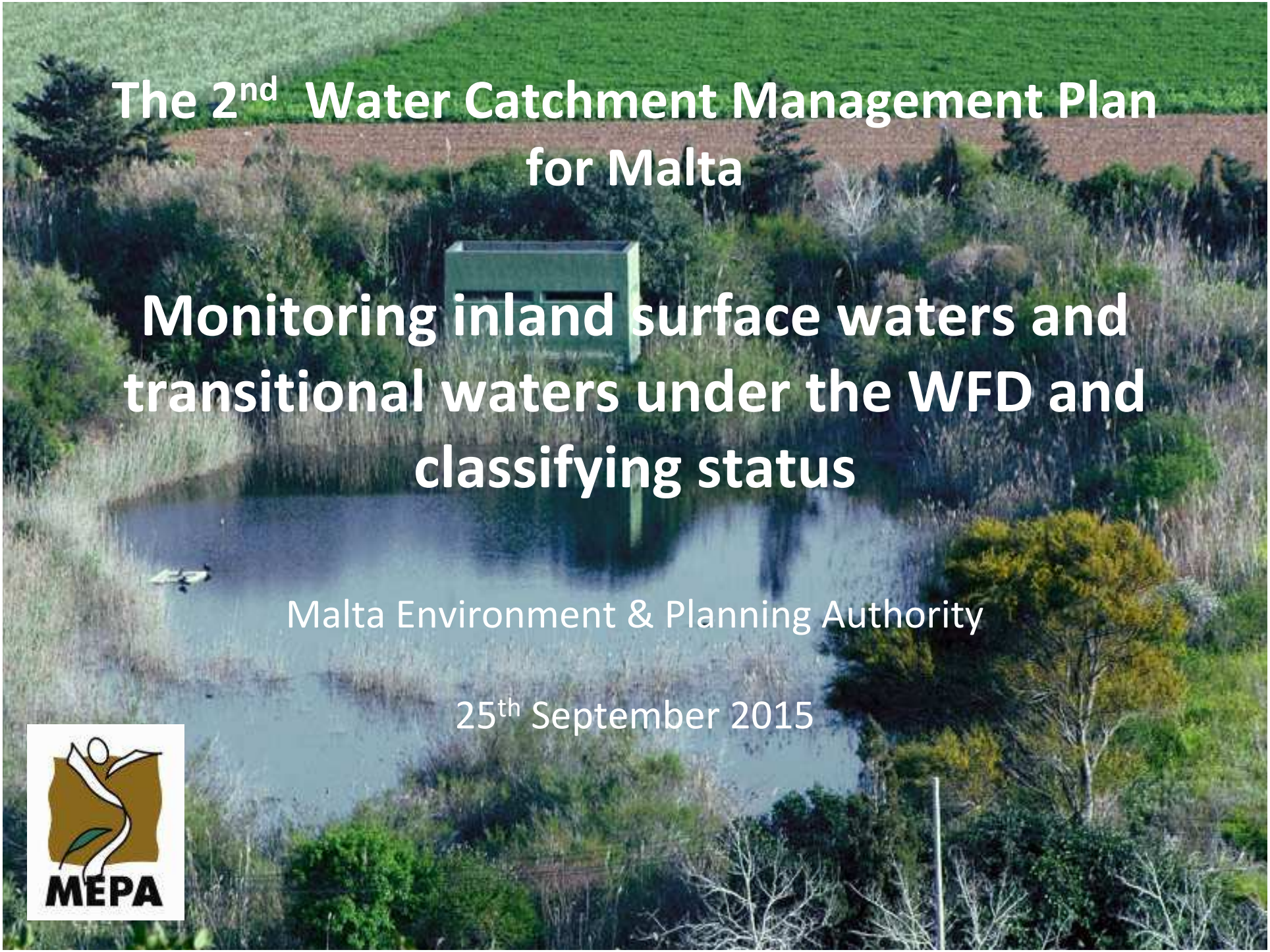


The 2nd Water Catchment Management Plan for Malta

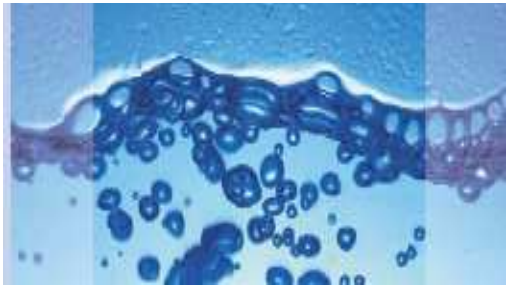
Monitoring inland surface waters and transitional waters under the WFD and classifying status

Malta Environment & Planning Authority

25th September 2015

MEPA

Why monitor?



Monitoring inland surface waters is a key step in the implementation of the WFD:

- **Comprehensive Monitoring Network** - Collect data on a range of environmental parameters.

