

# Guide on completing the survey

## Water aspects

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## STEP 1: Choose the type of water domain

Please choose the correct type of domain (Figure 1):

**A. Standing waters** - lakes, ponds, and pools of natural origin containing fresh (i.e. non-saline), brackish or salt water. Manmade freshwater bodies, including artificially created lakes and reservoirs, provided that they contain semi-natural aquatic communities.

**B. Running waters** - running waters, including springs, streams, rivers, canals and temporary water courses.

**C. Marine ecosystems** – Marine habitats are directly connected to the oceans, i.e. part of the continuous body of water which covers the greater part of the earth's surface and which surrounds its land masses. Marine waters may be fully saline, brackish or almost fresh. Marine habitats include those below spring high tide limit (or below mean water level in non-tidal waters) and enclosed coastal saline or brackish waters, without a permanent surface connection to the sea but either with the intermittent surface or sub-surface connections (as in lagoons).



**Figure 1.** The three water domains for assessment tool.

According to the chosen domain, please evaluate four aspects:

- Substrate of waterbody
- Human impact
- Ecosystem services
- Biological and Ecological aspects

Every aspect will be evaluated separately and there is developed different evaluation scale (Table 1) for every aspect.

**Table 1.** The point system for the assessment tool

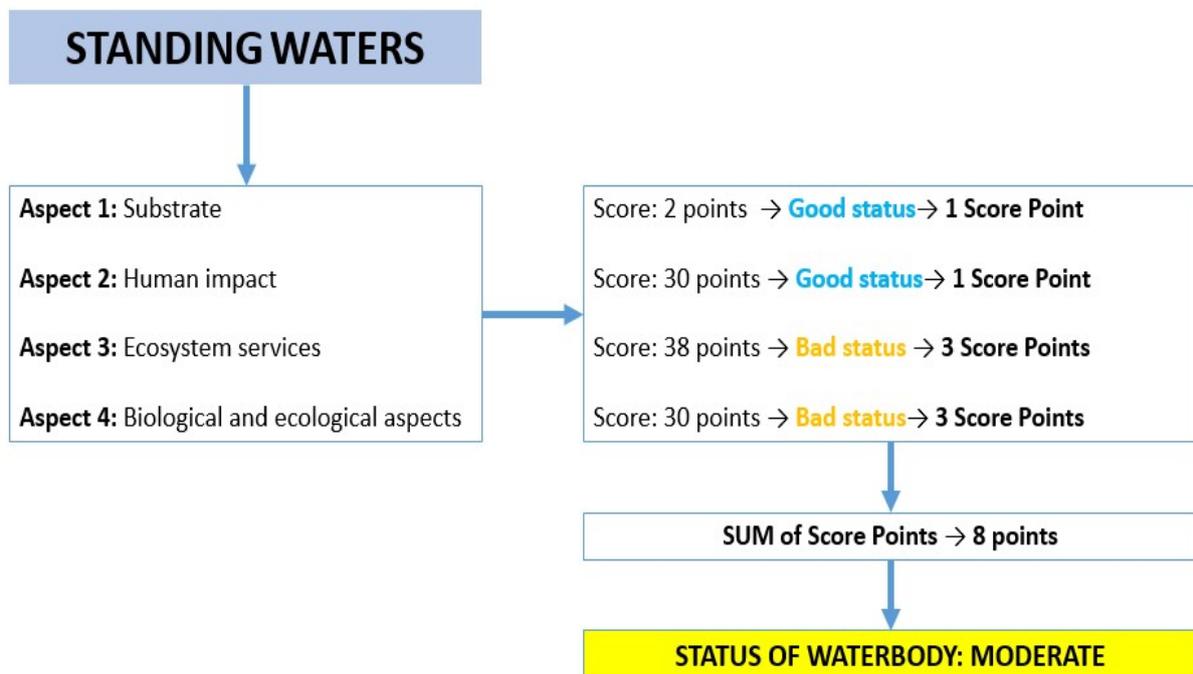
Aspect	Status	Score Points	Standing waters	Running waters	Marine Environments
Substrate	Good	1	2	2	2
	Moderate	2	4	4	4
	Bad	3	6	6	6
Human impact	Good	1	29 – 47	30 – 50	31 – 52
	Moderate	2	48 – 67	51 – 70	53 – 74
	Bad	3	68 – 87	71 – 90	75 – 93
Ecosystem services	Good	1	16 – 26	16 – 26	21 – 35
	Moderate	2	27 – 37	27 – 37	36 – 50
	Bad	3	38 – 48	38 – 48	51 – 63
Biological and Ecological aspects	Good	1	19 – 31	10 – 16	12 – 19
	Moderate	2	32 – 44	17 – 23	20 – 28
	Bad	3	45 – 57	24 – 30	29 – 36

The total score will be the sum of score points of every aspect (Table 2).

**Table 2.** Scale for assessing the Ecological status of waterbody

Sum of Score points	Ecological Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

The final score and status of waterbody will be carried out like in figure 2 below.



**Figure 2.** Flowchart how the status of waterbody will turn out.

## 1. Assessment guidance for standing waters

### Foreword for evaluation tool

The best time for evaluating water aspects is in the middle of vegetation period (in July).

According to the running waters domain, please evaluate four aspects:

- Substrate of waterbody
- Human impact
- Ecosystem services
- Biological and Ecological aspects

Every aspect will be evaluated separately and there is developed different evaluation scale (Table 3) for every aspect.

**Table 3. The point system for the assessment tool**

Aspect	Status	Score Points	Standing waters
Substrate	Good	1	2
	Moderate	2	4
	Bad	3	6
Human impact	Good	1	29 – 47
	Moderate	2	48 – 67
	Bad	3	68 – 87
Ecosystem services	Good	1	16 – 26
	Moderate	2	27 – 37
	Bad	3	38 – 48
Biological and Ecological aspects	Good	1	19 – 31
	Moderate	2	32 – 44
	Bad	3	45 – 57

The total score will be the sum of score points of every aspect (Table 4).

**Table 4.** Scale for assessing the Ecological status of waterbody

Sum of Score points	Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

### STEP 1: Assessing the substrate of the waterbody

Please evaluate the substrate of waterbody at shore and littoral zone. Please choose the main substrate of the zone (Figure 3).

- The **shore** of a sea, lake or river is the land along the edge of it.
- The **littoral** is the region or zone between the limits of high and low tides.



**Figure 3.** The two main zones, where substrate must be assessed.

Please evaluate the substrate of the shore zone and littoral zone by **choosing the main substrate** of the zone. It means the principle of exclusion should be used. You can select only one substrate (main one). The substrate types are rocky, gravel, sandy, plants, peat, clay, muddy sand, mud, and artificial substrate. Please note, that the three last substrates, if present, have higher scores because they present high human impact on the waterbody.

*The minimum possible sum of points can be 2 points – this represents the good (natural) substrate of the water environment. The maximum sum of substrate points can be 6 and this represents the bad (under high human impact) substrate of the waterbody. 4 points represent the moderate human impact on the shore or littoral zone and represent some human indicated modifications near the water.*

An example of the correct filling of the tool can be:

*If the „blue“ substrate is the main substrate, it will get always 1 point. If the „red“ substrate is dominating, it reflects high human impact and will get always 3 points.*

Shore zone main substrate	
Substrate	Points
Rocky	0
Gravel	0
Sandy	0
Plants	0
Peat	0
Clay	0
Muddy sand	0
Mud	0
Artificial (Concrete et al.)	3

Littoral zone main substrate	
Substrate	Points
Rocky	1
Gravel	0
Sandy	0
Plants	0
Peat	0
Clay	0
Muddy sand	0
Mud	0
Artificial (Concrete et al.)	0

The sum of points (4) indicates that there are moderate human impact and some modifications at the shore, but not in the waterbody itself. **The status of Substrate is moderate** and this corresponds to Status Score Point (**SSP**) 2 (moderate).

## STEP 2: Assessing the human impact

Please evaluate every indicator, which represents human impact to the waterbody at the scale:

- 1 point if the indicator is not present at the site
- 2 points if the indicator is nearby of the site (200 – 1000 meters)
- 3 points if the indicator is at the site (perimeter up to 200 meters)

Some of the indicators (Figure 4) represent potential sources (e.g. tourism objects, waste, and rainwater discharge points) and most of them potential diffuse pollution sources. These indicators reflect a different type of disturbances indicated by human activity which could affect ecosystem ecological status negatively. Lower scores mean the better ecological status of the waterbody.



**Figure 4.** Some examples of negative human impact on waterbodies.

**Note:** To assess these indicators of human impact, the map of the waterbody could give additional information.

Please evaluate **only the presence** of these human impact indicators. **You do not have to assess the whole range of the impact of these indicators.**

*If the indicator, that is listed, is present at the evaluation site (up to 200 meters perimeter), it will always get 3 points and it represents potentially high human impact. If the indicator is present nearby, it will always get 2 points and it represents moderate human impact (this do not impact evaluation site directly). If the indicator is not present at the evaluation site, it always will get 1 point, and this should represent the small human impact and natural status of the waterbody.*

### **Definitions for human impact indicators:**

**Housings** – (house, household) A household consists of all the people in a family or group who live together in a house.

