OBJETIVOS DE DESARROLLO SOSTENIBLE

Proyecto 100k Strong con South Dakota School of Mines & Technology y la UPC

La UPC ganó la importante subvención del Fondo de Innovación 100K Strong in the Americas, una iniciativa que apoya a las asociaciones de educación superior y aumenta la capacitación de los estudiantes. En ese sentido, fue importante la participación de la Oficina Internacional y la facultad de Ingeniería de la UPC, que realizaron un trabajo clave durante todo el proceso de postulación.

Gracias a este estímulo económico, las carreras de Ingeniería Civil e Ingeniería Ambiental de la UPC y la facultad de Ingeniería de South Dakota School of Mines and Technology (SDSMT) trabajarán en la ejecución de un proyecto de saneamiento con la implementación de nuevas tecnologías y un innovador sistema de captación de agua de niebla. El objetivo es mejorar la calidad de vida de las familias que carecen del servicio de agua, en el distrito de Villa María del Triunfo.

Voluntariado en Lomas de Paraíso - Implementación y mantenimiento de sistemas atrapanieblas

El 26 de marzo y el 2 de abril, un grupo de alumnos de las carreras de Ingeniería Ambiental e Ingeniería Civil participaron como voluntarios en la implementación y mantenimiento de sistemas atrapanieblas en Lomas del Paraíso, en Villa María del Triunfo. Estos sistemas sirven para capturar niebla y generar agua para usos como el riego de biohuertos en zonas aledañas, generando beneficios a la comunidad.

Escherichia coli Contamination of Water for Human Consumption and Its Associated Factors in Peru: A Cross-Sectional Study

Authors: Hernández-Vásquez, A.; Visconti-Lopez, F.J.; Vargas-Fernández, R.

Abstract: The objective of the study was to determine the factors associated with the presence of Escherichia coli contamination in water supplies for human consumption in Peru. A secondary analysis of the Food and Nutrition Surveillance by Life Stages survey (VIANEV) of 2017-2018 was performed. The presence of E. coli contamination in the water samples for human consumption of the households evaluated was defined as a dependent variable. A supply was considered contaminated when there was at least 1 colony-forming unit of E. coli in 100 mL of water for human consumption. Data from 886 participants were analyzed. It was found that 25.2% of household water supply sources for human consumption had E. coli at the time of sampling. Water reservoirs such as buckets or other containers (adjusted prevalence ratio [aPR]: 1.15; 95% confidence interval [CI]: 1.18-1.93), households belonging to a poor wealth quintile (aPR: 1.82; 95% CI: 1.01-3.25), residing in a rural area (aPR: 1.36; 95% CI: 1.01-1.83), and having a low human development index (aPR: 2.12; 95% CI: 1.15-3.91) were more likely to contain E. coli in water supplies for human consumption. However, households with chlorine concentrations of 0.5 mg/L or more in water (aPR: 0.20; 95% CI: 0.11-0.33) and with household members with a higher education (aPR: 0.67; 95% CI: 0.45-0.99) were less likely to contain E. coli in drinking-water supplies. From 2017 to 2018, one in four Peruvians had contamination by E. coli in the water supply to their homes, which was associated with socio-demographic factors, management, and water treatment.

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Spatial and socioeconomic inequalities in the access to safe drinking water in Peruvian households

Authors: Al-Kassab-Córdova, A.; Silva-Perez, C.; Robles-Valcarcel, P.; Bendezu-Quispe, G.; Ortiz, A.I.; Benites-Zapata, V.A.

Abstract: Access to safe drinking water has increased in Peru over the last decades, from 47% (2008) to 52% (2018). Nevertheless, such access would differ according to socioeconomic and regional factors. Thus, this study aimed to assess the socioeconomic inequality in the access to safe drinking water and identify its spatial distribution. We conducted a cross-sectional study based on the secondary data analysis of the 2021 Peruvian Demographic and Health Survey. Access to safe drinking water was a dummy variable categorised as safe if the residual chlorine concentration was ≥0.5 mg/L. Nationwide, 29.22% of households had access to safe drinking water. A pro-rich inequality in access to safe drinking water was observed. The spatial distribution was clustered. Significant hotspots were found in the south and centre of the country; however, cold spots were found in most areas. SaTScan analysis identified 32 and 63 significant clusters at high and low risks of having access to safe drinking water, respectively. In conclusion, approximately one out of four Peruvian households has access to safe drinking water, which was mostly concentrated among the wealthier households. Intra- and interdepartmental inequalities in access to safe drinking water were found, with several high-risk clusters.

Keywords: drinking water, inequality, Latin America, Peru, spatial analysis

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Simulation of a mechanical prototype for the extraction of soil sampling using PETG and PLA material

Authors: Marcelo Culqui, Jhon Quispe, Leonardo Vinces

Abstract: Corn production in Perú during the last five years has been reduced for various reasons and the inefficient application of technology, because the progress of technology has been decreasing the intervention of the human hand in the field. For example, the use of automated pivot irrigation systems has had a positive impact on the efficiency of irrigation administered to the plants; however, this system has resulted in the neglect of the plants in the first months, generating a final production lower than that estimated for each harvest season. In view of this, the use of Unmanned Aerial Units (UAV) is proposed in order to collect soil samples around the cultivated field to be delivered to the laboratory for analysis. This mechanism consists of an arm with two degrees of freedom including an extractor that presents an auger with a worm inside, in turn it will have a rotational movement through a reduction box, the design will be manufactured in PLA and PETG material to be implemented in the UAV and perform extractions of samples of sand and soil present in Olmos, Lambayeque, Peru. In addition, this model includes a storage tank for the samples obtained to be able to perform up to three samples at different points during a single flight. The expected result is to obtain up to three samples in a range of 250 grams per extraction point in one flight, so the sampling depth will be 16 cm and a diameter of 6 cm.

