

Water and Environment Support

in the ENI Southern Neighbourhood region

Activity: WES N-E-MO-2

Training workshop on marine litter monitoring & mitigation

Marine litter monitoring in Morocco: results & outputs

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ASSESSING MARINE LITTER IN MOROCCO



Water and Environment Support
in the ENI Southern Neighbourhood region

**LITERATURE
REVIEW**

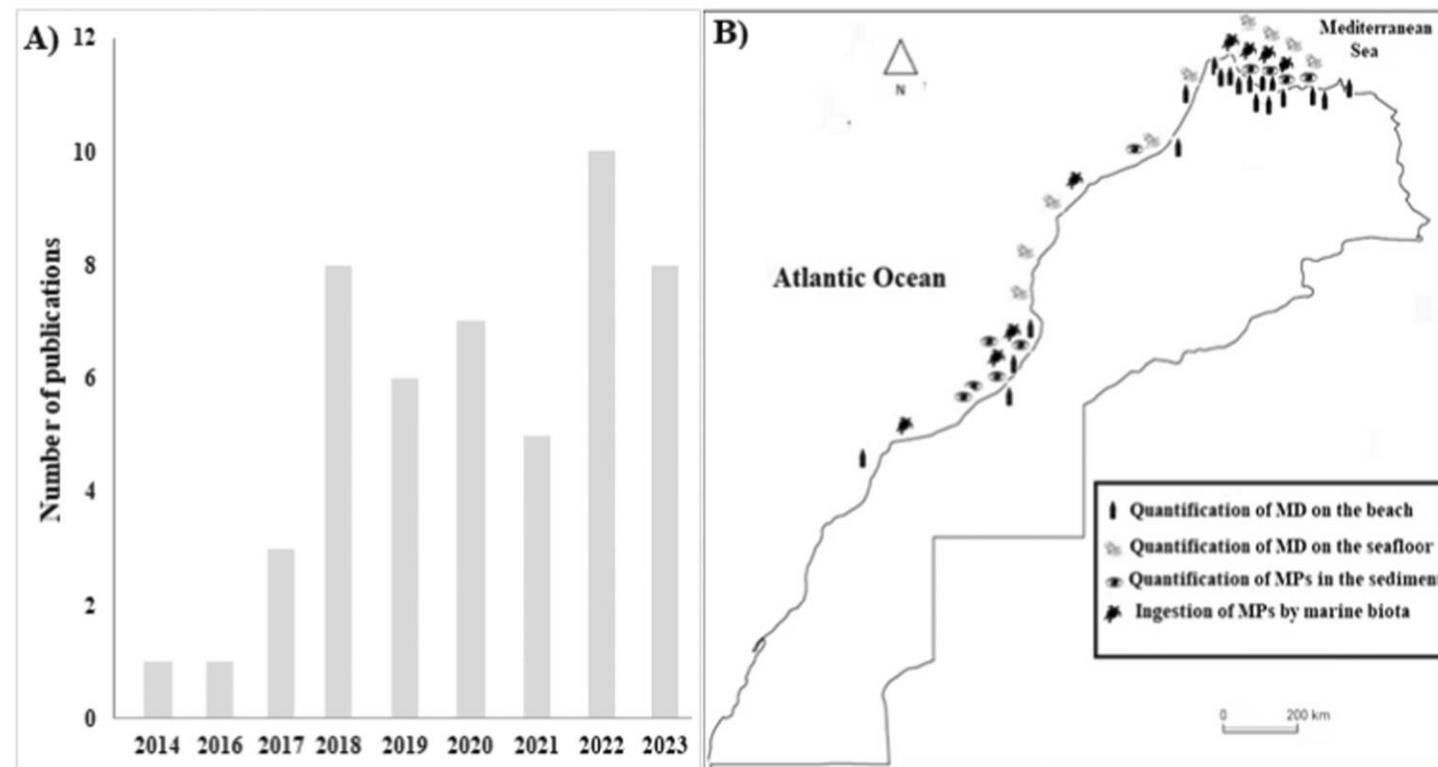
**SWIM-H2020
SM BEACH
LITTER DATA**

**WES FLOATING
& SEAFLOOR
LITTER DATA**



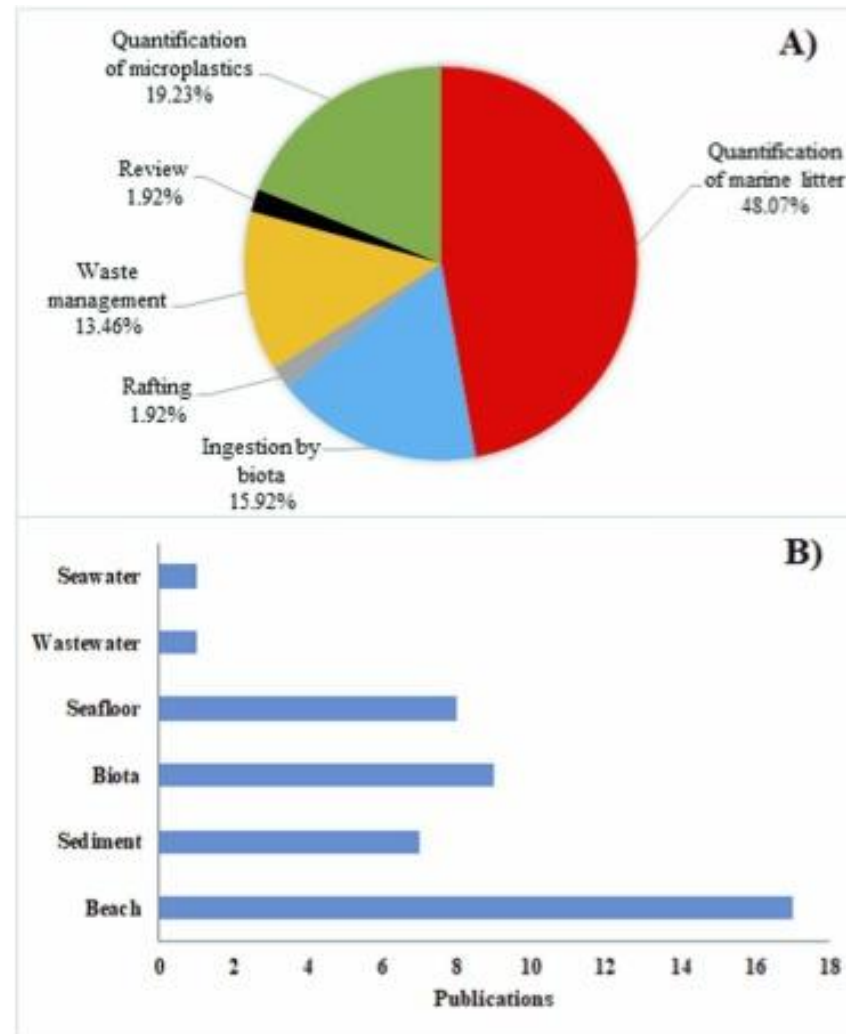
ASSESSING MARINE LITTER IN MOROCCO – LITERATURE REVIEW & KEY FINDINGS

Mghili, B., Ben-Haddad, M., Zerrad, O., Rangel-Buitrago, N., Aksissou, M., 2024. Tackling marine plastic pollution in Morocco: A review of current research, regulatory measures, and future challenges. *Reg. Stud. Mar. Sci.* 69, 103286, <https://doi.org/10.1016/j.rsma.2023.103286>



ASSESSING MARINE LITTER IN MOROCCO – LITERATURE REVIEW & KEY FINDINGS

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ASSESSING MARINE LITTER ON THE MOROCCAN COASTLINE

– LITERATURE REVIEW & KEY FINDINGS

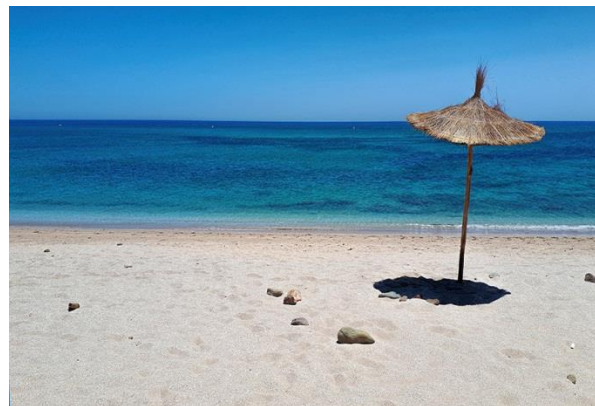
Year of publication	Country	Number of surveyed sites	Reference
2017	Morocco	1	Alshawafi et al., 2017
2018	Morocco	14	Maziane et al., 2018
