

Description of Attributes

This document describes the characteristics of constructed wetlands based on the main structure of the database behind CWetlands, which means that the attributes have been classified as **site-** (meaning the entire treatment plant, e.g., including previous and posterior treatment steps employing other technologies), **system-** (the sequence of constructed wetland modules), and **cell-** (individual constructed wetland unit) information.

Site-related attributes

SITE_ID

The unique identifier of a constructed wetland site.

SITE_NAME

Name of the constructed wetland site. This attribute is usually derived from location names found in scientific journal articles, e.g. based on municipalities, campuses etc.

CTRY_CODE

The so-called ISO 3166-1 alpha-3 codes which are three-letter country codes defined in ISO 3166-1, a part of the ISO 3166 standard published by the International Organization for Standardization (ISO). This attribute serves as a unique identifier of member states of the United Nations in the CWetlands database.

Reference/Further reading:

One World Nations Online. Country Codes List. Available [here](#).

LAT

Geographic coordinate specifying the north-south position of the constructed wetland site, in decimal degrees. Positive numbers indicate a north-south position on the Northern hemisphere, negative numbers stand for the Southern hemisphere.

LONG

Geographic coordinate specifying the east-west position of the constructed wetland site, in decimal degrees. Positive numbers indicate a position east of the Greenwich meridian, negative numbers stand for a position west of the prime meridian.

WW_TYPE

Type of wastewater based on source.

Wastewater is water that has experienced a decrease in quality due to human influence, making it unsafe for use or discharge into the environment. It is either one or a combination of two or more of the following: “domestic effluent consisting of blackwater and greywater; water from commercial establishments and institutions, including hospitals; industrial effluent, stormwater and other urban runoff; and agricultural, horticultural and aquaculture runoff” (WWAP 2017).

For the CWetlands database, the information about the type of wastewater has been coded similarly to the NADBv2, employing the following 3-letter codes:

Code	Description
AGR	Point-source pollution, e.g. from industrial animal farming, and diffuse pollution such as <u>agricultural</u> runoff which is “water from agricultural fields that does not infiltrate into the soil and runs off as overland flow” (WWAP 2017).
COM	“Water from <u>commercial</u> establishments and institutions, including hospitals” (WWAP 2017).
DOM	<u>Domestic</u> wastewater, which is “composed of blackwater, greywater and potentially other types of wastewater deriving from household activities in residential settlements (WWAP 2017).
MUN	<u>Municipal</u> wastewater originates “from domestic, industrial, commercial and institutional sources within a given human settlement or community” (WWAP 2017).
STO	<u>Stormwater</u> is “surface runoff of rainwater and other forms of precipitation (i.e. snowmelt) in urban areas, where much of the land surface is covered by pavements, buildings and compacted landscapes that do not allow water to infiltrate in the soil, thus increasing the runoff volume” (WWAP 2017).
IND	<u>Industrial</u> wastewater is “water discharged after being used in, or produced by, industrial or energy production processes” (WWAP 2017).
OTH	Waters defined by others as wastewater but not falling under the definition above.
UNK	Unknown, i.e. the type of wastewater was not mentioned in the information source about a particular constructed wetland.

Reference/Further reading:

United Nations World Water Assessment Programme. The United Nations World Water Development Report 2017. Wastewater – The Untapped Resource. Available [here](#).

OTH_WW_TYP

Description of the wastewater type if it has been coded as “OTH” (other).

CLIM_ID

The unique identifier of a climate record related to the site of a constructed wetland.

T_ANN_MEAN

Long-term annual mean temperature (1970-2000) derived from bioclimatic variables with 10 minutes resolution provided by WorldClim Version 2, in °C.

Reference/Further reading:

WorldClim – Global Climate Data. WorldClim Version2. Available [here](#).

P_ANN_MEAN

Long-term annual mean precipitation (1970-2000) derived from bioclimatic variables with 10 minutes resolution provided by WorldClim Version 2, in mm.

Reference/Further reading:

WorldClim – Global Climate Data. WorldClim Version2. Available [here](#).

CTRY_NAME

Name of the country based on the list of UN member states (United Nations, 2018).

CONTINENT

Geographic region assigned to the constructed wetland site based on the M49 Standard (UNSD, 1999).

