Challenge name	*No water – no coffee*
Challenge owner	*Organization: Brewanda*
	□ Company □ Research □ Student team
	Paul van Weert & Geert van Kollenburg
Email challenge owner	
Phone challenge owner	
CoC Number	
Preferred way to contact	*□ email □ Phone call □ SMS / what's app* *□ Other; In person*
Brief summary	Coffee production in Rwanda is by far the largest agricultural export of the country. Coffee is produced by some 500.000 farmers. A major issue for them is water management, as all these farmers make use of relatively large water streams. This challenge focuses on finding solutions for sustainable water management to improve the local livelihood of Rwanda's farmers and other citizens.

About the challenge owner

As a former intern (2006/2007) at the Analytical laboratory in the Chemistry faculty at TU/e, with around 8 years of experience in QA/QC, and another 8 years as a barista, working with Rwanda specialty coffee, Paul van Weert now seeks sustainable solutions for future problems that are faced by developing countries.
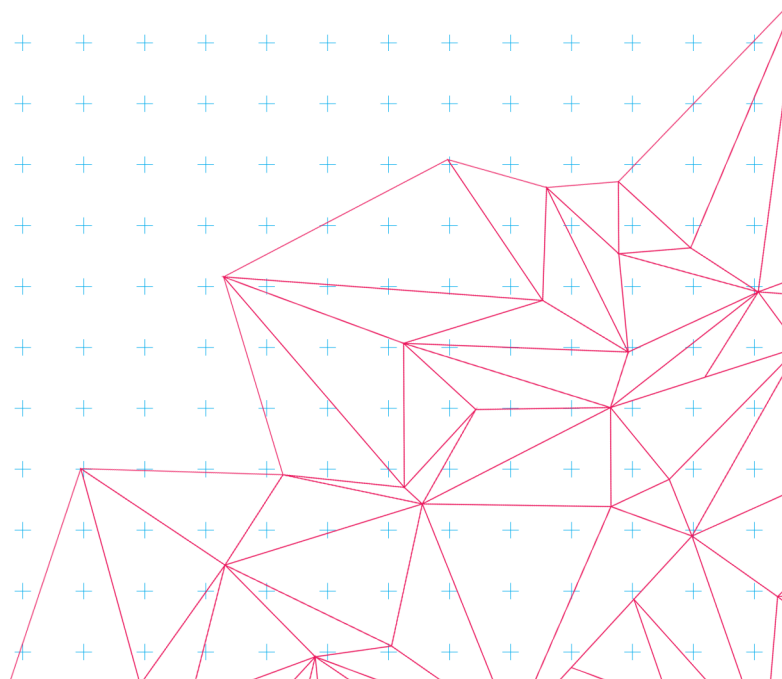
Challenge description

Climate change is expected to influence availability and quality of specialty coffee. While the demand for this type of coffee is expected to double in the coming years, the area of arable soil for coffee production could decrease by 50% by 2050. One of the most pressing issues is the sustainable use of water.

We believe water is the circular component where the most ecological impact can be obtained. It is part of a circular dynamic (weather/climate) and part of the community's needs. Waste water from coffee washing is a known source of pollution that affects the ecology in many ways, preventing pollution and ensuring reusability of wastewater is therefore a high priority.

One of the challenges is to find solutions that fit the means that are available on-site. For example, analytical devices need to fit the energy availability and data-analytic solutions needs to fit IT infrastructure. There are also social aspects to the challenge which may be investigated. For example, students may think of ways to inform local producers about the need of the proposed solution and/or how to ensure proper implementation of said solution.

The end goal is to realize full reusability of waste water for local applications (drinking water, irrigation, washing etc.) to significantly reduce the effects of coffee washing on the social and natural environment. The absence of contamination and presence of minerals and nutrients in effluent water may become a sustainable resource for irrigation (e.g., of coffee trees) in plantations and surrounding agricultural practices. When water is clean enough to be used as drinking water, it can be certified and act as a local source for farmers. This can significantly reduce the need for bottled water.

Challenge picture

Input and involvement of challenge owner

The involvement of the challenge owners would be advising, supervising and working directly with the project group on the challenge. There is significant experience with chemical characteristics of polluted water and quality assurance of food products, that can help students make decisions.

Resources

Time, expertise and examples of practical situations in which to apply developed devices/methods.