2019	Morocco	14	Nachite et al., 2019
2020	Morocco	5	Mghili et al., 2020
2022	Morocco	3	Bouzekry et al., 2022

- ✓ Majority of items found were made of plastic
- ✓ Items generally originated from land-based sources (tourism and recreational activities) and commercial fishing
- ✓ Most abundant items: plastic bags, food wrappers, plastic bottles, plastic pieces and plastic caps
- ✓ Average litter densities were similar to values reported by other surveys in the Mediterranean
- ✓ Beaches were found in non-GES

ASSESSING MARINE LITTER IN MOROCCO – LITERATURE REVIEW & KEY FINDINGS

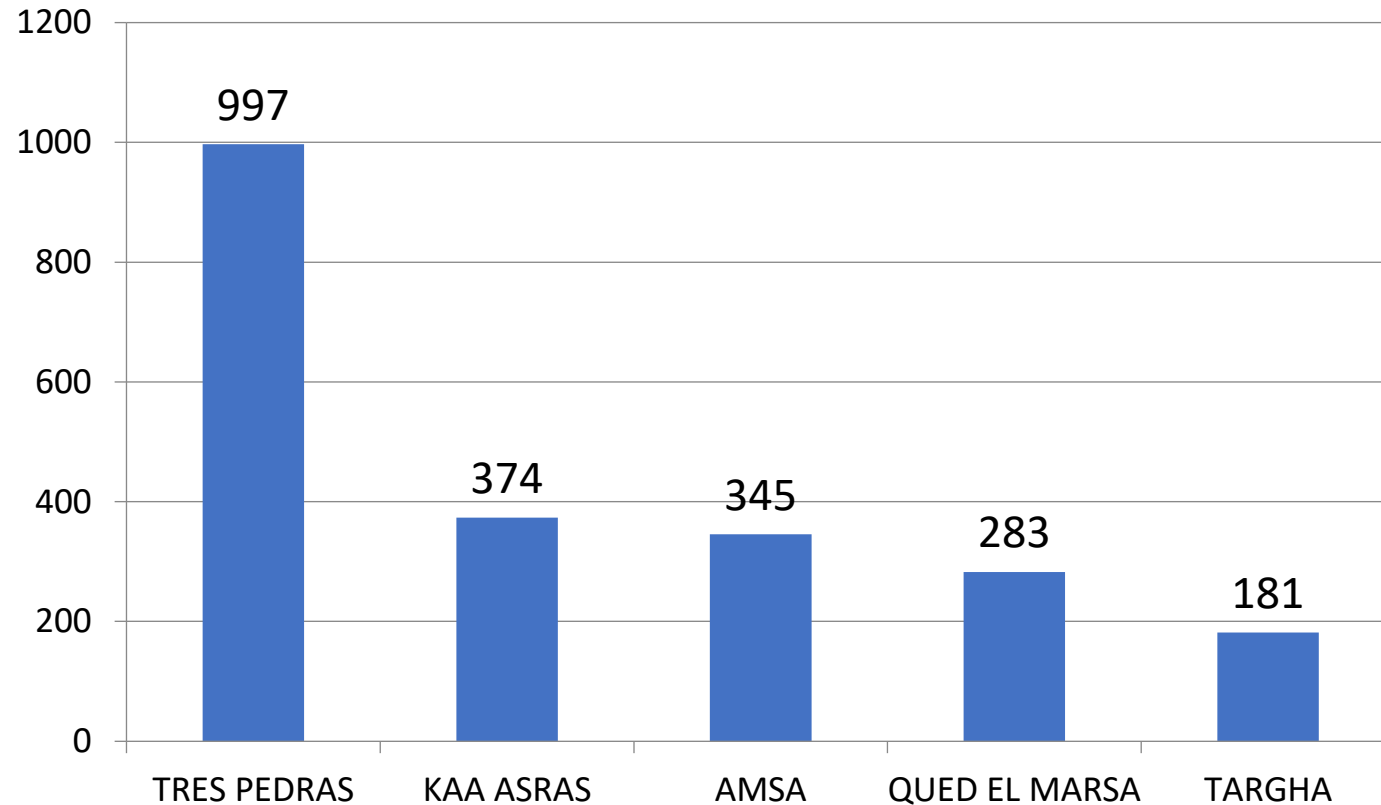
Loulad et al. (2017)	Seafloor	Atlantic	Trawl surveys	0–1768 kg/km ²	Plastic	83 %
Loulad et al. (2019)	Seafloor	Mediterranean	Trawl surveys	26 ± 68–80 ± 133 kg/km ²	Plastic	73 %
Rhinane et al. (2019)	Seafloor	Atlantic	Trawl surveys	16.84–30.15 kg/km ²	Plastic	40 %
Azaaouaj and Nachite (2019)	Seafloor	Mediterranean	Scuba Diver	0.997 items/m ²	Plastic	75 %
Houssa et al. (2021)	Seafloor	Atlantic	Trawl surveys	368 ± 1111 kg/km ²	Plastic	86.5 %
Buhl-Mortensen et al. (2022)	Seafloor	Atlantic	Trawl surveys	652.4 items/m ²	Plastic	-
Mghili et al. (2023b)	Seafloor	Mediterranean	Trawl surveys	813 items/km ²	Plastic	57 %
Ben haddouch et al. (2023)	Seafloor	Atlantic	Trawl surveys	76.5 ± 59.9 items/km ²	Plastic	81 %

