SUSTAINABLE DEVELOPMENT GOALS

My Drop of Water (A Scientific Roadmap for Environmental Management Tools)

Students from the Environmental Engineering program at UPC participated on June 7, 2022, via Blackboard, in the lecture “Mi gota de Agua (Una hoja de ruta científica para la construcción de herramientas de gestión ambiental)” with the aim of gaining non-structural concepts applicable in the construction of a comprehensive water resources management proposal.

36 participating students benefited from this event.

Methodology for Hydroelectric Potential Evaluation in High Jungle Area with Scarce Topographic and Hydrological Information Using GIS and Algorithm MATLAB

Authors: Orozco, J.C., Aranzana, M.F.G., Hurtado, S.S.

Abstract: Due to scarcity of topographic and hydrological information in high jungle areas, many times projects based on water management are not developed. This is of interest because they involve hydroelectric generation projects. The latter are considered important because of their capacity to satisfy the energy demand of a population and to minimize environmental impact of energy generation. In this sense, we propose a methodology for hydroelectric potential evaluation in high jungle areas that considers the following steps: (a) develop an algorithm in MATLAB in charge of searching geographical conditions for hydroelectric power plant's location, (b) definition of restrictions: political delimitation, environmental and demographic, (c) generation of average flows based on rainfall-runoff models, estimation of hydroelectric potential and economic evaluation of selected points. The high jungle area studied was Utcubamba basin, in department of Amazonas, Peru, where 2 possible locations with hydroelectric power of 5.33 and 6.09 MW were located.

Keywords: —hydroelectric potential, renewable energy, algorithm, geographic information system, hydrological model

Journal of Advances in Information Technology , Volume 13, 2022, pages: 277-283

https://doi.org/10.12720/jait.13.3.277-283

Sustainable Urban Drainage System to Avoid Flooding of Rain Origin and Improving Green Areas, Lima, Peru

Authors: Amaro, L., Luis, J., Cuya, V., Lorena, R., Dávila, S., Rosana, M.

Abstract: Lima's Villa El Salvador is one of the cities of Peru with the highest population growth rate in recent decades, and still it is needing to develop many urban infrastructure services. However, this process of urbanization has also produced a decrease in the permeability of the terrain causing in recent years flooding and severe damages by the occurrence of heavy rains in the district. It was proposed the implementation of a sustainable urban drainage system (SUDS) to provide an engineering solution to this problem. It consists of a set of elements of the drainage network that will allow the collection, transport, retention, infiltration, and rainwater evacuation sustainably. Four SUDS alternatives were analyzed using well-founded methodologies to select the best alternative solution for the existing problem using technical, economic, and environmental criteria. The implementation of a retention tank and green ditches is the solution adopted to reduce the risk of flooding because of urbanization in the studied area. Runoff from the upper part of the basin will be collected through the green ditches, and the collected water will be distributed to increase the green spaces of the district. However, it will be necessary to supplement with irrigation to preserve them since this locality is climatologically arid. Successful storm water management requires integration with the urban and regional development plans.

Keywords: Sustainable drainage, Urban drainage, Green space

Lecture Notes in Civil Engineering , 2022, Volume 183, pages: 115-126

https://doi.org/10.1007/978-981-16-5543-2_10

HydroTi: An Irrigation System for Urban Green Areas using IoT

Authors: Carrillo-Pasiche, P., Miranda-Gutarra, A., Ugarte, W.

Abstract: Irrigation systems and their performance to efficiently accomplish their function have gained notoriety in recent years. Therefore, those systems are not capable of approaching many factors as water-saving and irrigation automation. Here we present a new irrigation system based on the IoT, analyzing the most important factors that involve an efficient irrigation process taking into consideration water usage and saving this resource. Thus, we developed a prototype using Arduino Uno which is connected to sensors that can lead a web application named HydroTi to determine when to irrigate and how much water to use. This function was enabled by Adafruit IO, a web service useful for IoT projects. To validate the effectiveness of this solution, we compared different irrigation types to determine that the automatic irrigation mode of HydroTi is better w.r.t. water consumption in Metropolitan Lima, Peru urban areas.

