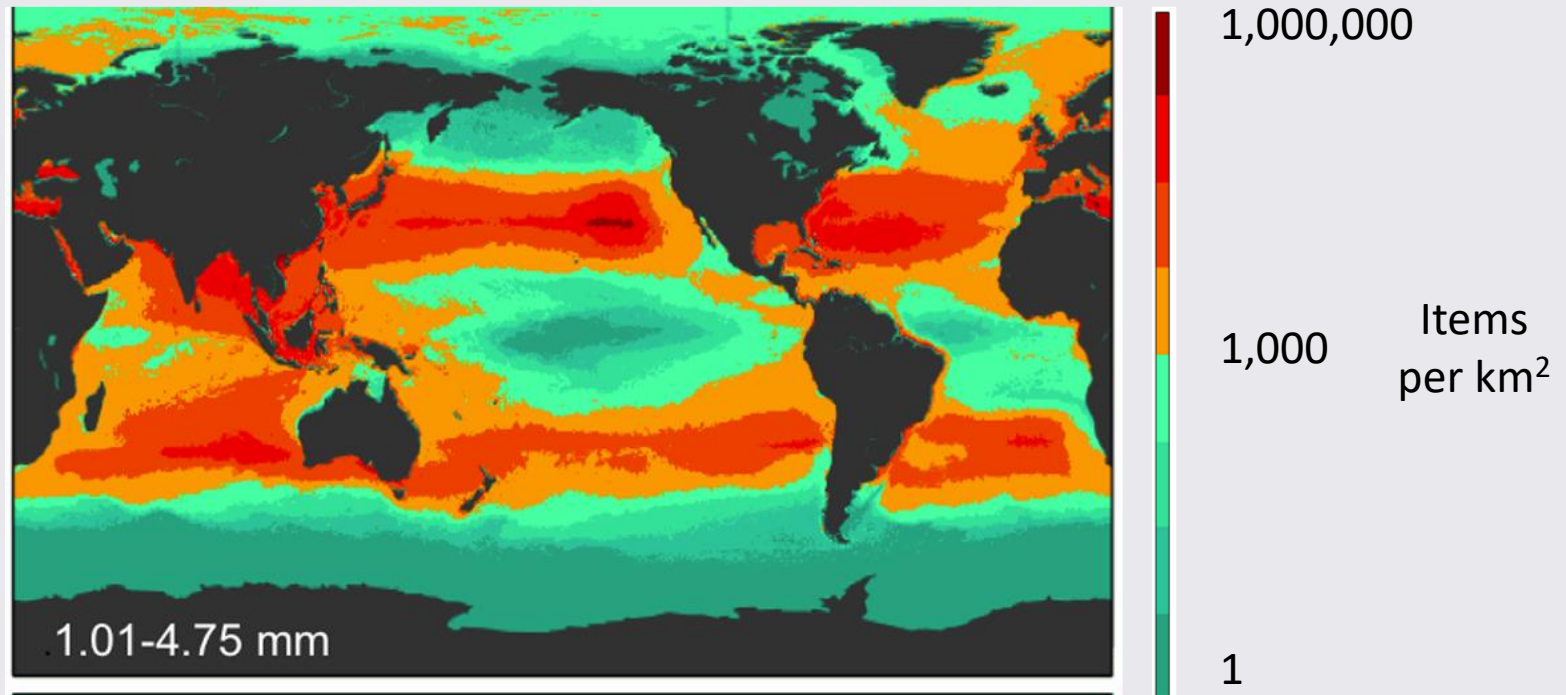


Estimated 5-12 million tonnes of plastic enter the ocean each year

Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea

Marcus Eriksen^{1*}, Laurent C. M. Lebreton², Henry S. Carson^{3,4}, Martin Thiel^{5,6,7},
Charles J. Moore⁸, Jose C. Borerro⁹, Francois Galgani¹⁰, Peter G. Ryan¹¹,
Julia Reisser¹²

2014



Jambeck et al. estimate 90-250 mT/year from South Africa

Land-based sources and pathways of marine plastics in a South African context

Verster and Bouwman 2020, *S. Afr. J. Sci.*

Estimate plastics entering the sea: 15-40 mT/year
(6x less than Jambeck et al. estimate)

