Linking on site water recovery options to key resilience drivers using the OSiRIS tool

A C++ modelling approach available as standalone application

Seppe Ongena 21/10/24

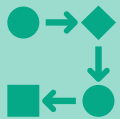# Contents (click for link)

Introduction: what is the model (not) for?

App layout: screenshots, description of app

Example workflow: from data to results

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OSiRIS: what is it?

OSiRIS Model and current OSiRIS App

High flexibility with building blocks, configurable in .json file:

Water tanks: volume, pre-filled or not, is tracked over time with pollutant concentration

Treatments and pumps: simplified, based on "specsheet"

Applications (e.g. toilet):

- Water use: any tank or external source

- Wastewater production: any tank or external sink, adds pollutant to source water

- Different IE per application → multiple applications = household and/or community

- Actor (pump, treatment, gravity, tap pressure) provides flow

- Sources: 2 types

Catchment: catchment area with pollutant concentration and collection efficiency

Tap: tap water source with pollutant concentration

Sinks: e.g., sewer system, infiltration, collection trucks

PV system: installed panel capacity (kWp), battery, efficiencies

OSiRIS: what is it?

OSiRIS Model and current OSiRIS App

High flexibility with building blocks (contd.):

⚙ Controls:

- Hysteresis or full control, for filling/emptying tank, increasing/decreasing tank concentrations

- Separate limits for locally produced and grid energy, e.g. grid as back-up

- Any number of steps (e.g. first treatment, then pumping to other tank, then infiltration)

Highly efficient C++ model

- Rapid simulation

- 12 seconds for 10 years @ 15 min resolution (350 000 time points, 114 000 000 datapoints on Intel i5-1145G7)

- Water and pollutant balances for error checks

- Streaming in & out of data: low RAM memory use, potential for online data streaming

OSiRIS: what is it?

OSiRIS Model and **current OSiRIS App**

Standalone app (.exe, Windows)

- User interface for scenario management and comparison based on KPI
- Scheme automatically adapts to user input
- Simulation results displayed in graphs
- Results, settings, and graphs saved to file

Pre-configured household from building blocks

- Most model parameters configurable
- Default pollutant = chloride
- Modifiable from centralized to extremely decentralized

Sub-models built-in:

- Diurnal water usage patterns: enables use of high-resolution precipitation data(15 min)
- Garden watering based on insolation (~plant transpiration)
- Insolation and cloud models if insolation data is unavailable
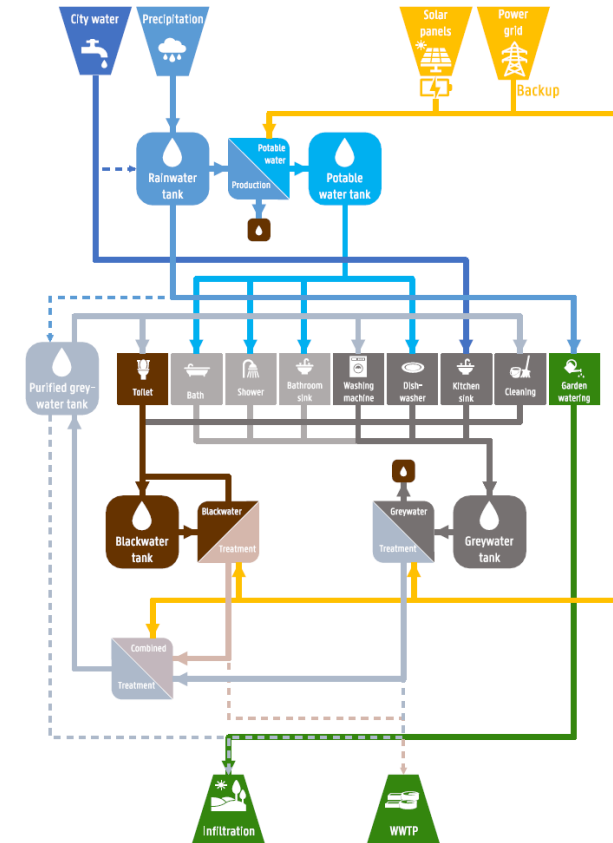
What is it *not* for?

⚙️ Complex modeling of wastewater treatment

- e.g. distinction between recalcitrant and degradable organics not *currently* possible
- Degradation is implemented in model (can be used separately), but not released in app

📐 Design tool for dimensioning volumes/treatments/photovoltaics

- Not straightforward *currently*
- Main focus = scenario comparison
- Possible through trial-and-error
- Future "design mode" potential

🧠 Smart control of rainwater tank refilling/emptying (e.g. RainPlus project)

- Full refill when empty
- Implementation of more dynamic control possible in future

💵 OPEX/CAPEX estimation

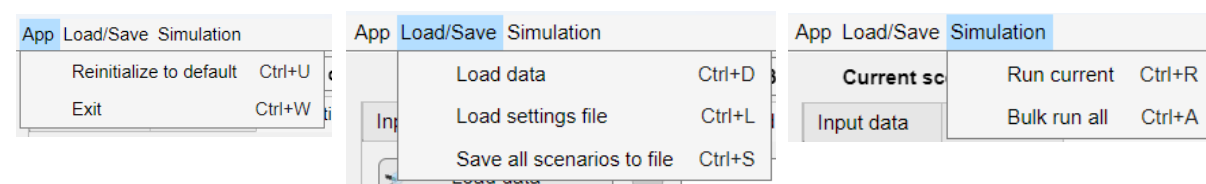# App layout

Main Interface

1.0 User input side (changing settings, scenario's,…)   **2.0 Graph side** (display results, current scheme,…)
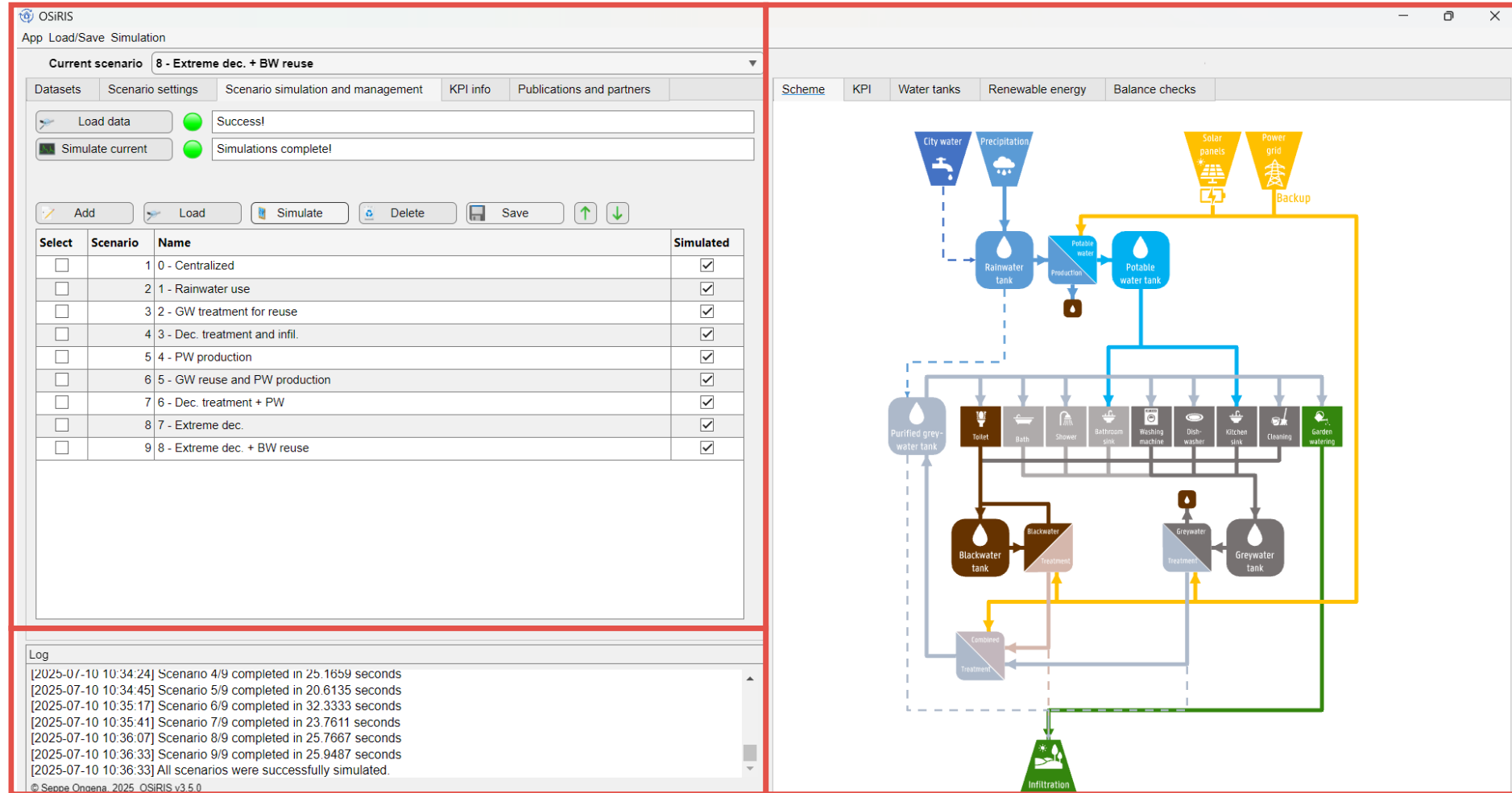
Log (simulation progress, errors, info,…)