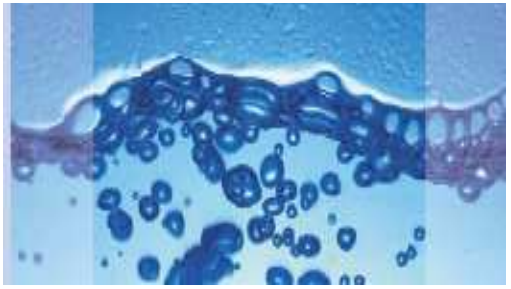
- Provide information on the **degree and magnitude** of existing human induced **pressures**.

- Help **classify the status** of each water body and monitor the improvements in status as the plan is implemented.

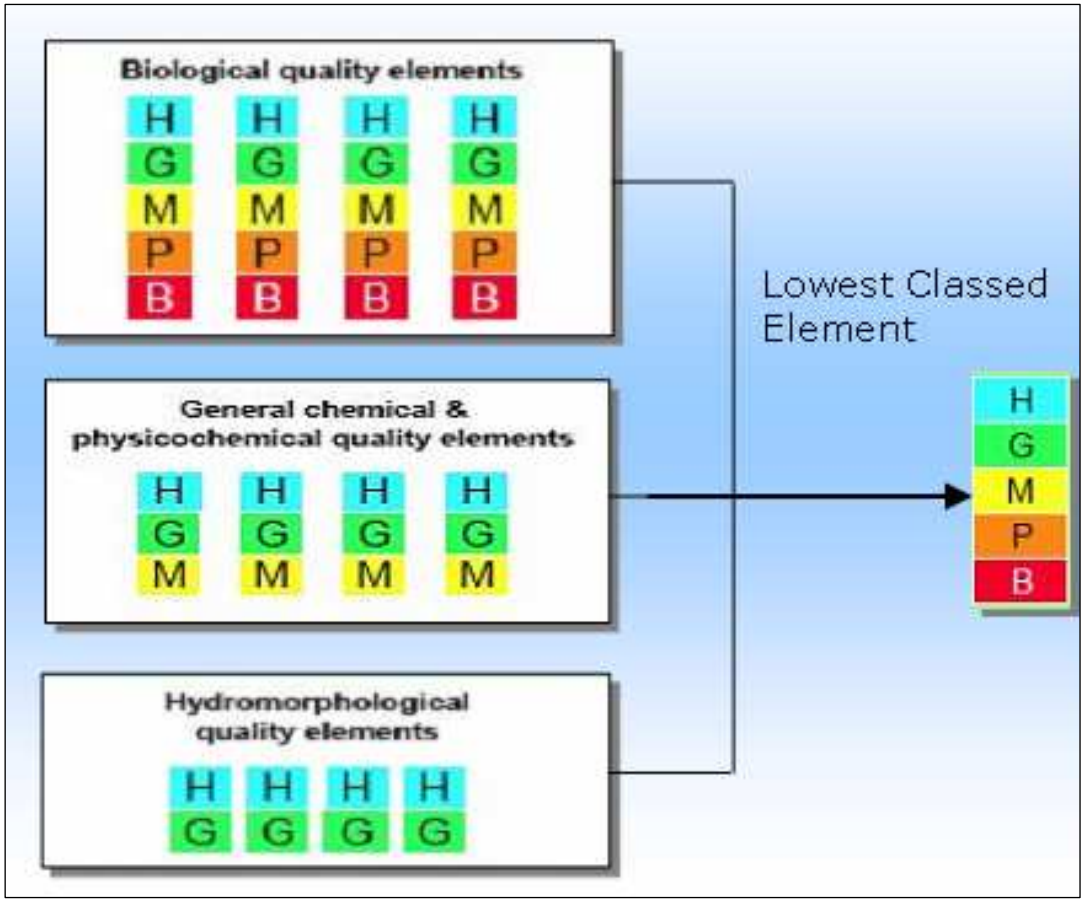
- Assist in **identifying additional actions** needed to control pressures and improve in subsequent WFD cycles.