**Buildings** – all other buildings excluding households. Bars, hotels, shopping centers etc.

**Industrial buildings** – all buildings related to industry: factories, power plants etc.

**Agricultural buildings** – all buildings related to agriculture: animal farms, constructions for manure storage, silos (a tower or pit on a farm used to store grain or other products), barns etc.

**Agricultural land** – area where different crops are been cultivated.

**Maintained grassland and lawn area** – the natural, seminatural or artificial grassland (lawn) which is maintained by human

**Pastureland** – an area of grassland where farm animals graze.

**Garden land** – an area of land next to house or building, with plants, trees, and grass.

**Loading of shore/beach area by filling earth** – bringing additional mineral resources to the shore/beach area.

**Road area** – a long piece of hard ground built between two places for driving.

**Parking area** – (parking lot) an area where cars or other vehicles may be left temporarily.

**Railway** – constructions for train or metro transportation.

**Minings** – industry, and activities connected to get mineral resources (coal, diamonds, oil shale etc.).

**Sediment removal** – activity when sediments of the waterbody are carried out from the waterbody (by pumps or mechanical ways).

**Cutting plants from lakes** – activity when plants (macrophytes) are carried out from the waterbody.

**Park** – public area of land with grass and trees where people go to relax and enjoy themselves.

**Beach** – area of sand or pebbles near the water.

**Tourism objects** – the places or objects which provide activities or services for persons.

**Piers and bridges** – a structure which sticks out into the waterbody and which people can walk on. This can be used for different vehicles for crossing over the waterbody. There can be tagged some boats or other water traffic objects along these structures.

**Boats** – water traffic object. In this category is included all kinds of water traffic objects (water bicycle, canoe, kayak etc.)

**Boat channel** – passage along with water flows or a route used by boats.

**Artificial shore protections** – constructions that should prevent erosion or rising water levels.

**Dam** – a wall built across a river to stop the flow of the water and make a lake.

**Dyke/Wier** – thick wall that prevents water flooding onto land from a river, lake or sea.

**Landfill** - a site for the disposal of waste materials by burial and the oldest form of waste treatment.

**Trash or litter** – rubbish or trash which is left lying around outside.

**Pollution** – unpleasant substances (in this case oily substances, not atmospheric pollution) that pollute the water.

**Artificial objects in the water** – old parts of bridges, piers or other constructions that indicate human impact and modifications in the water.

**Waste and rainwater discharge points** – pipes or culverts near or in the water that can be waste and rainwater discharge points.

An example of the correct filling of the tool can be:

Indicator	Score
Housings	2
Buildings	2
Industrial buildings	1
Agricultural buildings	1
Agricultural land	1
Maintained grassland and lawn area	1
Pastureland	1
Garden land	2
Loading of shore/beach area by filling earth	2
Road area	3
Parking area	1
Railway	1
Minings	1
Sediment removal	1
Cutting plants from lake	1
Park	2
Beach	2
Tourism objects	3
Piers and bridges	3
Boats	1
Boat channels	1
Artificial shore protections	1
Dam	2
Dyke/Wier	1
Landfill	1
Trash or litter	1
Pollution	2
Artificial objects in the water	1
Waste and rainwater discharge points	1

The sum of points (43) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Human impact aspect is **good** and this corresponds to **1 SSP** (Status Score Points).

### STEP 3: Assessing the ecosystem services

These 21 indicators (services) that marine environment offers are divided into 2 groups: „the good services“, that if used or present, do not affect the waterbody negatively and „the bad services“, that if used or present, could affect the waterbody ecological status. Explanations of Ecosystem services are in **Table 5**. Please note, that the scales of assessing the good and the bad services are vice versa.

To assess the good services (5 indicators: the presence of marine protection areas, natural sediments (not artificial), the presence of tides, removal of contaminated sediments and safety for swimming), the assessment scale is:

- 1 point – service is present or provided at the evaluation site
- 2 points – service is present or provided nearby the evaluation site (200 meters)
- 3 points – service is not present or provided at the evaluation site or nearby

*Usually, the ecosystem with the bad or moderate ecological status do not offer these ecosystem services and therefore it indicates human modifications or human impact of the waterbody.*

Assessing the potentially „bad services“ (Sixteen indicators: presence of commercial fishing, presence of wind turbines, production of hydrothermal energy, other energy production ways present, presence of ice roads, presence of ramps or small harbours, presence of transit ports, presence of shipping routes, significantly modified seafloor, signs of erosion, presence of artificial coastal structures, presence of point source pollution, signs of diffuse pollution, signs of wastewater discharge to the sea, recreational constructions and presence of leisure fishing and hunting) one have to consider that:

- 1 point – service is not present or provided at the evaluation site or nearby
- 2 points – service is present or provided nearby the evaluation site (200 meters)
- 3 points – service is present or provided at the evaluation site

*If these potentially „bad services“ are offered at the evaluation site, then there is high or moderate human impact on the status of the waterbody. The waterbody with the good condition/status usually do not offer these services and should be in natural condition with no (or few) signs of human impact.*

**Table 5.** Explanation of the services that waterbody can provide

Service	Explanation
Potential of using reed (Phragmites sp.) as a material	With carrying the reed out from the waterbody, people carrying off the potential phosphorus, nitrogen and organic matter within
Inflow(s) are present	Inflows and outflows increase the water exchange of waterbody and will make it more stable against pollution and human impact
Outflow(s) are present	
Endangered species are present (flora and fauna)	Endangered species reflect the good status of water chemistry, substrate, and balanced food webs because usually, the endangered species are sensitive to different types of disturbances in waterbody (e.g. turbid water, increasing biogen levels, algal blooms, anoxic conditions)
Protection areas are present	Protection areas are created to preserve some concrete landscape, ecosystem or species habitat, therefore this should affect the waterbody positively.
Bluespace is safe for swimming	Safety for swimmers reflects the good condition of the shore and littoral zone (no trash, broken bottles etc.). Under this service, we also consider that the microbiological parameters are at good (allowed) levels and no harmful algal blooms.

Crayfish catching opportunities	Crayfish is sensitive to changes in water quality and this species is quite rare, therefore it reflects the good status of the waterbody.
Using water for drinking purposes	Additional water abstraction makes waterbody more unstable and more sensitive to the human impact and pollution.
Using water for other purposes	
Using mud from waterbody	Pumping or digging or using other methods to collect the mud from the waterbody disturbs stratification and could affect water transparency and therefore influences the stability of the ecosystem.
Fish stock	The presence of the fish stock encourages fishing from the waterbody. Humans usually prefer to catch predatory fishes, which affect the balance of predatory and prey fishes.
Fishing opportunities	
Visible algal bloom are present	Visible algal blooms indicate the additional nutrients that are available for phytoplankton blooms to form biomass.
Opportunity of regulating water level	Regulating the water level will block the natural water flow and collects additional sediments behind the dam.
Constructions for flood protection are present	Every additional construction at the shore or in the water changes the natural shore and could affect waterbody negatively.
Existence of infrastructure	Potential pollution source for the waterbody. Increases number of people who uses water for recreational purposes.

**Note:** To assess these services, the map of the waterbody could give additional information.

An example of the correct filling of the tool can be:

Indicator/Service	Score
	1-present; 2-present nearby; 3-not present
Potential of using reed ( <i>Phragmites</i> sp.) as a material	1
Inflow(s) are present	1
Outflow(s) are present	1
Endangered species are present (fauna and flora)	3
Protection areas are present	1
Bluespace is safe for swimming	2
Predatory fish catching opportunities	2

Indicator	Score
	1-not present; 2-present nearby; 3-present
Using water for drinking purposes	3
Using water for other purposes than drinking (cooling water, industrial water et al.)	1
Using mud from blue space (for purposes of mud therapy and agriculture) substantially	1

Commercial fishing	1
Production of hydrothermal energy	1
Visible algal bloom are present	2
Water level regulation	1
Constructions for flood protection are present	1
Existence of infrastructure and presence of recreational service providers	1
Fishing opportunities	2

The sum of points (25) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Ecosystem services aspect is **good** and this corresponds to **1 SSP** (Status Score Points).

#### STEP 4: Assessing the biological and ecological aspects

For the additional information, please measure, if possible, the air and water temperatures. **This is not important for assessing the potential status of the waterbody.**

*An example of the correct filling of the tool should be:*

a) Water and Air temperature:

Water temperature	11,5	Air temperature	19
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These indicators that are listed in the fourth part of the water aspects tool should assess the potential of the aquatic environment using easily assessable biological, ecological, hydrophysical and –chemical indicators/parameters.

#### 4.1. Water level assessment

For the water level assessment, you should notice the marks at the shore (**Figure 5**). If there are some trees, posts or some artificial constructions, then there are usually marks of the high-water period (look the picture). It is much harder to distinguish the low water level from the average water level.



**Figure 5. Water level fluctuations:** H – high water level (the tree is lighter above the roots); A – average water level; L – low water level.

