Dr. Eva Reynaert
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Short bio

Dr. Eva Reynaert is a tenure-track group leader in the department of Process Engineering at Eawag. Her research focuses on advancing sustainable water reuse, in which technologies achieve just the right level of treatment for specific end uses of reclaimed water and can be monitored effectively to ensure the protection of human and environmental health. She is passionate about translating scientific insights into practical solutions and collaborates with a wide range of stakeholders. Accordingly, she is committed to knowledge exchange and engagement with non-academic audiences, including regulators, technology developers, system operators, and end users of reclaimed water.

Education and Training

- **PhD in Environmental Engineering**, ETHZ, Zurich, Switzerland (2024)
  Thesis: Risk-based evaluation of the microbial water quality in on-site non-potable water reuse systems. https://doi.org/10.3929/ethz-b-000667768
  Advisors: Prof. Dr. Eberhard Morgenroth and Dr. Timothy R. Julian
- **MSc in Environmental Sciences and Engineering**, EPFL, Lausanne, Switzerland (2017)
  Thesis: Effect of influent composition on the microbial communities and granulation process in aerobic granular sludge systems.
  https://infoscience.epfl.ch/handle/20.500.14299/141012
  Advisor: Prof. Dr. Christof Holliger

Employment

since 2026	Tenure-track group leader at Eawag (Switzerland)
2024-2026	Postdoctoral researcher at the German Environment Agency and the Technical University of Berlin (Germany)
2020-2023	Research assistant in the Institute for Environmental Engineering, ETH Zurich (Switzerland)
2017-2020	Research assistant in the Department of Process Engineering at Eawag (Switzerland)
2016	Intern in the Department of Sanitation, Water and Solid Waste (Sandec) at Eawag (Switzerland)
2014-2016	Student teaching assistant in the Section for Environmental Sciences and Engineering at EPF Lausanne (Switzerland)
2015	Intern in the Department for Water and Environment at Stucky SA (Switzerland)

2014	Intern in the Department for Water and Environment at Gruner Böhringer AG (Switzerland)

Grants and fellowships

2024-2026	Postdoc.Mobility Fellowship from the Swiss National Science Foundation (105'000 CHF)
2024	Fellowship for Postdoctoral Researchers from the Alexander von Humboldt Foundation (2 years, declined in favour of Postdoc.Mobility Fellowship)
2022-2023	Doc.Mobility Fellowship from ETH Zurich (12'000 CHF)
2022-2023	ETH4D Research Challenge: Online-monitoring of recycled water quality, ETH Zurich (30'000 CHF)
2014-2016	Excellence Fellowship from EPFL for students with outstanding academic records (10'000 CHF)
2014-2016	Fellowship from the Dr. Max Husmann Foundation Zurich (12'000 CHF)

Honours and awards

2025	Culmann Prize for PhD thesis
2022	Muelheim Water Award for the Autarky Water Wall project at Eawag
2017	Master's degree with mention of excellence
2011	Award from Novartis for remarkable achievements and exceptional commitment (Maturandenpreis)
2010	Award from the Baehler Foundation Basel for the best diploma

Publications

*: corresponding author; ^: equal contributions; <u>supervised student</u>

Peer-reviewed journal publications

24. **Reynaert, E***, Jahne, MA, and Sylvestre, É (2026). Monitoring frequencies for on-site water reuse: a risk-based framework applied to greywater reuse. *ES&T Water*. https://doi.org/10.1021/acsestwater.5c01511

23. Hamilton, KA, Quon, H, Ashbolt, NJ, Gurian, PL, **Reynaert, E**, Haas, CN, Morgenroth, E, and Wilson, AM (2025). Making Waves: Moving beyond the 1 in 10,000 benchmark in quantitative microbial risk assessment (QMRA) through evidence-informed risk approaches and systems decision-making. *Water Research*, 124903. https://doi.org/10.1016/j.watres.2025.124903

22. Dittmann, D, Görnt, A, Bauer, A, Seelig, AH, Thalmann, M, Helmecke, M, Thor, JH, **Reynaert, E**, Wilkes, T, Silalahi, J, Junghans, V, Zahn, D, Klitzke, S, Peters, A, Pfeifer, S, Förster, C, Hübner, N, Jekel, M, Reemtsma, T, Haberkamp, J, and Ruhl, AS (2025). Point-of-Use Re-Use (PU_2R): a viable approach for sustainable decentralized reuse of water from single-household cesspits for agricultural irrigation. *Water Reuse*, jwrd2025029. https://doi.org/10.2166/wrd.2025.029