- For **inland surface waters**: enable MEPA to identify the best monitoring and management regimes, taking into account the need to protect the valuable habitats and species they harbour.

Classification of Status for Surface Waters



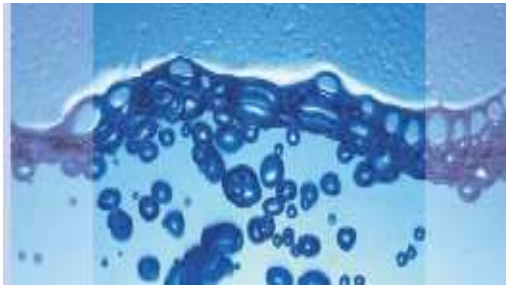
Ecological Status



Chemical Status

Alachlor	✓
Anthracene	✓
Atrazine	✓
Benzene	✓
Brominated diphenylethers	
Cadmium	
Carbon tetrachloride	
ETC……	

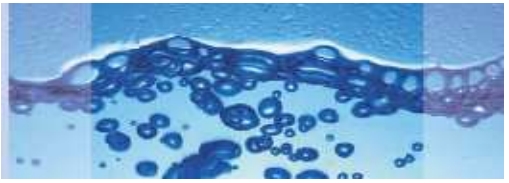
Baseline Monitoring during 1st Cycle



Inland surface and Transitional Water Monitoring

1. Hydromorphological, biological and physico-chemical quality elements	2. Contaminants in water	3. Contaminants in sediment
January 2012 – January 2013	December 2011 – February 2012	May - June 2013