1.0 User input side

Main menus (quickly select actions, shortcut keys possible)

Tab selector

1.1 Datasets

1.2 Scenario settings

1.3 Scenario simulation and management

1.4 KPI info

1.5 Publications and partners

Scenario selector

select scenario for editing, copying settings to new scenario, displaying plots,…

Tab contents

App Load/Save Simulation

| Current scenario | 8 - Extreme dec. + BW reuse | ▼ |

| Datasets | Scenario settings | Scenario simulation and management | KPI info | Publications and partners |

| 🔧 Load data | 🟢 | Success! |
| ▶ Simulate current | 🟢 | Simulations complete! |

| Add | Load | Simulate | Delete | Save | ↑ | ↓ |

Select	Scenario	Name	Simulated
☐	1	0 - Centralized	☑
☐	2	1 - Rainwater use	☑
☐	3	2 - GW treatment for reuse	☑
☐	4	3 - Dec. treatment and infil.	☑
☐	5	4 - PW production	☑
☐	6	5 - GW reuse and PW production	☑
☐	7	6 - Dec. treatment + PW	☑
☐	8	7 - Extreme dec.	☑
☐	9	8 - Extreme dec. + BW reuse	☑

App Load/Save Simulation

Reinitialize to default   Ctrl+U

Exit   Ctrl+W

App Load/Save Simulation

Load data   Ctrl+D

Load settings file Ctrl+L

Save all scenarios to file Ctrl+S

App Load/Save Simulation

Current sc

Input data

Run current Ctrl+R

Bulk run all Ctrl+A

1.1 Datasets

Timezone for data reading

Datasets | Scenario settings | Scenario simulation and management | KPI info | Publications and partners

Time zone: Europe ▼ Europe/Brussels ▼

Precipitation data

C:/Users/songena/OneDrive - UGent/PhD/Content/1. Decentralized household

Browse file

Delimiter: ; ▼   Decimal sep.: , ▼   Time format: yyyy-MM-dd'T'HH:mm:ss.SSSZZZZ

Data should be a .csv file obtained from **WaterInfo.be** or in a similar format.

Precipitation file selection
including browse button, file options, required format tooltip

File format:
- Metadata header rows
- Followed by (at least) two columns for the data:
. - #Timestamp: first column, in time format
. - Value: precipitation in mm
- Followed by optional footer rows

Renewable energy data

Insolation threshold for irrigation: 5 kWh/m²/d

☑ Use photovoltaic panel model

Model settings | Data settings

Panel slope (degrees): 40
Panel tilt angle (degrees): 0

☐ Advanced settings

Cloud data table (days or %)

	Clear	Cloudy	Overcast
J	3.2000	9.2000	18.5000
F	3.3000	10.9000	14.1000
M	4.4000	13.3000	13.5000
A	4.8000	15.2000	10.0000
M	5.1000	16.5000	9.4000
J	4.7000	16.8000	8.5000
J	5.8000	18.9000	6.3000
A	5.6000	19.0000	6.4000
S	5.9000	15.4000	8.7000

Renewable energy data
option between PV model (1.1.1) and datafile (1.1.2)

1.1.1 Datasets: PV model

Solar panel orientation

(Solar panel technological settings in House characteristics (1.2.1))

(Advanced) Atmospheric model parameters
- For calculation of total panel irradiation
  = beam, diffuse and reflected irradiance
- Based on trigonometric model

Cloud model parameters

= number or % of clear, cloudy, and overcast days
- Probabilistic model
- Random number to determine type of day
- Cloud probability:
  - 0-20% on a clear day
  - 20-80% on a cloudy day
  - 80-100% on overcast day
- "Spawn" in cloud: value 0 or 1
- Clouds eliminate beam insolation, slightly increase diffuse insolation, drastically reduce reflections

Screenshot content

Datasets | Scenario settings | Scenario simulation and management | KPI info | Publications and partners

Time zone: Europe / Europe/Brussels

Precipitation data

C:/Users/songena/OneDrive - UGent/PhD/Content/1. Decentralized household

Browse file

Delimiter: ; Decimal sep.: , Time format: yyyy-MM-dd'T'HH:mm:ss.SSSZZZZ;

Data should be a .csv file obtained from **WaterInfo.be** or in a similar format.

Renewable energy data

Insolation threshold for irrigation: 5 kWh/m²/d

☑ Use photovoltaic panel model

Model settings | Data settings

Panel slope (degrees): 40
Panel tilt angle (degrees): 0

☑ Advanced settings

Advanced settings

T_{LK}, Linke turbidity factor: 3
ρ, ground reflectivity: 0.2

Cloud data table (days or %)

	Clear	Cloudy	Overcast
J	3.2000	9.2000	18.5000
F	3.3000	10.9000	14.1000
M	4.4000	13.3000	13.5000
A	4.8000	15.2000	10.0000
M	5.1000	16.5000	9.4000
J	4.7000	16.8000	8.5000
J	5.8000	18.9000	6.3000
A	5.6000	19.0000	6.4000
S	5.9000	15.4000	8.7000

1.1.2 Datasets: renewable energy

Similar to precipitation data

1.2 Scenario settings

Datasets	Scenario settings	Scenario simulation and management	KPI info	Publications and partners

House characteristics	Tanks	Technological specifications	Reuse	

General

Number of persons in household	2.3
Projected roof area (m²)	106
House location (latitude, °)	51.00111
House location (longitude, °)	4.084444
House location (altitude, m)	5

☐ Show advanced settings

☑ Renewable energy

☑ Battery capacity (kWh)	2
PV system size (kWp)	0.5

Subtab selection

1.2.1 House characteristics

1.2.2 Tanks

1.2.3 Technological specifications

1.2.4 Reuse

1.2.1 Scenario settings: house characteristics

House characteristics | Tanks | Technological specifications | Reuse

General
- Number of persons in household: 2.3
- Projected roof area (m²): 106
- House location (latitude, °): 51.00111
- House location (longitude, °): 4.084444
- House location (altitude, m): 5

☑ **Renewable energy**
- ☑ Battery capacity (kWh): 2
- PV system size (kWp): 0.5

☑ Show advanced settings

Advanced settings

Flows and concentrations | Rain correction factor | Photovoltaics

Pollutant name (only affects graph legends): Chloride

Pollutant concentrations in tap- and rainwater (mg/L)
- c_{tap}: 70
- c_{rain}: 7.7

Appliance daily flows (L/p/d)
Q_{TL}	21.3
Q_{BT}	5.1
Q_{SH}	23.8
Q_{WM}	16.6
Q_{BS}	9.4
Q_{DW}	2.3
Q_{KS}	17.1
Q_{CL}	5.8
Q_{GA}	7.4

Wastewater pollutant concentrations for tap water (mg/L)
c_{TL}	100
c_{BT}	166
c_{SH}	284
c_{WM}	450
c_{BS}	237
c_{DW}	716
c_{KS}	223
c_{CL}	600
c_{GA}	0

Flows and concentrations | Rain correction factor | **Photovoltaics**

- Photovoltaic panel heat efficiency: 0.9 $\eta_{heat} = (1 - losses\ due\ to\ heat)$
- Efficiency of the DC/AC inverter: 0.95 $\eta_{inverter}$
- Efficiency of the battery: 0.9 $\eta_{battery}$

(Advanced) Values used to convert solar irradiance (data or PV model) to available energy

Advanced settings

Flows and concentrations | **Rain correction factor** | Photovoltaics

Total rain correction factor: 0.81 η_{rain}

1. Correction for roof slope & tilt (in case SW = main wind direction)

Slope	NE	NW	SW	SE
30°	0.75	1	1.25	1
35°	0.7	1	1.3	1
40°	0.64	1	1.36	1
45°	0.57	1	1.43	1
50°	0.48	1	1.52	1
≥50°	0.45	1	1.55	1

2. Correction for roof type

Roof type	Factor
Flat with gravel	0.6
Flat with bitumen	0.7-0.8
Flat with slate or tile	0.75-0.9
Sloped with slate or tile	0.9-0.95
Sloped with glazed tiles	0.9-0.95
Sloped with bitumen	0.8-0.95

3. Correction for coarse filter

Filter type	Factor
Self-cleaning filter well	0.9
Filter in downcomer pipe	0.9
Cyclone filter	0.95

General settings and renewable energy settings
(i.a. checkbox whether to use renewable energy and whether to use a battery)

(Advanced) Total daily flows
(used to calculate diurnal flow values based on literature patterns)

(Advanced) Pollutant concentrations for tap water
(the model will subtract the tap water concentration from these values and add the background concentration from the used source water streams)

(Advanced) Rain correction factor tables
(for main wind/rain direction, evaporation, filter efficiencies,…)

1.2.2 Scenario settings: tanks

	Datasets	Scenario settings	Scenario simulation and management	KPI info	Publications and partners

House characteristics	Tanks	Technological specifications	Reuse

Tank settings

(is the tank installed?, maximum volume?, is tank initially filled with tap water?, what is the initial volume?)