ASSESSING MARINE LITTER IN MOROCCO – SWIM-H2020 SM BEACH LITTER DATA



The beach litter surveys were carried out on beaches located in five sites along the Mediterranean coastline of Morocco, namely the sites of Qued El Marsa, Tres Pedras, Amsa, Targha and Kaa Asraas

ASSESSING MARINE LITTER IN MOROCCO – SWIM-H2020 SM BEACH LITTER DATA – LITTER DENSITY



- ✓ A total of 13,078 items were recorded, removed and classified.
- ✓ The average litter density was calculated to be 436 items/100m.

A total of 30 beach transects were surveyed, which extended over a distance of 3,000m and covered an area of 125,550m²

ASSESSING MARINE LITTER IN MOROCCO – SWIM-H2020 SM BEACH LITTER DATA – LITTER DENSITY

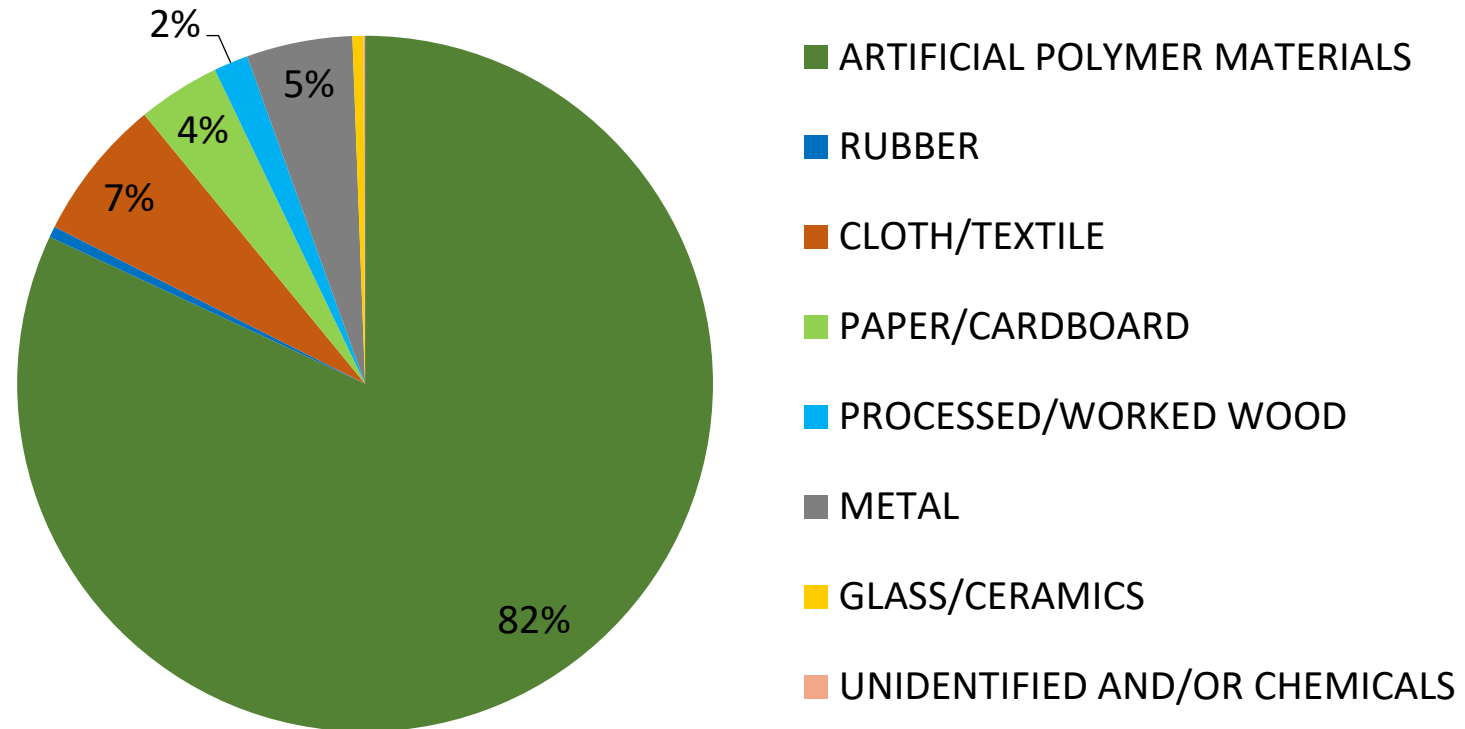
Site Name	Litter Density per 100m	(E) LCR	(M) LCR
Tres Pedras	997	50	8
Kaa Asras	374	19	3
Amsa	345	17	3
Qued El Marsa	283	14	2
Targha	181	9	1

The average litter density exceeded the European threshold value by 22 times and the Mediterranean threshold by 3 times.

