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Prishtina 2024**

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Faculty of Civil Engineering, University of Prishtina "Hasan Prishtina"
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ISCCE 2024

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FOREWORD

It is with great pleasure that we present the abstracts compiled from the 2nd International Student Conference of Civil Engineering. This conference, organized jointly by the Faculty of Civil Engineering at the University of Prishtina "Hasan Prishtina" in Kosovo and the Faculty of Civil Engineering at the Polytechnic University of Tirana in Albania, stands as a testament to the collaborative spirit and scholarly endeavors of our institutions. Our main aim in convening this conference has been to foster an environment where young minds in the field of civil engineering can come together, exchange ideas, and contribute to the advancement of knowledge in this vital domain. Over the course of three days, from 25 to 27 April 2024, we had the privilege of hosting a diverse array of participants, including esteemed keynote speakers from various corners of the globe. We sincerely thank all the participants, speakers, organizers, and supporters who have contributed their time, expertise, and enthusiasm to make this conference a resounding success. We hope that these abstracts will serve as a source of inspiration and knowledge for current and future generations of civil engineers, driving progress and innovation in the field.

Sincerely,

Prof. Ass. Dr. Florim GRAJÇEVCI



Dean of the Faculty of Civil Engineering, University of Prishtina "Hasan Prishtina".

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Keynote Abstracts





Seismic Retrofit: Technical and Economic Aspects in the Light of 2023 Türkiye Earthquakes and Scenario Studies Conducted for Istanbul

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**Keynote Speaker*

2023 Kahramanmaraş Earthquakes caused destruction in 11 provinces with a population of more than 14 million and demonstrated the poor seismic performance of sub-standard buildings in Türkiye one more time. Approximately 100,000 reinforced concrete buildings were either heavily damaged or collapsed during the sequence of earthquakes causing more than 50,000 casualties. The catastrophic consequences of the disaster highlighted the importance of risk mitigation efforts, particularly seismic retrofitting, on the existing building stock. It was clearly seen that the losses could have been minimized if proper measures have been taken before the earthquakes. Meanwhile, a rapid assessment and risk prioritization procedure was applied to approximately 25,000 sub-standard existing reinforced concrete buildings in Istanbul, Türkiye considering a 7.5 M_w scenario earthquake and design level earthquake cases, and the results of this project are summarized in this study. The outputs demonstrated that $\frac{1}{4}$ of the investigated buildings was classified as very high risk for the scenario earthquake case. Then, the findings on 25,000 individually examined buildings are extrapolated to a building stock of nearly 583,000 pre-2000 reinforced concrete low and mid-rise buildings. It was determined that 20% of the pre-2000 building stock in Istanbul needs urgent intervention according to the scenario earthquake case while this ratio was obtained to be 40% for the design level earthquake case. Eventually, the conducted cost-benefit analyses demonstrated that seismic retrofitting option is the most feasible intervention approach towards minimization of losses both in terms of cost and duration.

Keywords: *Seismic Retrofit, Türkiye Earthquakes, Risk Mitigation, Building Performance, Cost-Benefit Analysis, Earthquake Scenarios.*



In Maps we trust! – About fake or trust in the era of Artificial Intelligence

Georg Gartner

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The digital information era is fundamentally changing science and society. By using maps as examples, the impact of our digital world in the advent of using more and more Artificial Intelligence and Machine Learning will be discussed. Maps and further cartographic means, which communicate information tailored to human users through various media, play a key role in this information era. This is related to the fact that we can witness that more spatial data than ever is produced currently. Numerous sensors of all kinds are available, measuring values, and storing them in databases, which are linked to other databases embedded in spatial data infrastructures, following standards and accepted rules. We can witness also that we are not short of ever more new modern technologies for all parts of the spatial data handling processes, including data acquisition (e.g. UAVs), data modelling (e.g. service-oriented architectures, AI), data visualization and dissemination (e.g. augmented-reality) allowing us to acquire, store, link, and process more and more data. The problem is often not that we do not have enough data but rather too many. We need to make more and more efforts to deal with all that data in an efficient sense, mining the relevant information and linking and selecting the appropriate information for a particular scenario. Ultimately, this should allow an effective and efficient usage of data in a trustworthy manner. All of this brings cartography in a key role, as maps and cartography play a key role in this respect as cartography works with abstraction, narrations, and holistic views to allow for efficient and effective interfaces between data and humans.