	Nominal volumes (m³)		Initial volume (m³)	
Potable water tank)	☑	1	☑	1
Rainwater tank	☑	10	☑	10
Purified greywater tank	☑	1	☑	1
Blackwater/septic tank	☑	1	☐	0
Greywater buffer tank	☑	0.5	☐	0

assumes tap water

☑ Show advanced settings

Advanced settings - control parameters

$max(c_{PGW})$ [350]

(Advanced) maximum PGW concentration
Maximum allowed pollutant concentration in the purified greywater tank. When exceeding this concentration, the tank will be purged with rainwater (see reuse settings).

$min(V_{RW})$ [0.5]

(Advanced) minimum RW tank level
Minimum volume of the rainwater tank. When below this, the refilling mechanism will come into action.

1.2.3 Scenario settings: technological specifications

Datasets | Scenario settings | Scenario simulation and management | KPI info | Publications and partners

House characteristics | Tanks | Technological specifications | Reuse

☑ Greywater treatment
Design flow (m³/d) — 1.2
Energy use (kWh/m³) — 1.85
Water recovery — 0.9
Rejection — 0

☑ Blackwater treatment
Design flow (m³/d) — 1.2
Energy use (kWh/m³) — 0.5
Water recovery — 0.9
Rejection — 0

☑ Potable water treatment
Design flow (m³/d) — 0.6
Energy use (kWh/m³) — 1.5
Water recovery — 0.8
Rejection — 0.95

☑ Combined grey- and blackwater treatment
Design flow (m³/d) — 1.2
Energy use (kWh/m³) — 2.5
Water recovery — 0.7
Rejection — 0.95

☑ Water pumps
Design flow (m³/d) — 15
Energy use (kWh/m³) — 1.5

Q_{feed} or $Q_{influent}$ c_{feed} or $c_{influent}$ — $Q_{permeate}$ or $Q_{effluent}$ $c_{permeate}$ or $c_{effluent}$

$Q_{retentate}$ or Q_{waste} $c_{retentate}$ or c_{waste}

Water recovery (r)

$$r = \frac{Q_{permeate}}{Q_{feed}} = 1 - \frac{Q_{retentate}}{Q_{feed}}$$

Rejection (R)

$$R = \frac{c_{feed} - c_{permeate}}{c_{feed}} = 1 - \frac{c_{permeate}}{c_{feed}}$$

☑ Show advanced settings

Advanced settings - salts removal in buffer tanks
Removal in blackwater tank — 0.05
Removal in greywater tank — 0.05

Technology selection
(select whether a technology is present and fill its primary specifications)

Water pumps
(whether to consider pump energy for i.a. rainwater pumping to applications or when a treatment is not installed)

Theoretical explanation and visualisation of the primary specifications recovery and removal

(Advanced) Salts removal due to sedimentation

1.2.4 Scenario settings: reuse

Datasets	Scenario settings	Scenario simulation and management	KPI info	Publications and partners

House characteristics	Tanks	Technological specifications	Reuse

☑ Reuse blackwater?

Blackwater excess   Send to sewer ▼

Greywater excess   Empty by truck ▼

Rainwater excess   Infiltrate ▼

Purge water   Infiltrate ▼

☐ Treat rainwater before purging/refilling purified greywater tank?

☑ Rainwater excess: pass through purified greywater tank (purge)?

> This serves as a purge by diluting the PGW with rainwater. WARNING! Can heavily impact energy use when the rainwater is also treated first!

General reuse settings

Destination tank of wastewater after use

(toilet WW goes to blackwater tank per definition, gardening water is not recoverable)

	Source water:	Wastewater to:
Toilet flushing	Purified greywater ▼	Blackwater tank ▼
Bathing	Purified greywater ▼	Greywater tank ▼
Showering	Purified greywater ▼	Greywater tank ▼
Bathroom sink	Potable water ▼	Greywater tank ▼
Washing machine	Purified greywater ▼	Greywater tank ▼
Dishwasher	Purified greywater ▼	Greywater tank ▼
Kitchen sink	Potable water ▼	Greywater tank ▼
Cleaning	Purified greywater ▼	Blackwater tank ▼
Garden watering	Purified greywater ▼	Infiltration ▼

City water
Potable water
Rainwater
Purified greywater

Selection of water source per application

1.3 Scenario simulation and management
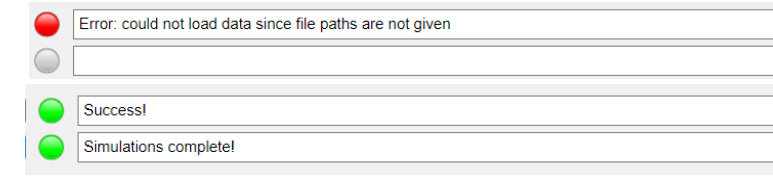
Load data for current scenario

Simulate the model for this scenario
(Save settings for current scenario, reload data if necessary)

Data loading progress info

Simulation progress info

Scenario overview/manipulation

When adding a scenario, the settings of the currently selected scenario will be copied

Load one or multiple scenario settings files

Bulk simulation of scenarios (see next slides)

Move selected scenarios up/down in list and plots

Save settings, schemes, KPI, results to file (see next slides)

Delete selected scenarios

A " * " indicates settings were changed but not yet saved/simulated

Is scenario already simulated? Re-simulating will overwrite results

| Error: could not load data since file paths are not given |
| Success! |
| Simulations complete! |

| Datasets | Scenario settings | Scenario simulation and management | KPI info | Publications and partners |

Load data — Success!
Simulate current — Simulations complete!

| Add | Load | Simulate | Delete | Save | ↑ ↓ |

Select	Scenario	Name	Simulated
☐	1	0 - Centralized	☑
☐	2	1 - Rainwater use	☑
☐	3	2 - GW treatment for reuse	☑
☐	4	3 - Dec. treatment and infil.	☑
☐	5	4 - PW production	☑
☐	6	5 - GW reuse and PW production	☑
☐	7	6 - Dec. treatment + PW	☑
☐	8	7 - Extreme dec.	☑
☐	9	8 - Extreme dec. + BW reuse*	☑

Bulk simulation

Saving files: save dialog screen

Save configuration

Browse folder

Select folder

Select scenarios to save output for

Select output to save

Select variables in the data to save

Scenarios

Save output

Data variables

Select	Name	Simulated
☐	0 - Centralized	☑
☐	1 - Rainwater use	☑
☐	2 - GW treatment for reuse	☑
☐	3 - Dec. treatment and infil.	☑
☐	4 - PW production	☑
☐	5 - GW reuse and PW production	☑
☑	6 - Dec. treatment + PW	☑
☑	7 - Extreme dec.	☑

☑ KPI
☑ Data
☑ Settings
☑ Schemes

▸ ☐ Model diagnostics
▸ ☑ Volumes
▸ ☑ Concentrations
▸ ☐ Treatments
▸ ☑ Energy
▸ ◼ Output flows
▸ ☐ Input flows
▸ ☐ Application flows
▸ ◼ Control flows

Save   Cancel

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Saving files: output

All possible warnings triggered

(full view - examples)

Datafiles: per scenario as .csv files, each variable = column

.png of schemes per scenario

KPI spider and line plot (.png) and KPI table (.csv)

Scenario settings as "human readable" .json files

Progress is shown in log

(collapsed view)

1.4 KPI info

Current scenario 8 - Extreme dec. + BW reuse

Datasets | Scenario settings | Scenario simulation and management | KPI info | Publications and partners

Scheme | KPI | Water tanks | Renewable energy | Balance checks

Configure

Water independence factor on import (WIF:I)

$$WIF_I = \frac{RW\ use\ (m^3)}{Total\ water\ use\ (m^3)} = \frac{RW\ use}{RW\ use + CW\ use}$$

When the rainwater tank does not need refilling and no city water is directly used (CW use = 0), the WIF:I is 100%. When either is present, the WIF:I will decrease.