Reference/Further reading:

United Nations Statistical Division. Standard country or area codes for statistical use (M49) – Geographic regions. Available [here](#).

SUB_REG

Geographic sub-region assigned to the constructed wetland site based on the M49 Standard (UNSD, 1999).

Reference/Further reading:

United Nations Statistical Division. Standard country or area codes for statistical use (M49) – Geographic regions. Available [here](#).

HDI

Human development index as per Human Development Report (UNDP, 2016).

Reference/Further reading:

United Nations Development Programme. Human Development Report 2016. Available [here](#).

HD_GROUP

Group of human development as per Human Development Report (UNDP, 2016).

For the CWetlands database, the information about the group of human development has been coded as follows:

Code	Description
VHI	Very high
HIG	High
MED	Medium
LOW	Low

Reference/Further reading:

United Nations Development Programme. Human Development Report 2016. Available [here](#).

LDC

Checkoff field about whether the country is a part of the Least Developed Countries as per UNSD (2018).

Reference/Further reading:

United Nations Statistical Division. Standard country or area codes for statistical use (M49) – Least Developed Countries. Available [here](#).

LLDC

Checkoff field about whether the country is a part of the Landlocked Developing Countries as per UNSD (2018).

Reference/Further reading:

United Nations Statistical Division. Standard country or area codes for statistical use (M49) – Land Locked Developing Countries. Available [here](#).

SIDS

Checkoff field about whether the country is a part of the Small Island Developing States as per UNSD (2018).

Reference/Further reading:

United Nations Statistical Division. Standard country or area codes for statistical use (M49) – Small Island Developing States. Available [here](#).

LIT_ID

The unique identifier of a literature record.

TITLE

Title of the publication.

YEAR

Publication year of the literature item (YYYY).

LIT_CITE

Citation of the publication as per Chicago citation style (16th generation).

System-related attributes

S_ID

The unique identifier of the constructed wetland system.

S_NAME

Name of the constructed wetland system.

S_AREA

Total system area, i.e. the sum of the surface area over all treatment cells, in m².

S_SCALE

Scale of the system, either experimental (laboratory/pilot) scale or full scale.

The information about the scale has been coded accordingly:

Code	Description
EXP	Experimental/laboratory/pilot scale
FUL	Full scale

S_PRE_TRT

Type of treatment stage before constructed wetland system.

For the CWetlands database, the information about the type of treatment previous to the constructed wetland has been coded by employing the following 3-letter codes:

Code	Description
NON	None
PRE	Preliminary
PRI	Primary
FAC	Facultative
SEC	Secondary
TER	Tertiary
OTH	Other types of previous treatment but not falling under the definition above
UNK	Unknown, i.e. the type of previous treatment was not mentioned in the information source about a particular constructed wetland

STAGE_CLS

Classification indicating the amount of stages (compartmentalisation).

The information about the compartmentalisation has been coded as follows:

Code	Description
SIN	Single-stage constructed wetland
TWO	Two-stage constructed wetland
MUL	Multi-stage constructed wetland

S_TYPE

Sequence of constructed wetlands cells based on traditional constructed wetland cell types, such as Free Water Surface (FWS), Horizontal Subsurface Flow (HSSF) and Vertical (subsurface) Flow (VF), separated through hyphen (e.g., VF-HSSF-FWS).

S_POST_TRT

Type of treatment stage after constructed wetland system, before disposal or use.

The information about the posterior treatment has been coded as follows:

Code	Description
NON	None
DIS	Disinfection
AER	Aeration
OTH	Other
UNK	Unknown

START_YEAR

The year the constructed wetland started operating [YYYY].

START_MTH

The month of the year the constructed wetland started operating [MM].

END_YEAR

The year the operation of the constructed wetland ended [YYYY].

END_MTH

The month of the year the operation of the constructed wetland ended [MM].

INV_COST

Investment cost for the implementation of the constructed wetland, in USD.

AN_COST

Annual cost for the operation and maintenance of the constructed wetland, in USD.

S_HYD_ID

The unique identifier of the record on the hydraulic performance of the constructed wetland system.

S_INFL

Average inflow rate of the constructed wetland system, in litres per day.

S_HLR

Average hydraulic loading rate of the constructed wetland system, in litres per m² and day.

S_HYD_BEG

Start date of the recording on the hydraulic performance of the constructed wetland system [YYYYMM].