21. <u>Hérold, G</u>, Rodino, F, Prévoteau, A, Carrara, S, and **Reynaert, E*** (2025). Long-term performance of low-cost free chlorine sensors to monitor on-site water reuse. *Water Science & Technology*, 92(2), 326-339. https://doi.org/10.2166/wst.2025.09

20. <u>Görnt, A</u>, Wilkes, T, Seelig, A, Sempert, T, Brasse, G, Maier, R, Zahn, D, Chang, HD, Reemtsma, T, Dittmann, D, Haberkamp, J, **Reynaert, E**, and Ruhl, AS. (2025). Chemical and microbial similarities and heterogeneities of wastewater from single-household cesspits for decentralised

water reuse. *Water Reuse*, 15 (2): 255–270. https://doi.org/10.2166/wrd.2025.011

19. Thor, J, Dittmann, D, Meyer, A, Zeeshan, M, Johne, S, **Reynaert, E***, and Ruhl, AS (2025). Transformation of persistent organic micropollutants by UV and UV/H_2O_2 in wastewater treatment plant effluent. *Water Supply*, *25*(1), 65-82. https://doi.org/10.2166/ws.2024.261

18 **Reynaert, E**, Sylvestre, É, Morgenroth, E, and Julian, TR (2024). Greywater recycling for diverse collection scales and appliances: Enteric pathogen log-removal targets and treatment trains. *Water Research*, 122216. https://doi.org/10.1016/j.watres.2024.122216

17. **Reynaert, E**, Nagappa, D, Sigrist, JA, and Morgenroth, E (2024). Ensuring microbial water quality for on-site water reuse: Importance of online sensors for reliable operation. *Water Research X*, 100215. https://doi.org/10.1016/j.wroa.2024.100215

16. Sylvestre, É, Jahne, M, **Reynaert, E**, Morgenroth, E, and Julian, TR (2024). A critical evaluation of parametric models for predicting faecal indicator bacteria concentrations in greywater. Microbial Risk Analysis, 100297. https://doi.org/10.1016/j.mran.2024.100297

15. **Reynaert, E***, Steiner, P, Yu, Q, D'Olif, L, Joller, N, Schneider, MY, and Morgenroth, E (2023). Predicting microbial water quality in on-site water reuse systems with online sensors. *Water Research, 120075*. https://doi.org/10.1016/j.watres.2023.120075

14. **Reynaert, E***, Gretener, F, Julian, TR, and Morgenroth, E (2023). Sensor setpoints that ensure compliance with microbial water quality targets for membrane bioreactor and chlorination treatment in on-site water reuse systems. *Water Research X*, 100164. https://doi.org/10.1016/j.wroa.2022.100164

13. Sylvestre, E**, Reynaert, E,** and Julian, TR (2023). Defining Risk-Based Monitoring Frequencies to Verify the Performance of Water Treatment Barriers. *Environmental Science & Technology Letters*, 10(4), 379–384. https://doi.org/10.1021/acs.estlett.3c00154

12. Hérold, G, Rodino, F, Golparvar, A, **Reynaert, E**, and Carrara, S (2023). Enhancing Water Safety in Decentralized Water Reuse Systems with Low-Cost Prussian Blue Amperometric Sensors for Free Chlorine Monitoring. *IEEE Sensors Letters*, 7(9), 6005704. https://doi.org/10.1109/LSENS.2023.3307084

11. Kollmann, J, Nath, S, Singh, S, Balasubramanian, S, **Reynaert, E**, Morgenroth, E, and Contzen, N (2023). Acceptance of on-site wastewater treatment and reuse in Bengaluru, India: The role of perceived costs, risks, and benefits. *Science of the Total Environment*, 165042. https://doi.org/10.1016/j.scitotenv.2023.165042

10. **Reynaert, E***, Hess, A, and Morgenroth, E (2021). Making Waves: Why water reuse frameworks need to co-evolve with emerging small-scale technologies. *Water Research X*, 100094. https://doi.org/10.1016/j.wroa.2021.100094