Water independence factor on export (WIF:E)

$$WIF_E = \frac{Infiltration\ (m^3)}{Total\ water\ disposal\ (m^3)} = \frac{Infiltration}{Infiltration + Sewer +}$$

If all excess water is infiltrated, the WIF:E is 100%.
If any water is sent to the sewer or a tank is emptied by truck, the WIF:E will decrease.

Circularity factor (CF)

$$CF = \frac{Water\ reused\ (m^3)}{Wastewater\ produced\ (m^3)}$$

The circularity factor is the ratio of water reused (from the PGW tank) to the total amount of wastewater produced. If all wastewater is reused, the CF will be 100%.

Recharge factor (RCF)

$$RCF = \frac{Water\ infiltrated\ (m^3)}{Precipitation\ (m^3)}$$

The recharge factor represents the closure of the local water cycle. If all harvested precipitation will eventually be infiltrated, and no water is either imported or exported (WIF:I = WIF:E = 100%), the RCF will be 100%. In all other cases, RCF>100% (net water import) or <100% (net water export).

Drought tolerance factor (DTF)

$$DTF = \frac{Volume\ RW\ tank\ (m^3)}{Peak\ monthly\ RW\ use\ (m^3/month)}$$

The drought tolerance represents how long a full rainwater tank can supply peak usage (usually summers if rainwater is used for gardening) in months.

Energy independence factor (EIF)

$$EIF = \frac{Renewables\ use\ (kWh)}{Total\ energy\ use\ (kWh)}$$

The EIF indicates the self-sufficiency of the system in terms of energy use. It will be 100% for no grid energy use, i.e., the renewable energy supply is always sufficient (esp. in the winter months) either trough production or storage capacity. If the grid backup is used, the EIF will decrease

Scenario	WIF:I	WIF:E	CF	RCF	DTF	EIF
0 - Centralized	0	0.0180	0	0.0416	0	0
1 - Rainwater use	0.4306	0.2746	0	0.4791	2.3634	1.0000
2 - GW treatment for reuse	0	0.5654	0.4447	0.9857	0	0.9986
3 - Dec. treatment and infil.	0.4306	1.0000	0	1.7444	2.3634	0.9943
4 - PW production	0.7212	0.0847	0	0.1344	1.0668	1.0000
5 - GW reuse and PW production	0.9084	0.1885	0.4447	0.2062	1.7775	0.9473
6 - Dec. treatment + PW	0.7209	1.0000	0	1.5867	1.0668	0.9360
7 - Extreme dec.	0.9085	1.0000	0.4425	1.0945	1.5643	0.8573
8 - Extreme dec. + BW reuse	1.0000	0.6145	0.7622	0.6146	4.1912	0.8454

Best used in conjunction with KPI graph tab

(gives calculation method for each KPI and a brief explanation)

1.5 Publications and partners

Datasets	Scenario settings	Scenario simulation and management	KPI info	Publications and partners

For more information:

Van de Walle et. al (2022). In silico assessment of household level closed water cycles: Towards extreme decentralization. Environmental Science and Technology, 10, 100148

Ongena et. al (s.d.). Linking on site water recovery options to key resilience drivers using the OSiRIS tool. Unpublished.

De Watergroep

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List of publications with more in-depth information on model and used default values

List of contributing partners

2.0 Graph side

Tab selector

2.1 Scheme

2.2 KPI

2.3 Water tanks

2.4 Renewable energy

2.5 Balance checks

Scheme	KPI	Water tanks	Renewable energy	Balance checks

Tab contents

2.1 Graphs: scheme

Scheme updates based on selected settings
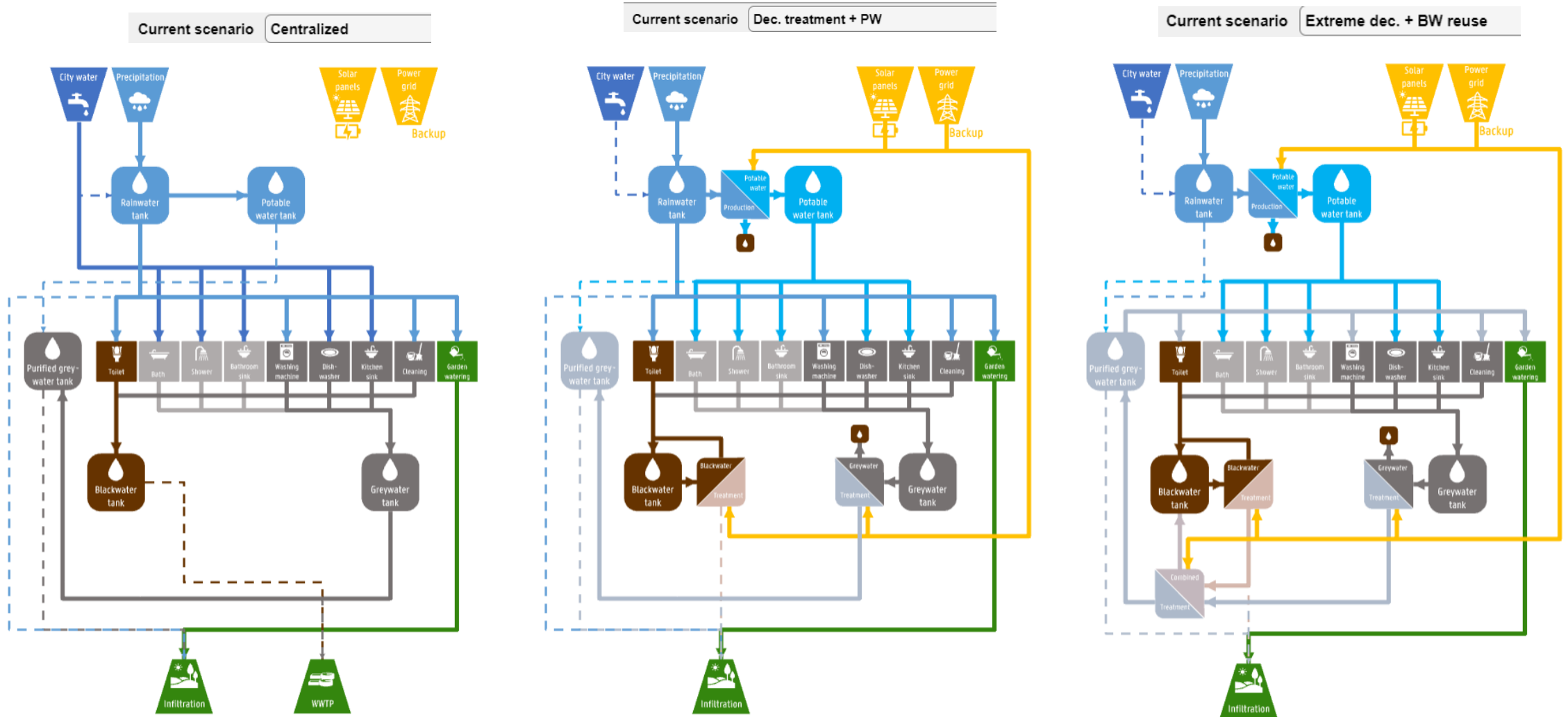
2.2 Graphs: KPI