The transport and fate of marine plastics in South Africa and adjacent oceans

Ryan 2020, *S. Afr. J. Sci.*

Estimate of plastics on SA beaches: <1 mT
(despite much litter stranding on beaches)

Sources



Stormwater Drains



Quantifying changes in litter loads in urban stormwater run-off from Cape Town, South Africa, over the last two decades

Weideman, E.A., Perold, V., Arnold, G. & Ryan, P.G. 2020

	n·ha ⁻¹ ·day ⁻¹			Mass g·ha ⁻¹ ·day ⁻¹		
	Resid.	Comm.	Indust.	Resid.	Comm.	Indust.
Total 2018-2019	5.0	203	576	2.4	115	377
Total 1996	6.4	71	731	13	58	383
% change	-22	+186	-21	-82	+98	-2

Rivers



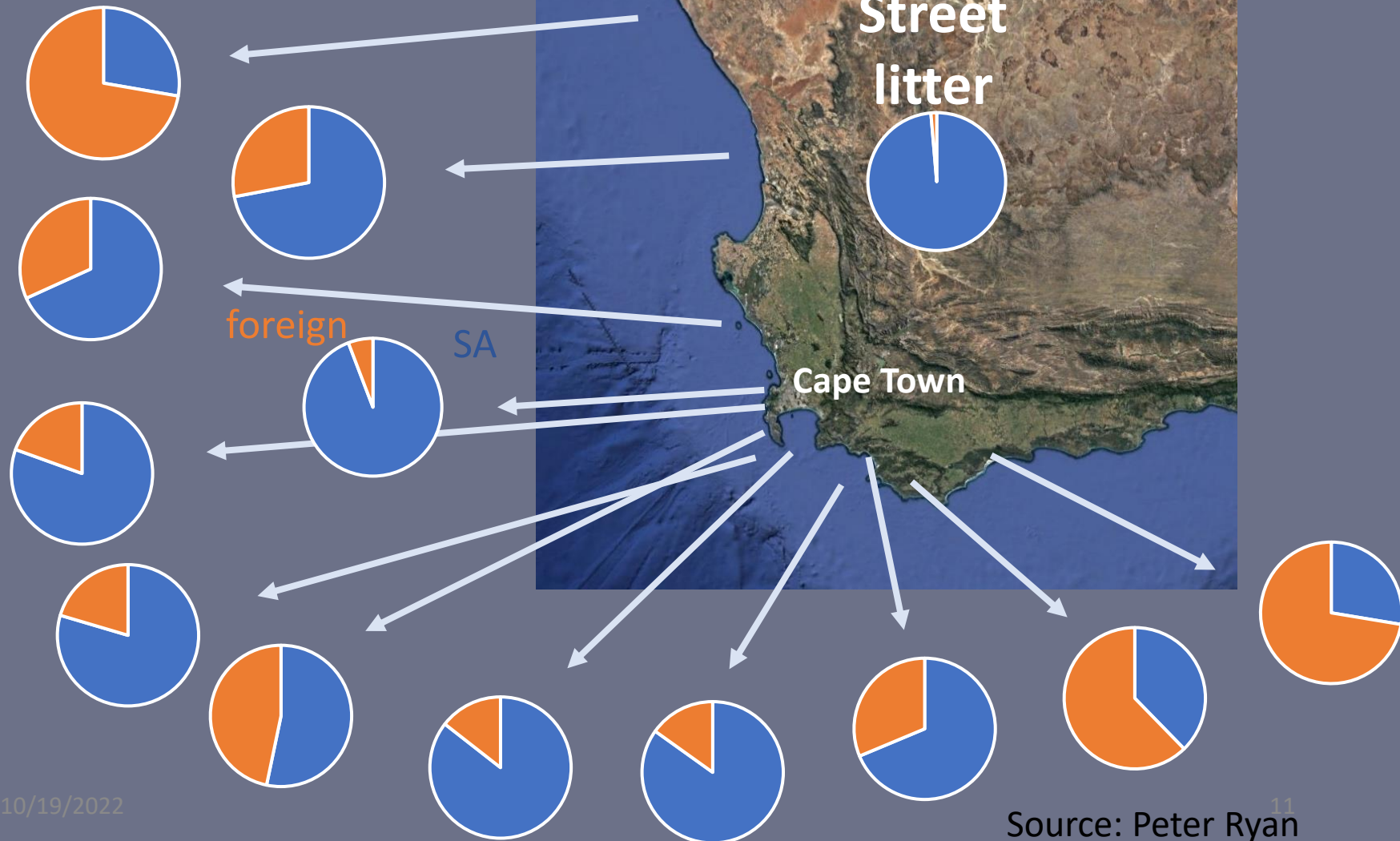
Wastewater Treatment Plants



10/19/2022

Sea-based

Origins of bottles on WC beaches