What resources do you offer to students?
□ Expertise; Expert Maarten van Schijndel, Hydrologist working at Waterschap de Dommel and also acting as independent business owner. Ed Krijgsman, coffee processing expert.□ Materials; Water(samples, from Rwanda), coffee (green and roasted), to be discussed.
□ Workplace; to be discussed.
□ Other;

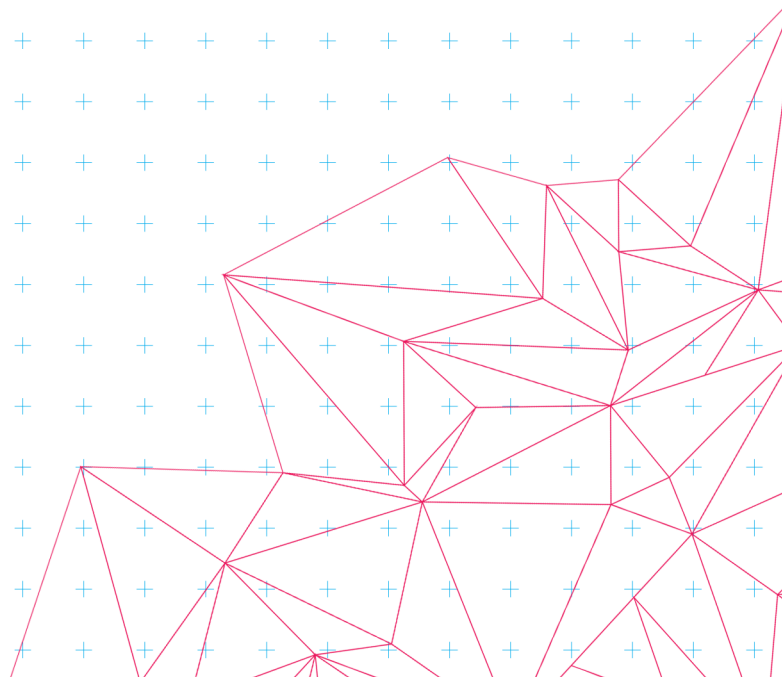Rwanda Specialty coffee for students to enjoy during the project (limited amounts, to be discussed).
Training: essential barista skills; to be discussed.
Training: coffee processing examples and practices.

Roles of different disciplines (only for ISBEP)

Discipline	Role
Biomedical Engineering	Turning waste products from coffee processing into building blocks for amino acids and other resources needed in or usable for biomedical engineering practices.
Architecture, Urbanism and Building Sciences	How to (re-)position water architecture in Rwanda, agroforestry integration in suburban areas and how to optimize renewable energy sources.
Electrical Engineering	Powering and operating electrical devices, power security and electrical safety of water filtering or similar processes.
Automotive Technology	Powering and operating electrical devices, power security and electrical safety of water filtering or similar processes.
Industrial Design	IQ OQ PQ PV (design) cycle implementation
Medical Sciences and Technology	How does a mRNA-API-production affect surrounding ecological systems, what do lipid nano-particles and heavy metals from pharmaceuticals industry mean to a helophytes waste water treatment facility?
Chemical Engineering and Chemistry	Major contributions: sensor evaluation with EE and validation in precision, accuracy and reproducibility. Upscaling small lab-hypothesis in CWS environment.
Sustainable Innovation	How to create awareness about sustainable water management, how to change behavior and adjust to new situations
Mechanical Engineering	Provide with technical solutions to currently unknown design/material/demand-problems in wastewater management systems.

Attachment 1: Roles of students from different disciplines

Automotive Technology	*During the Bachelor's program of AT, students are not specifically trained to develop a car. They learn all relevant components of the car and learn how to understand it as a system. The knowledge they gather over the course of the program include, but is not limited to, specialization in (combustion and electric) engines, thermodynamics, electromagnetics, power electronics and control systems.*
Architecture, Urbanism and Building Sciences	*AUBS students have insights in the way we adjust or reconstruct buildings, neighbourhoods or entire cities. They understand how to construct a sustainable building based on the ever-changing demands of the residents and users with the use of the latest technological advancements, how to design a city, taking into account economic, social, political and environmental requirements, and design methods that lead to a sustainable, healthy, comfortable and productive indoors and outdoors living environment.*
Electrical Engineering	*EE students combine aspects of applied physics, mathematics and computer science, all of which are applied to the development or analysis of electronic systems e.g. control systems, smart power grids, antenna systems, signal processing or PCB design. EE students are trained at a high abstraction level. This allows them to capture relevant aspects of a system and translate it to a model.*
Sustainable Innovation	*SI students focus on a global and societal understanding of the economics of innovation, transition studies, and they choose between a track on built environment or on energy systems. They usually work on the development of policy, strategy and/or research recommendations.*
Industrial Engineering	*IE students focus on analysing the business aspects of the proposition that is being developed and analysing operational processes. Depending on the project, this may include aspects such as: analysing the market potential, reviewing suitable business models, researching the supply chain, or the interaction with the product.*