4.47 Electrical conductivity of NBS effluents

Project Name: UNaLab (Grant Agreement no. 730052) and PHUSICOS (Grant Agreement no. 776681)

Author/s and affiliations: Laura Wendling[1], Ville Rinta-Hiiro[1], Maria Dubovik[1], Arto Laikari[1], Johannes Jermakka[1], Zarrin Fatima[1], Malin zu-Castell Rüdenhausen[1], Peter Roebeling[2], Ricardo Martins[2], Rita Mendonça[2], Gerardo Caroppi[3,4], Carlo Gerundo[4], Francesco Pugliese[4], Maurizio Giugni[4], Marialuce Stanganelli[4], Vittoria Capobianco[5], Farrokh Nadim[5], Amy Oen[5]

[1] *VTT Technical Research Centre Ltd, P.O. Box 1000 FI-02044 VTT, Finland*

[2] *CESAM – Department of Environment and Planning, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal*

[3] *Aalto University, Department of Built Environment, Espoo, Finland (gerardo.caroppi@aalto.fi)*

[4] *University of Naples Federico II (UNINA), Department of Civil, Architectural and Environmental Engineering, Naples, Italy*

[5] *Norwegian Geotechnical Institute (NGI), Oslo, Norway*

Electrical conductivity of the NBS effluents	Water Management
Description and justification	Water quality can profoundly impact both aquatic and terrestrial ecosystems. Changes to the quality of water may occur due to many different factors, including human activities. It is therefore important to monitor water quality in environments likely to be affected by anthropogenic activity, or in particularly sensitive aquatic ecosystems. Basic water quality parameters include pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) content and flow rate.
Definition	Electrical conductivity (EC) is a measure of a solution to conduct electricity (µS/cm or S/m). EC reflects a dissolved (ionisable) mineral salt content in water.
Strengths and weaknesses	+ An easy and straightforward assessment + Can be automated to ensure continuous data collection - Potential difficulties with maintenance and calibration of the automated equipment
Measurement procedure and tool	The conductivity (specific conductance) depends on the total concentration, mobility, valence and the temperature of the solution of ions. Electrolytes in a solution disassociate into positive (cations) and negative (anions) ions and impart conductivity. Most dissolved inorganic substances are in the ionised form in water and contribute to conductance. The conductance of the samples gives rapid and practical estimate of the variation in dissolved mineral content of the water supply. Conductance is defined as the reciprocal of the resistance involved and expressed as mho or Siemens. Conductivity is

	reported at 25 °C as temperature is proportional to the conductivity levels. In the aqueous solutions, the electrical conductivity is influenced by the presence of inorganic dissolved solids, each ion carrying an electrical charge. Typically, the distilled water has very low conductivity (ca. 0.05 µS/cm), whereas seawater has considerably higher values (ca. 50 000 µS/cm). Pollutants from urban, agricultural and industrial sources usually increase the electrical conductivity of water and make it unsuitable for usage. Generally, natural waters have stable conductivity levels, and the increase in electrical conductivity usually implies the disturbance associated, for example, with the urban runoff, which can contain elevated concentration of salts and other ions. The EC (in µS/cm) provides a rough approximation of the total dissolved solids (TDS, in mg/L) content, via the equation: $$Conductivity \times \frac{2}{3} = Total\ disolved\ solids$$
Scale of measurement	Plot scale
Data source	
Required data	Electrical conductivity measurement data
Data input type	Quantitative
Data collection frequency	Daily (using automated measurements) or weekly
Level of expertise required	Low
Synergies with other indicators	Synergies with the other water quality indicators in the *Water management* indicator group
Connection with SDGs	SDG 13 Climate action, SDG 14 Life below water
Opportunities for participatory data collection	Participatory data collection is possible under supervision
Additional information	
References	A number of standard methodologies for water testing are available from, e.g., the International Organization for Standardization (ISO), American Public Health Association (APHA), the European Environment Agency (EEA), and others.

ASTM. (2014). *ASTM D1125-14 Standard Test Methods for Electrical Conductivity and Resistivity of Water*. ASTM International, West Conshohocken, PA.

4.48 Water Framework Directive: Physico-chemical quality of surface waters

Project Name: UNaLab (Grant Agreement no. 730052), NAIAD (Grant Agreement no. 730497), PHUSICOS (Grant Agreement no. 776681)

Author/s and affiliations: Maria Dubovik[1], Laura Wendling,[1] Ville Rinta-Hiiro[1], Arto Laikari[1], Malin zu-Castell Rüdenhausen[1], Beatriz Mayor[2], Laura Vay[2], Marisol Manzano[3], Virginia Robles[3], Mar García-Alcaraz[3], Javier Calatrava[4], Raffaele Giordano[5], Miguel Llorente[6], Africa de la Hera[6], Javier Heredida[6], Laura Basco[7], Marta Faneca[7], Tiaravanni Hermawan[7], Elena Lopez-Gunn[2], Polona Pengal[8], Gerardo Caroppi[9,10], Carlo Gerundo[10], Francesco Pugliese[10], Maurizio Giugni[10], Marialuce Stanganelli[10], Vittoria Capobianco[11], Farrokh Nadim[11], Amy Oen[11]

1 VTT Technical Research Centre Ltd, P.O. Box 1000 FI-02044 VTT, Finland

2 I-CATALIST S.L., C/ Borni, 20, 28232 Las Rozas, Madrid, Spain

3 UPTC, Department of Mining and Civil Engineering, Technical University of Cartagena, 30202 Cartagena, Spain

4 UPTC, Department of Business Economics, Technical University of Cartagena, 30202 Cartagena, Spain

[5] CNR-IRSA, National Research Council – Water Research Institute, Bari, Italy

[6] IGME, Instituto Geológico y Minero de España (IGME)/Geological Survey of Spain, Ríos Rosas 23, 28003 Madrid, Spain

[7] Deltares, Boussinesqweg 1 2629 HV Delft, P.O. Box 177, 2600 MH Delft

[8] REVIVO, Institute for ichthyological and ecological research, Slovenia

[9] Aalto University, Department of Built Environment, Espoo, Finland (gerardo.caroppi@aalto.fi)

[10] University of Naples Federico II (UNINA), Department of Civil, Architectural and Environmental Engineering, Naples, Italy

[11] Norwegian Geotechnical Institute (NGI), Oslo, Norway

Water Framework Directive: Physicochemical 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 for protecting the water resources. Good ecological status of water bodies aggregates a number of indicators into an integrated indicator and it has been developed to determine and monitor the ecological