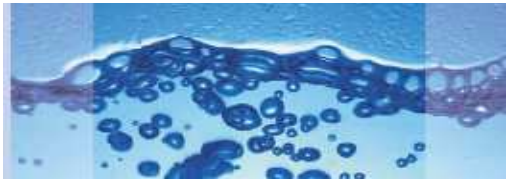
Baseline Monitoring during 1st Cycle



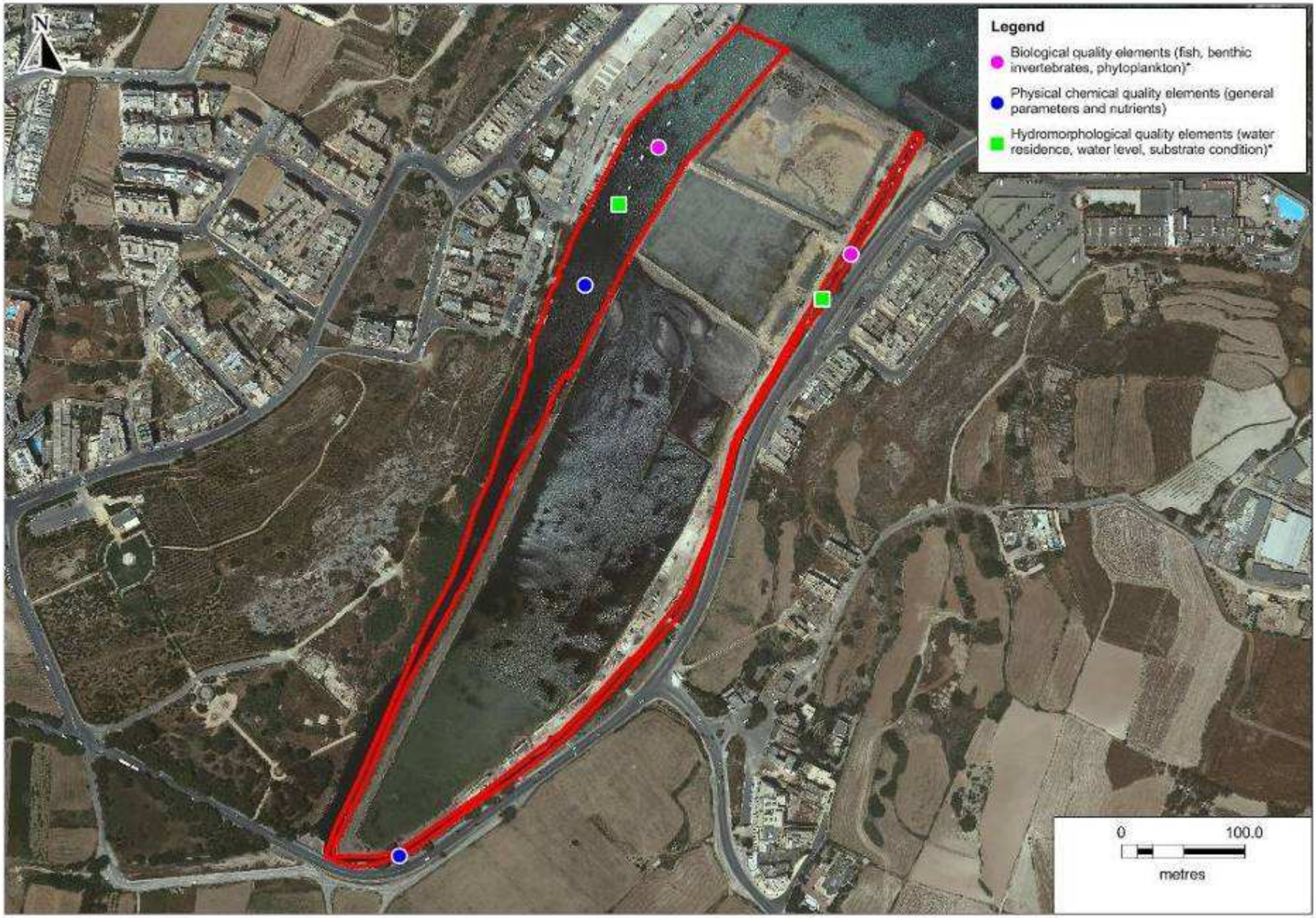
Biological Quality Elements	Hydromorphological elements	Chemicals and Supporting Physico-chemical elements
composition and abundance of **phytoplankton** (in standing waters and TW)	The characteristics of the surface water flow regime, depth variation, structure and substrate of the water body bed.	Transparency, temperature, oxygen, salinity, nutrients as measured in water
Distribution and abundance of the aquatic biological assemblages **Macrophytes and phytobenthos**		
Macroinvertebrates		
abundance and age-structure of freshwater species ***Aphanius fasciatus*** (where found)		

+ Key pressures had to be identified and quantified, with a particular focus on water abstraction, nutrient enrichment from agricultural practices and hydromorphological alterations.