Keywords: *Digital information era, maps, Artificial Intelligence, Machine Learning, spatial data, technologies, cartography.*



New possibilities for object documentation with hand-held mobile laser scanning

Karel Pavelka

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In recent years, hand-held mobile laser scanning, also known as personal laser scanning (PLS), has emerged as a powerful and efficient technology for capturing 3D data of objects and environments, surpassing traditional methods like manual measurements or stationary laser scanning. PLS enables fast data collection, high accuracy, and detailed capture of complex object details. The laser scanner emits beams to scan objects, measure distances, and create a point cloud of data, while the IMU tracks the device's position and orientation for accurate data registration. The key advantages of PLS include its mobility, fast data collection, high accuracy, and detailed scanning capabilities. Over the years, PLS technology has seen significant improvements in accuracy, range, scanning speed, and data density, making it a versatile tool for various industries and applications. PLS finds applications in cultural heritage preservation, architecture, engineering, forensics, and industrial design, enabling tasks such as documentation, reconstruction, quality control, and reverse engineering. Despite challenges like data processing complexity and scanning limitations, ongoing research aims to enhance PLS technology through sensor advancements, algorithm improvements, and software tools. This contribution shows the development of PLS, their accuracy, and usability, and presents the advantages of this relatively young technology, which is still under development. Projects and case studies using PLS are introduced here. In 2023, several of the world's leading manufacturers presented the next generation of PLS, which achieve very good results compared to classical geodesy technologies in the field of spatial point measurement. Future developments in PLS are expected to focus on enhancing data processing efficiency, real-time visualization, scanning range, accuracy, and integration with complementary imaging modalities. With its rapid advancements and broad applicability, PLS can be a new universal measuring instrument in geodesy just as the total station became the basic equipment of surveyors 40 years ago.

Keywords: *Mobile mapping system (MLS), personal mobile laser scanner (PLS), cultural heritage, documentation, point cloud, IMU.*



Reactive cementitious rubber composites for high-pressure water seals: From a basic idea to a commercialized product – Technical and personal perspectives.

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Annular swellable seals used in oil and gas wells present the tremendous advantage of being self-actuated. Indeed, the swelling itself generates a force against confinement. Their main drawback so far has been their low elastic modulus, limiting the amount of differential pressure these components can effectively seal. We discuss here a new composite material consisting of cementitious powder embedded in a nitrile rubber matrix. In contact with water, the composite undergoes significant swelling (up to 100 vol%) while at the same time increasing in stiffness. This unique response, which is attributed to the hydration of the cement inside the rubber matrix, makes this new material an outstanding candidate for industrial sealing applications in wet environments. The novel seal was commercialized in 2014 and still leads the market in terms of cost and performance. In this research, we will discuss the kinetics of water absorption and cementitious filler hydration, the resulting mechanical properties and development of microstructural heterogeneities, and the chemical changes occurring in the rubber matrix. We will also give some insight into the industrial process of developing and commercializing a novel swellable seal and add a personal perspective.

Keywords: *Seal, rubber, cement, self-actuation, commercialization.*



Flowing Towards Tomorrow: Unveiling the Water Wisdom of European Integration and a Sustainable Future

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In Southeast Europe, countries are at different stages of harmonizing, transposing, and implementing environmental legislation aligned with EU environmental legislation (acquis). So, Albania, Montenegro, Serbia, and the Republic of North Macedonia are official candidates, with accession negotiations and Chapters opened for these countries. Kosovo, Bosnia, and Herzegovina are potential candidate countries. The Republic of Moldova also has an EU Accession Agreement. Most EU candidate countries are under pressure to move forward faster with such alignment and require strengthened countries capacities, often requiring financial support. EU water policy is one of the cornerstones of environmental protection. The rules protect water resources and fresh and saltwater ecosystems and ensure clean drinking and bathing water. In this context, the Water Framework Directive provides the main framework and the objectives for European water policy. In the European Union's Water Framework Directive (WFD) context, "Good Status" refers to the ecological and chemical quality of water bodies such as rivers, lakes, coastal waters, and groundwater. The WFD aims to protect and improve the quality of water resources across EU member states. Water bodies must meet certain environmental objectives and standards the WFD sets to achieve Good Status. These objectives include criteria related to water bodies' biological, chemical, and physical characteristics. Achieving and maintaining Good Status requires comprehensive monitoring, assessment, and management of water resources. Member states must develop river basin management plans to outline measures for achieving Good Status and preventing further deterioration of water quality. Overall, Good Status represents a healthy and sustainable condition for water bodies, promoting biodiversity and ecosystem functioning and providing clean water for various uses such as drinking, recreation, and agriculture.

