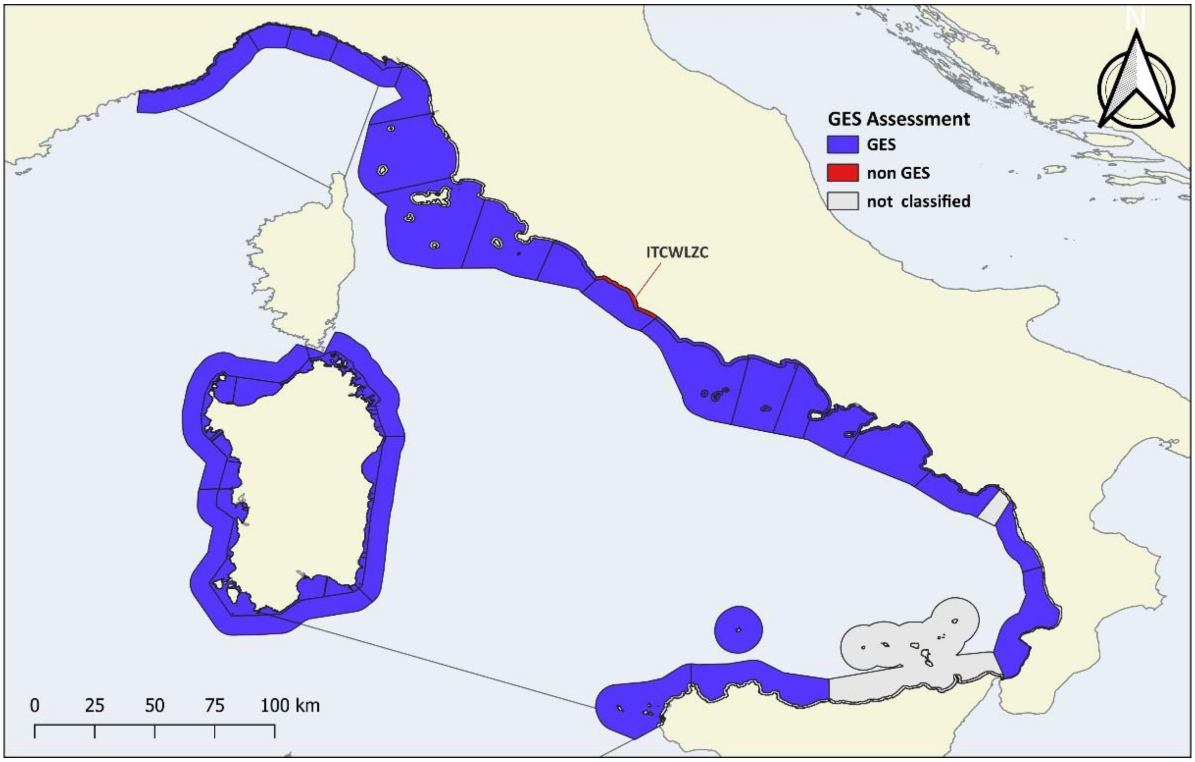

Figure WMS 3.1.3.4.8.E: Result of the GES assessment by applying the EQR methodology in the Italian waters in the Tyrrhenian Sea and CWMS at the level of subSAUs.