ASSESSING MARINE LITTER ON THE MOROCCAN COASTLINE – SWIM-H2020 SM BEACH LITTER DATA – LITTER DENSITY

Country	European Regional Sea	Number of surveyed beaches	Litter density (items/100m)	Reference
Turkey	Black Sea	9	3,297*	Bat et al., 2022
Croatia	Mediterranean	4	2,915	Vlachogianni et al., 2018
Slovenia	Mediterranean	3	495	Vlachogianni et al., 2018
Italy	Mediterranean	64	477	Fortibuoni et al., 2021
Croatia, Cyprus, France, Greece, Italy	Mediterranean	23	451	Vlachogianni et al., 2020
Spain	Mediterranean	6	440	Compa et al., 2022
Morocco	Mediterranean	5	436	Present study
Montenegro	Mediterranean	2	374	Vlachogianni et al., 2018
Albania	Mediterranean	5	333	Gjyli et al., 2020
Germany	Baltic	4	304	Hengstmann et al., 2017
Morocco	Mediterranean	12	269	Nachite et al., 2019
Greece	Mediterranean	10	201	Vlachogianni et al., 2018
Spain	Mediterranean	56	186	Asensio-Montesinos et al., 2019
Greece	Mediterranean	9	125	Vlachogianni and Scoullou, 2023
Germany	Baltic	10	90	Lenz et al., 2023
Spain	North-East Atlantic	40	61	Asensio-Montesinos et al., 2020
Denmark	Baltic	1	43	Strand et al., 2016

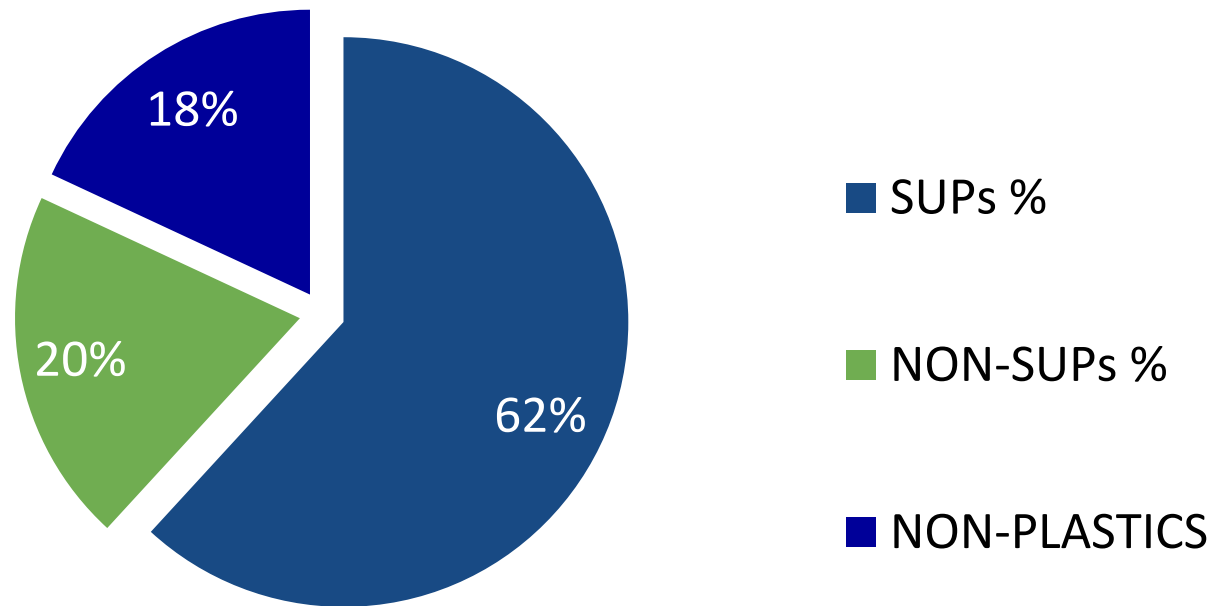
ASSESSING MARINE LITTER ON THE MOROCCAN COASTLINE – SWIM-H2020 SM BEACH LITTER DATA – COMPOSITION



ASSESSING MARINE LITTER ON THE MOROCCAN COASTLINE – SWIM-H2020 SM BEACH LITTER DATA – COMPOSITION

	Item code	Item name	Items count	%
1	G3	Shopping bags, incl. pieces	2083	15,9
2	G30	Crisps packets/sweets wrappers	1820	13,9
3	G21	Plastic caps/lids from drinks	1129	8,6
4	G27	Cigarette butts and filters	917	7,0
5	G10	Food containers incl. fast food containers	898	6,9
6	G8	Drink bottles >0.5l	741	5,7
7	G137	Clothing / rags (clothes, hats, towels)	725	5,5
8	G7	Drink bottles <=0.5l	681	5,2
9	G31	Lolly sticks	517	4,0
10	G79	Plastic pieces 2.5 cm > < 50cm	337	2,6
11	G175	Cans (beverage)	322	2,5
12	G156	Paper fragments	211	1,6
13	G124	Other plastic/polystyrene items (identifiable)	208	1,6
14	G50	String and cord (diameter less than 1cm)	173	1,3
15	G176	Cans (food)	154	1,2
16	G16	Jerry cans (square plastic containers with handle)	105	0,8
17	G171	Other wood < 50 cm	103	0,8
18	G33	Cups and cup lids	83	0,6
19	G158	Other paper items	81	0,6
20	G73	Foam sponge	79	0,6

ASSESSING MARINE LITTER ON THE MOROCCAN COASTLINE – SWIM-H2020 SM BEACH LITTER DATA – SUPs



**SUPs accounted for 62% of the
total litter items collected**

ASSESSING MARINE LITTER ON THE MOROCCAN SEA SURFACE – WES SEA SURFACE LITTER DATA

Location code	Survey area	Survey timing	Distance covered (m)	Observation width (m)	Area covered (m ²)	Marine litter counts
MAMDf1	Tamuda Bay	autumn	17,400	8	139,200	132
MAMDf2	Tamuda Bay	autumn	29,840	8	238,720	276
MAMDf	M'diq Bay	spring	8,450	8	67,600	61
MAMRf	Martil Bay	spring	22,200	8	177,600	148