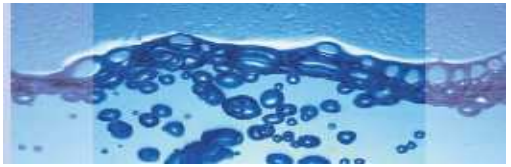
Baseline Monitoring during 2nd Cycle



Biological Quality Elements	Hydromorphological elements	Chemicals and Supporting Physico-chemical elements
composition and abundance of **phytoplankton** (in standing waters and TW) Frequency: monthly	– The characteristics of the surface water flow regime / water residence time, – depth variation / water depths – Substrate conditions/ Structure and substrate of the water body bed , channel/ water body edges, – Connection to groundwater (watercourses) – Structure of the riparian zone Frequencies: vary	Transparency, temperature, oxygen, salinity, nutrients (Total Nitrogen, Total Phosphorous, dissolved nitrates, dissolved nitrites, orthophosphates, Ammonium ions) Chl-a, Salinity Frequency – monthly every year
Distribution and abundance of the aquatic biological assemblages **Macrophytes and phytobenthos** **Frequency** :3/ 4 times a year		
Macroinvertebrates **Frequency: 3/**4 times a year		
abundance of killifish ***Aphanius fasciatus*** (where found) Frequency: 3/ 4 times a year		


N
Legend
Biological quality elements (fish, benthic invertebrates, phytoplankton)*
Physical chemical quality elements (general parameters and nutrients)
Hydromorphological quality elements (water residence, water level, substrate condition)*
0
100.0
metres

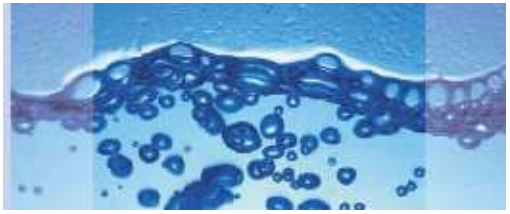
Ecological status



Transitional waters	Ecological Quality of water
Is-Salini	
Il-Maghluq ta' Marsascala	
Il-Ballut ta' Marsaxlokk	
Is-Simar	
L-Ġhadira	

Freshwaters	Ecological Quality of water
Bahrija	
Wied il-Luq	
Wied tal-Lunzjata	
Il-Qattara	
L-Ghadira ta' Sarraflu	

Results Ecological parameters – transitional waters

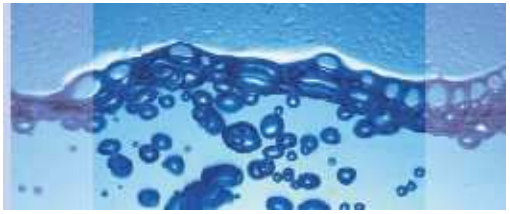


- Highly dynamic with resident organisms tolerant of high levels of salinity in soil and water. Species with lower affinity to salinity able to thrive at sites when freshwater prevails during the wet season.
- However physico chemical parameters (i.e. nutrients, dissolved oxygen, pH temperature) indicated that in some cases there are extreme hypoxic and anoxic conditions and **high inputs of nutrients** leading to impoverished aquatic assemblages.
- Also **lack of water circulation** in the case of Maghluq and lack of connectivity with sea in the case of Ballut contribute to instability of aquatic life, **coastal erosion** in case of Ballut
- **Ghadira** and **Simar** should be considered as TW
- Ecological status based on 1 BQE ranged from **Good** to **bad** during different months of the year

Coastal erosion at Ballut ta' Marsaxlokk

Source: MEPA map server (1994, 2004, 2008 and 2012) and Google Maps (2014)

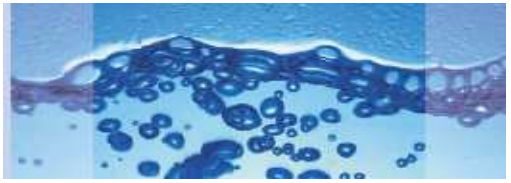
Results Ecological parameters – Watercourses and pools



- **Water courses**
  - Being small, highly dynamic and transient streams in terms of available flow, the ecological quality of these streams cannot be easily classified.
  - Seasonal variations in their physico-chemical parameters.
  - The composition of the **macroinvertebrate assemblages**, although varied is largely made up of tolerant and opportunistic species.
  - Ecological status of all watercourses, on 1 BQE alone, is **poor**