Plot (line or spider), table

Configuration dialog

| | Scheme | KPI | Water tanks | Renewable energy | Balance checks |
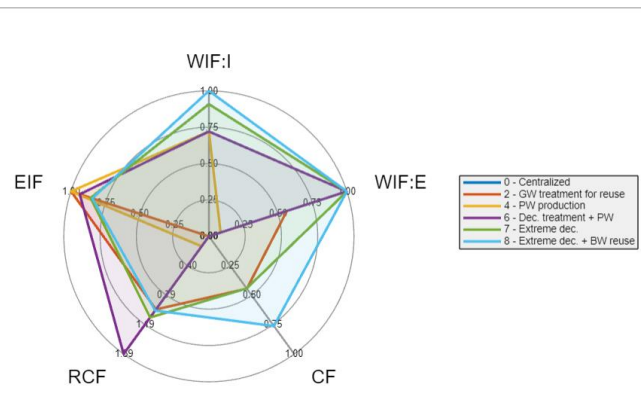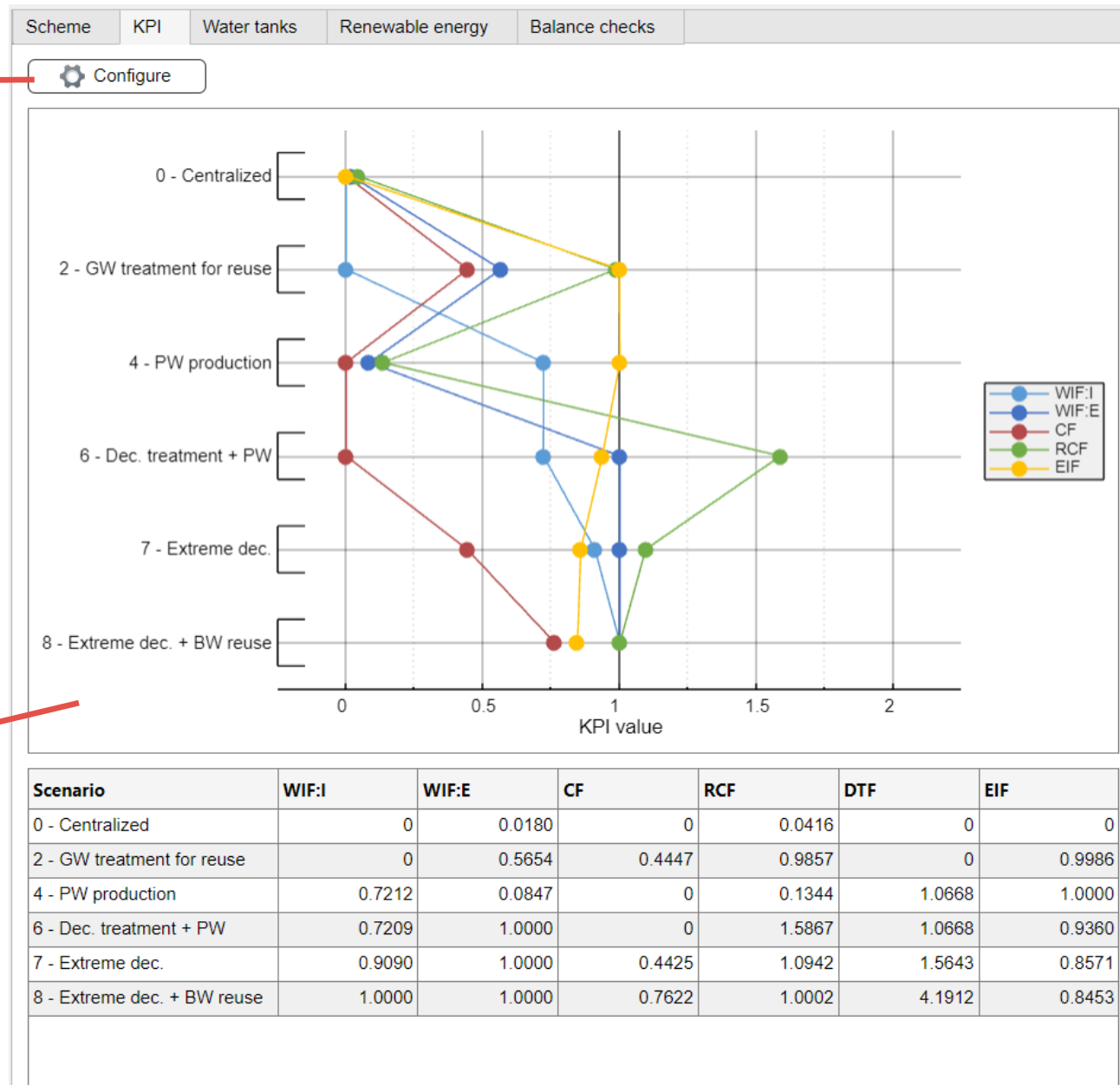
Configure

KPI plot configuration

Which scenario to
plot in graph/show in table

Plot type — Spider ▾

Spider
Line

Which KPI to
plot in graph

Scenarios

Select	Scenario	Simulated
☑	0 - Centralized	☑
☐	1 - Rainwater use	☑
☑	2 - GW treatment for reuse	☑
☐	3 - Dec. treatment and infil.	☑
☑	4 - PW production	☑
☐	5 - GW reuse and PW production	☑
☑	6 - Dec. treatment + PW	☑

KPI

☑ WIF:I
☑ WIF:E
☑ CF
☑ RCF
☐ DTF
☑ EIF

Apply   OK

Scenario	WIF:I	WIF:E	CF	RCF	DTF	EIF
0 - Centralized	0	0.0180	0	0.0416	0	0
2 - GW treatment for reuse	0	0.5654	0.4447	0.9857	0	0.9986
4 - PW production	0.7212	0.0847	0	0.1344	1.0668	1.0000
6 - Dec. treatment + PW	0.7209	1.0000	0	1.5867	1.0668	0.9360
7 - Extreme dec.	0.9090	1.0000	0.4425	1.0942	1.5643	0.8571
8 - Extreme dec. + BW reuse	1.0000	1.0000	0.7622	1.0002	4.1912	0.8453

2.3 Graphs: Water tanks

Plotting tank volumes over time
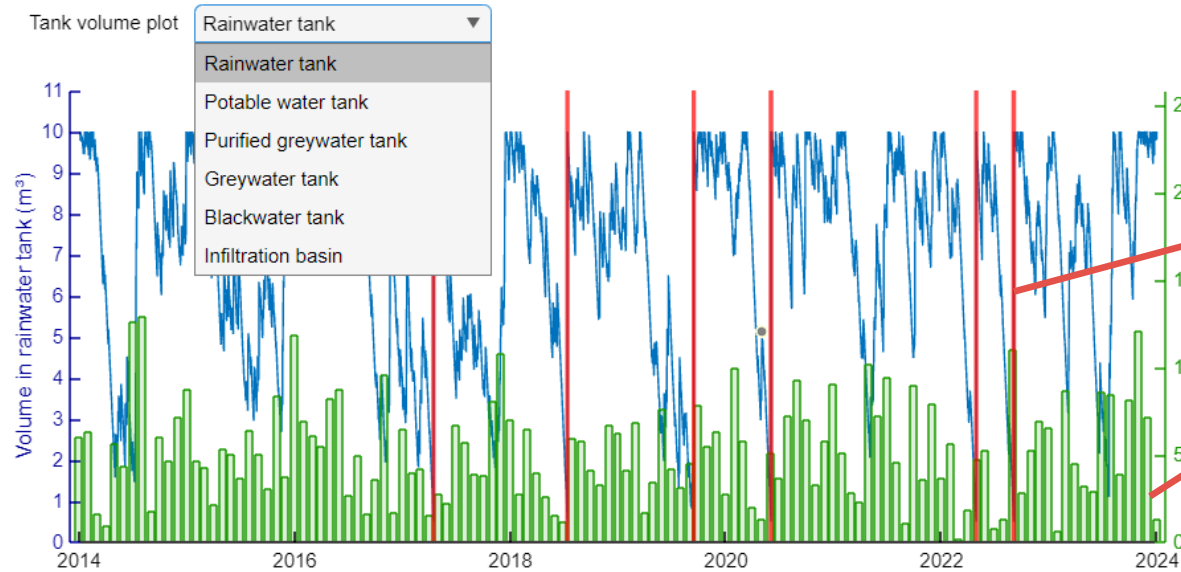
Rainwater tank refill

Total monthly precipitation

Plotting tank concentrations over time
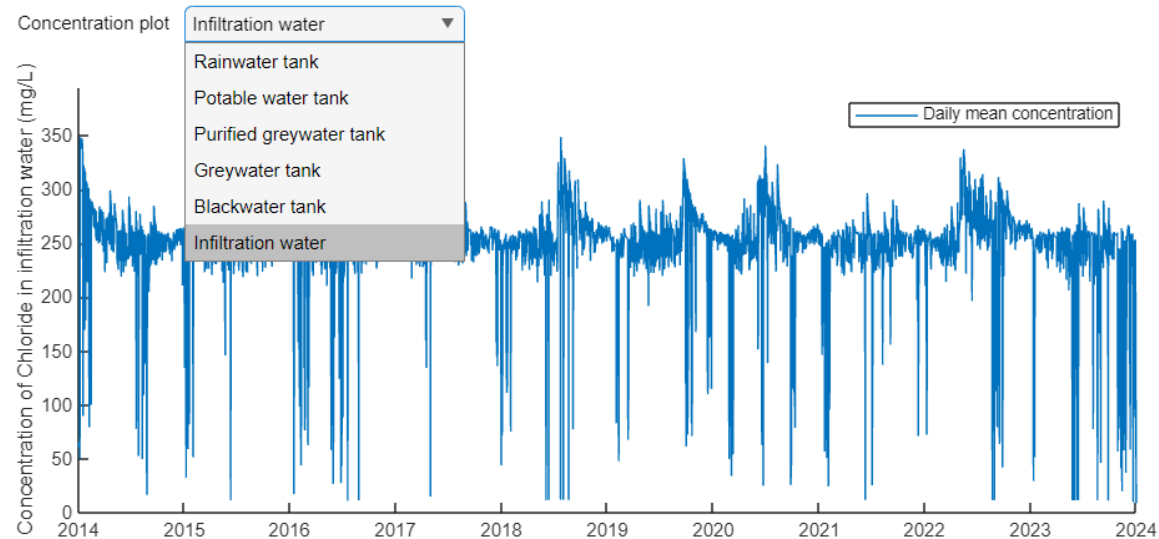
2.4 Graphs: renewable energy