S_HYD_END

End date of the recording on the hydraulic performance of the constructed wetland system [YYYYMM].

S_ORG_ID

The unique identifier of the record on the performance of the constructed wetland system regarding organics.

S_BOD_IN

Average system inflow concentration of the 5-day biochemical oxygen demand, in mg/l.

S_BOD_OUT

Average system outflow concentration of the 5-day biochemical oxygen demand, in mg/l.

S_BOD_EFF

Removal efficiency of the 5-day biochemical oxygen demand on system-level, either taken from the literature or calculated from values about BOD inflow and outflow concentration, in %.

SBODEFFTYP

Type of value regarding the removal efficiency of the 5-day biochemical oxygen demand on system level, either reported (REP) or calculated (CAL).

S_BOD_MT

Method which was applied for the measurement of the concentration of the 5-day biochemical oxygen demand.

S_BOD_ST

Standard which was applied for the measurement of the concentration of the 5-day biochemical oxygen demand.

S_COD_IN

Average system inflow concentration of the chemical oxygen demand, in mg/l.

S_COD_OUT

Average system outflow concentration of the chemical oxygen demand, in mg/l.

S_COD_EFF

Removal efficiency of chemical oxygen demand on system-level, either taken from the literature or calculated from values about COD inflow and outflow concentration, in %.

SCODEFFTYP

Type of value regarding the removal efficiency of the chemical oxygen demand on system level, either reported (REP) or calculated (CAL).

S_COD_MT

Standard which was applied for the measurement of the concentration of the chemical oxygen demand.

S_COD_ST

Standard which was applied for the measurement of the concentration of the chemical oxygen demand.

S_ORG_BEG

Start date of the record on the performance of the constructed wetland system regarding organics [YYYYMM].

S_ORG_END

End date of the record on the performance of the constructed wetland system regarding organics [YYYYMM].

S_SOL_ID

The unique identifier of the record on the performance of the constructed wetland system regarding solids.

S_TSS_IN

Average system inflow concentration of the total suspended solids, in mg/l.

S_TSS_OUT

Average system outflow concentration of the total suspended solids, in mg/l.

S_TSS_EFF

Removal efficiency of total suspended solids on system-level, either taken from the literature or calculated from values about TSS inflow and outflow concentration, in %.

STSSEFFTYP

Type of value regarding the removal efficiency of total suspended solids on system level, either reported (REP) or calculated (CAL).

S_TSS_MT

Method which was applied for the measurement of the concentration of the total suspended solids.

S_TSS_ST

Standard which was applied for the measurement of the concentration of the total suspended solids.

S_SOL_BEG

Start date of the record on the performance of the constructed wetland system regarding solids [YYYYMM].

S_SOL_END

End date of the record on the performance of the constructed wetland system regarding solids [YYYYMM].

S_N_ID

The unique identifier of the record on the performance of the constructed wetland system regarding nitrogen.

S_TN_IN

Average system inflow concentration of total nitrogen, in mg/l.

S_TN_OUT

Average system outflow concentration of total nitrogen, in mg/l.

S_TN_EFF

Removal efficiency of total nitrogen on system-level, either taken from the literature or calculated from values about TN inflow and outflow concentration. In %.

STNEFFTYP

Type of value regarding the removal efficiency of total nitrogen on system level, either reported (REP) or calculated (CAL).

S_TN_MT

Method which was applied for the measurement of the concentration of total nitrogen.

S_TN_ST

Standard which was applied for the measurement of the concentration of total nitrogen.

S_NH4N_IN

Average system inflow concentration of ammonia-nitrogen, in mg/l.

S_NH4N_OUT

Average system outflow concentration of ammonia-nitrogen, in mg/l.

S_NH4N_EFF

Removal efficiency of ammonia-nitrogen on system-level, either taken from the literature or calculated from values about NH4-N inflow and outflow concentration, in %.

SNH4NEFTYP

Type of value regarding the removal efficiency of ammonia-nitrogen on system level, either reported (REP) or calculated (CAL).

S_NH4N_MT

Method which was applied for the measurement of the concentration of ammonia-nitrogen.

S_NH4N_ST

Standard which was applied for the measurement of the concentration of ammonia-nitrogen.

S_NO3N_IN

Average system inflow concentration of nitrate-nitrogen, in mg/l.