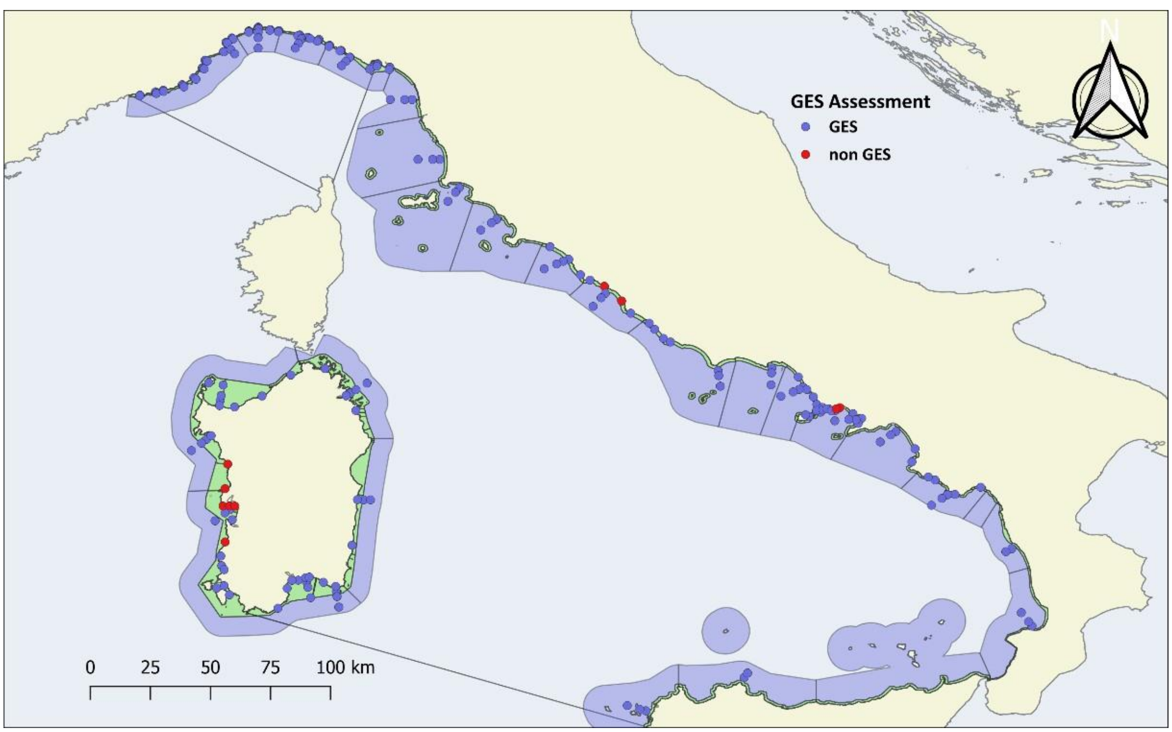

Figure WMS 3.1.3.4.9.E: Result of the GES assessment by applying the EQR method for the Italian part of the Tyrrhenian Sea and CWMS at the level of monitoring stations.

Table 3.1.3.4.12. Results of the assessment (G_NG.oN85- the good status class corresponding to all values below the 85th percentile set as the good/non-good boundary limit) for the Italian waters in the Tyrrhenian Sea and part of the CWMS provided at the level of the Spatial Assessment Units (SAUs). Blue coloured SAUs indicate good status.

AZ	SAU	CHL_N	CHL_GM	oN50	oN50+50	oN10	oN85	G_NG.oN85
CW	CW_ITA_ISL_E	8552	0,123	0,095	0,142	0,067	0,151	**G**
CW	CW_ITA_ISL_W	14080	0,141	0,104	0,156	0,079	0,169	**G**
CW	CW_ITA_TYR_N	5771	0,392	0,348	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_S	8772	0,319	0,263	0,395	0,085	1,124	**G**
OW	OW_ITA_ISL_E	24780	0,075	0,074	0,112	0,059	0,095	**G**
OW	OW_ITA_ISL_W	30285	0,084	0,083	0,124	0,068	0,098	**G**
OW	OW_ITA_TYR_N	85659	0,114	0,095	0,143	0,079	0,156	**G**
OW	OW_ITA_TYR_S	143789	0,088	0,077	0,116	0,061	0,111	**G**

CHL_N – number of grid point in the SAU; CHL_GM – geometric mean (5-year average); oN50 – mean; oN50+50 – Mean + 50%; oN10 – 10th percentile (Reference conditions); oN85 – 85th percentile (G/NG threshold)

Table 3.1.3.4.13. Result of the assessment (G_NG.oN85- the good status class corresponding to all values below the 85th percentile set as the good/non-good boundary limit based on satellite derived Chl *a* data) for the Italian waters in the Tyrrhenian Sea and part of the CWMS at the level of the finest Spatial Assessment Units (subSAUs). Blue coloured subSAUs indicate good status. Red coloured SAUs indicate non-good status.