Assessing the water level and its impacts on the status of the ecosystem, please use the scale:

- 1 point – average water level
- 2 points – high water level
- 3 points – low water level

From the ecological point of view and in our opinion, the average water level is the best, because this is the most common for the waterbody. The high water level is the second best thing because it is accompanied with the dilution effect. The low water level, on the other hand, brings concentration effect.

*An example of the correct filling of the tool should be:*

b) Water level:

Indicator	Score (1-average water level; 2-high water level; 3-low water level)
Water level	1

#### 4.2. Hydrochemical and –physical indicators

These indicators that are chosen reflect the bad condition of the waterbody or will affect the waterbody negatively.

Examples of turbid and clear water are in the picture below (Figure 6). In the turbid water, the light will absorb and the layer where light reaches (euphotic layer) is shallower. This influences the primary producers of water ecosystems (phytoplankton, algae, macrophytes) and behavior of fishes.



**Figure 6. Examples of turbid (left) and clear water (right)**

Water smell is one of organoleptic indicator and smelling or stinking water could indicate the wastewater discharge points or decomposition of organic matter. Also in anoxic or hypoxic conditions, there could be a microbiological activity (sulfate reducing bacteria) near the sediments and this results as toxic hydrogen sulfide ( $H_2S$ ) which smells like rotten egg.

Waste water and sewage discharge points are visible point sources and untreated or poorly treated wastewater is an additional source of nutrients which affect water ecosystem negatively.

Visible erosion (**Figure 7**) also carries additional nutrients into the water from the shore.



**Figure 7. Visible erosion at the shore of marine environment**

The water turbidity, the smell, waste water discharge and visible erosion should be assessed at the scale:

- 1 point – not present at the evaluation site
- 2 points – present nearby (200 m) of the evaluation site
- 3 points – present at the evaluation site

*An example of the correct filling of the tool should be:*

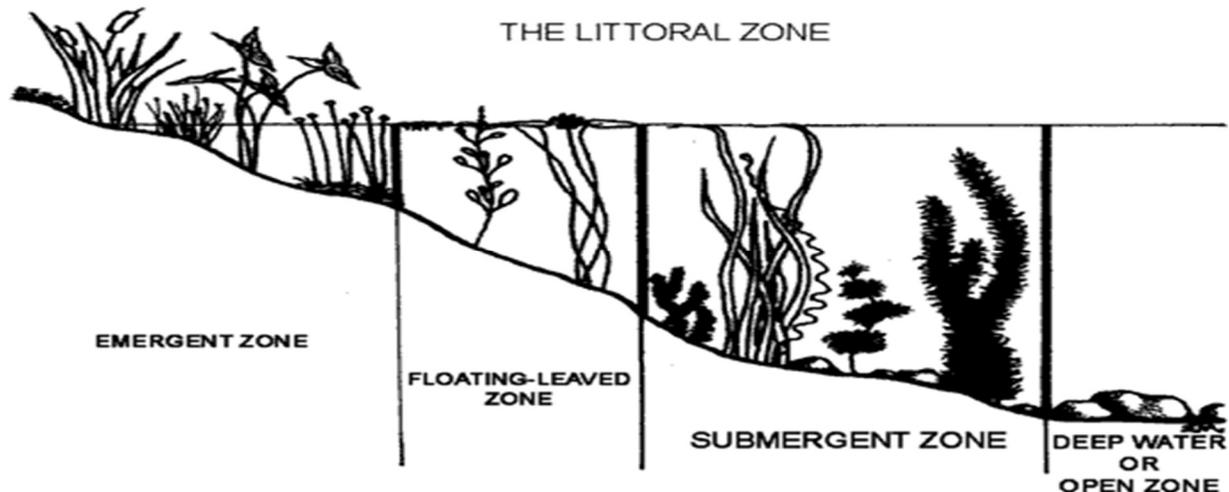
## c) Hydrophysical indicators:

Indicator	Score (1-not present; 2-present nearby (200-1000 m); 3-present at the site)
Water is turbid	1
Water smells or stinks	1
Waste water and sewage discharge points are present	1
Visible erosion in evaluation site	2

## 4.3. Biological and Ecological indicators

These indicators are also divided into two groups: „good“ indicators and „bad“ indicators if they are present at the evaluation site. There are chosen fourteen indicators: domination of emergent plants, domination of floating and floating-leaved plants, presence of invasive species, plants covered with periphyton, floating filamentous algae, dead fishes at the shore, presence of waterfowl, domination of submerged plants, presence of amphibians, presence of fishes, presence of aquatic mammals, presence of mussels, presence of aquatic insects and microbiological parameters (Figures 8 – 10).

The macrophyte categories are shown in the figure below (Figure 8).

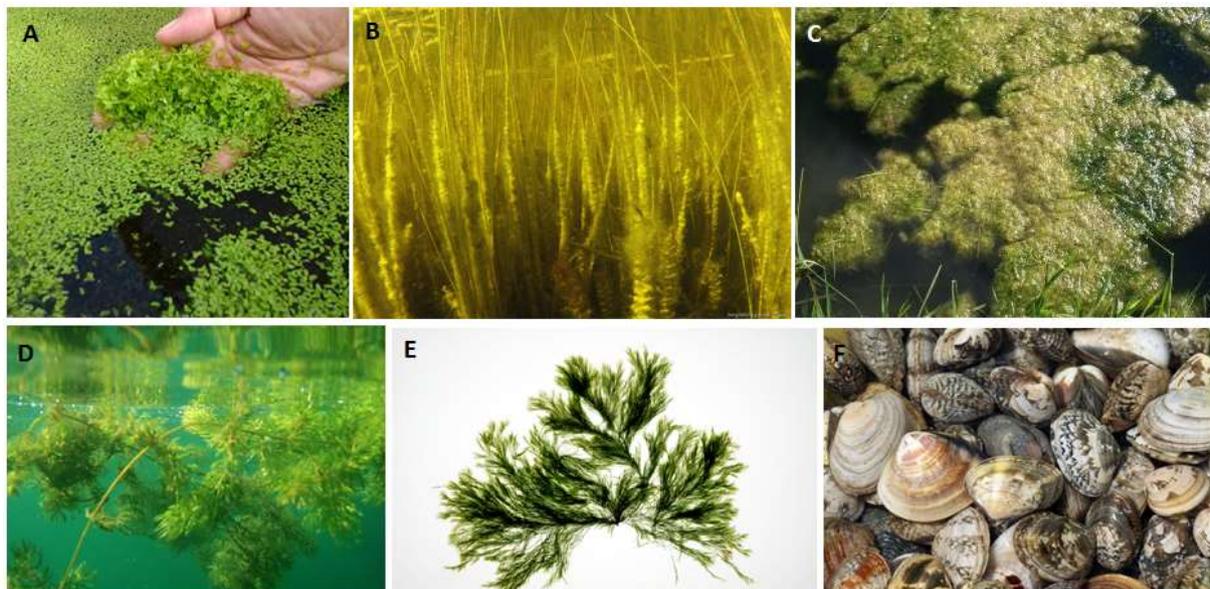


**Figure 8.** The macrophyte distribution zones and categories of macrophytes.

An **emergent plant** is one which grows in water but which pierces the surface so that it is partially in air. **Floating-leaved plants** are rooted in the lake bottom, but their leaves and flowers float on the water surface. Please see the examples below (Figure 9).



**Figure 9.** Emergent plant *Typha* sp. at the left. Floating-leaved plant *Nuphar lutea* at the right.



**Figure 10.** Different examples of biological indicators: A-floating plants (*Lemna* sp.), B-periphyton, C-floating filamentous algae, D-submerged plants (*Ceratophyllum* sp.), E-macroalgae (*Cladophora* sp.), F-mussels.

Please evaluate these seven indicator parameters (domination of emergent plants, domination of floating and floating-leaved plants, the presence of invasive species (flora and fauna), plants covered with periphyton, floating filamentous algae, dead fishes at the shore, the presence of waterfowl) at the scale:

- 1 point – not present at the evaluation site
- 2 points – present nearby (200 meters)
- 3 points – present at the evaluation site

Please evaluate these nine indicator parameters (domination of submerged plants, the presence of amphibians, the presence of fishes, the presence of aquatic mammals, the presence of shellfish, the presence of aquatic insects, microbiological parameters) at the scale:

- 1 point – present at the evaluation site
- 2 points – present nearby (200 meters)

- 3 points – not present at the evaluation site

The domination of submerged plants indicates the good light conditions in the waterbody. The presence of the wildlife indicates the good conditions of food supply and good living conditions. Microbiological parameters are chosen to reflect recreational safety for humans and usually when the ecosystem is not under the high human pressure/impact and water is transparent, there is no problematics with microbiological parameters.

An example of the correct filling of the tool should be:

d) Biological and Ecological indicators

Indicator	Score (1- not present; 2-present nearby; 3-present at site)
Domination of emergent plants	1
Domination of floating and floating-leaved plants	1
Invasive species present	2
Plants covered with slimy substance (periphyton)	1
Floating filamentous algae	1
Dead fish at the shore	2
Presence of waterfowl	2

Indicator	Score (1- present at site; 2- present nearby; 3-not present)
Domination of submerged plants	1
Presence of amphibians	3
Presence of fishes	1
Presence of aquatic mammals	3
Presence of mussels (including snails)	1
Presence of aquatic insects	1
Microbiological parameters (FIB and PIB - fecal indicator bacteria and pathogen indicator bacteria parameters) are in good level	2

The sum of points (28) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Abiotic and Ecological aspects is **good** and this corresponds to **1 SSP** (Status Score Points).