Litter monitoring on beaches



Beach surveys

- Beaches relatively more accessible
- Relatively less equipment required



Standing stock surveys

amount of litter at a period of time

- Only requires once-off sampling
- The information they provide is limited
- Value lies in the composition observed

Accumulation rate surveys

litter accumulation rate in a given area

- Requires an initial clean-up of the area, followed by regular sampling
- Can be conducted at different intervals: daily, weekly, monthly

Litter abundance on Cape Town beaches

Wolfgat Beach, Cape Town

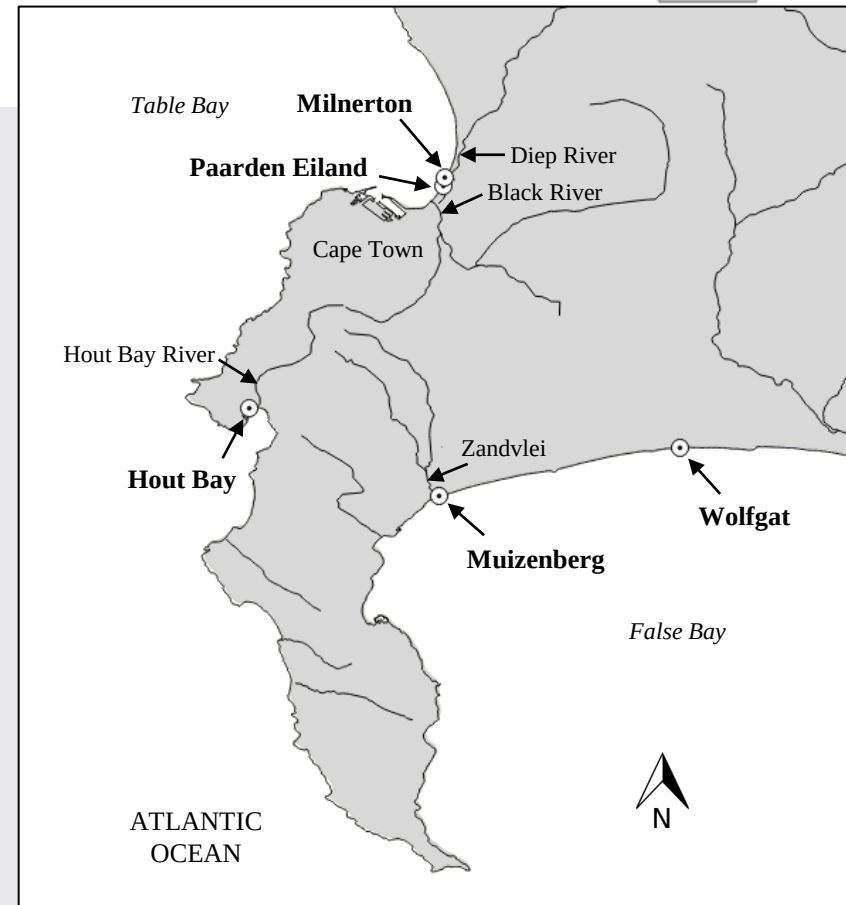




Accumulation and characteristics of plastic debris along five beaches in Cape Town