9. Sutherland, C^, **Reynaert, E***,^,Sindall, R, Riechmann, ME, Magwaza, F, Lienert, J, Buthelezi, S, Khumalo, D, Dhlamini, S, Morgenroth, E, and Udert, KM (2021). Innovation for improved hand hygiene in informal settlements: field testing the Autarky handwashing station in collaboration with informal settlement residents in Durban, South Africa. *Science of the Total Environment*, 149024. https://doi.org/10.1016/j.scitotenv.2021.149024

8. Sutherland, C^, **Reynaert, E***,^, Dhlamini, S, Magwaza, F, Lienert, J, Riechmann, ME, Buthelezi, S, Khumalo, D, Morgenroth, E, Udert, KM, and Sindall, R (2021). Socio-technical analysis of a sanitation innovation in a peri-urban household in Durban, South Africa. *Science of the Total Environment*, 143284. https://doi.org/10.1016/j.scitotenv.2020.143284

7. Ziemba, C, Sharma, P, Ahrens, T, **Reynaert, E**, and Morgenroth, E (2021). Disruptions in loading and aeration impact effluent chlorine demand during biological greywater recycling. *Water Research X*, 100087. https://doi.org/10.1016/j.wroa.2020.100087

6. Riechmann, ME, Ndwandwe, B, Greenwood, EE, **Reynaert, E**, Morgenroth, E, and Udert, KM (2021). On-site urine treatment combining $Ca(OH)_2$ dissolution and dehydration with ambient air. *Water Research X*, 100124. https://doi.org/10.1016/j.wroa.2021.100124

5. **Reynaert, E,** Greenwood, EE, Bonginkosi, N, Riechmann, ME, Sindall, RC, Udert, KM, and Morgenroth, E (2020). Practical implementation of true on-site water recycling systems for hand

washing and toilet flushing. *Water Research X*, 100051. https://doi.org/10.1016/j.wroa.2020.100051

4. Layer, M, Villodres, MG, Hernandez, A, **Reynaert, E**, Morgenroth, E, and Derlon, N (2020). Limited simultaneous nitrification-denitrification (SND) in aerobic granular sludge systems treating municipal wastewater: Mechanisms and practical implications. *Water Research X*, 100048. https://doi.org/10.1016/j.wroa.2020.10004

3. Ziemba, C, Larivé, O, **Reynaert, E**, Huisman, T, and Morgenroth, E (2020). Linking transformations of organic carbon to post-treatment performance in a biological water recycling system. *Science of the Total Environment*, 137489. https://doi.org/10.1016/j.scitotenv.2020.137489

2. Layer, M, Adler, A, **Reynaert, E**, Hernandez, A, Pagni, M, Morgenroth, E, Holliger, C, and Derlon, N (2019). Organic substrate diffusibility governs microbial community composition, nutrient removal performance and kinetics of granulation of aerobic granular sludge. *Water Research X*, 100033. https://doi.org/10.1016/j.wroa.2019.100033

1. Ziemba, C, Larivé, O, **Reynaert, E,** and Morgenroth, E (2018). Chemical composition, nutrient-balancing and biological treatment of hand washing greywater. *Water Research*, 144, 752–762. https://doi.org/10.1016/j.watres.2018.07.005

Selected publications for non-academic audiences

5. San Francisco Public Utilities Commission (SFPUC) (2024), Independent Advisory Panel for Single-Family Water Reuse Applications Report. https://www.sfpuc.gov/sites/default/files/documents/independent_advisory_panel_report_december_2024.pdf

4. **Reynaert, E**, Nagappa, D, and Morgenroth, E (2023). Research Brief: Using Sensors and Automated Chlorination to Improve the Microbial Water Quality of On-Site Sewage Treatment Plants in Bengaluru. *ETH Research Collection*. https://doi.org/10.3929/ethz-b-000603755

3. Nagappa, D and **Reynaert, E** (2023). How safe is water reuse in practice? New insights from Bengaluru. *Water Science Policy*. https://dx.doi.org/10.53014/NRLT6757

2. **Reynaert, E** and Sutherland, S (2021). Innovation for improved hygiene: testing a handwashing station that uses recycled water in the field. *Water Science Policy*. https://watersciencepolicy.com/article/innovation-for-improved-hygiene-testing-a-handwashing-station-that-uses-recycled-water-in-the-field-c01d3904e15c?language=English

1. Lüthi, C, Renggli, S, Reymond, P, **Reynaert, E**, Klinger, M, Sherpa, A, Sherpa, M, and Mtika, W (2018). Small Towns: Research on Solutions for the Sanitation (Planning) Gap. Sandec is conducting cross-sectional applied research on small town sanitation planning in Nepal, Malawi and Bolivia. *Sandec News*, 18, 12–13.

