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## 4.52 Total organic carbon (TOC) content of NBS effluents

**Project Name:** Connecting Nature (Grant Agreement no. 730222)

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| **Total organic carbon (TOC) content of NBS effluents** | **Water Management** |
|---|---|
| **Description and justification** | Total Organic Carbon (TOC) is a measure of the total amount of carbon in organic compounds and is a key parameter for accessing the organic load of water. Organic carbon occurs as the result of decomposition of plant or animal material in both surface and groundwater. It is an extremely important part of the carbon cycle (and hence carbon calculation of nature-based solutions) and a food source in aquatic ecosystems. Total organic carbon (including dissolved organic carbon - organic matter that can pass through a filter no larger than 0.45 µm) can also contribute to the acidity water bodies and can increase the turbidity of aquatic systems, impacting phototrophic organisms.<br><br>Nature-based solutions can play a key role in the carbon cycle and in relation to the total organic carbon balance. As such, understanding their role in relation to total organic carbon in water released from the nature-based solution is a key part of understanding their wider benefits, co-benefits and dis-benefits. |
| **Definition** | Total organic carbon in a water sample (mg/L C). Carbon load (mg/L over time) is also a critical part of the understanding of this indicator (mean concentration of carbon mg/L) |
| **Strengths and weaknesses** | + Well established protocols exist for analysing Total Organic Carbon in water<br>- Results can be heavily influenced by sampling frequency. |

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| | - Depending on sampling methodology, regular sampling visits might be required |
| **Measurement procedure and tool** | Organic carbon content analysis in effluent from nature-based solutions can be carried out through laboratory analysis of extracted water samples. For information on general water sampling procedures, see indicator 1.2 Water Quality General and the Connecting Nature Environmental Indicator Metrics Review Report. However, in-situ methods are also available (e.g., Proteus Multiparameter Water Quality Meter) and have the advantage of more regular/frequent sampling intensities.<br><br>If water sampling for subsequent analysis is carried out, once water samples have been collected, they are sent off for laboratory analysis. Total organic carbon (TOC) is a non-specific test. Rather than determining which particular compounds are present, the test quantifies the sum of all organic carbon within those compounds. A number of established and emerging methods exist for quantifying TOC, typically depending on expected concentration thresholds. An established methodology is thermal combustion ion chromatography using a tube furnace and readily accessible HPLC (Fung et al. 1996).<br><br>In addition to a Total Organic Carbon concentration, it can also be advisable to calculate change in flow rates due to the nature-based solution. By so doing, it may be possible to calculate PAH loading in addition to pollutant level. This is a worthwhile consideration as, it is possible that concentrations in water could increase whilst overall pollutant load can decrease (due to a significant reduction in water flow over time). |
| **Scale of measurement** | Typically carried out on a site scale, but could be combined with city-wide water quality monitoring if NBS is sufficiently scaled-up. |
| **Data source** | |
| **Required data** | Spatial data in relation to water flows and sampling methodologies |
| **Data input type** | Quantitative and spatial |
| **Data collection frequency** | Regular sampling/continuous sampling is recommended to avoid missing pollution spikes/first flush events. However, if background levels are the target for evaluation, less frequent sampling may be adequate. |
| **Level of expertise required** | Water sampling does not necessarily require a high degree of expertise. Laboratory analysis does however require |

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| | technical expertise. In-situ analysis only requires technical expertise in relation to installation of equipment. |
| **Synergies with other indicators** | Improved water quality can have correlations with nature, health and social value of a waterways, particularly in relation to biodiversity indicators. There are also links to climate change mitigation due to the links to the carbon cycle story. |
| **Connection with SDGs** | SDG3, SDG4, SDG6, SDG8-SDG12; SDG14-SDG17: Clean water supply; Links to environmental education; Clean water; Job creation; Cleaner water supply; Social equality in relation to water quality; Sustainable urban development; More sustainable water management; Improved water quality (for life below water); Improved water quality (for life on land); Environmental Justice; Opportunities for collaborative working |
| **Opportunities for participatory data collection** | Opportunities are available for participatory processes, particularly in relation to taking water samples for subsequent analysis. Automated dataloggers offer less opportunity for such participation with participation limited to observing and processing the data produced. There are also opportunities for stewardship of equipment or nature-based solution, etc. |
| **Additional information** | |
| **References** | Fung, YS, Wu, Z and Dao, KL (1996) Determination of Total Organic Carbon in Water by Thermal Combustion-Ion Chromatography. *Analytical Chemistry 68*(13), 2186-2190. |

## 4.53 General ecological status of surface waters

**Project Name:** UNaLab (Grant Agreement no. 730052)

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| **Ecological status of surface waters** | **Water management** |
|---|---|
| **Description and justification** | Water covers ca. 71 % of the Earth's surface but only 2.5 % of it is fresh, stored as groundwater and in glaciers. Water is vital for living organisms, and it enables a multitude of human activities such as agriculture, manufacturing and transportation of goods. Available water resources are being extensively used for a variety of purposes, and ensuring that the water quality is monitored and the degraded water bodies are enhanced is essential |