VRIJE UNIVERSITEIT BRUSSEL

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Inti Ernesto Rodríguez Levy**

The public defense will take place on **Tuesday 21st November 2023 at 4:30pm** in room **D.0.07** (Building **D,** VUB Main Campus)

To join the digital defense, please click here
Meeting ID: 593 304 2303
Access Code: CReAUCB

NAVIGATING THE HIDDEN CURRENTS: UNEARTHING ALTERNATIVE APPROACHES FOR INTEGRATED GROUNDWATER MANAGEMENT IN THE VALLE ALTO BASIN OF BOLIVIA

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Abstract of the PhD research

Integrated water management can be challenging in developing countries for various reasons, including limited financial/technical resources and capacity, limited data and understanding, and political and social challenges. This situation is even more significant when dealing with groundwater, which, due to its condition as a "hidden resource", is often ignored and underestimated by decision-makers despite the multiple ecosystem services it provides. This research explores the possibility of using accessible and low-cost alternatives to obtain relevant technical information for groundwater management in basins belonging to rural municipalities in central Bolivia.

Initially, the application of a soil water balance is proposed to identify groundwater recharge zones in the Valle Alto basin. Rainfall was considered the model's primary input source, and 24 biophysical variables were characterized. This characterization included evaluating global circulation models to overcome the lack of reliable meteorological information in the study area.

On a more local level, this study also included the development of a simplified and multi-criteria decision methodology to identify groundwater recharge zones at a micro-basin level (Virvini) located in the northeastern end of the Valle Alto basin. In this case, a more participative approach was considered, based on including local knowledge in all stages of methodology development. As a result, the EARLI approach has been developed (an acronym for "Enhanced Algorithm for Recharge based on the Rainfall and Land cover Inclusion"), based on categorical values and only six variables with significant influence on water infiltration to determine said zones.

Finally, this research has also focused on mapping the Virvini micro-basin subsurface to characterize the local aquifer system through Electrical Resistivity Tomography (ERT). This method was used as a fast, efficient, non-invasive and cost-effective alternative, identifying the main groundwater recharge and discharge areas and the most vulnerable areas for potential contamination or human interventions that could affect the basin's natural conditions, also serving as an additional validation method of what was found in the previous steps of the research.