Keywords: *EU water acquis, Good Environmental Status, WFD Water Framework Directive, Sister Directives.*



Rare means important - the story of research on rare earth elements in the environment of urban areas

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**Keynote Speaker*

Rare earth elements (REEs) are a group of elements, where 17 metals are included, such as lanthanides and yttrium. Some of them play an important role in modern industry, especially IT and transportation. Hence, their resources are extremely important for the future world economy. However, their distribution is not equal in the world, which might be problematic for some regions to develop modern techniques used in IT devices, batteries, and parts used in renewable energy sources, such as solar panels and electric car batteries. It is well known that some background concentration of REEs is recorded in the earth's crust and most of the soils worldwide. However, recent investigations showed some increase of selected REEs in the urban areas and areas related to human activity. This might suggest the release of some elements from the IT devices, car parts, and other modern technique devices to the environment. There have been some investigations on the accumulation of REEs in soils and plants to examine the potential effect on the environment. There are no limits on REEs for environment elements yet, due to limited investigations within the area and the high cost of such measurements. However, it is important to examine whether we can notice any potential effect on the environment and humans, as well as if we can potentially find plants useful for bioindication or even phytoremediation of these elements. A few years ago, we started several investigations on the potential accumulation of REEs in plants and soils in urban areas. We have examined several cities (including Prishtina) and areas near the roads. Some interesting findings we have noticed might be a crucial value for future investigations. Most important is that some elements revealed the high accumulation potential in selected plant species, we have also found the potential source of REEs from transportation and the range of road influence, as well as the types of land use related to the higher REEs accumulation.

Keywords: *Rare earth elements, distribution, modern industry, accumulation, environment, investigations.*



Design Principles for Building Structures: Lessons Learned from Recent Earthquakes

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Earthquakes are one of the most destructive natural disasters, causing significant loss of life and economic loss. Across the globe, they consistently result in substantial casualties and extensive financial damage. For instance, the Kobe earthquake of 1995 claimed over 6000 lives, while the 2023 earthquake in Turkey resulted in a death toll surpassing 60000, with economic losses exceeding 100 billion US dollars for both events. For a long time, the threat of earthquakes was seen as inevitable, with the understanding that buildings would inevitably suffer damage from the shaking of the ground. Consequently, efforts to mitigate earthquake risks primarily focused on disaster management preparedness. Although suggestions for improving construction methods were proposed as early as the beginning of the 20th century, it's only in recent decades that enhanced and intensified research has revealed effective strategies for reducing structures' vulnerability to earthquakes. Reducing the risk of disasters is a paramount concern not only for engineers and disaster managers but also for global development planners and policymakers. In this context, the objective of this study is to present recent practices in earthquake protection measures for buildings in a clear and easily understandable manner by shedding light on these measures by drawing insights from lessons learned from recent earthquakes and describing the fundamental principles guiding the seismic design of structures. The chosen methodology involves explaining these principles using illustrations, examples, and explanatory text. The fundamental principles, along with accompanying photographs (provided by the author or third parties), have been developed through extensive research and design activities within the challenging and rapidly evolving field of structural/earthquake engineering.

Keywords: *Building structures, design principles, natural risks, earthquakes, seismic provisions.*



Advanced numerical simulations of geotechnical challenges

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** Keynote Speaker*

In numerical simulation of soil media, it is of great importance that the simulation should be as close as possible to the real phenomenon. In the field of geotechnical earthquake engineering multiphase modelling has great importance since the real behavior of the soil in loading and unloading is simulated. In defining the multiphase model, different approaches are available in the literature. Nevertheless, dynamic phenomena in porous media defining nonlinear material behavior including infinite soil media have not been considered. In this work, both the linear and nonlinear behavior of the soil medium and the simulations of boundary conditions in the soil medium are presented. The newly developed infinite elements in static, dynamic, and fully saturated conditions provide interesting and reliable results.