Total monthly solar irradiance (line), and stacked area renewables and grid use
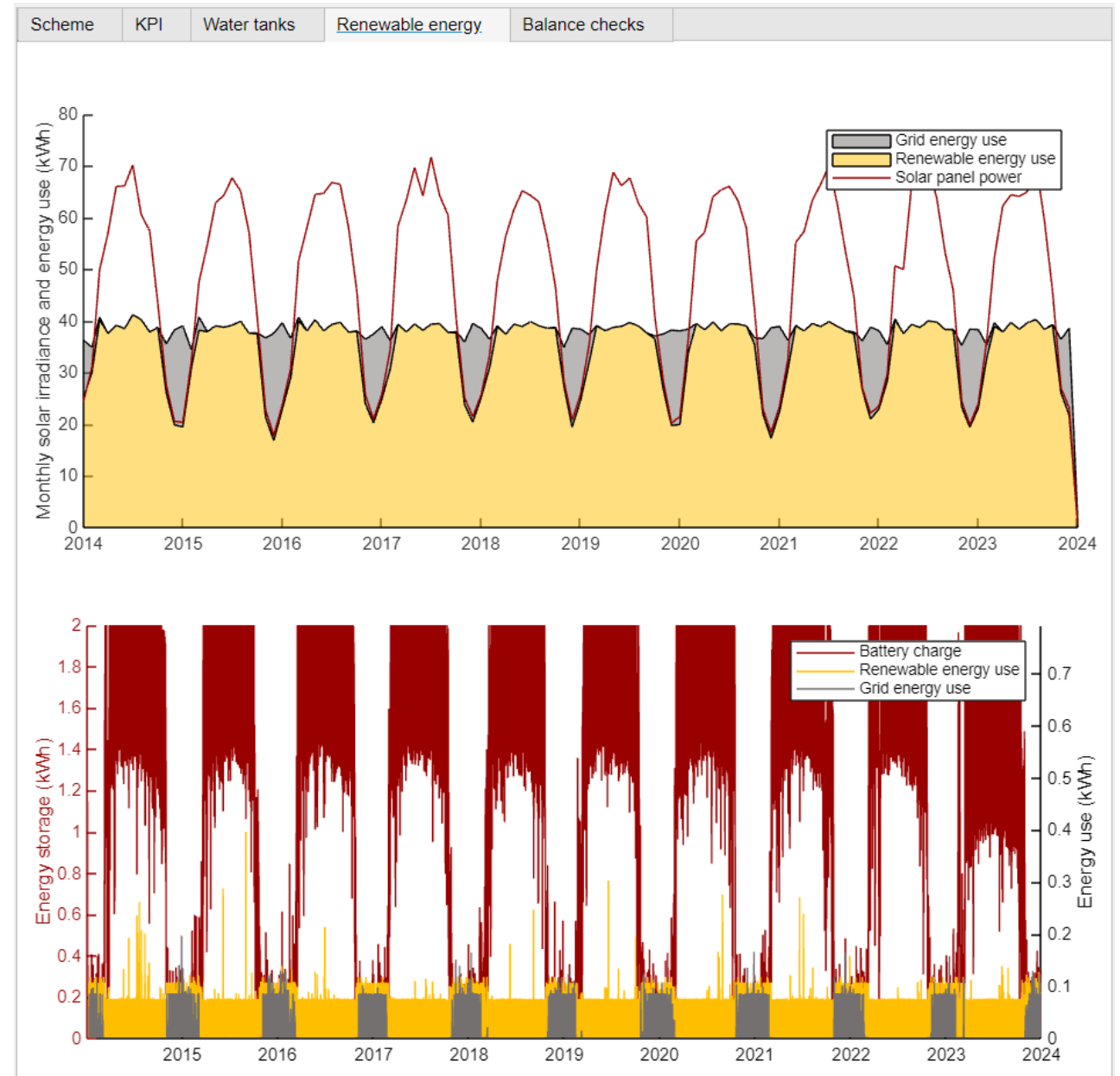
Battery charge and energy use over time

2.5 Graphs balance checks

Balance checks for model correctness

(see explanation)
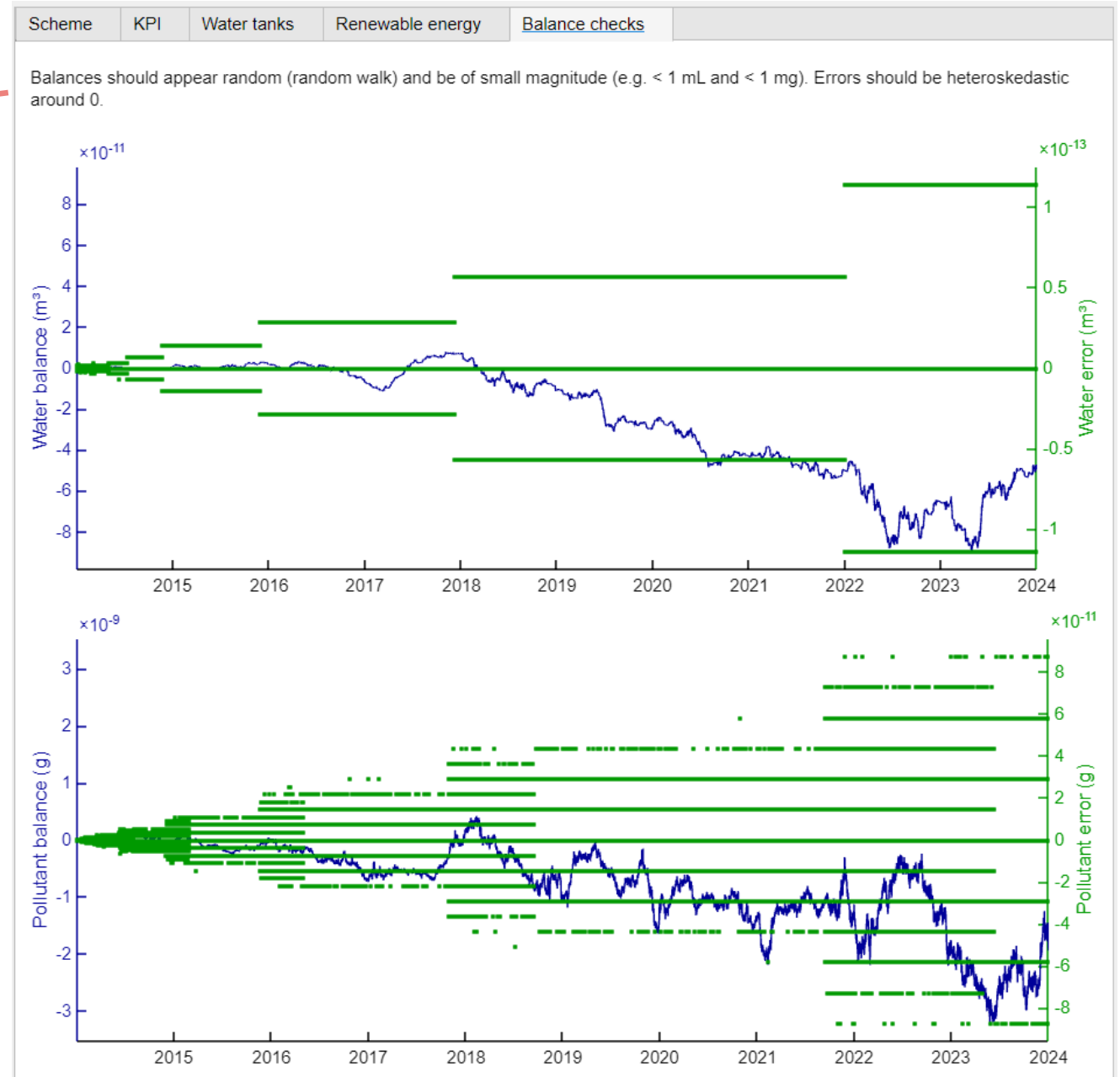
Example workflow: step 0 – Initialization