AZ	SAU	subSAU	CHL_N	CHL_GM	oN50+50	oN10	oN85	G_NG.oN85
CW	CW_ITA_ISL_E	ITCWSDEA	2259	0,121	0,142	0,067	0,151	**G**
CW	CW_ITA_ISL_E	ITCWSDEB	2887	0,109	0,142	0,067	0,151	**G**
CW	CW_ITA_ISL_E	ITCWSDEC	3406	0,137	0,142	0,067	0,151	**G**
CW	CW_ITA_ISL_W	ITCWSDWA	8314	0,116	0,156	0,079	0,169	**G**
CW	CW_ITA_ISL_W	ITCWSDWB	5766	0,185	0,156	0,079	0,169	**NG**
CW	CW_ITA_TYR_N	ITCWLGA	761	0,616	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_N	ITCWLGB	276	0,522	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_N	ITCWLGC	143	0,409	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_N	ITCWLGD	534	0,253	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_N	ITCWLZD	599	0,787	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_N	ITCWTCA	1014	0,43	0,522	0,085	0,882	**G**
CW	CW_ITA_TYR_N	ITCWTCB	1311	0,176	0,522	0,085	0,882	**G**

AZ	SAU	subSAU	CHL_N	CHL_GM	oN50+50	oN10	oN85	G_NG.oN85
CW	CW_ITA_TYR_N	ITCWTCC	789	0,317	0,522	0,085	0,882	G
CW	CW_ITA_TYR_N	ITCWTCD	344	1,730	0,522	0,085	0,882	NG
CW	CW_ITA_TYR_S	ITCWBCA	64	0,212	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWCMA	432	0,162	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWCMB	702	0,275	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWCMC	801	0,327	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWCMD	495	1,014	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWLBA	572	0,233	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWLBB	478	0,198	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWLZA	654	0,409	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWLZB	1468	0,390	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWLZC	844	1,253	0,395	0,085	1,124	NG
CW	CW_ITA_TYR_S	ITCWSCA	378	0,322	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWSCB	883	0,178	0,395	0,085	1,124	G
CW	CW_ITA_TYR_S	ITCWSCC	1001	0,133	0,395	0,085	1,124	G
OW	OW_ITA_ISL_E	ITOWSDEA	8730	0,090	0,112	0,059	0,095	G
OW	OW_ITA_ISL_E	ITOWSDEB	10495	0,066	0,112	0,059	0,095	G
OW	OW_ITA_ISL_E	ITOWSDEC	5555	0,072	0,112	0,059	0,095	G
OW	OW_ITA_ISL_W	ITOWSDWA	15955	0,084	0,124	0,068	0,098	G
OW	OW_ITA_ISL_W	ITOWSDWB	14330	0,083	0,124	0,068	0,098	G
OW	OW_ITA_TYR_N	ITOWLGA	4859	0,126	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWLGB	3545	0,109	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWLGC	2720	0,112	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWLGD	7785	0,105	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWLZD	5559	0,141	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWTCA	13450	0,116	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWTCB	22405	0,098	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWTCC	19399	0,098	0,143	0,079	0,156	G
OW	OW_ITA_TYR_N	ITOWTCD	5937	0,267	0,143	0,079	0,156	NG
OW	OW_ITA_TYR_S	ITOWBCA	1929	0,075	0,116	0,061	0,111	G

AZ	SAU	subSAU	CHL_N	CHL_GM	oN50+50	oN10	oN85	G_NG.oN85
OW	OW_ITA_TYR_S	ITOWCMA	5617	0,074	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWCMB	11225	0,094	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWCMC	6385	0,123	0,116	0,061	0,111	**NG**
OW	OW_ITA_TYR_S	ITOWCMD	7155	0,171	0,116	0,061	0,111	**NG**
OW	OW_ITA_TYR_S	ITOWLBA	10334	0,075	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWLBB	4301	0,071	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWLZA	10625	0,099	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWLZB	16280	0,100	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWLZC	5465	0,202	0,116	0,061	0,111	**NG**
OW	OW_ITA_TYR_S	ITOWSCA	12688	0,090	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWSCB	17915	0,074	0,116	0,061	0,111	**G**
OW	OW_ITA_TYR_S	ITOWSCC	33870	0,067	0,116	0,061	0,111	**G**

CHL_N – number of grid point in the SAU; CHL_GM – geometric mean (5-year average); oN50 – mean; oN50+50 – Mean + 50%; oN10 – 10^{th} percentile (Reference conditions); oN85 – 85^{th} percentile (G/NG threshold)

Table 3.1.3.4.14. Result of the assessment derived by application of the EQR methodology in the Tyrrhenian Sea and CWMS: the Waters of Italy provided at the level of the subSAUs. Blue-coloured subSAUs indicate likely in GES. Red-coloured subSAUs indicate likely in non-GES. Only the evaluated subSAUs are presented. For the present application of the EQR methodology, the following GES/non GES boundary values were applied: $EQR_{normalized}$ <0,62 – non GES; * type IIIW: GM > 0,48 non GES.