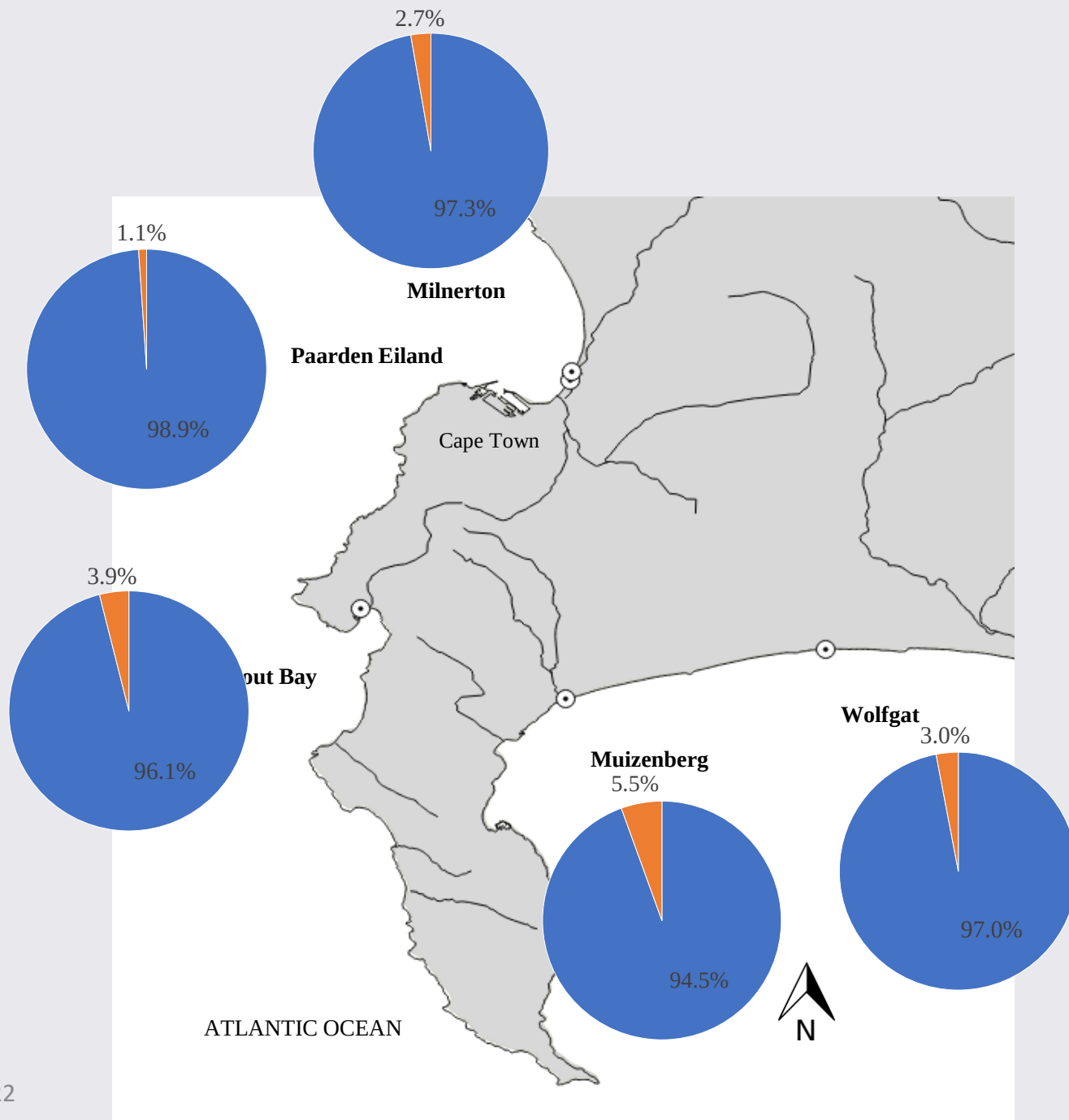
Takunda Y. Chitaka^{*}, Harro von Blottnitz

- Total of 36 620 items (52.9 kg) collected
- 372 distinguishable item types
- 10 material types
- 19 functional type categories