Keywords: *Numerical simulation, earthquake engineering, multiphase modelling.*



Applying concepts of Reliability, Risk, and Resilience in the Management of Civil Infrastructures

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This paper presents a comprehensive exploration of the interactions among reliability, robustness, risk, and resilience in the context of efficient and sustainable civil infrastructure management. For a thorough understanding of how these crucial concepts can be integrated to enhance the management of civil infrastructures, each concept is systematically explored. The discussion begins by defining reliability as the probability of a civil infrastructure achieving its intended function without failure during its service life, which is a crucial indicator for effective management. Risk is then characterized as the expected value of consequences arising from exposure to hazards, encompassing the modeling of exposure, infrastructure vulnerability, and the resultant consequences. The paper subsequently delves into the concept of robustness, highlighting its role in evaluating the potential for disproportionate collapse and its influence on reducing infrastructure vulnerability. In turn, resilience is explored as the capacity of infrastructure to withstand or rapidly recover from hazardous events, with a focus on criteria such as robustness, redundancy, resourcefulness, and rapid recovery. Quality control is positioned as a crucial component of infrastructure management, emphasizing the need for continuous monitoring and decision-making based on Key Performance Indicators (KPIs) like safety, availability, economy, and reliability. These KPIs are integral in developing a risk-informed approach, quantifiable in monetary terms, and pivotal in the decision-making process through Net Present Value (NPV) theory. The paper addresses advancements in management tools, focusing on the transition to risk- or resilience-based systems, the integration of robust predictive and decision-making tools, and the adoption of digital twin models. These developments signify a move towards more sustainable management practices. Finally, this paper outlines future research directions and potential contributions toward advancing the implementation of sustainable management of civil infrastructures.

Keywords: *Risk, Robustness, Resilience, Quality control, Sustainable Management, Infrastructure systems.*





Structural and Earthquake Engineering





The behavior of flat slabs reinforced concrete structures with different floors, in seismic areas.

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The design and construction of tall buildings in seismic-prone areas must adhere to technical standards and regulations. However, these standards are often challenged by the preferences of architects, designers, and investors. There is a common desire for quick and cost-effective completion of the design and construction process. Balancing these considerations is crucial to ensure the safety and integrity of tall buildings, especially in areas prone to seismic activity. Horizontal structural elements like flat slabs made of reinforced concrete are highly sought after for their applicability in various structural systems, providing versatility in building use. Constructors often request and emphasize the use of flat slabs to expedite construction, minimize physical effort, and simultaneously lower construction costs. Architects also frequently make these requests to enhance the flexibility of interior organization and reorganization in residential and functional spaces. For the effective utilization of flat slabs as a structural component, structural designers need to conduct thorough analyses to understand and mitigate various effects. This involves exploring the potential of different geometric shapes, establishing the minimum geometric conditions for use, assessing the material qualities of the elements, and considering the boundary conditions of supports. Careful analysis by structural designers is crucial to ensure the reliability and safety of structures employing flat slabs. Support spaces, dimensions of vertical elements like columns and walls, and the risk of punching shear from columns into the slab are critical variables directly influencing the size of flat reinforced concrete slabs. Challenges arise in dealing with deflection developments influenced by the rheology of materials. The potential for seismic actions further heightens the risk associated with using flat slabs in structures with expansive support spaces and substantial floor loads. Careful consideration and analysis of these variables are essential for ensuring the structural integrity and safety of buildings employing flat slab systems, particularly in seismic-prone areas.

Keywords: *Flat slab, strengthening, penetration, period of oscillation.*



The structural analysis of the frame and dual systems, a case study of the 10-story structure designed based on capacity.