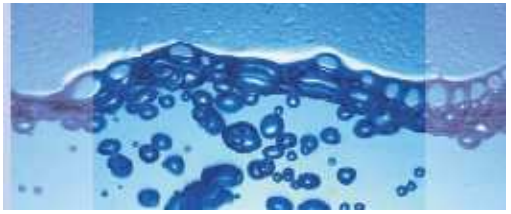
- **Pools**
  - Lack any water flows – despite them being permanent high fluctuations in water depth
  - Ecological quality varies depending on the site. The **Qattara** water body revealed a well-balanced and diversified faunal assemblage. Biological assemblage at il-Qattara comparable to that found in Maltese Watercourse environments. Maximum ecological level achievable in a Maltese freshwater context.
  - **Ghadira ta' Sarraflu** has an impoverished aquatic biodiversity due mainly to vertical edges of the pond, lack of aquatic vegetation and presence of alien species.
  - **Ghadira** and **Simar**, although heavily engineered, appear to have renaturalised and host permanent biological assemblages
  - Main threats are the presence of **alien species** and **eutrophication**.

Baseline Monitoring for chemical parameters during 1st Cycle



Contaminants in Water	Contaminants in sediment
•monitored during 3 consecutive months	•monitored during 1 week (May-June) in superficial sediments
•A total of **47** chemicals were monitored, consisting of PAHs, pesticides, heavy metals, plasticizers, solvents etc.	•A total of **72** chemicals were monitored, including RBSPs
•Replicate samples taken for each parameter	•Replicate samples taken for each parameter
•Analytical methods in line with QA QC Directive 2009/90/EC and use of EQS values for inland surface waters	•Analytical methods in line with QA QC Directive 2009/90/EC. No EQS values for sediment in EQS Directive therefore use of guidelines from literature

Results of contaminants in water



7 chemicals detected

1 exc EQS

40 chemicals

No trace

(1) **Di(2-ethylhexyl)phtalate (DEHP)** – 100% of samples (**EQS-AA : 1.3ug/l** - 1.08 Bahrija valley)

(2) **Nickel** – 88% of samples (**EQS-AA: 20ug/l** - 14.667 Ballut ta' Marsaxlokk)

(3) **Lead** – 43% (**EQS-AA: 7.2ug/l** - 3.683 Bahrija, Ballut, S-Salini)

(4) **Trichloromethane** – 4 samples (**EQS-AA: 2.5ug/l** - 0.587 Wied Lunzjata, Wied il-Luq)

(5) **Fluoranthene** – 2 samples from the same WB (**EQS-AA: 0.1ug/l** - 0.017 Maghluq ta' Marsascala)

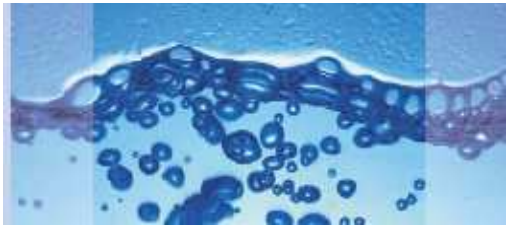
(6) **Dichloromethane**

(7) **Mercury**

Once at Wied Lunzjata

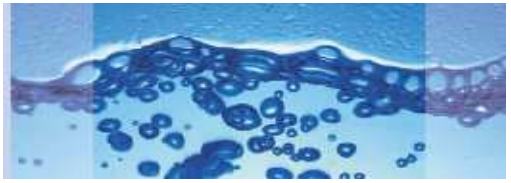
(**EQS-AA: 20 ug/l** and **EQS AA 0.05ug/l** respectively - 0.288 and 0.071 respectively)

Results of contaminants in water



- Correlation between levels of contaminants and water catchment parameters
- For each sub-catchment, the following parameters were determined:
  - Surface area
  - Number of animal husbandry units
  - Surface area covered by urban development
  - Surface area covered by agricultural land
  - Surface area covered by vegetation
  - Surface area covered by industrial complexes