AZ	subSAU	CHL_GM/μg L^{-1}	$EQR_{normalized}$	GES/non GES
CW	ITCWCMA	0,131	1,00	G
CW	ITCWCMB	0,205	1,00	G
CW	ITCWCMC	0,529	0,74	G
CW	ITCWCMD	0,705	0,74	G
CW	ITCWLGA	0,241	0,99	G
CW	ITCWLGB	0,199	1,00	G
CW	ITCWLGC	0,247	0,97	G
CW	ITCWLGD	0,167	1,00	G
CW	ITCWLZA	0,347	0,94	G
CW	ITCWLZB	0,637	0,78	G
CW	ITCWLZC	0,994	0,53	NG
CW	ITCWLZD	0,478	0,69	G
CW	ITCWSDEA	0,116	1,00	G
CW	ITCWSDEB	0,098	1,00	G
CW	ITCWSDEC	0,045	1,00	G
CW	ITCWSDWA	0,139	0,93	G
CW	ITCWSDWB	0,624	0,83	G
OW	ITOWCMA	0,117	*	G
OW	ITOWCMB	0,151	*	G
OW	ITOWCMC	0,279	*	G
OW	ITOWCMD	0,260	0,87	G
OW	ITOWLBA	0,125	*	G
OW	ITOWLBB	0,094	*	G
OW	ITOWLGA	0,166	1,00	G
OW	ITOWLGB	0,185	*	G
OW	ITOWLGC	0,203	0,99	G
OW	ITOWLGD	0,195	0,98	G
OW	ITOWLZA	0,242	0,98	G
OW	ITOWLZB	0,251	0,95	G
OW	ITOWLZC	0,200	0,98	G
OW	ITOWLZD	0,173	0,63	G
OW	ITOWSCA	0,129	*	G
OW	ITOWSCB	0,082	*	G
OW	ITOWSDEA	0,164	*	G
OW	ITOWSDEB	0,170	*	G
OW	ITOWSDEC	0,034	*	G
OW	ITOWSDWA	0,153	*	G
OW	ITOWSDWB	0,217	*	G
OW	ITOWTCA	0,129	*	G
OW	ITOWTCB	0,138	*	G
OW	ITOWTCC	0,119	*	G
OW	ITOWTCD	0,295	0,93	G

Assessment of IMAP Common Indicator 17

Geographical scale of the assessment	The Sub-regions within the Mediterranean region based on integration and aggregation of the assessments at Sub-division levels
Contributing countries	In alphabetical order: Albania, Algeria*, Croatia. Cyprus, France, Greece. Israel, Italy, Lebanon, Malta, Montenegro. Morroco, Slovenia, Spain, Tunisia*, Türkiye (*data from the literature)
Mid-Term Strategy (MTS) Core Theme	Enabling Programme 6: Towards Monitoring, Assessment, Knowledge and Vision of the Mediterranean Sea and Coast for Informed Decision-Making
Ecological Objective	EO9. Contaminants cause no significant impact on coastal and marine ecosystems and human health
IMAP Common Indicator	CI17. Level of pollution is below a determined threshold defined for the area and species
GES Definition (UNEP/MED WG 473/7) (2019)	Level of pollution is below a determined threshold defined for the area and species
GES Targets (UNEP/MED WG 473/7) (2019)	• Concentrations of specific contaminants below Environmental Assessment Criteria (EACs) or below reference concentrations • No deterioration trend in contaminants concentrations in sediment and biota from human impacted areas, statistically defined • Reduction of contaminants emissions from land-based sources
GES Operational Objective (UNEP/MED WG473/7) (2019)	Concentration of priority contaminants is kept within acceptable limits and does not increase

The IMAP Environmental Assessment of the Aegean and Levantine Seas (AEL) Sub-region

411. The assessment of the of the Aegean and Levantine Seas (AEL) Sub-region is provided by using the CHASE+ (Chemical Status Assessment Tool) methodology for the Aegean Sea (AEGS) Sub-division and the Levantine Sea (LEVS) Sub-division.

412. Data were grouped per parameter, matrix, station location and sampling year. In the cases where a station was sampled during various years, and/or there were more than one data point for the station at a certain year, the average concentrations (i.e., arithmetic mean) were calculated and used in the CHASE+ assessment. Average concentrations were also used in the NEAT application in the ADR.