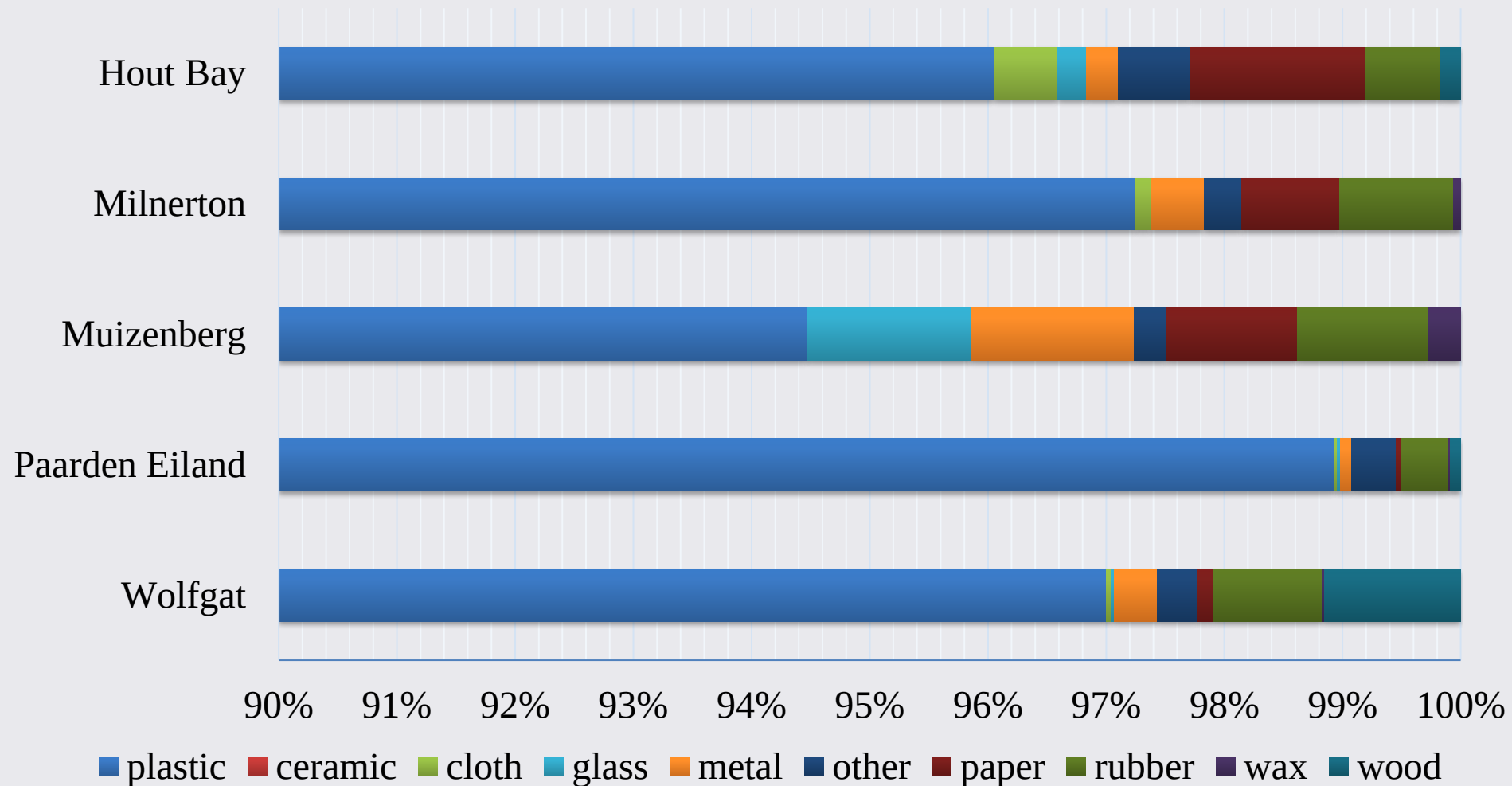


Accumulation rates

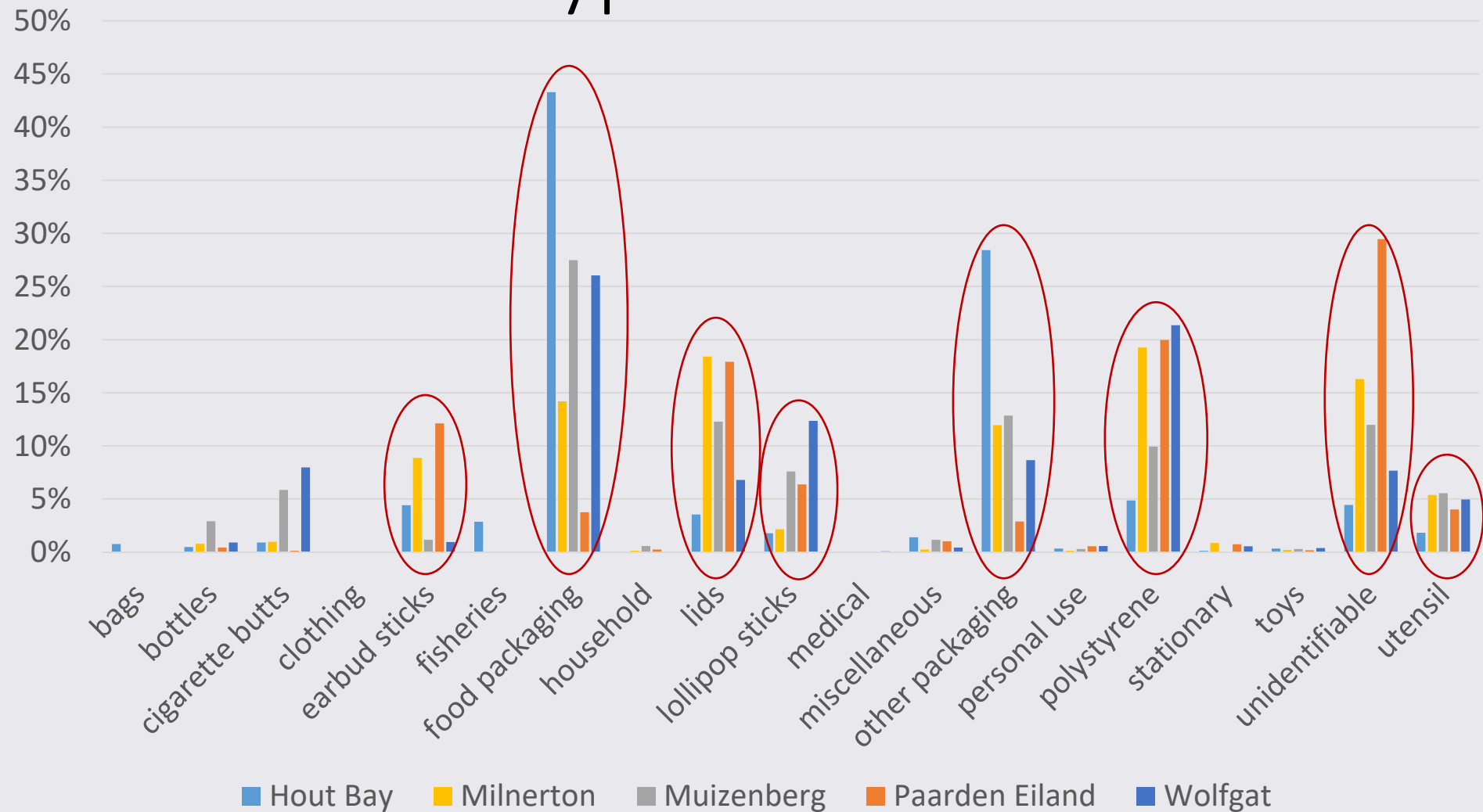
	Hout Bay	Milnerton	Muizenberg	Paarden Eiland	Wolfgat
Total Identified Item Types	162	110	65	246	206
Count (items.day⁻¹.100m⁻¹)					
Daily Accumulation Rate	594	521	36	2961	2197
Standard Error	494	364	28	2386	825
Coefficient of Variation	80%	70%	78%	81%	38%
Weight (g.day⁻¹.100m⁻¹)					
Daily Accumulation Rate	1294	827	134	4421	2340
Standard Error	732	871	134	3329	1181
Coefficient of Variation	57%	105%	100%	75%	50%



Material types by count



Functional types



Food related items accounted for 20% – 49% of plastic items

Prevalent & abundant items

	Average proportion
Clamshell polystyrene	8.3%
Lollipop sticks	6.1%
Snack packets	6.0%
Single sweet wrappers	5.4%
Cotton bud sticks	5.0%
Straws	4.0%
Thin PS	3.1%
Lids	2.8%
Lollipop wrappers	2.7%