**STEP 5: Assessing the status of water aspects of waterbody**

To assess the status of the waterbody, please sum up the **Status Score Points (SSP)** and find the corresponding status class from the table:

Sum of Score points	Ecological Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

The good status indicates that there are no negative impacts of human activities and the ecosystem of a waterbody is in good status. There are no disturbances for the waterbody. The moderate status indicates that there are some negative impacts on the ecosystem and there occur some disturbances for the ecosystem. The bad status indicates that waterbody is under a lot of stress from human activity and this influences the status and environmental conditions of the waterbody.

According to the example fillings of the tool, the status of a waterbody is:

Aspect	Status Score Points (SSP)
Substrate	2 (moderate)
Human impact	1 (good)
Ecosystem Services	1 (good)
Abiotic and Ecological	1 (good)
<b>Sum of SSP (all four aspects)</b>	<b>5</b>
<b>Status of waterbody</b>	<b>GOOD</b>

## 2. Assessment guidance for running waters

### Foreword for evaluation tool

The best time for evaluating water aspects is in the middle of vegetation period (in July).

According to the running waters domain, please evaluate four aspects:

- Substrate of waterbody
- Human impact
- Ecosystem services
- Biological and Ecological aspects

Every aspect will be evaluated separately and there is developed different evaluation scale (Table 6) for every aspect.

**Table 6.** The point system for the assessment tool

Aspect	Status	Score Points	Running waters
Substrate	Good	1	2
	Moderate	2	4
	Bad	3	6
Human impact	Good	1	30 – 50
	Moderate	2	51 – 70
	Bad	3	71 – 90
Ecosystem services	Good	1	16 – 26
	Moderate	2	27 – 37
	Bad	3	38 – 48
Biological and Ecological aspects	Good	1	10 – 16
	Moderate	2	17 – 23
	Bad	3	24 – 30

The total score will be the sum of score points of every aspect (Table 7).

**Table 7.** Scale for assessing the Ecological status of waterbody

Sum of Score points	Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

**STEP 1: Assessing the substrate of the waterbody**

Please evaluate the substrate of waterbody at shore and littoral zone. Please choose the main substrate of the zone (Figure 11).

- The **shore** of a sea, lake or river is the land along the edge of it.
- The **littoral** is the region or zone between the limits of high and low tides.

**Figure 11.** The two main zones, where substrate must be assessed.

Please evaluate the substrate of the shore zone and littoral zone by **choosing the main substrate** of the zone. It means the principle of exclusion should be used. You can select only one substrate (main one). The substrate types are rocky, gravel, sandy, plants, peat, clay, muddy sand, mud, and artificial substrate. Please note, that the three last substrates, if present, have higher scores because they present high human impact on the waterbody.

*The minimum possible sum of points can be 2 points – this represents the good (natural) substrate of the water environment. The maximum sum of substrate points can be 6 and this represents the bad (under high human impact) substrate of the waterbody. 4 points represent the moderate human impact on the shore or littoral zone and represent some human indicated modifications near the water.*

An example of the correct filling of the tool can be:

If the „blue“ substrate is the main substrate, it will get always 1 point. If the „red“ substrate is dominating, it reflects high human impact and will get always 3 points.

Shore zone main substrate		Littoral zone main substrate	
Substrate	Points	Substrate	Points
Rocky	0	Rocky	1
Gravel	0	Gravel	0
Sandy	0	Sandy	0
Plants	0	Plants	0
Peat	0	Peat	0
Clay	0	Clay	0
Muddy sand	0	Muddy sand	0
Mud	0	Mud	0
Artificial (Concrete et al.)	3	Artificial (Concrete et al.)	0

The sum of points (4) indicates that there are moderate human impact and some modifications at the shore, but not in the waterbody itself. **The status of Substrate is moderate** and this corresponds to Status Score Point (**SSP**) 2 (moderate).

## STEP 2: Assessing the human impact

Please evaluate every indicator, which represents human impact to the waterbody at the scale:

- 1 point if the indicator is not present at the site
- 2 points if the indicator is nearby of the site (200 – 1000 meters)
- 3 points if the indicator is at the site (perimeter up to 200 meters)

Some of the indicators (Figure 12) represent potential sources (e.g. tourism objects, waste, and rainwater discharge points) and most of them potential diffuse pollution sources. These indicators reflect a different type of disturbances indicated by human activity which could affect ecosystem ecological status negatively. Lower scores mean the better ecological status of the waterbody.



**Figure 12.** Some examples of negative human impact on waterbodies.

**Note:** To assess these indicators of human impact, the map of the waterbody could give additional information.

Please evaluate **only the presence** of these human impact indicators. **You do not have to assess the whole range of the impact of these indicators.**

*If the indicator, that is listed, is present at the evaluation site (up to 200 meters perimeter), it will always get 3 points and it represents potentially high human impact. If the indicator is present nearby, it will always get 2 points and it represents moderate human impact (this do not impact evaluation site directly). If the indicator is not present at the evaluation site, it always will get 1 point, and this should represent the small human impact and natural status of the waterbody.*

**Definitions for human impact indicators:**

**Housings** – (house, household) A household consists of all the people in a family or group who live together in a house.

**Buildings** – all other buildings excluding households. Bars, hotels, shopping centers etc.

**Industrial buildings** – all buildings related to industry: factories, power plants etc.

**Agricultural buildings** – all buildings related to agriculture: animal farms, constructions for manure storage, silos (a tower or pit on a farm used to store grain or other products), barns etc.

**Agricultural land** – area where different crops are been cultivated.

**Maintained grassland and lawn area** – the natural, seminatural or artificial grassland (lawn) which is maintained by human

**Pastureland** – an area of grassland where farm animals graze.

**Garden land** – an area of land next to house or building, with plants, trees, and grass.

**Loading of shore/beach area by filling earth** – bringing additional mineral resources to the shore/beach area.

**Road area** – a long piece of hard ground built between two places for driving.

**Parking area** – (parking lot) an area where cars or other vehicles may be left temporarily.

**Railway** – constructions for train or metro transportation.

**Minings** – industry, and activities connected to get mineral resources (coal, diamonds, oil shale etc.).

**Sediment removal** – activity when sediments of the waterbody are carried out from the waterbody (by pumps or mechanical ways).

**Modified river bed (channeling and straightening)** – any indicator that indicates human modifications of the riverbed (concrete walls, channeling, straightening etc.).

**Cutting plants from lakes** – activity when plants (macrophytes) are carried out from the waterbody.

**Park** – public area of land with grass and trees where people go to relax and enjoy themselves.

**Beach** – area of sand or pebbles near the water.

**Tourism objects** – the places or objects which provide activities or services for persons.

**Piers and bridges** – a structure which sticks out into the waterbody and which people can walk on. This can be used for different vehicles for crossing over the waterbody. There can be tagged some boats or other water traffic objects along these structures.

**Boats** – water traffic object. In this category is included all kinds of water traffic objects (water bicycle, canoe, kayak etc.)

**Boat channel** – passage along with water flows or a route used by boats.

**Artificial shore protections** – constructions that should prevent erosion or rising water levels.

**Dam** – a wall built across a river to stop the flow of the water and make a lake.

**Dyke/Wier** – thick wall that prevents water flooding onto land from a river, lake or sea.

**Landfill** - a site for the disposal of waste materials by burial and the oldest form of waste treatment.

**Trash or litter** – rubbish or trash which is left lying around outside.

**Pollution** – unpleasant substances (in this case oily substances, not atmospheric pollution) that pollute the water.

**Artificial objects in the water** – old parts of bridges, piers or other constructions that indicate human impact and modifications in the water.

**Waste and rainwater discharge points** – pipes or culverts near or in the water that can be waste and rainwater discharge points.

An example of the correct filling of the tool can be:

Indicator	Score
Housings	2
Buildings	2
Industrial buildings	1
Agricultural buildings	1
Agricultural land	1
Maintained grassland and lawn area	1
Pastureland	1
Garden land	2
Loading of shore/beach area by filling earth	2
Parking area	3
Road area	3
Railway	1
Mining	1
Sediment removal	1
Modified river bed (channelling and straightening)	1
Cutting plants from river	2
Park	2
Beach	3
Tourism objects	3
Piers and bridges	1
Boats	1
Boat channels	1
Waste and rainwater discharge points	2
Artificial shore protections (for against erosion)	1
Artificial objects in the water	1
Dam	1
Dyke/Weir (reservoir)	2
Landfill	1
Trash or litter	1
Pollution	1

The sum of points (46) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Human impact aspect is **good** and this corresponds to **1 SSP** (Status Score Points).

### STEP 3: Assessing the ecosystem services

The ecosystem services are divided into two groups: services that, if used, affect waterbody positively and services that, if used, affect waterbody negatively. Ecosystem services are divided into three types: regulating and maintaining services, provisioning services, and cultural services. See the explanations of the services from the table below (Table 8).