Publication of code and datasets

9. Code for: **Reynaert, E***, Jahne, MA, and Sylvestre, É (2026). Monitoring frequencies for on-site water reuse: a risk-based framework applied to greywater reuse. https://doi.org/10.25678/000GSK

8. Data for: Hérold, G, Rodino, F, Prévoteau, A, Carrara, S, and **Reynaert, E** (2025). Long-term performance of low-cost free chlorine sensors to monitor on-site water reuse. https://doi.org/10.25678/000EEJ

7. Code for: **Reynaert, E**, Sylvestre, É, Morgenroth, E, and Julian, TR (2024). Greywater recycling for diverse collection scales and appliances: Enteric pathogen log-removal targets and treatment trains. https://doi.org/10.25678/000D1A

6. Data for: **Reynaert, E**, Nagappa, D, Sigrist, JA, and Morgenroth, E (2024). Ensuring microbial water quality for on-site water reuse: Importance of online sensors for reliable operation. https://doi.org/10.25678/000cct

5. Data for: **Reynaert, E**, Steiner, P, Yu, Q, D'Olif, L, Joller, N, Schneider, MY, and Morgenroth, E (2023). Predicting microbial water quality in on-site water reuse systems with online sensors. https://doi.org/10.25678/000885
4. Data for: **Reynaert, E**, Gretener, F, Julian, TR, and Morgenroth, E (2023). Sensor setpoints that ensure compliance with microbial water quality targets for membrane bioreactor and chlorination treatment in on-site water reuse systems. https://doi.org/10.25678/0007nq
3. Data for: **Reynaert, E**, Hess, A, and Morgenroth, E (2021). Making Waves: Why water reuse frameworks need to co-evolve with emerging small-scale technologies. https://doi.org/10.25678/0002qd
2. Data for: Ziemba, C, Sharma, P, Ahrens, T, **Reynaert, E**, and Morgenroth, E (2021). Disruptions in loading and aeration impact effluent chlorine demand during biological greywater recycling. https://doi.org/10.25678/0002zn
1. Data for: Ziemba, C, Larivé, O, **Reynaert, E**, Huisman, T, and Morgenroth, E (2020). Linking transformations of organic carbon to post-treatment performance in a biological water recycling system. https://doi.org/10.25678/00020v