Baseline Monitoring for chemical parameters during 1st Cycle



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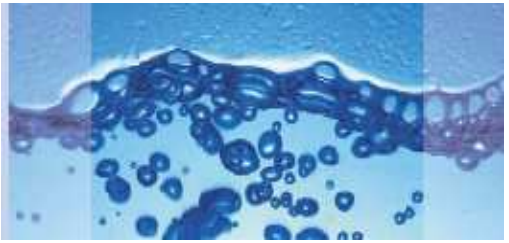
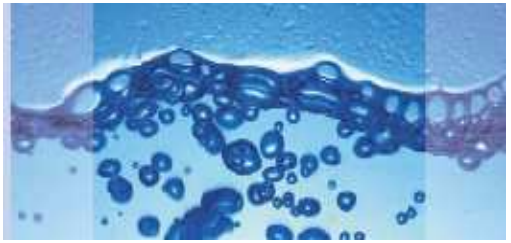
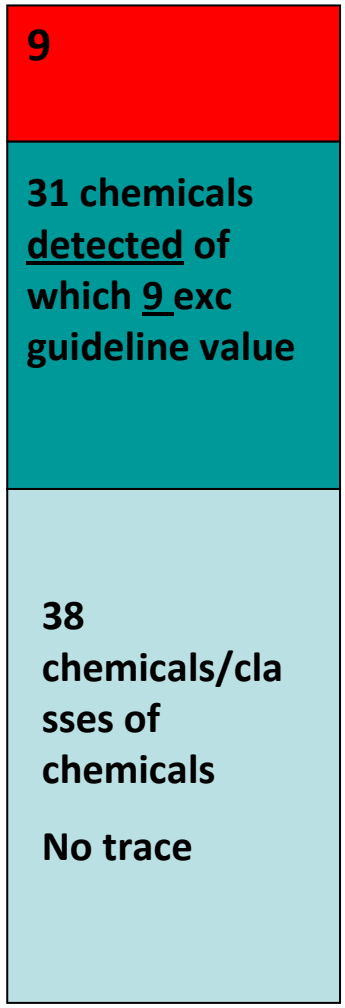
Results of organic contaminants in sediment and chemical affinity to TOC



- Measured total organic carbon, total phosphorous and total nitrogen
- Sediments from Wied il-Lunzjata and s-Simar showed the highest levels of organic pollution, S-Salini and Bahrija – the lowest
- Granulometry also carried out – correlation analysis showed that smaller grain size is associated with higher nitrogen loads but not correlated with total phosphorous content
- TOC positively correlated with total nitrogen loads
- **Cadmium** indicated a high affinity with organic carbon.

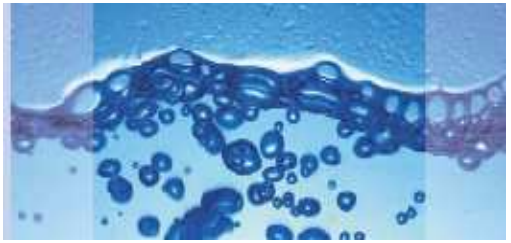
Results of organic contaminants in sediment and chemical affinity to TOC





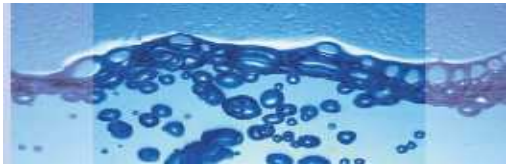
- Anthracene, Cadmium, DEHP (detected once), Fluoranthene, Lead, PAHs, Nickel, Chromium, Copper, Zinc, Manganese, Barium, Boron, Beryllium, Cobalt, Fluorides, Dioxin and dioxin like compounds, dioxin like PCBs
- Chemicals exceeding guideline values were **Cadmium, Fluoranthene, Lead, certain PAHs, Nickel, Zinc, Dioxin and dioxin like compounds**
- Study confirmed that **Mercury** is not of concern – never detected in sediment
- **DEHP** only detected once at Qattara at a level which is probably of low ecological significance.
- Both **nickel and Lead were found to be present in sediments and the water column**
- Polyaromatic hydrocarbons were found to be high at the transitional waters of il-Maghluq of Marsascala and il-Ballut ta' Marsaxlokk, and are correlated with the industrial activities associated with this port area.