Example workflow: overview

Within a scenario, go through tabs from left to right, changing settings where needed (see next slides)
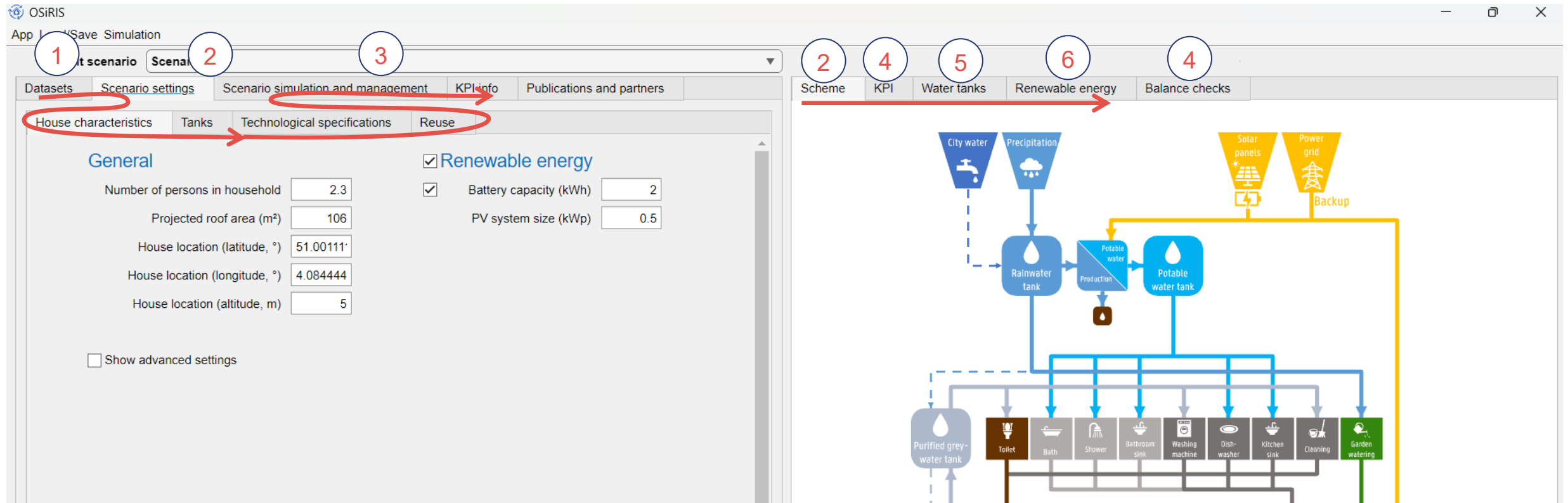
Example workflow: step 1 – Input data

Select time zone area and time zone

Select precipitation file from example data

Make sure the formats are correct

Solar data can be loaded or left to the photovoltaic panel model to generate. **If using photovoltaic data, the temporal coverage should be equal or greater than the precipitation data!**

Example workflow: step 2 – Settings

Go over each tab and change settings where wanted (open the scheme tab for visual feedback)

Example workflow: step 3 – Simulate

Press the "simulate current" button and change the scenario name by double clicking it in the table

Example workflow: step 4 – Evaluate KPI

Evaluate the KPI graph (right side of app) and table. Are these results what you expected?
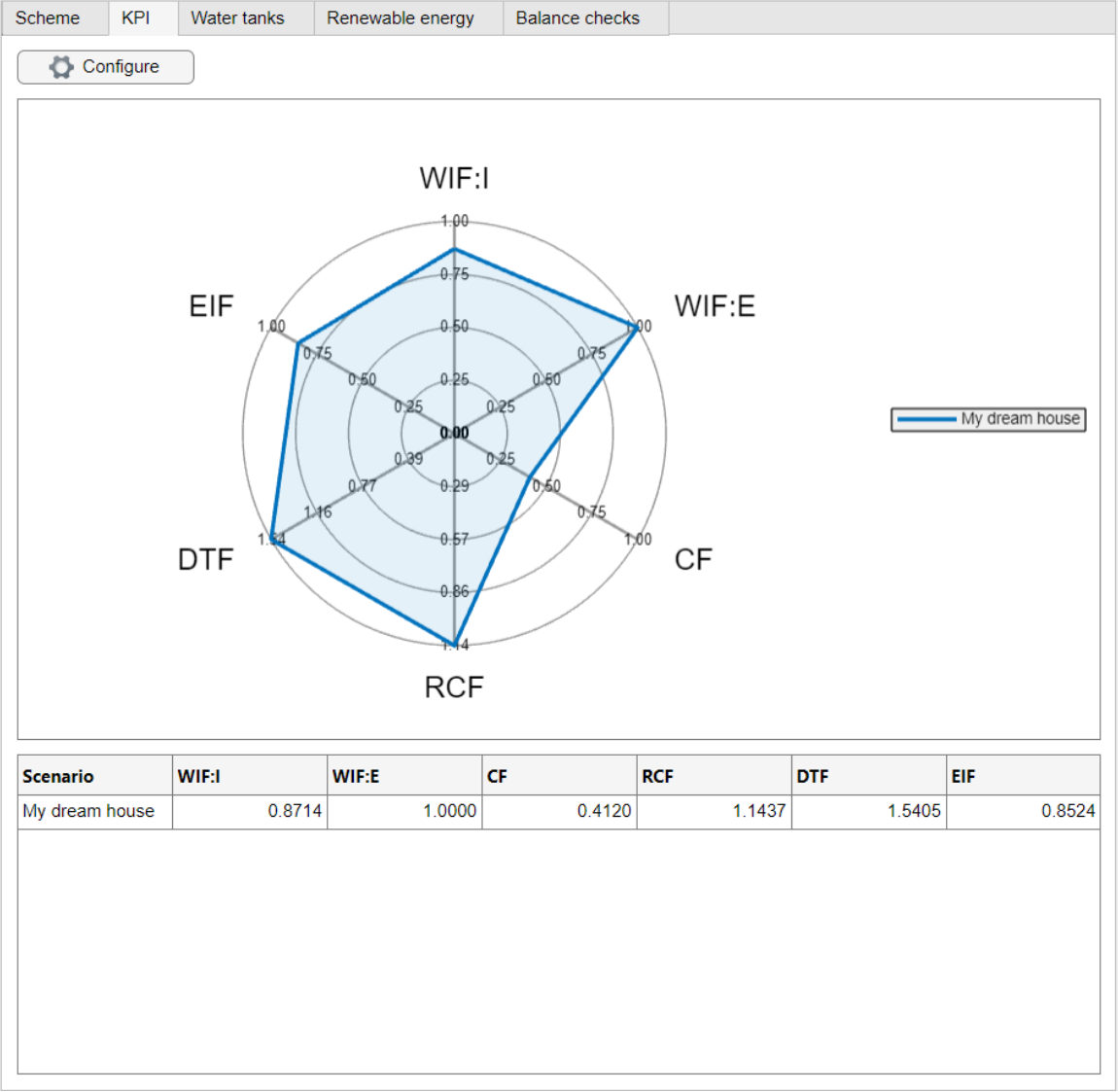
If the results seem weird to you, you can always check the balance to see if I forgot to account for something in the model.

Scenario	WIF:I	WIF:E	CF	RCF	DTF	EIF
My dream house	0.8714	1.0000	0.4120	1.1437	1.5405	0.8524
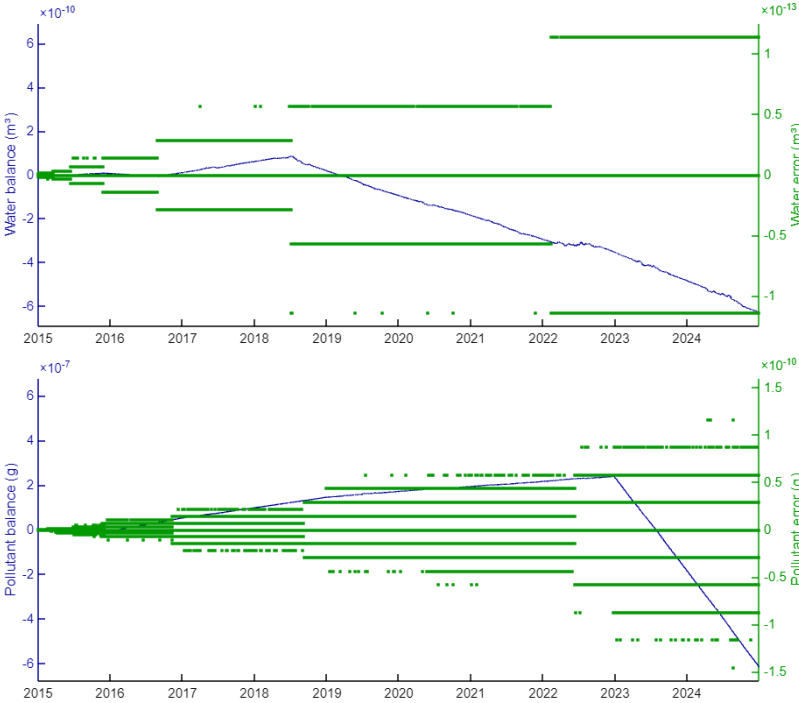
Example workflow: step 5 – Delve into water tanks