Keywords: Arduino, IoT, Irrigation system.

Proceedings of the 2022 IEEE 29th International Conference on Electronics, Electrical Engineering and Computing, INTERCON 2022. 2022

https://doi.org/10.1109/INTERCON55795.2022.9870094

Concrete Sustainable Buildings Using Domestic Wastewater Treated

Authors: Verde, S., Aranibar, A., Rodriguez, J., Eyzaguirre, C.

Abstract: During recent years, the rapid growth of the population in urban areas has promoted the development of housing, roads, shopping centres and industries; having increased the consumption of tap water in the concrete industry. A solution to this problem, is to use domestic wastewater treated, due to the large quantities produced and the need to include them within the life cycle of the water; thus bridging the gap of service in urban and rural areas. The present research seeks to use the domestic wastewater treated in the production of concrete for construction; the results show slightly for the slump, initial setting time and splitting tensile increase, and that the resistance to compression and flexural is decreased.

Keywords: Buildings, Compression, Domestic Wastewater, Flexural, Splitting Tensile, Sustainable Concrete

Materials Science Forum , 2022 , Volume 1053, pages: 303-308

https://doi.org/10.4028/p-9y2t40

Ancestral Technological Solutions and their Application in current times

Authors: Barbachán Ruales, E.A., Barbachán Villalobos, M.A., Cáceres Coral, J., Ruiz Camus, C.N., Casas Huamanta, E.R.

Abstract: The present work aims to recognize and revalue the technological solutions that our ancestors applied in accordance with the environment in order to be applied in current times. Quantitative research, of a descriptive type with an ethnographic, technological method, applied to students, teachers and university graduates in the technological and engineering area. The sample is non-probabilistic through convenience sampling. Concluding that, effectively, our ancestors applied various technological solutions in accordance with their environment, among which we find, for the metallurgical mining aspect, the Huayras; in the treatment and planting of water las Amunas; in infrastructure, earthquake-resistant technologies using mesh bags or Shicras; in soil and water management, the waru warus, production in floodplain or riverside areas, agriculture in Amazonian Várzea soils, these technologies have application in current times, which would be profitable and convenient in an eco system. sustainable, only 22% of those surveyed have knowledge of these technologies, so it is necessary to teach them from basic education.

Keywords: Ancestral technology, Environment, Scientific talent, Technological solution

Universidad y Sociedad , 2022 , Volume 14, pages: 476-486 .

https://repositorioacademico.upc.edu.pe/handle/10757/660097

Proposal for operating rules of a Qocha for water use purposes

Authors: Miranda-Dávila, M.; Ruíz-Olarte, W.;Samaniego, A.A.

Abstract: In the Peruvians high Andean areas, structures for traditional use to store water with recharge purposes have been identified; these are small reservoirs called Qochas. In these areas, the only water source is rain, which occurs during the year's wet season. The high Andean inhabitants identify the Qochas as sources of water to be used during the seasons and dry times. This work presents a proposal for operating rules of a Qocha to have water resources for use by the high Andean inhabitants, maintaining its filtration function as part of the rainwater harvesting. The process included the characterization of the operation of a Qocha through operation simulations to define the stored volume, discharge volume, and infiltration. Four different climatic scenarios were considered, namely wet, dry, and their combination, to identify the volume stored and the minimum infiltration. These results make it possible to propose an operation rule to have a usable volume while the Qocha maintains its original functions and purposes in water harvesting. The methodology was applied to a Qocha located in the Department of Ayacucho at 3700 m.a.s.l. The results show that the beneficiaries of the area of influence can take advantage of part of the stored volume during the dry season without taking away its function in rainwater harvesting.

Keywords: Ancient techniques; Andes; natural infrastructure; ponds; rainwater harvesting; water harvesting
Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology; Volume 2022-July2022

https://doi.org/10.18687/LACCEI2022.1.1.389