Ecotoxicological significance



- ✓ 8 chemicals or classes did not exceed any of the guideline values and therefore may be considered as not occurring at levels of ecotoxicological significance (Anthracene, benzo(k)fluoranthene, DEHP, indeno(1,2,3-c,d)-pyrene, chromium, copper, manganese, and the class of dioxin like polychlorinated biphenyls.)
- ✓ Levels of **Fluorides** were found to be above detection limits in all WBs. Levels toxic to benthic organisms in literature range from 230 – 1500mg/kg dw. These are well above the levels reported locally.
- **?** EcoTox of **barium, boron, beryllium, cobalt** cannot be assessed at present – no guideline values have been identified. Such metals may be occurring naturally, or at levels below their toxicity
- ✘ **Cadmium, Fluoranthene, Lead, certain PAHs, Nickel, Zinc, Dioxin and dioxin like compounds** of ecotoxicological significance to different degrees

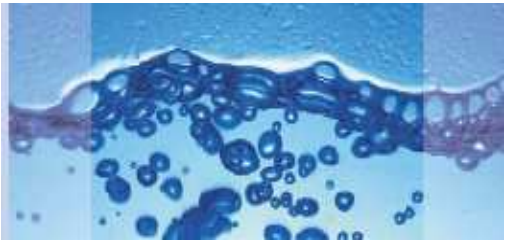
Chemical status



Water body	Chemical quality of the Water matrix		Chemical quality of the sediment matrix	
Transitional water				
Is-Salini		High confidence All parameters were below their respective EQS		High confidence All parameters were at levels below the guideline values of ecotoxicological significance in surface waters
Il-Maghluq ta' Marsascala		High confidence All parameters were below their respective EQS		High confidence
Il-Ballut ta' Marsaxlokk		High confidence All parameters were below their respective EQS.		High confidence
Is-Simar		High confidence All parameters were below their respective EQS.		High confidence All parameters were at levels below the guideline values of ecotoxicological significance in surface waters
L-Ghadira		High confidence All parameters were below their respective EQS.		High confidence All parameters were at levels below the guideline values of ecotoxicological significance in surface waters

Water courses				
Bahrija		Medium Confidence All parameters were below their EQS.		High confidence All parameters were at levels below the guideline values of ecotoxicological significance in surface waters
Wied il-Luq		High confidence All parameters were well below their respective EQS		High confidence All parameters were at levels below the guideline values of ecotoxicological significance in surface waters
Wied tal-Lunzjata		High confidence All parameters were well below their respective EQS		High confidence **Lead** and **dioxin like compounds**
Pools				
Il-Qattara		High confidence All parameters were well below their respective EQS		High confidence **Cadmium, Lead** and **Zinc**
L-Ghadira ta' Sarraflu		High confidence All parameters were below their respective EQS		High confidence All parameters were at levels below the guideline values of ecotoxicological significance in surface waters

Future monitoring for chemicals in water and sediment



- **for water quality** using the same list of chemicals (47 parameters) as previously carried out
  - + 6 times a year (every 2 months) for 7 chemicals in water that have been identified as occurring ADL in at least one of the WBs (incl. **dichlormethane, trichlormethane, DEHP, Fluoranthene, mercury, Lead, Nickel**)
  - + **perchlorates** – levels of perchlorates in dust fall in Malta and Gozo well above background levels (recommended to monitor for first 5 years)
- **for sediment quality** using the same chemical parameters
  - frequency – Once a year for the next 2 years