Assessing the potentially „good services“ (Four indicators: the presence of endangered species (flora and fauna), protection areas nearby, predatory fish catching opportunities and safety of bluespace for swimming) one have to consider that:

- 1 point – service is present or provided at the evaluation site

- 2 points – service is present or provided nearby the evaluation site
- 3 points – service is not present or provided at the evaluation site or nearby

*Usually, the ecosystem with the bad or moderate ecological status do not offer these ecosystem services and therefore it indicates human modifications or human impact of the waterbody.*

Assessing the potentially „bad services“ (twelve indicators: using water for drinking purposes or other purposes (industrial), commercial fishing, artificially modified waterbody (e.g. channeling), non-point source pollution, point source pollution, wastewater discharge, regulating water level, constructions for flood protection, infrastructure for recreation, fishing opportunities and water traffic opportunities) one have to consider that:

- 1 point – service is not present or provided at the evaluation site or nearby
- 2 points – service is present or provided nearby the evaluation site (200 meters)
- 3 points – service is present or provided at the evaluation site

*If these potentially „bad services“ are offered at the evaluation site, then there is high or moderate human impact on the status of the waterbody. The waterbody with the good condition/status usually do not offer these services and should be in natural condition with no (or few) signs of human impact.*

**Table 8. Explanation of the services that waterbody can provide**

Service	Explanation
Endangered species (fauna and flora) present	Endangered species reflect the good status of water chemistry, substrate, and balanced food webs because usually, the endangered species are sensitive to different types of disturbances in waterbody (e.g. turbid water, increasing biogen levels, algal blooms, anoxic conditions)
Protection areas nearby	Protection areas are created to preserve some concrete landscape, ecosystem or species habitat, therefore this should affect the waterbody positively.
BlueSpace is safe for swimming	Safety for swimmers reflects the good condition of the shore and littoral zone (no trash, broken bottles etc.). Under this service, we also consider that the microbiological parameters are at good (allowed) levels and no harmful algal blooms.
Predatory fish catching opportunities	The dominance of predatory fishes reflects the good status of waterbody through balanced foodweb. Predatory fishes manage to preserve the balance between predatory and prey fishes.
Using water for drinking purposes	Additional water abstraction makes waterbody more unstable and more sensitive to the human impact and pollution.
Using water for other purposes than drinking (cooling water, industrial water et al.)	
Artificial modification of waterbody	Every additional construction at the shore or in the water changes the natural shore and could affect waterbody negatively.
Other constructions for flood protection	
Non-point source pollution (can't detect, but visible biogenic pollution)	The diffuse pollution is hard to detect but there are some visible signs of it. For example: floating filamentous algae, turbid (green) water could be some indications. Also the agricultural land and animal farms nearby. These indicators affect waterbody negatively.

Point source pollution	Point source pollution comes from pipes or tubes and could bring a lot of nutrients to the waterbody for primary producers to consume.
Wastewater discharge	One of the main indicator in the cities. Wastewater discharge will collect a lot of nutrient-rich water and with poor water treatment is the most common nutrient source for the waterbody.
Water level regulating	Regulating the water level will block the natural water flow and collects additional sediments behind the dam.
Existence of infrastructure and presence of recreational service providers	Potential pollution source for the waterbody. Increases number of people who uses water for recreational purposes.
Commercial fishing	The presence of the fish stock encourages fishing from the waterbody. Humans usually prefer to catch predatory fishes, which affect the balance of predatory and prey fishes.
Fishing opportunities	
Water traffic opportunity	Water traffic is potential pollution source.

**Note:** To assess these services, the map of the waterbody could give additional information.

*An example of the correct filling of the tool can be:*

Indicator/Service	Score 1-present; 2-present nearby; 3-not present
Endangered species (fauna and flora) present	1
Protection areas nearby	1
BlueSpace is safe for swimming	1
Predatory fish catching opportunities	3

Indicator	Score 1-not present; 2-present nearby; 3-present
Using water for drinking purposes	3
Using water for other purposes than drinking (cooling water, industrial water et al.)	1
Artificial modification of waterbody	1
Other constructions for flood protection	1
Non-point source pollution (can't detect, but visible biogenic pollution)	1
Point source pollution	2
Wastewater discharge	1
Water level regulating	1
Existence of infrastructure and presence of recreational service providers	1
Commercial fishing	2

Fishing opportunities	1
Water traffic opportunity	1

The sum of points (22) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Ecosystem services aspect is **good** and this corresponds to **1 SSP** (Status Score Points).

#### STEP 4: Assessing the biological and ecological aspects

*These indicators that are listed in the fourth part of the water aspects tool should assess the potential of the aquatic environment using easily accessible biological, ecological, hydrophysical indicators/parameters.*

For the additional information, please measure, if possible, the air and water temperatures. **This is not important for assessing the potential status of the waterbody.**

*An example of the correct filling of the tool should be:*

a) Water and Air temperature:

Water temperature	11,5	Air temperature	19
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#### 4.1. Water level assessment

For the water level assessment, you should notice the marks at the shore. If there are some trees, posts or some artificial constructions, then there are usually marks of the high-water period (look the **Figure 13**). It is much harder to distinguish the low water level from the average water level.



**Figure 13. Water level fluctuations:** H – high water level (the tree is lighter above the roots); A – average water level; L – low water level.

Assessing the water level and its impacts on the status of the ecosystem, please use the scale:

- 1 point – average water level
- 2 points – high water level
- 3 points – low water level

From the ecological point of view and in our opinion, the average water level is the best, because this is the most common for the waterbody. The high water level is the second best thing because it is accompanied with the dilution effect. The low water level, on the other hand, brings concentration effect.

*An example of the correct filling of the tool should be:*

b) Water level:

Indicator	Score (1-average water level; 2-high water level; 3-low water level)
Water level	1

#### 4.2. Hydrophysical indicators

These indicators that are chosen reflect the bad condition of the waterbody or can affect the waterbody negatively.

Examples of turbid and clear water are in **Figure 14**. In the turbid water, the light will absorb and the layer where light reaches (euphotic layer) is shallower. This influences the primary producers of water ecosystems (phytoplankton, algae, macrophytes) and behavior of fishes.



**Figure 14. Examples of turbid (left) and clear water (right)**

Water smell is one of organoleptic indicator and smelling or stinking water could indicate the wastewater discharge points or decomposition of organic matter. Also in anoxic or hypoxic conditions, there could be a microbiological activity (sulfate reducing bacteria) near the sediments and this results as toxic hydrogen sulfide ( $H_2S$ ) which smells like „rotten egg“.

Visible erosion also carries additional nutrients into the water from the shore (**Figure 15**).



**Figure 15. Visible erosion at the shore of marine environment**

The water turbidity, the smell, and visible erosion should be assessed at the scale:

- 1 point – not present at the evaluation site
- 2 points – present nearby (200 m) of the evaluation site
- 3 points – present at the evaluation site

*An example of the correct filling of the tool should be:*

c) Hydrophysical indicators:

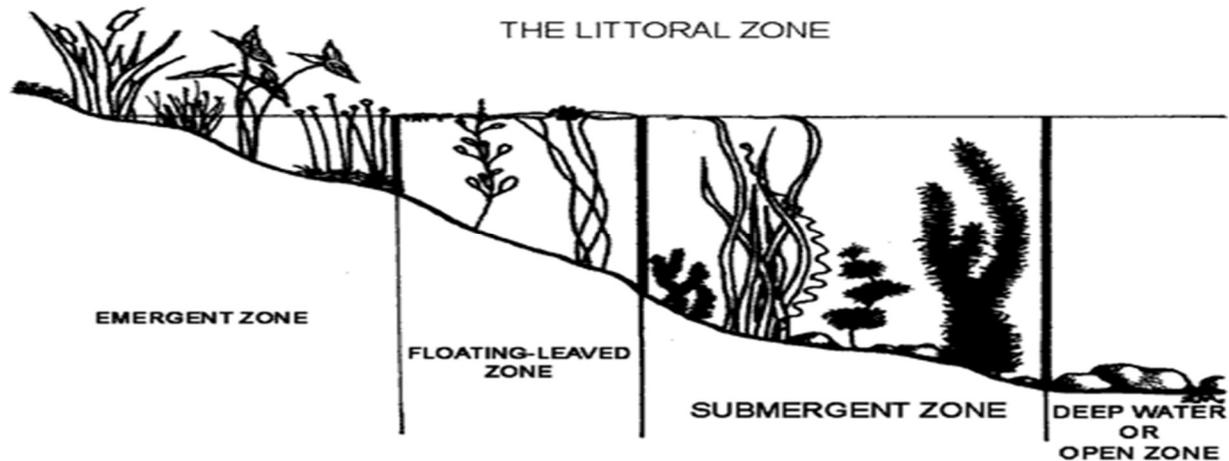
Indicator	Score (1-not present; 2-present nearby (200-1000 m); 3-present at the site)
Water is turbid	1
Water smells or stinks	1
Waste water and sewage discharge points are present	1
Visible erosion in evaluation site	2

#### 4.3. Biological and Ecological indicators

These indicators are also divided into two groups: „good“ indicators and „bad“ indicators if they are present at the evaluation site. There are chosen fourteen indicators: domination of emergent plants, domination of floating and floating-leaved plants, presence of invasive species, plants covered with periphyton, floating filamentous algae, dead fishes at the shore, presence of waterfowl, domination of submerged plants, presence of amphibians, presence of fishes, presence of aquatic mammals, presence of mussels, presence of aquatic insects and microbiological parameters.