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The structural analysis of frame and dual systems is a critical task in seismically active regions to ensure the safety and stability of buildings. Eurocode 8 provides guidelines for designing and constructing structures that can withstand earthquakes. Dual systems consist of Ram systems, with vertical elements like structural walls and columns, while Frame Systems are primarily composed of beams and columns connected to form a rigid frame. This paper explores the behavior of structures with frame and dual systems featuring a flat slab reinforced with perimeter beams. It focuses on buildings with +10 stories, considering varying floor heights: the basement and 5th floor with a height of $H=5m$, and other floors with a height of $H=3m$. The goal is to compare results obtained from different structural systems, emphasizing the importance of understanding the structural system to ensure user safety and stability. The analysis covers various load combinations, including gravitational loads, horizontal wind actions, and seismic actions. It addresses vertical element sizing, column ductility control, and the creation of M-N interaction diagrams for columns. In the check of vertical elements, the dual system with a flat slab reinforced with perimeter beams and the dual system with beams are treated as systems with non-sway joints. Meanwhile, the frame system with a flat slab reinforced with perimeter beams and the frame system with beams are treated as systems with sway joints. The displacements meet Eurocode 8 requirements between floors in both directions, with a maximum drift in the short direction (direction Y) differing by about 2.48% between these systems. The check of the P- Δ effect also meets Eurocode 8 requirements in both directions, with the maximum index in the short direction (direction Y) differing by about 4.9% between these systems. In contrast, comparing results from the analysis of the frame system with beams and the frame system with a flat slab reinforced with perimeter beams, smaller displacements are obtained by 29.72%. The displacements between floors do not meet Eurocode 8 requirements in both directions, with the maximum drift in the short direction (direction Y) differing by about 28.06% between these systems.

Keywords: *Frame systems, dual systems, Flat slab, displacement, P- Δ effect.*



Analysis of Structure Response in the Case of Superstructures. Case Study: Superstructure of the Technical Faculties Building

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This paper aims to analyze and compare the response of the existing structure before and after retrofitting/reconstruction of the superstructure. The study case-exercises of constructing the superstructure of the faculty building from the main entrance to the library is examined in the example. The comparison of results obtained from linear static analysis according to the regulations from the 1970s and current Eurocode standards shows that the EC offers over 30% structural safety. The high stiffness of the structural core, the small number of floors, and the high-capacity beam – low-capacity column joints create an elastic response under horizontal loads. The columns are not loaded by the action of earthquakes when over 90% of the action is carried by the reinforced seismic core - walls. Linear and nonlinear static analyses show that it is not possible to use the ductility of the system. Target displacements range from 5mm to 10mm, depending on the input data. The capacity curve of the structure intersects the demand curve in the elastic response phase of the system and for a response modification factor of 1.5 or 1.0, the target displacement is achieved through elastic behavior. European standards, which are the basis of the analysis, recommend evaluating the system also for local failures. In the example of the faculty building, local failures occur as a result of deformations that cannot be dissipated by the columns in permanent and temporary design situations. Whereas the system fails under the action of earthquakes when displacements up to 24mm are reached. The waffle slab has deformations that exceed the recommended values by up to 34%. In addition, under the action of earthquakes with the formation of more plastic hinges, these deformations increase and lead to collapse. The two added floors, which increase the load that is transferred to the foundation when the existing structural system is used for load transfer, require up to 100% higher capacity of beams and columns.

Keywords: *Review of the existing structure, response of the structure, behavior factor, construction materials, superstructure.*



Designing cylindrical silos according to "Eurocode" European standards

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This work aims to instruct the design of silos according to European standards, considering these structures as special, sensitive, flexible, and with high load-bearing capacities. The geometry of the silo design is a potential issue considering their arched shapes, appropriate bottom shapes of the silo, and the flow of the deposited material during unloading. Geometric shapes with rotational symmetry around the circular silo create favorable effects and good structural performance even during loading and unloading processes. Geometric silo design aims to maximize the capacity of silos while minimizing construction costs. The development of silo design procedures takes into account the selection of the optimal hopper angle and minimum external dimensions of the silo. The ideal geometric shape of material discharge from the silo ensures smooth unloading. This refers to mass flow. The standards used for designing and calculating the effects and behavior of deposited materials in silos are crucial for their stability and functionality. Taking into account the developed design criteria for silos, the design component includes combinations of external actions, load patterns, primary and secondary effects on structural elements, and the relative flexibility of the elements. The buckling of cylindrical silo walls as a result of asymmetric filling is a significant consideration. If the point of drawdown at the bottom of the hopper is not at the vertical rotational axis of the silo and if the material flow channel interferes with the silo walls, non-uniform pressure develops, which manifests around the perimeter of the silo, causing horizontal and vertical buckling in the cylinder walls. This buckling presentation issue is crucial in the geometric selection of silos to avoid buckling. The theoretical part presents possible geometric shapes of silos, external actions from the most unfavorable cases of loading and unloading effects, the calculation of internal influences according to membrane theory, actions from wind and seismicity, and their combinations for various limit states. In the numerical part, an example is taken for the analysis and design of cylindrical silos based on the theoretical part. In the final section, the computer program Sofistik is utilized.