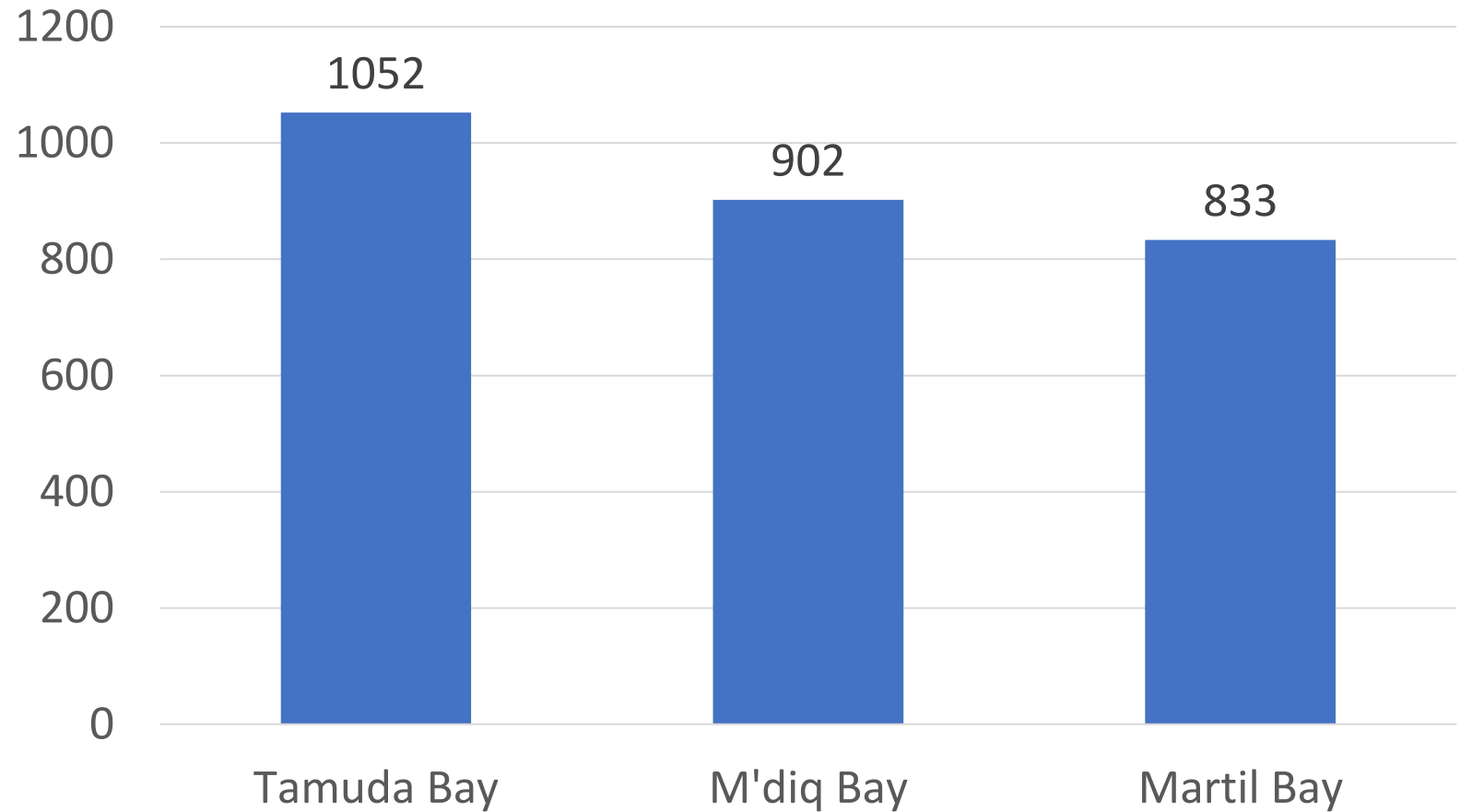
ASSESSING MARINE LITTER ON THE MOROCCAN SEA SURFACE – WES SEA SURFACE LITTER DATA

During the two sea surface litter campaigns in the bays of Tamuda, M'diq, and Martil, a total of 617 litter items were observed, classified, and recorded.