The macrophyte categories are shown in the figures 16-18.

The macrophyte categories are shown in the figure below (Figure 16).

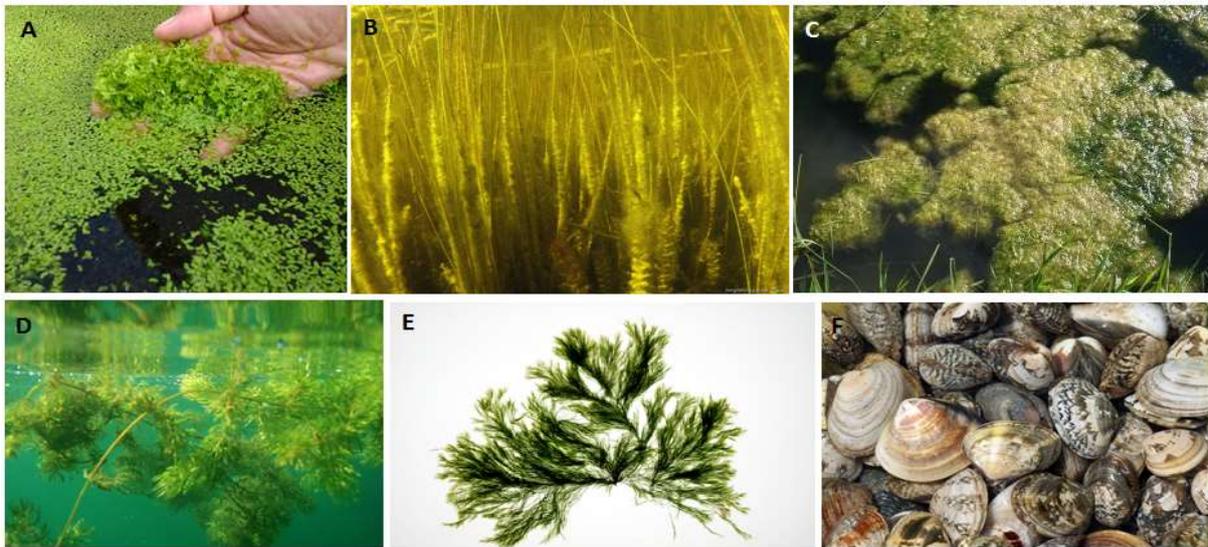


**Figure 16.** The macrophyte distribution zones and categories of macrophytes.

An **emergent plant** is one which grows in water but which pierces the surface so that it is partially in air. **Floating-leaved plants** are rooted in the lake bottom, but their leaves and flowers float on the water surface. Please see the examples below (Figure 17).



**Figure 17.** Emergent plant *Typha* sp. at the left. Floating-leaved plant *Nuphar lutea* at the right.



**Figure 18.** Different examples of biological indicators: A-floating plants (*Lemna* sp.), B-periphyton, C-floating filamentous algae, D-submerged plants (*Ceratophyllum* sp.), E-macroalgae (*Cladophora* sp.), F-mussels.

Please evaluate these seven indicator parameters (domination of emergent plants, domination of floating and floating-leaved plants, the presence of invasive species (flora and fauna), plants covered with periphyton, floating filamentous algae, dead fishes at the shore, the presence of waterfowl) at the scale:

- 1 point – not present at the evaluation site
- 2 points – present nearby (200 meters)
- 3 points – present at the evaluation site

Please evaluate these seven indicator parameters (domination of submerged plants, the presence of amphibians, the presence of fishes, the presence of aquatic mammals, the presence of shellfish, the presence of aquatic insects, microbiological parameters) at the scale:

- 1 point – present at the evaluation site
- 2 points – present nearby (200 meters)
- 3 points – not present at the evaluation site

The domination of submerged plants indicates the good light conditions in the waterbody. The presence of the wildlife indicates the good conditions of food supply and good living conditions. Microbiological parameters are chosen to reflect recreational safety for humans and usually when the ecosystem is not under the high human pressure/impact and water is transparent, there is no problematics with microbiological parameters.

*An example of the correct filling of the tool should be:*

d) Biological and Ecological indicators

Indicator	Score (1- not present; 2-present nearby; 3-present at site)
Domination of emergent plants	1

Domination of floating and floating-leaved plants	1
Invasive species present	2
Plants covered with slimy substance (periphyton)	1
Floating filamentous algae	1
Dead fish at the shore	2
Presence of waterfowl	2

Indicator	Score (1- present at site; 2- present nearby; 3-not present)
Domination of submerged plants	1
Presence of amphibians	3
Presence of fishes	1
Presence of aquatic mammals	3
Presence of mussels (including snails)	1
Presence of aquatic insects	1
Microbiological parameters (FIB and PIB - fecal indicator bacteria and pathogen indicator bacteria parameters) are in good level	2

The sum of points (28) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Abiotic and Ecological aspects is **good** and this corresponds to **1 SSP** (Status Score Points).

#### STEP 5: Assessing the status of water aspects of waterbody

To assess the status of the waterbody, please sum up the **Status Score Points (SSP)** and find the corresponding status class from the table:

Sum of Score points	Ecological Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

The good status indicates that there are no negative impacts of human activities and the ecosystem of a waterbody is in good status. There are no disturbances for the waterbody. The moderate status indicates that there are some negative impacts on the ecosystem and there occur some disturbances for the ecosystem. The bad status indicates that waterbody is under a lot of stress from human activity and this influences the status and environmental conditions of the waterbody.

According to the example fillings of the tool, the status of a waterbody is:

Aspect	Status Score Points (SSP)
Substrate	2 (moderate)
Human impact	1 (good)
Ecosystem Services	1 (good)
Abiotic and Ecological	1 (good)

Sum of SSP (all four aspects)	5
Status of waterbody	GOOD

### 3. Assessment guidance for marine environments

#### Foreword for evaluation tool

The best time for evaluating water aspects is in the middle of vegetation period (in July).

According to the Marine environments domain, please evaluate four aspects:

- Substrate of waterbody
- Human impact
- Ecosystem services
- Biological and Ecological aspects

Every aspect will be evaluated separately and there is developed different evaluation scale (Table 9) for every aspect.

**Table 9.** The point system for the assessment tool

Aspect	Status	Score Points	Marine Environments
Substrate	Good	1	2
	Moderate	2	4
	Bad	3	6
Human impact	Good	1	31 – 52
	Moderate	2	53 – 74
	Bad	3	75 – 93
Ecosystem services	Good	1	21 – 35
	Moderate	2	36 – 50
	Bad	3	51 – 63
Biological and Ecological aspects	Good	1	12 – 19
	Moderate	2	20 – 28
	Bad	3	29 – 36

The total score will be the sum of score points of every aspect (Table 10).

**Table 10.** Scale for assessing the Ecological status of waterbody

Sum of Score points	Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

#### STEP 1: Assessing the substrate of the waterbody

Please evaluate the substrate of waterbody at shore and littoral zone. Please choose the main substrate of the zone (Figure 19).

- The *shore* of a sea, lake or river is the land along the edge of it.
- The *littoral* is the region or zone between the limits of high and low tides.



**Figure 19.** The two main zones, where substrate must be assessed.

Please evaluate the substrate of the shore zone and littoral zone by **choosing the main substrate** of the zone. It means the principle of exclusion should be used. You can select only one substrate (main one). The substrate types are rocky, gravel, sandy, plants, peat, clay, muddy sand, mud, and artificial substrate. Please note, that the three last substrates, if present, have higher scores because they present high human impact on the waterbody.

*The minimum possible sum of points can be 2 points – this represents the good (natural) substrate of the water environment. The maximum sum of substrate points can be 6 and this represents the bad (under high human impact) substrate of the waterbody. 4 points represent the moderate human impact on the shore or littoral zone and represent some human indicated modifications near the water.*

An example of the correct filling of the tool can be:

*If the „blue“ substrate is the main substrate, it will get always 1 point. If the „red“ substrate is dominating, it reflects high human impact and will get always 3 points.*

Shore zone main substrate	
Substrate	Points
Rocky	0
Gravel	0
Sandy	0
Plants	0
Peat	0
Clay	0

Littoral zone main substrate	
Substrate	Points
Rocky	1
Gravel	0
Sandy	0
Plants	0
Peat	0
Clay	0

Muddy sand	0
Mud	0
Artificial (Concrete et al.)	3

Muddy sand	0
Mud	0
Artificial (Concrete et al.)	0

The sum of points (4) indicates that there are moderate human impact and some modifications at the shore, but not in the waterbody itself. **The status of Substrate is moderate** and this corresponds to Status Score Point (SSP) 2 (moderate).