Keywords: *Silos, buckling, flexibility, granular materials.*



Effect of reducing the vertical stiffness of the seismic walls and their retrofit on the High-Rise Building of 24 stories.

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The construction of structures without considering various installations often leads to significant demands for improvements, interventions, intersections, and additions of the substructures, which can fundamentally contradict the original structural design. These interventions frequently result in the reduction or weakening of structural elements, directly affecting the stiffness and load-bearing capacities, and shear capacity of the structure. Among the most notable cases of structural intervention are instances where the load-bearing capacities of vertical elements, particularly those exposed to horizontal forces, are reduced. The cause of such effects has been analyzed, including the effect of reducing the capacity of seismic walls—such as the creation of new openings to meet elevator standards in tall buildings—and the subsequent analysis of reinforcements for such scenarios. This thesis aims to analyze and compare the structural response with and without openings in the shear walls. Shear walls are typically positioned along the perimeter or in the core of the building. Their placement is determined by the building's design and the anticipated load distribution. These structures are crucial for counteracting the forces generated during earthquakes, which can induce horizontal swaying or deformation in buildings. Shear walls effectively mitigate these effects by providing stability and limiting excessive lateral movement. In addition to their function in transferring lateral loads, shear walls also bear vertical loads effectively, contributing to the overall structural integrity of the building. The impacts of shear wall openings are in the stiffness, capacity, and ductility of the whole structure. This study will use the “Etabs” software to perform linear and non – linear analysis to obtain the results of the natural period, base shear – displacement, and capacity for shear walls with openings and without openings and compare the results. Depending on where and how big the openings of the shear walls are it was concluded that the stiffness and the capacity will decrease but the ductility and natural period will increase depending on the percentage of the openings.

Keywords: *Ductility, Capacity, Non-Linear static analysis, pushover curves, Etabs Software.*



The Chronology and Post - Fire Effects on General Medicine Hospital Building, Tirana University Hospital Center

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This paper presents a case study of the fire's chronology and identification of it from a fire protection system. The way that other systems have reacted at the time of fire such as fire alarms, access controls, AHUs, pressurization systems, and elevators. This building has the implementation of BMS (Building Management System) and it is a new building finished just a year ago, so we present here the importance of monitoring the system at the time that a fire starts. And the benefits of integrating BMS with the fire identification system through smoke sensors. We also indicate that the REI compartment area, especially the application of REI walls and doors, had a high effectiveness in limiting the fire in the technical rooms on level 1 and ground floor. It indicates the effects and damage caused to the building, and what could have happened if the exposed to the fire had been longer. Here is highlighted also the general damage to the Hospital, including the departments that went out of service, which affects the hospital's functionality. After the fire, a site investigation was done to determine the post-fire damage assessment on the reinforcement structure, and the proposals for intervention and repairs of the structure.

Keywords: *Fire systems, BMS, structural damage, post-fire.*



Different additional effects appearing from the structural construction stage.

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The Safety impact of structural construction can have safety effects on the stability, reliability, and functionality of the building. However, during the construction, these effects impact may also be on workers, residents, and visitors, including risks of accidents, injuries, and property damage if proper safety measures are not implemented. During the execution process of structures, especially in the case of reinforced concrete structures, avoiding the possibility of deviations both in geometric aspects and in materials is challenging. As a result of this issue, this paper addresses the topic of geometric deviations and material resistance during execution. Approaching the theoretical analysis of some of the defects that appeared in structures during construction and the wide range of additional effects that arise, as well as the preparatory steps for covering defects such as partial safety coefficients and the treatment of accidental eccentricity which are assumed at a percentage scale in the design phases, and the direct relationship of these factors will be shown to demonstrate how these defects affect the structure's response. The calculation of reinforced concrete structures based on structural standards allows for a limited percentage of deviations due to construction, which should not exceed these limits so that the structure's reactions to horizontal actions such as earthquakes, dead loads, and live loads do not exceed the values anticipated in the design stage. These effects are analyzed in the paper. Additionally, the effects of bending of structural elements influenced by axial compression forces are part of the treatment for the additional effects. The results of internal forces and bending moments from the designed plans are compared with the actual calculated values of forces and bending moments of the structure or their elements to assess geometric deviations and deviations in the concrete strength of structural elements, as well as the risks posed by these elements.