ASSESSING MARINE LITTER ON THE MOROCCAN SEA SURFACE – WES SEA SURFACE LITTER DATA - DENSITY

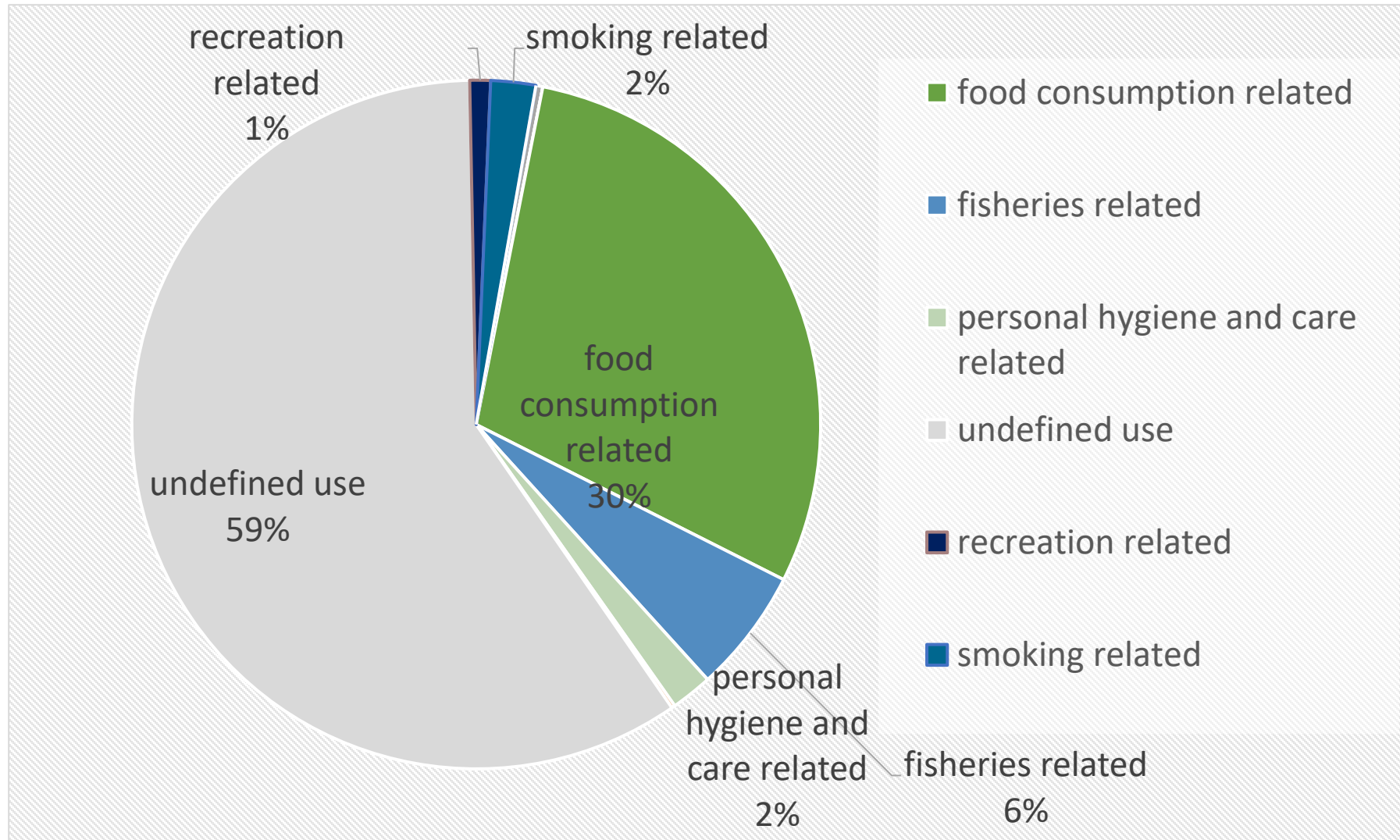
**Average floating
litter density:
929 items/km²**



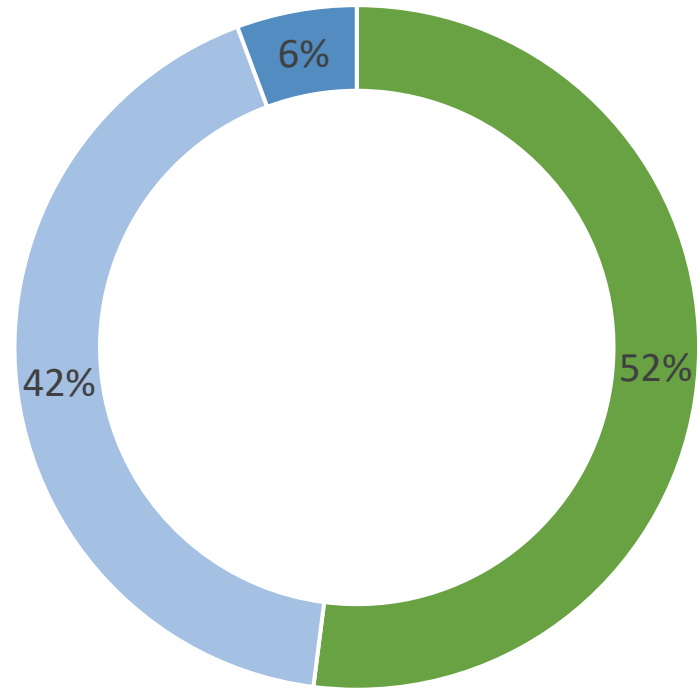
ASSESSING MARINE LITTER ON THE MOROCCAN SEA SURFACE – WES SEA SURFACE LITTER DATA - COMPOSITION

No	Item code	Item name	Items count	Items %
1	J79	fragments of non-foamed plastic 2.5cm \geq \leq 50cm	174	29.0
2	J30	plastic crisps packets/sweets wrappers	146	23.7
3	J4	small plastic bags	52	8.4
4	J3	plastic shopping/carrier/grocery bags	38	6.2
5	J242	plastic string and cord (diameter less than 1cm) not from dolly ropes or unidentified	28	4.5
6	J53	plastic nets and pieces of net 2.5 cm \geq \leq 50 cm	20	3.2
7	J241	other identifiable non-foamed plastic items	17	2.8
8	J24	plastic rings from bottle caps/lids	11	1.8
9	J171	other processed wooden items 2.5 cm \geq \leq 50 cm	10	1.6
10	J82	fragments of foamed polystyrene 2.5 cm \geq \leq 50 cm	9	1.5
11	J25	plastic tobacco pouches / plastic cigarette packet packaging	9	1.5
				84.1%