Conference contributions

11. **Reynaert, E**. Keynote: Risk-based treatment and monitoring of on-site water reuse on Earth. Keynote presentation at: 2025 MELiSSA Conference, October 2025, Granada, Spain.
10. **Reynaert, E** and Sylvestre É. Risk-based monitoring frequencies for on-site greywater treatment and reuse. Oral presentation at: 22nd Health Related Water Microbiology Conference, June 2025, Amersfoort, The Netherlands.
9. **Reynaert, E**, Buchholz, H, and Ruhl, AS. Monitoring of a UV/H_2O_2 process with online sensors. Wasser, May 2025, Münster, Germany.
8. **Reynaert, E** and Morgenroth, E. Combining online sensors with process understanding for safe on-site water reuse. Poster and pitch presentation at: 19th IWA Leading Edge Conference on Water and Wastewater Technologies, June 2024, Essen, Germany.
7. **Reynaert, E**, Gretener, F, Julian, TR, and Morgenroth, E. Setting health risk-based sensor targets for on-site water reuse. Oral presentation at: 13th IWA International Conference on Water Reclamation and Reuse, January 2023, Chennai, India.
6. Morgenroth, E and **Reynaert, E**. Dezentrale Wassersysteme: Möglichkeiten für Wiederverwendung, Energie- und Nährstoffrückgewinnung. 54. Essener Tagung für Wasserwirtschaft, June 2021, Essen, Germany.
5. **Reynaert, E**. Technology Showcase: the Autarky Handwashing Station. Video presentation at: UNC Water and Health Conference, October 2020, online.
4. Exhibition booth: Presentation of a Blue Diversion Autarky Toilet model. 5th International Faecal Sludge Management Conference, February 2019, Cape Town, South Africa.
3. **Reynaert, E**, Ziemba, C, Larivé, O, and Morgenroth, E. Correcting Nutrient Imbalance in Hand Washing Water to Permit Recycling with a Biologically Activated Membrane Bioreactor. Poster presentation at: IWA: 2nd International Resource Recovery Conference, August 2017, New York, USA.
2. Layer, M, Adler, A, **Reynaert, E**, Hernandez, A, Morgenroth, E, Holliger, C, and Derlon, N. Influent wastewater composition governs microbial community composition, nutrient removal performance and kinetics of granulation in aerobic granular sludge. Presentation at: IWA Biofilms: Granular Sludge Conference, March 2018, Delft, The Netherlands.
1. Adler, A, **Reynaert, E**, Layer, M, Derlon, N, and Holliger, C. Influence of Wastewater Composition On Microbial Communities Of Aerobic Granules And Their Nutrient Removal Performances. Presentation at: 10th International Conference on Biofilm Reactors, May 2017, Dublin, Ireland.

Selected presentations for non-academic audiences

4. **Reynaert, E.** „Réutilisation de l'eau sur site: Conditions d'hygiène." Oral presentation in French as part of: PEAK-VaLoo Course B37/26 Resource-oriented sanitation systems: technologies, opportunities, and challenges, January 2026, Dübendorf, Switzerland.
3. Bauer, A, **Reynaert, E**, and Thalmann, M. „Point-of-Use Reuse: Prozessoptimierung für dezentrale landwirtschaftliche Wasserwiederverwendung und Auswirkungen auf den Boden. KWB-Fachveranstaltung „Wasserwiederverwendung – Wie weit sind wir in Berlin-Brandenburg?" Oral presentation in German at: Water reuse in Berlin-Brandenburg, November 2024, Potsdam, Germany.
2. **Reynaert, E** and Morgenroth, E. What is the state of science? Risk-based treatment targets for on-site water reuse. Webinar organized by the San Francisco Public Utilities Commission.
1. Exhibition booth: Presentation of full-scale prototypes of the Blue Diversion Autarky Toilet and Autarky Handwashing Station. Reinvented Toilet Expo, November 2018, Beijing, China.

Supervision

(Co-)supervision of PhD students

2025-ongoing Julia Pries (co-supervision with Prof. Aki S. Ruhl at TU Berlin). Topic: *Decentralized treatment of contaminated water with gravity-driven membrane filtration and UV-LED disinfection*

2025-ongoing Jacqueline Händel (co-supervision with Prof. Aki S. Ruhl at TU Berlin). Topic: *Layer-by-layer coated nanofiltration membranes for drinking water treatment and water reuse*.

2024-ongoing Annika Görnt (co-supervision with Prof. Aki S. Ruhl at TU Berlin; I joined in Annika's second year of PhD).

Supervision of postdoctoral researchers

2026-ongoing Dr. Mira Chaplin. Topic: *Using inactivated human pathogenic viruses to verify removal in greywater reuse systems*

Supervision of MSc and BSc theses, research assistants, and interns

2026 Milena Heusser (MSc thesis, Environmental Engineering, ETH Zurich). Co-supervision together with Mira Chaplin. Topic: *Microbial risk assessment of a greywater recycling system. Case study: Chuderboden farm*

Clara Bahrs (MSc thesis, Environmental Science and Technology, TU Berlin). Co-supervision together with Aaron Bauer. Topic: *Comparison of organic micropollutant removal by different UV/H_2O_2 post-treatment configurations in membrane bioreactor effluent for water reuse*

Benno Wolbring (BSc thesis, Environmental Science and Technology, TU Berlin). Co-supervision together with Julia Pries. Topic: *Bacteriophage removal during the startup of gravity-driven membrane filtration treating diverse water matrices*