Keywords: *Geometrical deviation, Material quality, partial safety coefficient, additional inner forces.*



Assessing the Seismic Performance of a Communist-Era Albanian Residential Building Using Nonlinear Static and Dynamic Analyses

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This study will present the seismic performance assessment of a 5-story premodern reinforced concrete building using static and dynamic nonlinear analysis procedures. The building was designed as a template model during the communism period in Albania to save architectural fees and build throughout the country. The current condition of these buildings is at a critical level due to many deficiencies. The investigations after the November 26, 2019, earthquake in Albania have shown that the aging of concrete, poor workmanship, corrosion of longitudinal bars, and insufficient confinement reinforcement were among the main reasons for the severe damages observed from this typology. In this study, the mathematical model will be prepared in the Zeus-NL package, a powerful software capable of running an enormous number of analyses almost effortlessly. The capacity curve of the building will be assessed using static nonlinear analysis (Pushover) following Uniform, Inverted Triangular, and Modal shape patterns in both orthogonal directions. Additionally, the demand calculations will be performed using a group of 10 ground motion records for the utilization of the time history analyses. The limit states are defined as immediate occupancy (IO), life safety (LS), and collapse prevention (CP) following modern guidelines. The evaluation of the structural performance will be achieved by monitoring the base shear ratio and the global drift ratio. Furthermore, the comparison of the lateral loading patterns for the pushover analysis effects on the capacity curve will be derived at the end of the study.

Keywords: *Pushover Analysis, Time History Analysis, 5-story RC Building Typology, Seismic Performance Assessment.*



A Practical Guide to Incremental Dynamic Analysis for a Premodern Reinforced Concrete Building Template in Albania

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The current study will present a methodology for the implementation of the Incremental Dynamic Analysis (IDA) on a premodern 5-stories reinforced concrete residential building. The building selected was designed and built during the communism period of Albania following no seismic guidelines. The mathematical model will be prepared in the environments of Zeus-NL software, specifically designed for applications in earthquake engineering. For the utilization of the IDA, it will be used a suite of 20 ground motion records showing no marks of directivity. The results of each analysis gathered from the software will be further processed using the stepping algorithm to plot the IDA curve. For the intensity measure (IM) the 5% damped first mode spectral acceleration, $S_a(T1,5\%)$ will be selected, while the damage measure (DM) will be represented in the plots by the maximum global drift ratio, Θ_{max} . The limit states will be defined based on modern guidelines and former studies. On each of the IDA curves, the immediate occupancy (IO), collapse prevention (CP), and global instability (GI) performance points will be presented. Beyond the interpretation of the structural performance based on the limit states, the generation of fractiles will show potential information at about any IM or DM step. Hence, the IDA fractiles will be prepared into 16%, 50% (IDA median), and 84% as suggested in the literature. Finally, the global seismic performance of the considered building will be interpreted based on the thousands of nonlinear dynamic analyses under the IDA procedure.

Keywords: *Incremental Dynamic Analysis, Zeus-NL, Premodern RC Building Typology, Seismic Performance Assessment.*



Program of Works for the multi-store Building B+P+5, method used: Gant Chart and Pert Chart

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Construction is an industry characterized by high complexity and continuous dynamic change, where effective project management, human resources, and materials management become essential for overall success. This study analyzes the program of construction works, focusing on the key processes that influence the efficiency of construction projects and the challenges encountered during their implementation. Through a combined methodology that includes the analysis of qualitative and quantitative data, the study identifies critical factors contributing to the construction program of works, including project planning, risk management, interaction between different parties, and the application of new technologies. Findings suggest that improving communication and coordination among different interested parties, as well as integrating advanced technologies into construction processes, can help increase efficiency and reduce project timelines. The study also offers recommendations for best practices that construction companies can adopt to address challenges and improve the performance of construction projects. In our research we have analyzed the program of works plan using two methods for the project of a B+P+5, the Gantogram methodology and the Pert methodology.