ASSESSING MARINE LITTER ON THE MOROCCAN SEA SURFACE – WES SEA SURFACE LITTER DATA - SOURCES



ASSESSING MARINE LITTER ON THE MOROCCAN SEA SURFACE – WES SEA SURFACE LITTER DATA - SUPS



■ SUP ■ non SUP plastics ■ non plastics

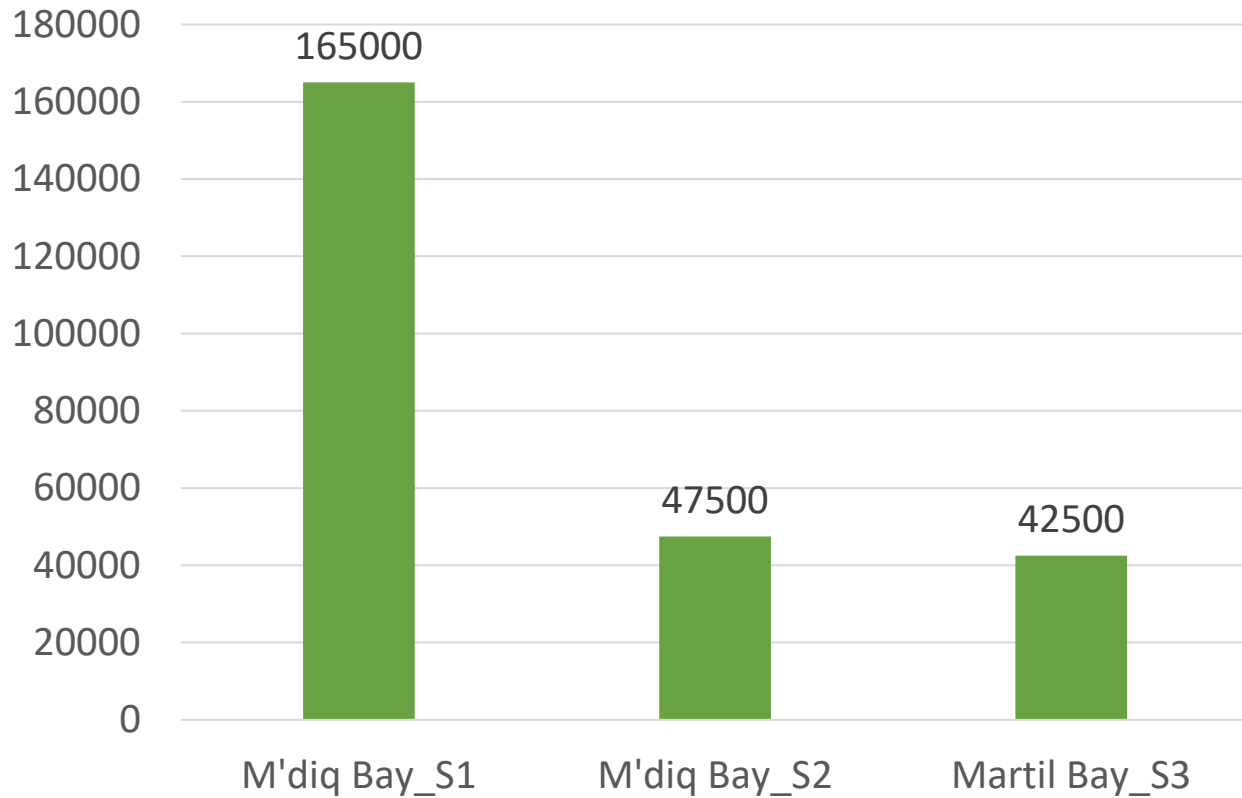
ASSESSING MARINE LITTER ON THE MOROCCAN SEAFLOOR – WES SEAFLOOR LITTER DATA

Location code	Survey area	Survey timing	Distance covered (m)	Observation width (m)	Area covered (m ²)	Marine litter counts
MAMDb1	M'diq Bay	autumn	100	4	400	66
MAMDb2	M'diq Bay	autumn	100	4	400	19
MAMDb2	M'diq Bay	spring	100	4	400	17

Two survey campaigns for seafloor macrolitter were conducted in autumn 2022 and spring 2023 in the Moroccan marine waters. During the autumn campaign, two seafloor macrolitter surveys with scuba divers were conducted at the Bay of M'diq. A total surface area of 800 m² were surveyed by two dedicated surveyors, each having an observation width of 2 m.



ASSESSING MARINE LITTER ON THE MOROCCAN SEAFLOOR – WES SEAFLOOR LITTER DATA - DENSITY



Average seafloor litter density: 85,000 items/km²

**IMAP CI23
THRESHOLD VALUE
38 items/km²**



ASSESSING MARINE LITTER IN MOROCCO – LITERATURE REVIEW & KEY FINDINGS

Azaaouaj and Nachite (2019)	Seafloor	Mediterranean	Scuba Diver	997,000 items/km ²
Buhl-Mortensen et al. (2022)	Seafloor	Atlantic	Trawl surveys	652,400,000 items/km ²
Mghili et al. (2023b)	Seafloor	Mediterranean	Trawl surveys	813 items/km ²
Ben haddouch et al. (2023)	Seafloor	Atlantic	Trawl surveys	76.5 ± 59.9 items/km ²

ASSESSING MARINE LITTER ON THE MEDITERRANEAN SEAFLOOR - REPORTED DENSITIES

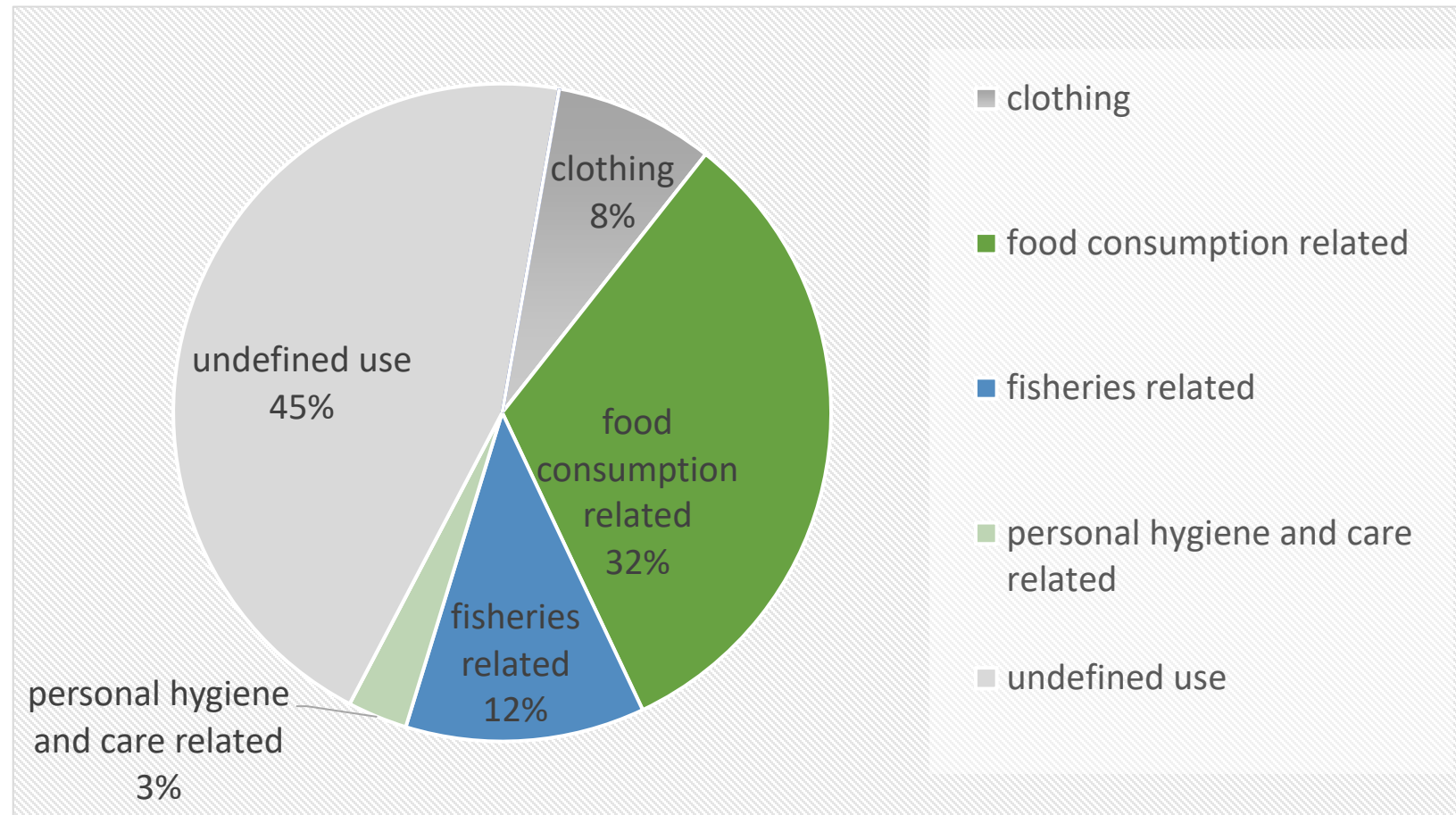
Area	Depth (m)	items/100 m ²	Plastic (%)	Source
Adriatic Sea	3-24	2.78 ± 3.35	36	Vlachogianni, et al., 2017
Gulf of Aqaba, Red Sea	0-10	280	42	Abu-Hilal and Al-Najjar, 2009
N. Hawaiian Island, Lisianski Island	10	0.4*10 ⁻³ – 6.2*10 ⁻³	-	Donohue et al., 2001
Gray's Reef National Marine Sanctuary, USA	16-20	0.52 ± 0.11	-	Bauer et al., 2008
Eastern Mediterranean Sea, Greece	0-25	1.5	55.47	Katsanevakis and Katsarou, 2004

