



TRANSCEND

Summer School 2026

La Paz - Bolivia

October 12 – 18th, 2026

Hotel RENNOVA, Calacoto, Calle 13 and Julio Patiño No. 695



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Summary

The Summer School of TRANSCEND project is an intensive 60-hour program scheduled for October 12–18, 2026, designed in collaboration with the Living Lab of the Titicaca–Desaguadero–Poopó (TDPS) transboundary system. It is jointly organized by the Stockholm Environment Institute (SEI), the University of Manchester (UoM), the IMDEA Water Institute (Spain), IIAREN (Faculty of Agronomy, UMSA, Bolivia), and the Binational Autonomous Authority of the TDPS Water System (ALT). The target audience comprises 34 to 45 professionals from the agricultural and water resource sectors in Bolivia and Peru, including technical staff from national agencies, regional governments, and watershed committees, as well as producers and specialists in agricultural analysis within the Andean region of both countries.

The program has seven cumulative modules: hydrological and economic modeling applied to agriculture (WEAP, covering allocation scenarios and net benefits for quinoa, potato, barley, maize, and alfalfa); fundamentals of remote sensing and spectral indices (GEE and QGIS); land-use and land-cover classification to map crops and distinguish between rain-fed and irrigated agriculture; estimation of water use and consumption via Earth observation (simplified P–ET balance using CHIRPS, GSMaP, ERA5, and MOD16); mapping water presence and source quality (optical data, Sentinel-1, and bloom proxies); and agronomic crop water balance alongside irrigation efficiency monitoring and control, featuring a case study on automated drip irrigation for quinoa. The pedagogical approach combines theory, exercises using real TDPS data, and model-handling sessions.



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Agenda	Monday 12	Tuesday 13	Wednesday 14	Thursday 15	Friday 16	Saturday 17	Sunday 18
	Hydrology in Agriculture	Hydro economics and Introduction to Satellite Monitoring	Fundamentals of Remote Sensing (RS)	Land Use and Land Cover via Remote Sensing	Soil Monitoring and Efficient Irrigation	Field visit in Bolivia	Field visit in Peru
09:00-10:30	Fundamentals of hydrology and modelling applied to agriculture. WEAP structure, key hydrological parameters, and soil moisture methods focused on agriculture. [SEI]	Representation of agricultural water demand in river basins (yield, production). Economic modelling applied to irrigated crops (focus on profitability). Detection and monitoring of surface water in the optical domain: data repositories and products. [SEI, IMDEA]	Long-term surface water dynamics using global products. Practical exercise with the JRC Global Surface Water Explorer. [SEI, UoM]	Classification fundamentals and algorithms. Spectral patterns; K-Means, PCA, CART, Random Forest, SVM. Sampling strategy, spatial autocorrelation, training samples versus test samples [UoM, SEI].	Introduction to the AquaCrop model: basic principles, model components, and data required for its application. Simulation of crop development, water balance, and yield. A practical example of AquaCrop application in an agricultural system in the Bolivian Altiplano. [IIAREN]	Departure from La Paz city Batallas Municipality Multipurpose Project [Irrigation for forage crops and Andean wetlands] Arrival to Municipality of Copacabana	Departure from Copacabana Productive irrigation systems in Ilave (Pilcuyo) Arrival to municipality of Puno Return to La Paz city, October 19
10:30-10:40	Morning break						
10:40 -12:10	Modelling in WEAP: fundamentals of the soil moisture method. Hydrological model simulation and calibration. Catchment hierarchy (parent/child) and land-use representation. [SEI]	Data acquisition systems and sensors. Spatial, spectral, radiometric, and temporal resolution (Landsat, Sentinel, MODIS). Spectral behaviour of vegetation, soil, and water. [UoM, SEI]	Indirect water quality indicators derived from satellite imagery [SEI, UoM]	Creation of the classification input. Spatial/temporal filtering, cloud-free seasonal/annual mosaics, collection of training samples and geometries, pixel-by-pixel extraction [UoM]	AquaCrop and water management. Evaluation of crop response to varying water availability conditions. Concepts of irrigation, water deficit, and water productivity. Example of simulation and result interpretation using AquaCrop [IIAREN]		
12:10-14:00	Lunch break						
14:00-15:30	WEAP Modelling: Climate data and interpolation methods for watersheds. Integration of land use and land cover layers. [SEI]	Vegetation and water spectral indices (NDVI, EVI, SAVI, NDWI, NDMI): what each measure and when to use it. Time series of indices for crop phenology and water stress. [UoM, SEI]	Principles of satellite altimetry, available products, and preprocessing. Water level changes in shallow lakes (example: Poopo). [SEI]	Training, mapping, and accuracy assessment. Supervised classifiers in GEE; thematic map export; confusion matrix, overall accuracy, Kappa, and K-fold validation. Change detection and irrigated area mapping (map algebra, dry/wet season dynamics, rainfed vs. irrigated signatures) [UoM, SEI]	Application of modeling to agricultural management. Analysis of water availability scenarios and their effect on the crop. Interpretation of AquaCrop results and discussion on the use of models to support efficient water management in agricultural systems. [IIAREN]		
15:30-15:40	Afternoon break						
15:40-17:10	Practical consolidation of the WEAP model (climate + land use and land cover + agricultural demand). Discussion on the basin structure and next steps toward hydro-economic analysis. [SEI]	Platforms, accounts, and installation. GEE community registration, cloud project, API authentication, initial commands. Google Colab, QGIS 3.44 LTR, and shared script repository. [UoM, SEI]	Practical digital image processing. Importing collections, metadata, brightness/contrast/histogram, band composition, index calculation, zonal statistics, and threshold masks in GEE [SEI, UoM].	Earth observation climate products (CHIRPS, GSMaP, ERA5). MODIS MOD16 evapotranspiration product (structure, scaling, resolution). Time-series processing, simplified water balance (P-ET), zonal statistics, land use and land cover cross-referencing, and trend analysis. [UoM]	Automated Drip Irrigation System (PROSUCO – Faculty of Agronomy). Water application during the most sensitive phenological stages (quinoa: flowering / grain filling). Optimization of water resources and the farmer's time through automatic irrigation [IIAREN].		