Take a closer look at the levels and concentrations of each tank – and the infiltration basin
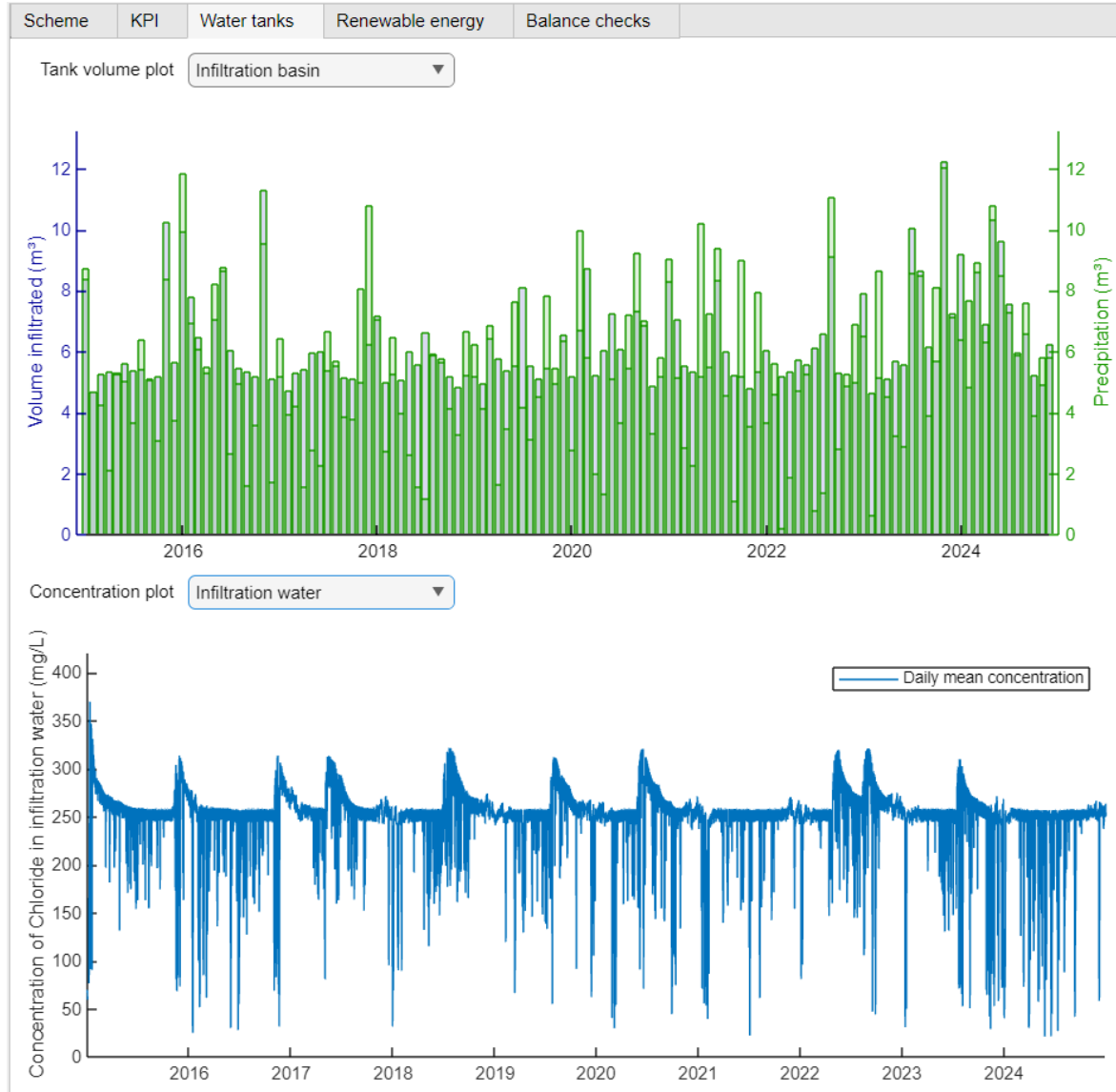
Admire the buffering effect of a decentralized household

Local regulations may apply here!

Example workflow: step 6 – Feeling energetic

Examine the energy usage
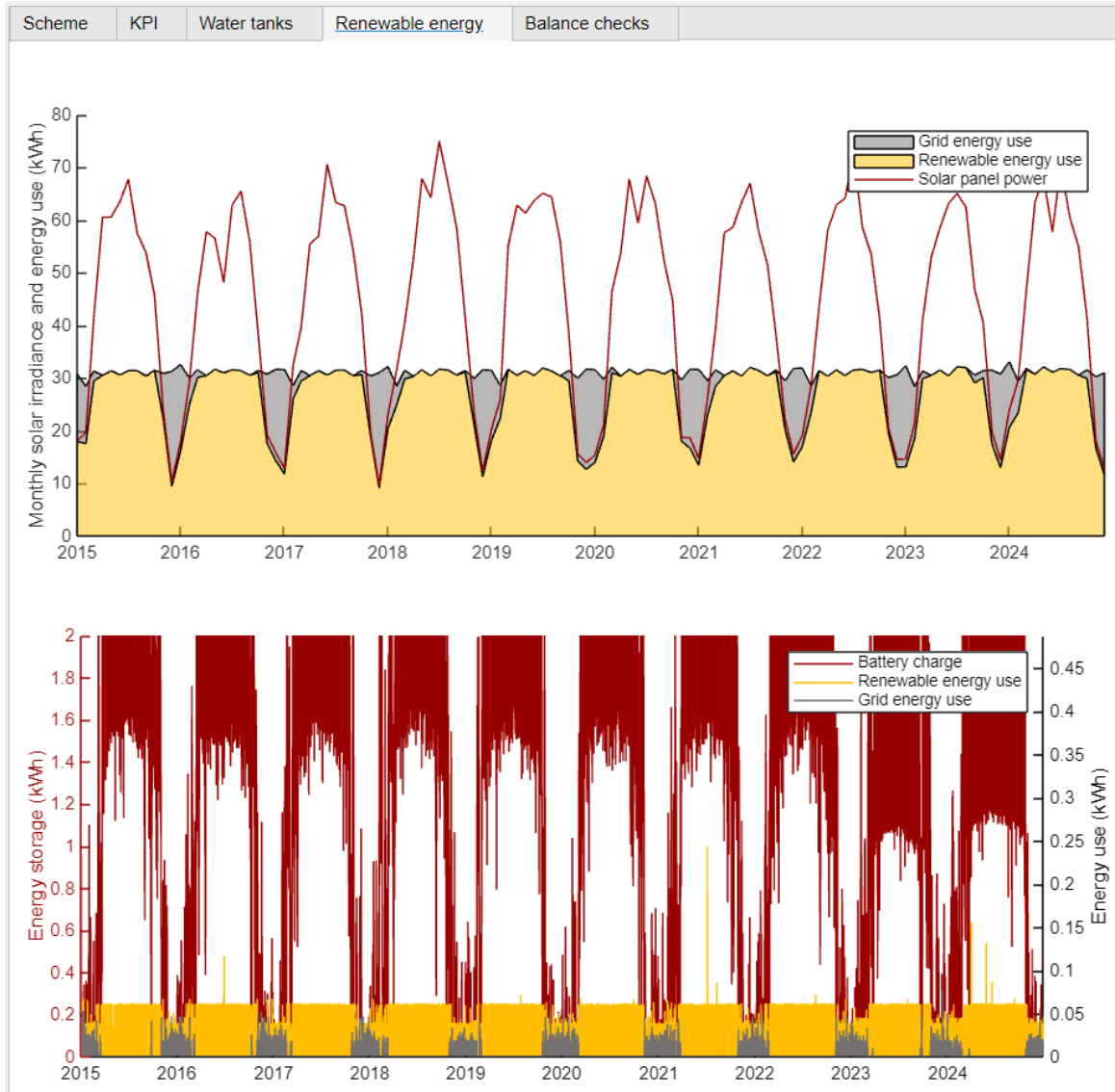
Grid energy used in winter. Notice the intersection of solar panel power and total energy requirement (use) and the disparity between renewable energy use and available solar power.

Battery is discharged most in winter, plenty full in summer.

Example workflow: step 7 – Save results

Press save, choose folder, select scenarios to save, which outputs, and which variables to save

Ir. Seppe Ongena

E: Seppe.Ongena@ugent.be

T: +32 9/264 59 76

in   Seppe Ongena

www.cmet.ugent.be

www.capture-resources.be