2025 Jan Thor (MSc thesis, Environmental Science and Technology, TU Berlin). Topic: *Statistical meta-analysis of the UV sensitivity at 254 nm of microorganisms and organic micropollutants using a mixed linear modelling approach*

2024 Hendrik Buchholz (MSc thesis, Environmental Science and Technology, TU Berlin). Topic: *Control and monitoring of a UV/H_2O_2 process using online sensors*

Jihad Benjelloun (MSc thesis, Agricultural Engineering, Agronomic and Veterinary Institute Hassan II, Morocco). Topic: *Fluorescence excitation/emission matrices as a tool to monitor the removal of organic micropollutants from wastewater effluents*

2023 Gaétan Hérold (MSc thesis, Micro- and Nanotechnology, EPFL). Topic: *Enhancing water safety in decentralized water reuse systems with low-cost Prussian blue amperometric sensors for free chlorine*

Cedric Ormond (MSc thesis, Mechanical Engineering, ETH Zurich). Topic: *Remote monitoring system for the Water Wall*

Florian Hitz (BSc thesis, Computer Sciences, ETH Zurich). Topic: *Using fluorescence spectroscopy to predict the microbial quality of recycled water*

Deepthi Nagappa (EPP visiting scientist). Topic: *Adapting policy to current practices: A review of on-site non-potable water reuse in Bengaluru, India*

2022 Philipp Steiner (Civil servant). Topic: *Predicting microbial water quality with online sensors*

Deepthi Nagappa (Research assistant). Topic: *Evaluating water quality in implemented water reuse systems in Bengaluru, India*

2021 Lukas D'Olif and Noah Joller (MSc project, Environmental Engineering, ETH Zurich). Topic: *Experimental validation of an algorithm that predicts the microbial quality of recycled water*

2020 Qixing Yu (MSc thesis, Environmental Sciences and Engineering, EPFL). Topic: *Using online sensor measurements to predict the hygienic water quality in a small-scale water reuse system*

Flavia Gretener (MSc thesis, Environmental Engineering, ETH Zurich). Topic: *Online measurement of hygienic water quality in a small-scale water reuse system*

2018 Michael Congiu (Research assistant). Topic: *Evaluating phage removal in gravity-driven membrane filtration*

Esther Greenwood (Intern, Lund University). Topic: *Field-testing a recirculating handwashing station in a public park in Zurich, Switzerland*

Teaching

2026 2026 PEAK-VaLoo Course B37/26 Resource-oriented sanitation systems: technologies, opportunities, and challenges. Course for practitioners at Eawag.

2024 2024 Machine Learning for Water Quality Monitoring. Full-day workshop for PhD students at the Chair of Urban Water Systems Engineering, Technical University of Munich.

2023 2023 Microbiology laboratory. One-week practical course for BSc students in Environmental Sciences, ETHZ.

2022 2022 Guest lecture in: Appropriate Technologies for Sustainable Development - a focus on low- and middle-income countries. Summer school, University of Brescia (online).

2021 2021 Guest lecture in: Sanitary Engineering in Developing Countries. Course for MSc students in Environmental Sciences and Engineering, EPFL.

Community service and consulting

2020-ongoing Reviewer for *Water Research*, *Water Research X*, *Science of the Total Environment*, *Microorganisms*, *Research in Engineering*, and *ACS Environmental Science & Technology*

2025-ongoing Lead of the working group "Develop methods to determine microbial risk and targets that ensure microbial safety for decentralized water reuse systems" within the community of practice *Building Infrastructure Locally for Decentralized Water Systems (BILD)*

2024-ongoing Active member of two working groups of COST Action CA23104 (Water4Reuse) that aims to improve water management and promote the recycling and reuse of treated wastewater.

2023-2025 Delegate of the German Institute for Standardisation (DIN) for the revision of ISO standard 30500 on prefabricated non-sewered sanitation systems, and leader of a working group dedicated to establishing health-based water quality requirements

2023- Member of an independent advisory panel to review health risk-based assessments for water

2024	reuse applications in single-family settings for the San Francisco Public Utilities Commission.
2021-2023	Consultant for two private companies for the industrialization of the Water Wall, a closed-loop water recycling technology developed at Eawag. A recirculating handwashing station using the Water Wall technology is now available commercially
2022	Consultant for TUV Sud for the evaluation of the Sanitation Readiness Index.