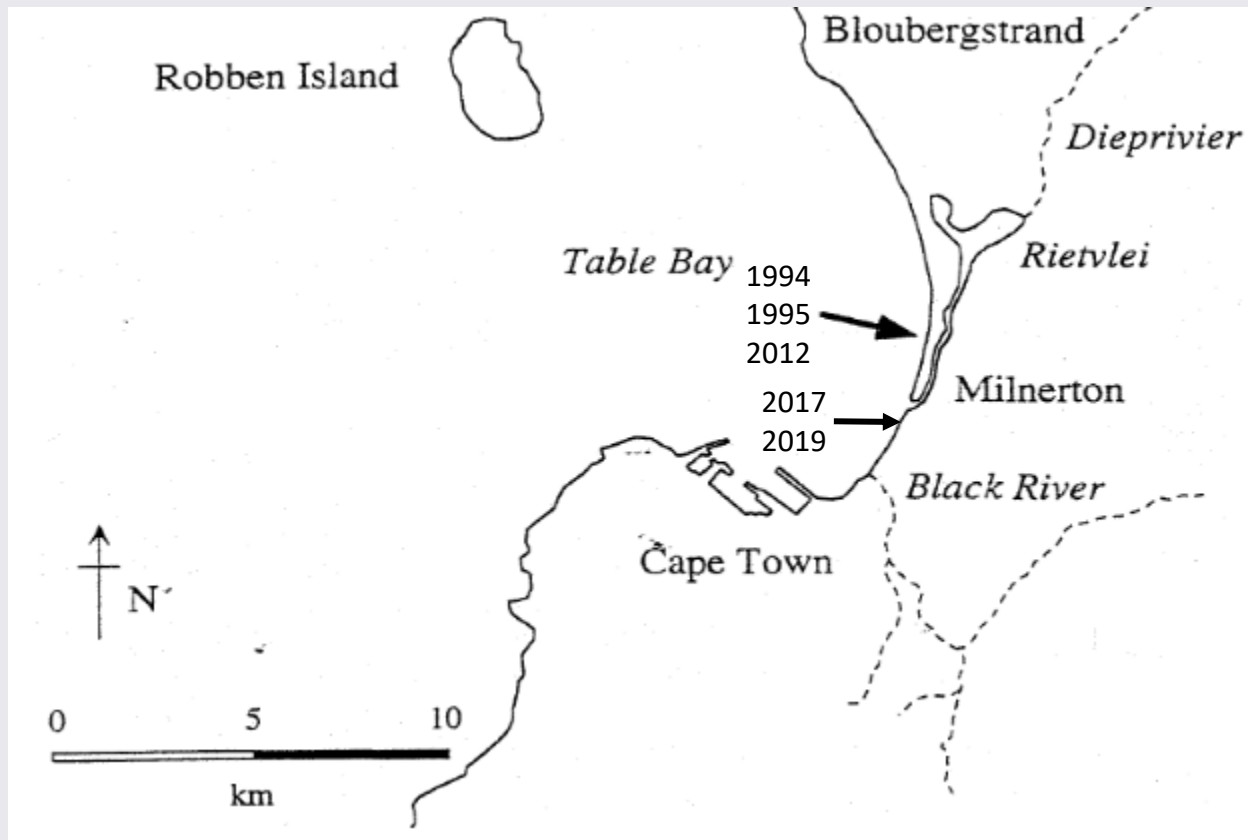
Bottles vs lids

		Hout Bay	Milnerton	Muizenburg	Paarden Eiland	Wolfgat
Counts (items.day ⁻¹ .100m ⁻¹)	Lids	7.2	27.7	0.4	119.6	38.4
	Bottles	0.8	1.3	0.3	2.3	4.2
Weights (g.day ⁻¹ .100m ⁻¹)	Lids	16.1	61.4	0.9	269.5	87.6
	Bottles	19.7	26.6	7.9	52.5	108.7

Milnerton beach

Ryan et al. 2014; Chitaka, 2020

	1994	1995	2012	2017	2019
items. m ⁻¹ .day ⁻¹	1,55	2,87	14,58	5,23	7,76
% plastic	84,5	85,7	92,6	97,1	87,7



Classifying litter

- Macro $>25\text{mm}$
- Meso $\sim 2 - 25\text{mm}$
- Micro $<2\text{mm}$

Most “microplastics” are microfibres

Linen

Acrylics

Polyester

Cotton

Wool

But 92% ‘natural’ fibres

Rayon

Cellulosics

PET

Polyamide

Polypropylene



Thank you!

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