Average seafloor litter density: 8.5 items/100m²

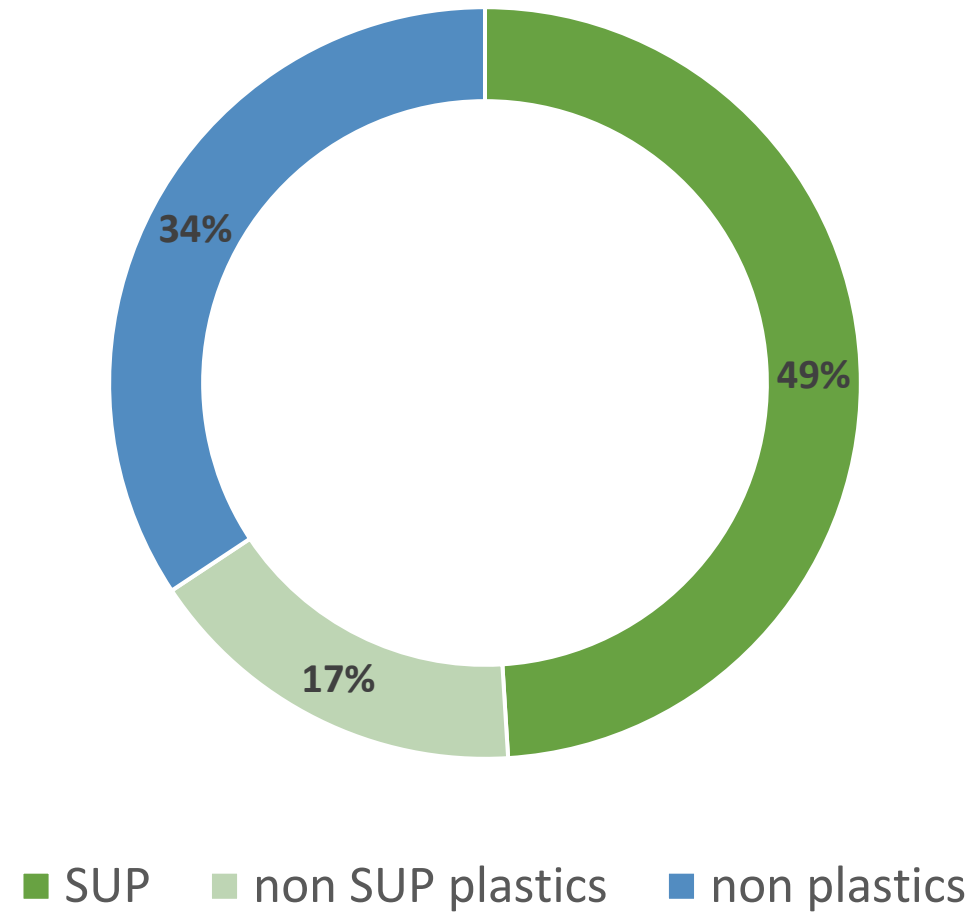
ASSESSING MARINE LITTER ON THE MOROCCAN SEAFLOOR – WES SEAFLOOR LITTER DATA - COMPOSITION

No	Item code	Item name	Items count	Items %
1	J8	plastic drink bottles >0.5 l	10	9.8
2	J59	plastic fishing line	10	9.8
3	J3	plastic shopping/carrier/grocery bags	9	8.8
4	J7	plastic drink bottles ≤ 0.5 l	6	5.9
5	J156	paper fragments	6	5.9
6	J137	clothing	5	4.9
7	J30	plastic crisps packets/sweets wrappers	5	4.9
8	J4	small plastic bags	5	4.9
9	J79	fragments of non-foamed plastic 2.5cm ≥ ≤ 50cm	5	4.9
10	J225	plastic food containers made of hard non-foamed plastic	4	3.9
				63.7

ASSESSING MARINE LITTER ON THE MOROCCAN SEAFLOOR – WES SEAFLOOR LITTER DATA - SOURCES



ASSESSING MARINE LITTER ON THE MOROCCAN SEAFLOOR – WES SEAFLOOR LITTER DATA - SUPs





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Environment Support**
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Thank you for your attention!

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