CHASE+ (Chemical Status Assessment Tool) methodology was tested and then applied for assessment of IMAP CI 17 further to its application by the European Environmental Agency (EEA) to assess environmental status categories for the European Seas (Andersen et al. 2016, EEA 2019)[78]. This assessment methodology uses just one threshold, compared to the two used in the traffic light system.
The first step in this tool is to calculate the ratio $C_{measured}/C_{threshold}$ (C is the concentration) called the contamination ratio (CR) for each assessment element in a matrix. Then a contamination score (CS) is calculated as follows[79]:

$$CS=\frac{1}{\sqrt{n}}\sum_{i=1}^{n}CR_i$$

where n is the number of elements assessed for each matrix.
Based on the contamination ratio (CR) or on contamination score (CS), the elements are assessed. In line with the results of assessments, the stations/areas can be classified into non problem area (NPA) and problem area (PA), by applying 5 categories: NPAhigh (CR or CS=0.0-0.5), NPAgood (CR or CS =0.5-1.0), PAmoderate (CR or CS =1.0-5.0), PApoor (CR or CS =5.0-10.0) and PAbad (CR or CS > 10.0). NPA areas are considered in GES while PA areas are considered as non-GES. The boundary limit of 1 between GES and non-GES is based on the choice that only values that are equal or below the threshold are considered in GES.
Both methodologies i.e. the NEAT and CHASE+ need to define decision rules to determine the quality status. One decision rule used is the "One out all out approach" (OOAO) that says that if one element of the assessment is not in good status, the whole area is described as not in GES. This decision rule is very stringent. An additional approach is based on setting a limit, such as a proportion (%) of elements, that should each be in GES for the area to be classified as in GES. Within the present work it was recommended that if at least 75% of the elements are in GES, the station should be considered in GES. The same recommendation was given when assessing certain areas or the whole Sub-region or Sub-division i.e., when 75% of the stations are in GES for a certain parameter, the whole Sub-region is in GES for this particular parameter and not the overall status of the Sub-region or Sub-division. This more lenient approach for the GES-non GES decision rule compensates for stricter thresholds applied within the CHASE+ methodology. This approach was discussed and approved by the Meeting of CorMon Pollution Monitoring, 2022, and therefore it is also applied in the 2023 MED QSR assessments.

a) The Aegean Sea (AEGS) Sub-division

Available data

413. Data for the AEGS were available only for the sediment matrix. Table 4.3.1.1.a summarizes the available data. Trace metals (TM – Cd, Hg and Pb) in sediments were reported for 32 stations by Türkiye (2018), while data for Cd and Pb were reported for 34 stations by Greece, i.e. for 5 stations in 2019 and 29 stations in 2020. In addition, Pb data were available for 28 stations located in the area of the Saronikos Gulf and Elefsis Bay for 2018 (Karageorgis et al. 2020a, Karageorgis et al. 2020b). Individual concentrations of each of the 16 required PAHs were reported by Greece (11 stations in 2019 and 10 stations in 2020) as well as for Σ_{16} PAHs. Data for Σ_5 PAHs[80] were reported by Türkiye for 32 stations

[78] Andersen, J.H., Murray, C., Larsen, M.M., Green, N., Høgåsen, T., Dahlgren, E., Garnaga-Budrė, G., Gustavson, K., Haarich, M., Kallenbach, E.M.F., Mannio, J., Strand, J. and Korpinen, S. (2016) Development and testing of a prototype tool for integrated assessment of chemical status in marine environments. Environmental Monitoring and Assessment 188(2), 115.
EEA (2019) Contaminants in Europe's Seas. Moving towards a clean, non-toxic marine environment. EEA Report No 25/2018.
[79] The contamination sum minimizes the problem of 'dilution' of high values when several substances from an area are analyzed, and takes to some extent possible synergistic effects of contaminants into account by using square root of 'n' instead of 'n'.
[80] Σ_5 PAHs is the sum of the concentrations of Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene and Benzo(ghi)perylene. Turkiye reported also the concentration of Σ_4PAHs that is the sum of the first 4 compounds in Σ_5 PAHs. Both Σ5 PAHs and Σ4 PAHs are non-mandatory parameters for CI 17, whereby Σ16 PAHs, is a mandatory parameter.

sampled in 2018. Concentrations of total PCBs (Σ_7 PCBs[81]), individual concentrations for each PCB congener, Lindane and Dieldrin were reported for 31 stations by Türkiye (2018).