### STEP 2: Assessing the human impact

Please evaluate every indicator, which represents human impact to the waterbody at the scale:

- 1 point if the indicator is not present at the site
- 2 points if the indicator is nearby of the site (200 – 1000 meters)
- 3 points if the indicator is at the site (perimeter up to 200 meters)

Some of the indicators (Figure 20) represent potential sources (e.g. tourism objects, waste, and rainwater discharge points) and most of them potential diffuse pollution sources. These indicators reflect a different type of disturbances indicated by human activity which could affect ecosystem ecological status negatively. Lower scores mean the better ecological status of the waterbody.



**Figure 20.** Some examples of negative human impact on waterbodies.

Please evaluate **only the presence** of these human impact indicators. **You do not have to assess the whole range of the impact of these indicators.**

*If the indicator, that is listed, is present at the evaluation site (up to 200 meters perimeter), it will always get 3 points and it represents potentially high human impact. If the indicator is present nearby, it will always get 2 points and it represents moderate human impact (this do not impact evaluation site directly). If the indicator is not present at the evaluation site, it always will get 1 point, and this should represent the small human impact and natural status of the waterbody.*

#### **Definitions for human impact indicators:**

**Housings** – (house, household) A household consists of all the people in a family or group who live together in a house.

**Buildings** – all other buildings excluding households. Bars, hotels, shopping centers etc.

**Industrial buildings** – all buildings related to industry: factories, power plants etc.

**Agricultural buildings** – all buildings related to agriculture: animal farms, constructions for manure storage, silos (a tower or pit on a farm used to store grain or other products), barns etc.

**Agricultural land** – area where different crops are been cultivated.

**Maintained grassland and lawn area** – the natural, seminatural or artificial grassland (lawn) which is maintained by human

**Pastureland** – an area of grassland where farm animals graze.

**Garden land** – an area of land next to house or building, with plants, trees, and grass.

**Loading of shore/beach area by filling earth** – bringing additional mineral resources to the shore/beach area.

**Road area** – a long piece of hard ground built between two places for driving.

**Parking area** – (parking lot) an area where cars or other vehicles may be left temporarily.

**Railway** – constructions for train or metro transportation.

**Minings** – industry, and activities connected to get mineral resources (coal, diamonds, oil shale etc.).

**Sediment removal** – activity when sediments of the waterbody are carried out from the waterbody (by pumps or mechanical ways).

**Cutting plants from lakes** – activity when plants (macrophytes) are carried out from the waterbody.

**Park** – public area of land with grass and trees where people go to relax and enjoy themselves.

**Beach** – area of sand or pebbles near the water.

**Tourism objects** – the places or objects which provide activities or services for persons.

**Piers and bridges** – a structure which sticks out into the waterbody and which people can walk on. This can be used for different vehicles for crossing over the waterbody. There can be tagged some boats or other water traffic objects along these structures.

**Boats** – water traffic object. In this category is included all kinds of water traffic objects (water bicycle, canoe, kayak etc.)

**Boat channel** – passage along with water flows or a route used by boats.

**Artificial shore protections** – constructions that should prevent erosion or rising water levels.

**Dam** – a wall built across a river to stop the flow of the water and make a lake.

**Dyke/Wier** – thick wall that prevents water flooding onto land from a river, lake or sea.

**Landfill** - a site for the disposal of waste materials by burial and the oldest form of waste treatment.

**Trash or litter** – rubbish or trash which is left lying around outside.

**Pollution** – unpleasant substances (in this case oily substances, not atmospheric pollution) that pollute the water.

**Artificial objects in the water** – old parts of bridges, piers or other constructions that indicate human impact and modifications in the water.

**Waste and rainwater discharge points** – pipes or culverts near or in the water that can be waste and rainwater discharge points.

**Harbour** – an area of deep water which is protected from the sea by land or walls, so that boats can be left there safely.

**Windmill** – a structure that has parts which are turned around by the wind and that is used to produce power, pump water, etc.

**Water traffic** – the movement of ships, persons, etc., in an area over a water route.

*An example of the correct filling of the tool can be:*

Indicator	Score
Housings	2
Buildings	1
Industrial buildings	1
Agricultural buildings	1
Agricultural land	1
Maintained grassland and lawn area	2
Pastureland	1
Garden land	2
Loading of shore/beach area by filling earth	2
Parking area	1
Road area	2
Railway	1
Mining	1
Sediment removal	1
Cutting plants	1
Park	2
Beach	3
Tourism objects	1
Piers and bridges	2
Boats	2
Boat channels	1
Waste and rainwater discharge points	1
Artificial shore protections (for against erosion)	2
Artificial objects in the water	1
Dam	1
Landfill	1
Trash or litter	2
Pollution	1
Harbour	1
Windmills	1
Water traffic	1

The sum of points (43) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Human impact aspect is **good** and this corresponds to **1 SSP** (Status Score Points).

**Note:** To assess these indicators of human impact, the map of the waterbody could give additional information.

### STEP 3: Assessing the ecosystem services

The ecosystem services are divided into two groups: services that, if used, affect waterbody positively and services that, if used, affect waterbody negatively. Ecosystem services are divided into three types: regulating and maintaining services, provisioning services, and cultural services. See the explanations of the services from the table below (Table 11).

Assessing the potentially „good services“ (Four indicators: the presence of endangered species (flora and fauna), protection areas nearby, predatory fish catching opportunities and safety of bluespace for swimming) one have to consider that:

- 1 point – service is present or provided at the evaluation site
- 2 points – service is present or provided nearby the evaluation site
- 3 points – service is not present or provided at the evaluation site or nearby

*Usually, the ecosystem with the bad or moderate ecological status do not offer these ecosystem services and therefore it indicates human modifications or human impact of the waterbody.*

Assessing the potentially „bad services“ (Twelve indicators: using water for drinking purposes or other purposes (industrial), commercial fishing, artificially modified waterbody (e.g. channelling), non-point source pollution, point source pollution, wastewater discharge, regulating water level, constructions for flood protection, infrastructure for recreation, fishing opportunities and water traffic opportunities) one have to consider that:

- 1 point – service is not present or provided at the evaluation site or nearby
- 2 points – service is present or provided nearby the evaluation site (200 meters)
- 3 points – service is present or provided at the evaluation site

*If these potentially „bad services“ are offered at the evaluation site, then there is high or moderate human impact on the status of the waterbody. The waterbody with the good condition/status usually do not offer these services and should be in natural condition with no (or few) signs of human impact.*

**Table 11.** Explanation of the services that waterbody can provide

Service	Explanation
Marine protection areas are present	Protection areas are created to preserve some concrete landscape, ecosystem or species habitat, therefore this should affect the waterbody positively.

Natural sediments	Natural sediments (gravel, sand, rocks) offers more habitats for flora and fauna than artificial (concrete) and therefore affect waterbody ecological status positively.
Tides are present	Tides are natural phenomena and the biota of marine habitats are adapted for tides (in these areas are usually higher species richness).
Removal of contaminated sediments	Removing contaminated sediments import additional phosphorus and nitrogen out from the waterbody.
BlueSpace is safe for swimming	Safety for swimmers reflects the good condition of the shore and littoral zone (no trash, broken bottles etc.). Under this service, we also consider that the microbiological parameters are at good (allowed) levels and no harmful algal blooms.
Commercial fishing present	The presence of the fish stock encourages fishing from the waterbody. Humans usually prefer to catch predatory fishes, which affect the balance of predatory and prey fishes.
Wind turbines	Wind turbines make sound and vibration that can affect fauna of the waterbody. Studies have shown that wind turbines can affect the behavior of fishes.
Production of Hydrothermal energy	Every energy production way that uses natural waterbody needs some artificial constructions in or near the waterbody that influences the extent of the human impact. This is also potential pollution source for the waterbody.
Other energy production ways	
Ice roads	Transport is one of the main potential pollution sources for the waterbody. Therefore it can affect waterbody negatively.
Ramps and small harbors	
Transit ports	
Shipping routes and navigation intensity	
Significantly modified seafloor	Every additional construction at the shore or in the water changes the natural shore and could affect waterbody negatively.
Signs of erosion present	Erosion can bring additional phosphorus, nitrogen or pollution that is accumulated in terrestrial areas to the waterbody.
Artificial coastal structures	Every additional construction at the shore or in the water changes the natural shore and could affect waterbody negatively.
Point source pollution	Point source pollution comes from pipes or tubes and could bring a lot of nutrients to the waterbody for primary producers to consume.
Diffuse pollution	The diffuse pollution is hard to detect but there are some visible signs of it. For example: floating filamentous algae, turbid (green) water could be some indications. Also the agricultural land and animal farms nearby. These indicators affect waterbody negatively.
Wastewater discharging into sea	One of the main indicator in the cities. Wastewater discharge will collect a lot of nutrient-rich water and with poor water treatment is the most common nutrient source for the waterbody.

Existence of infrastructure and presence of recreational services providers	Potential pollution source for the waterbody. Increases number of people who uses water for recreational purposes.
Leisure fishing and hunting opportunities	The presence of the fish stock encourages fishing from the waterbody. Humans usually prefer to catch predatory fishes, which affect the balance of predatory and prey fishes.