SPECIALIST PROFILES OF THE COURSE INSTRUCTORS

UNIVERSITY OF MANCHESTER, UK

Professor Timothy Foster (timothy.foster@manchester.ac.uk)

Internationally leading interdisciplinary researcher at the intersection of water resources, agriculture, Earth Observation, and environmental data science. Over 15 years of experience developing data-driven tools and methods for sustainable irrigation management, agricultural water monitoring, and water resource management.

Leads a research group of 15+ scientists developing and evaluating EO-based solutions to strengthen water sustainability and food security across Africa, Asia, Europe, and the Americas. Senior advisory roles with United Nations Food and Agriculture Organization, International Water Resources Association, International Association of Hydrological Sciences, and the Daugherty Water for Food Global Institute.

Research Associate Christhian Santana Cunha (christhian.santanacunha@manchester.ac.uk)

Research Associate in Remote Sensing of Irrigated Croplands at the Department of Civil Engineering and Management, The University of Manchester, developing and evaluating Earth Observation (EO)-based solutions to strengthen water sustainability and food security in Africa, Europe and the Americas. Environmental Manager with a PhD in Remote Sensing. Works in the field of remote sensing applied to the mapping of agricultural areas, wetlands, flood extents, land use and land cover changes, time series analysis, climate change, environmental degradation, deforestation and wildfires, using cloud computing tools and programming languages for research, analysis and geospatial data science. Has experience in integrated water resources management, hydrology, hydrological modelling and environmental management.

STOCKHOLM ENVIRONMENT INSTITUTE, COLOMBIA

Sebastian Palomino – PhD. Research Fellow (sebastian.palomino@sei.org)

Researcher with the Water team at SEI Latin America. In this role, he leads the remote sensing component, focusing on developing and applying satellite-based methodologies to monitor and manage water resources and water-related ecosystems.

His research centers on integrating observations from multiple satellite missions to understand the changes and dynamics of natural systems and water resources. Through this work, Sebastián contributes to interdisciplinary research initiatives that combine Earth observation science, hydrology, and ecosystem management, placing a strong emphasis on operational monitoring and long-term environmental sustainability.





His academic background includes an undergraduate degree in Environmental Engineering, a master's degree in urban engineering, and a PhD in Engineering from the University of Medellín, Colombia. Additionally, he completed a postdoctoral stint as a research associate at the Institute of Environment at Florida International University (USA), where he participated in projects focused on developing satellite-based water resource monitoring methodologies.

Camilo Gonzales – MSc. Research Associate (camilo.gonzalez@sei.org)

Research Associate at SEI Latin America, where he contributes to the development of research and applied projects focused on water resources management, climate change adaptation, and decision-making under uncertainty. As part of the Water team, he participates in the design, implementation, and visualization of decision-support tools, integrating hydrological and socioeconomic modeling, spatial analysis, and interactive approaches to strengthen planning processes and public policy dialogue.

Camilo possesses extensive experience in hydrological modeling using WEAP, as well as in developing interactive tools and visualization dashboards for water resources planning using R, Python, and Power BI. His work increasingly incorporates the use of "Serious Games" as participatory tools to foster stakeholder engagement and knowledge co-production. Additionally, he explores the application of artificial intelligence and data-driven methods to optimize information processing, scenario analysis, and decision support.