414. Data were compiled from the IMAP-IS, as reported by 31st October 2022. As mentioned, additional data from the scientific literature were also used (Karageorgis et al., 2020 a,b).

Table 3.1.4.1.1.a. Data available for the assessment of the AEGS sub- division. Only data for the sediment matrix were available.

Source	IMAP-File	Country	Sub-division	Year	Cd	Hg	Pb	Σ_{16} PAHs	Σ_5 PAHs	Σ_7 PCBs	Lindane	Dieldrin
Sediment												
IMAP_IS	446	Turkiye	AEGS	2018	32	32	32	0	32	31	31	31
IMAP_IS	652	Greece	AEGS	2019	5	0	5	11	11	11	0	0
IMAP_IS	652	Greece	AEGS	2020	29	0	29	10	10	10	0	0
Lit[1]		Greece	AEGS	2018	0	0	28	0	0	0	0	0

[1]Karageorgis et al, 2020 a,b

415. Based on the available data, the assessment was performed for TM, Σ_{16} PAHs and Σ_7 PCBs in sediment. In addition, the AEGS was assessed based on Σ_5 PAHs as well. This is not a mandatory parameter but was included in the assessment given significant more data available for Σ_5 PAHs compared to Σ_{16} PAHs (53 vs 21 data points, respectively) encompassing a larger area of the AEGS. Therefore, we made an exception to possibly increase confidence of the assessment. When possible, a qualitative description was provided for the additional parameters or stations.

Setting the GES/non-GES boundary value/threshold for the CHASE+ application in the AEGS.

416. The thresholds used for the CHASE+ assessment methodology were the updated sub-regional BACs [82]. Table 4.3.1.2.a summarizes the thresholds values, the same ones used in the assessment of LEVS subdivision within the Aegean Levantine Seas Sub-region (AEL).

Table 3.1.4.1.2.a. Summary of the threshold values used in present pilot application for GES assessment of the Levantine and Aegean Seas sub-divisions. MedEACs are presented for comparison.

	AEL_BAC	MED_BAC	MedEAC
Sediments, µg/kg dry wt			
Cd	118	161	1200
Hg	47.3	75	150
Pb	23511	22500	46700
Σ_{16} PAHs	41	32	4022*
Σ_5 PAHs^	17.2	31.8	
Σ_7 PCBs	0.19	0.40	68+

* ERL value derived for the sum of 16 PAHs by Long et al., 1995, do not appear in the Decisions of COP. + sum of the individual MedEACs values of the 7 PCB compounds as they appear in Decision IG.23/6;^ Values are not set by Decision IG.22/7, therefore the BAC value for Σ_5 PAHs is calculated as a sum of the individual BAC values as provided for the 5 PAHs compounds.

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[81] PCBs congeners 28,52,101,118,132,153,180

[82] MED_BACs were adopted by 2017 COP, while the use of sub-regional BACs within the preparation of the 2023 MED QSR was approved by the Meeting of CorMon Pollution held on 27 and 30 May 2022

Integration of the areas of assessment for the AEGS.

417. The locations of the sampling stations are presented in Figures AEGS 3.1.4.1.1.C - AEGS 3.1.4.1.4.C.

418. The locations of the sampling stations were sorted by group of contaminants. As explained above, data were available only for the sediment matrix. Data for TM, PAHs were reported by Türkiye at each of the 32 sampling stations, as well as for PCBs in sediments at 31 out of the 32 sampling stations. Data for Cd and Pb were reported by Greece at 34 stations and for PAHs at 15 of these stations. In addition, data for 6 stations with only PAHs concentration were reported. Additional data from the literature (Karageorgis et al., 2020) for Pb only were available for 28 stations.

419. Further to IMAP implementation, the monitoring stations were considered for grouping in the two main assessment zones i.e., the coastal (within 1 nm from the shore) and offshore zones. Twenty-one stations in Türkiye were coastal and 11 belonged to the offshore zone. In Greece, 35 stations were classified as coastal and 31 as offshore. Due to the limited number of data points, more so if dividing into coastal and offshore stations, the spatial nesting of stations in spatial assessment units (SAUs) to the level considered meaningful for IMAP CI 17 was not possible in AEGS. Spatial nesting would decrease the reliability and the representativeness of each station for the assessment of the Aegean Sea Sub-division. Therefore, at this stage, the assessment was based on specific stations irrespective of their positions either in offshore or coastal zones.