S_NO3N_OUT

Average system outflow concentration of nitrate-nitrogen, in mg/l.

S_NO3N_EFF

Removal efficiency of nitrate-nitrogen on system-level, either taken from the literature or calculated from values about NO3-N inflow and outflow concentration, in %.

SNO3NEFTYP

Type of value regarding the removal efficiency of nitrate-nitrogen on system level, either reported (REP) or calculated (CAL).

S_NO3N_MT

Method which was applied for the measurement of the concentration of nitrate-nitrogen.

S_NO3N_ST

Standard which was applied for the measurement of the concentration of nitrate-nitrogen.

S_N_BEG

Start date of the record on the performance of the constructed wetland system regarding nitrogen [YYYYMM].

S_N_END

End date of the record on the performance of the constructed wetland system regarding nitrogen [YYYYMM].

S_P_ID

The unique identifier of the record on the performance of the constructed wetland system regarding phosphorous.

S_TP_IN

Average system inflow concentration of total phosphorous, in mg/l.

S_TP_OUT

Average system outflow concentration of total phosphorous, in mg/l.

S_TP_EFF

Removal efficiency of total phosphorous on system-level, either taken from the literature or calculated from values about TP inflow and outflow concentration, in%.

STPEFFTYP

Type of value regarding the removal efficiency of total phosphorous on system level, either reported (REP) or calculated (CAL).

S_TP_MT

Method which was applied for the measurement of the concentration of total phosphorous.

S_TP_ST

Standard which was applied for the measurement of the concentration of total phosphorous.

S_P_BEG

Start date of the record on the performance of the constructed wetland system regarding phosphorous [YYYYMM].

S_P_END

End date of the record on the performance of the constructed wetland system regarding phosphorous [YYYYMM].

S_BIO_ID

The unique identifier of the record on the performance of the constructed wetland system regarding biological wastewater quality indicators.

S_ECOL_IN

Average system inflow concentration of e.coli, in number per 100 ml.

S_ECOL_OUT

Average system outflow concentration of e.coli, in number per 100 ml.

S_ECOL_EFF

Removal efficiency of e.coli on system-level, either taken from the literature or calculated from values about e.coli inflow and outflow concentration.

SECOLEFTYP

Type of value regarding the removal efficiency of e.coli on system level, either reported (REP) or calculated (CAL).

S_ECOL_MT

Method which was applied for the measurement of the concentration of e.coli.

S_ECOL_ST

Standard which was applied for the measurement of the concentration of e.coli.

S_FCOL_IN

Average system inflow concentration of fecal coliforms, in number per 100 ml.

S_FCOL_OUT

Average system outflow concentration of fecal coliforms, in number per 100 ml.

S_FCOL_EFF

Removal efficiency of fecal coliforms on system-level, either taken from the literature or calculated from values about fecal coliforms inflow and outflow concentration, in %.

SFCOLEFTYP

Type of value regarding the removal efficiency of fecal coliforms on system level, either reported (REP) or calculated (CAL).

S_FCOL_MT

Method which was applied for the measurement of the concentration of fecal coliforms.

S_FCOL_ST

Standard which was applied for the measurement of the concentration of fecal coliforms.

S_BIO_BEG

Start date of the record on the performance of the constructed wetland system regarding biological wastewater quality indicators [YYYYMM].

S_BIO_END

End date of the record on the performance of the constructed wetland system regarding biological wastewater quality indicators [YYYYMM].

Cell-related attributes

C_ID

The unique identifier of the constructed wetland cell.

C_TYPE

Type of cell based on traditional constructed wetland types.

For the CWetlands database, the information about the cell type has been coded as follows:

Code	Description
FWS	Free water surface
HSSF	Horizontal subsurface flow
VF	Vertical flow
OTH	Other
UNK	Unknown

INTENS_MTH

Intensification method employed at the constructed wetland cell.

For the CWetlands database, the information about the intensification method has been coded as follows:

Code	Description
NON	None
AER	Aeration
CIR	Recirculation
CIP	Reciprocation
PSA	Partial saturation
REA	Use of reactive media
OTH	Other
UNK	Unknown

Reference/Further reading:

Dotro et al. 2017. Treatment Wetlands. Available [here](#).

PLANT_GEN

Plant genus.

PLANT_SPEC

Name of employed wetland plant species.