Keywords: Irrigation;Prototypes; Programmable logic arrays; Production;Soil; Autonomous aerial vehicles; Three-dimensional printing;UAV; precision agriculture; sample extraction;soil;corn; 3D printing

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Propose the surface flow constructed wetland in the treatment of acid drainage in the closure of a tailings deposit

Authors: Mariana Alexandra Diaz Crespo, Silvia Rocío Blas Cadillo, Shirley Alexandra Gonzales Baldeon, Nicole Stefany Damián Esperilla and Ulises Francisco Giraldo Malca

Abstract: Acid drainage is made up of three elements, sulfur, water and air. Acidic waters are common in all types of mines, but especially in abandoned mines, which do not have proper treatment, control and monitoring, which could affect areas of influenza. For this reason, it is important to develop an efficient, low-cost, and feasible acid drainage treatment method for artisanal mines. Therefore, this research focuses on the possibility of considering the surface flow constructed wetland in the closure of a tailings deposit, for the treatment of acid drainage. A theoretical and practical study will be carried out to identify and estimate the concentration of heavy metals in acidic waters and build a treatment system through constructed wetlands.

Keywords: Tailings deposit, passive closure, acid drainage, surface flow wetlands.

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Microbasin Hydrological Modeling Located in a High Andean Zone for Monthly Flows Estimation, Using GR2M, Temez and Lutz Scholtz Models

Authors: Huaycha Conde, Wagner; Mayhua Gutierrez, Natali Mirella; Santos Hurtado De Bazan, Sissi

Abstract: In Peruvian remote areas, hydrometric stations records are limited. This limitation delays study of water resource management in high Andean zone of central-southern Peru. Therefore, in this work, hydrological modeling is carried out in Paucarbamba micro-watershed to generate flows from the pluviometric data obtained from the scarce SENAMHI pluviometric stations. These hydrological models are GR2M, Lutz Scholtz and Temez. After results analyzing, Lutz Scholtz model has a satisfactory fit with the following validation coefficients Nash = 1.00, PBIAS = 5.52 and RMSE = 0.05. In conclusion, for generation of monthly mean flows in Paucarbamba microbasin, Lutz Scholtz hydrologic model has better fit according to validation coefficients analysis.

Keywords: hydrologic model, GR2M model, Lutz Scholtz model, Temez model, HEC-H4 software.

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Minimally Active Neutralization of Acid Mine Drainage through the Monte Carlo Method

Authors: Kevinstiv Castro Huaman, Yaneth Vasquez Olivera, Vidal Aramburu Rojas, Luis Arauzo, Carlos Raymundo Ibañez and Francisco Dominguez

Abstract: The necessity of mining valuable metals must be balanced with the safe and effective disposal or remediation of the resulting waste. Water, one of our most valuable resources, is a major component of the mining process, and its post-operation storage often results in acid mine drainage. While many remediation methods have been studied, they have low economic feasibility, as minimally active methods alone were inadequate, and thus required additional, costly active methods for effective neutralization. This study looks to neutralize acid mine drainage with only minimally passive methods, through an optimized dosage of lime, fly ash, and aluminum hydroxide. Wastewater samples of pH 3.62 and 5.03, containing 1.36 and 2.21 percent sulfides, respectively, were experimentally treated, with the utilized dosage parameters generated using the Monte Carlo method for neutralizing acidity. The remediated water samples presented 0.01% and 0.16% sulfur content values, which corresponds to 99.3% and 92.8% reductions, respectively. These results present, for the first time, that minimally active methods could achieve a pH of 8.5 without active methods. While future studies should validate these results and provide a more complete characterization of the water samples, the major challenge of neutralization was addressed, and, thus, these results contribute process incentives for mining companies to economically remediate their waste water in order to safeguard their surrounding communities and return valuable water back to the water cycle.

Keywords: acid mine drainage; water remediation; sulfur contamination; acid water; passive methods; Monte Carlo

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Variation in the concentration of heavy metals due to rains and floods in the Rimac river basin, Lima-Peru

Authors: Mariana Alexandra Diaz Crespo, Silvia Rocío Blas Cadillo, Shirley Alexandra Gonzales Baldeon, Nicole Stefany Damián Esperilla and Ulises Francisco Giraldo Malca

Abstract: The urban agglomeration of Lima and Callao is the second largest city in the world located in a desert, and its supply depends on three small rivers, the Rímac River being the one with the greatest water supply, affected by contamination by mining tailings, sewage and Solid waste. In order to know the climatological and hydrographic conditions that favor the concentration of heavy metals in the water, the relationship between rainfall, water discharges and concentration of aluminum, cadmium, iron and lead in the Rímac River hydrographic system in the period 2018 – 2021. For which data processing was carried out from six meteorological stations, a water quality monitoring point and four limnimetric stations, through dynamic tables. As a result, it was found that the concentration of heavy metals is higher in the lower basin when rainfall and river level increase in localities of the Alto Rímac sub-basin, which presents intense mining activity, unlike the Santa Eulalia sub-basin. river where there are no large-scale mining operations, whose records present weaker relationships with the concentration of heavy metals. In conclusion, the highest concentration of heavy metals in the lower basin occurs during the months with the most intense rains in the headwaters of the basin, as the dragging capacity increases during the flooding of rivers and streams, allowing concentrations to exceed up to 120 times the quality standards for the production of drinking water.

Keywords: mining contamination, basin, trace metals, wet season, EQS.

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