**Note:** To assess these services, the map of the waterbody could give additional information.

An example of the correct filling of the tool can be:

Indicator/Service	Score
	1-present; 2-present nearby; 3-not present
The presence of marine protection areas	1
Natural sediments (not artificial)	1
The presence of tides	1
Removal of contaminated sediments	3
Safety for swimming	1

Indicator	Score
	1-not present; 2-present nearby; 3-present
Commercial fishing present	3
Wind turbines	1
Production of Hydrothermal energy	1
Other energy production ways	1
Ice roads	1
Ramps and small harbors	2
Transit ports	1
Shipping routes and navigation intensity	1
Significantly modified seafloor	1
Signs of erosion present	2
Artificial coastal structures	1
Point source pollution	1
Diffuse pollution	2
Wastewater discharging into sea	1
Existence of infrastructure and presence of recreational services providers	2
Leisure fishing and hunting opportunities	2

The sum of points (30) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Ecosystem services aspect is **good** and this corresponds to **1 SSP** (Status Score Points).

#### STEP 4: Assessing the biological and ecological aspects

These indicators that are listed in the fourth part of the water aspects tool should assess the potential of the aquatic environment using easily accessible biological, ecological, hydrophysical indicators/parameters.

For the additional information, please measure, if possible, the air and water temperatures. **This is not important for assessing the potential status of the waterbody.**

An example of the correct filling of the tool should be:

a) Water and Air temperature:

Water temperature	11,5	Air temperature	19
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#### 4.1. Hydrophysical indicators

These indicators that are chosen reflects the bad condition of the waterbody or will affect the waterbody negatively. Examples of turbid and clear water are in **figure 21**. In the turbid water, the light will be absorbed, scattered and light penetration (euphotic layer) is smaller. This influences the primary producers of water ecosystems (phytoplankton, algae, macrophytes) and behavior of fishes and other hydrobionts.

The unpleasant smell of water is one of organoleptic indicator and smelling or stinking water could indicate the wastewater discharge points or decomposition of organic matter. Also in anoxic or hypoxic conditions, there could be a microbiological activity (sulfate reducing bacteria) near the sediments and this results as toxic hydrogen sulfide (H<sub>2</sub>S) which smells like rotten egg.

The water turbidity and the smell of water should be assessed at the scale:

- 1 point – not present at the evaluation site
- 2 points – present nearby (200 m) of the evaluation site
- 3 points – present at the evaluation site



**Figure 21. Examples of turbid (left) and clear water (right)**

An example of the correct filling of the tool should be:

b) Hydrophysical indicators:

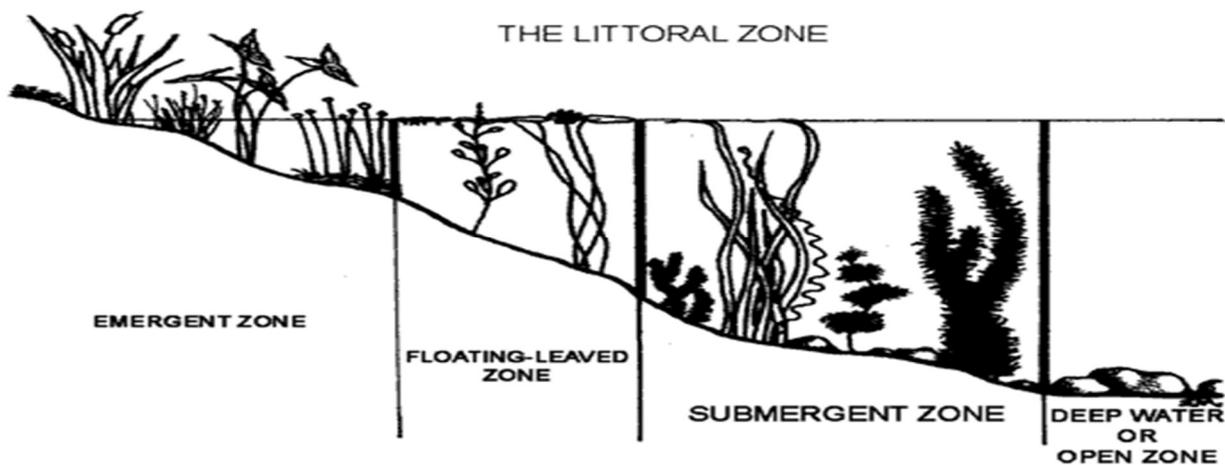
Indicator	Score (1-not present; 2-present nearby, 3-present at site)
Water is turbid	1
Water smells or stinks	1

#### 4.2. Biological and Ecological indicators

These indicators are also divided into two groups: „good“ indicators and „bad“ indicators if they are present at the evaluation site. There are chosen eighteen indicators: domination of emergent plants, domination of floating and floating-leaved plants, presence of invasive species, domination of reed (*Phragmites* sp.) at the shore, dead fish at the shore, presence of waterfowl, plants covered with periphyton, presence of floating filamentous algae, essential amount of livestock at the shore, domination of submerged plants, presence of amphibians, presence of fishes, presence of aquatic mammals, presence of mussels, presence of aquatic insects, presence of endangered species, presence of macroalgae, collecting seaweed from the waterbody.

The macrophyte categories are shown in the figures 22-24.

The macrophyte categories are shown in the figure below (Figure 22).



**Figure 22.** The macrophyte distribution zones and categories of macrophytes.

An **emergent plant** is one which grows in water but which pierces the surface so that it is partially in air. **Floating-leaved plants** are rooted in the lake bottom, but their leaves and flowers float on the water surface. Please see the examples below (Figure 23).



**Figure 23.** Emergent plant *Typha* sp. at the left. Floating-leaved plant *Nuphar lutea* at the right.



**Figure 24.** Different examples of biological indicators: A-floating plants (*Lemna* sp.), B-periphyton, C-floating filamentous algae, D-submerged plants (*Ceratophyllum* sp.), E-macroalgae (*Cladophora* sp.), F-mussels.

Please evaluate these nine indicator parameters (domination of emergent plants, domination of floating and floating-leaved plants, presence of invasive species, domination of reed (*Phragmites* sp.) at the shore, dead fish at the shore, presence of waterfowl, plants covered with periphyton, presence of floating filamentous algae, essential amount of livestock at the shore) at the scale:

- 1 point – not present at the evaluation site
- 2 points – present nearby (200 meters)
- 3 points – present at the evaluation site

Please evaluate these nine indicator parameters (domination of submerged plants, the presence of amphibians, the presence of fishes, the presence of aquatic mammals, the presence of mussels, the presence of aquatic insects, the presence of endangered species, the presence of macroalgae, collecting seaweed from the waterbody) at the scale:

- 1 point – present at the evaluation site
- 2 points – present nearby (200 meters)
- 3 points – not present at the evaluation site

The domination of submerged plants indicates the good light conditions in the waterbody. The presence of the wildlife indicates the good conditions of food supply and good living conditions.

*An example of the correct filling of the tool should be:*

c) Biological and Ecological indicators:

Indicator	Score (1- not present; 2-present nearby; 3-present at site)
Domination of emergent plants	1
Domination of floating and floating-leaved plants	1
Invasive species present	2
Domination of reed at the shore	1
Dead fish at the shore	1
Presence of waterfowl	2
Plants covered with slimy substance (periphyton)	2
Floating filamentous algae	1
Livestock at shore	1

Indicator	Score (1- present at site; 2- present nearby; 3-not present)
Domination of submerged plants	1
Presence of amphibians	3
Presence of fishes	1
Presence of aquatic mammals	3
Presence of mussels (including snails)	1
Presence of aquatic insects	1
Endangered species are present	2
Macroalgae are present	1
Seaweed collection	3

The sum of points (30) indicates that there is small human impact and there is few or no diffuse or point pollution sources and this should not affect the status of waterbody negatively. The status of Abiotic and Ecological aspects is **good** and this corresponds to **1 SSP** (Status Score Points).

**STEP 5: Assessing the status of water aspects of waterbody**

To assess the status of the waterbody, please sum up the **Status Score Points (SSP)** and find the corresponding status class from the table:

Sum of Score points	Ecological Status of waterbody
4 – 5 points	Good status
6 – 9 points	Moderate status
10 – 12 points	Bad status

The good status indicates that there are no negative impacts of human activities and the ecosystem of a waterbody is in good status. There are no disturbances for the waterbody. The moderate status indicates that there are some negative impacts on the ecosystem and there occur some disturbances for the ecosystem. The bad status indicates that waterbody is under a lot of stress from human activity and this influences the status and environmental conditions of the waterbody.

According to the example fillings of the tool, the status of a waterbody is:

Aspect	Status Score Points (SSP)
Substrate	2 (moderate)
Human impact	1 (good)
Ecosystem Services	1 (good)
Abiotic and Ecological	1 (good)
<b>Sum of SSP (all four aspects)</b>	<b>5</b>
<b>Status of waterbody</b>	<b>GOOD</b>



Floating filamentous algae in the Lake Elistvere