Camilo holds a degree in Civil Engineering from the Escuela Colombiana de Ingeniería Julio Garavito (ECI) and a dual master's degree: one in Water Science and Engineering (Hydroinformatics) from IHE Delft – Institute for Water Education (UNESCO, Netherlands), and another in Civil Engineering with a specialization in Water Resources and the Environment from the Escuela Colombiana de Ingeniería Julio Garavito.

Gustavo Ayala – MSc. Research Fellow (gustavo.ayala@sei.org)

Researcher at SEI Latin America. He conducts studies and monitors various projects related to water resource management and the strengthening of water sector institutions, applying numerical simulation tools for water systems—such as WEAP—and supporting the development of decision-support systems.

Gustavo has about ten years of experience in technical assistance and project management within Bolivia's water resources sector. He has taught postgraduate courses at various Bolivian universities, covering subjects related to numerical modeling of water resources. He was a member of the Institute of Hydraulics and Hydrology, where he participated in projects focused on managing water resources from strategic



sources—such as Andean glaciers—with support from the Japan International Cooperation Agency (JICA). Additionally, he worked at Bolivia's Ministry of Environment and Water, focusing on the planning and management of projects and programs for the water sector. He also served as a technical consultant for the Inter-American Development Bank (IDB), supporting public policy reform programs in Bolivia's water resources sector.

Gustavo holds a degree in Civil Engineering from the Universidad Mayor de San Andrés (Bolivia) and a master's degree in Regional Planning (Civil Engineering and Environment) from Tohoku University (Japan).

IMDEA WATER INSTITUTE, SPAIN

Francesco Sapino – PhD. researcher (francesco.sapino@agua.imdea.org)

Postdoctoral researcher at IMDEA Water as of November 2024, working on the TRANSCEND project. Since February 2025, he has been employed as a postdoctoral researcher on the WaterTheft project.

Francesco holds a bachelor's degree in Energy Engineering from the Polytechnic University of Turin and a master's degree in environmental economics from the University of Turin. After a research stay at the University of Salamanca (USAL) for his master's thesis, he joined the USAL research group led by Dr. Dionisio Pérez-Blanco, where he completed a PhD in Economics, earning the "International Mention" distinction and an extraordinary doctoral award. During his doctoral studies, he undertook research visits to institutions such as IVM-VU in Amsterdam and CMCC in Venice and participated in numerous international conferences. His thesis introduced a hydro-economic framework to address agricultural water scarcity under deep uncertainty. Francesco's research focuses on modeling coupled human-natural systems to manage uncertainty and ensure robust policy assessments. His approach links economic and environmental objectives, with plans to incorporate behavioral economics into agro-economic modeling.

MAYOR DE SAN ANDRÉS UNIVERSITY, BOLIVIA

Eleodoro Baldivieso Estrada. PROSUCO Researcher.

An agronomist with over 20 years of experience in rural development, strategic planning, and agricultural risk management within contexts of climate vulnerability. A specialist in project formulation, evaluation, and management, he combines institutional leadership roles—such as Head of Planning and Management at PROSUCO—with high-level consultancy work for international organizations (FAO, SDC, Swisscontact, WFP, Helvetas). He is a certified mentor in Participatory Action Research (PAR) through the UNESCO/K4C Chair and a pioneer in the co-creation of agro-climatic innovations that





integrate ancestral knowledge with modern technology (such as the “Pachagrama” and systems utilizing natural indicators and early warning mechanisms). He possesses extensive experience in designing technical assistance and rural extension (ATER) models, strengthening smallholder farmer organizations, and developing local talent (“Yapuchiris” in aymara language).

Gavi Alavi Murillo – PhD. IDEPROQ Researcher

She holds a degree in Agricultural Engineering from the Universidad Mayor de San Andrés (UMSA), as well as a master’s degree in water resources engineering and a PhD in Bioscience Engineering from KU Leuven (Belgium). Her professional and academic career focuses on research and management regarding agriculture, water resources, soil, and climate change, with an emphasis on agricultural systems and mountain ecosystems. She possesses experience in interdisciplinary research and academia—gained in both Bolivia and Belgium—addressing issues related to the sustainability and adaptation of production systems in the face of environmental changes.

Throughout her career, she has participated in various research, consultancy, and cooperation projects, developing expertise in management and monitoring of soils, water resources, and climate change, as well as in agricultural system modeling and the assessment of production systems. She has worked with academic and cooperation institutions such as UMSA, KU Leuven, CIAT, and IICA, and has experience in university teaching, thesis supervision, and the dissemination of research findings. Her work has primarily taken place within the Andean context, integrating biophysical and climatic approaches to contribute to the understanding and sustainable management of natural resources.



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