Keywords: *Program of Works, construction works, Gantogram, Pert method, Management.*



Experimental and Theoretical Investigation of the Behavior of a Concrete Beam Reinforced with Conventional Steel Bars

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This research study conducts a comprehensive examination of the structural behavior of reinforced concrete beams that utilize conventional steel reinforcement bars, framed within the context of European norms and standards (Eurocodes). Through an experimental approach, the study investigates these beams under static loading conditions, gathering experimental data on maximal force, displacement trajectories, crack initiation and development, and ultimate failure modes. Simultaneously, robust theoretical analysis is carried out using analytical methods and advanced finite element modeling (FEM) to simulate and assess the experimental findings, ensuring alignment with Eurocode principles and calculations for direct comparison between empirical and theoretical results. The primary objective is to critically evaluate the correlation between the predictions based on Eurocodes and the actual structural performance, with a focus on the effectiveness of conventional reinforcement practices in enhancing structural integrity and load-bearing capacity. The insights gained from this study are crucial for refining design strategies and advancing engineering practices, leveraging the latest advancements in experimental equipment utilized in academic and research settings. This research not only validates the reliability of theoretical models based on Eurocodes but also identifies potential areas for further improvement in the design and analysis of reinforced concrete structures within the European context.

Keywords: *Reinforced Concrete Beams, Experiment, Displacement, Cracks, Failure.*



Reliability analysis of factor of safety in retaining walls reinforced with geogrids or geotextiles.

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Allowable stress design (ASD) and semi-probabilistic design (SPD) are two traditional design techniques for geosynthetic reinforced soil walls (RSW) that are used to calculate the factors of safety against failure mechanisms. These techniques are unable to account for every uncertainty. The implementation of probabilistic techniques in geotechnical engineering has grown dramatically in the last several years. Because there is a shortage of experience and literature, we have discovered that many engineers are worried about the implications of these advancements and how they may be confidently implemented. Our main objective is to describe probabilistic approaches that emphasize the basis of the methodologies as well as their real-world relevance to the geotechnical and geological engineering profession. The geotechnical world is different in many ways from the structural and mechanical world, and a study dealing with reliability methods from a geotechnical point of view is needed. Geotechnical engineers and geologists work with materials whose characteristics and distribution are frequently uncertain, tackling challenges where loads and resistances interact closely. Traditionally, the geotechnical field has addressed uncertainties in significant projects through an 'observational' approach, which is quite compatible with reliability-centered techniques. The research delves into constructing a framework aimed at ensuring the reliability design of (RSW) by specifically addressing uncertainties in the design process and considering the actual safety and reliability levels. It will explain the fundamentals of probabilistic analysis and design concerning both the internal and external stability limit states of RSW. The analytical model for the five failure mechanisms of internal and external stability are defined and are used to calculate margins of safety in terms of probability of failure through probabilistic methods, where parameters can be set as either deterministic (with no associated variability) or probabilistic (with associated variability).

Keywords: *Reliability analysis, Analytical model, Probability of failure (Pf), Reliability index (β), Coefficients of variation (COV), Probabilistic methods.*



Computational Methods in Civil Engineering





Analysis of Cold-Formed Sections Elements under compression loads: Conventional methods vs Finite Element Approach

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This research endeavors to comprehensively examine the analysis of steel cold-formed section elements under compression loads employing Abaqus finite element software. The study is motivated by the imperative to rigorously evaluate the efficacy and computational performance of Abaqus relative to traditional analytical methodologies in the context of cold-formed steel structures. Employing a rigorous analytical framework, incorporating numerical simulations and empirical validation, we aim to elucidate the comparative merits and limitations of Abaqus in modeling the complex mechanical behavior of steel cold-formed sections under compressive loading regimes. Through a series of meticulously designed experiments, we scrutinize various aspects of the structural response of steel cold-formed sections, including buckling modes, stress distributions, and load-carrying capacities. We focus particularly on the comparison of buckling load distributions obtained from Abaqus simulations and those derived from conventional analytical methods. By meticulously examining the discrepancies between the two approaches, we seek to shed light on the accuracy and reliability of Abaqus in predicting critical buckling phenomena inherent in steel cold-formed sections.

Keywords: *Cold-formed sections, axial loads, finite element analysis, deformations, local buckling.*



Assessing the Load-Bearing Capacity of Frame Systems and increasing it through the application of FRP Techniques

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This paper presents a reliability study on reinforced concrete (RC) frame system retrofitted by Fiber Reinforced Polymers (FRP) confinement using the Join Method applications. The analyses concrete frame system with columns dimensions, 30/80 cm and beams 30/60 cm, design with details, respectively oriented in class of concrete C 30/37. The testing of the concrete in frame including the columns and beams result with low concrete class C 20/25 compared with design class. In Process of evaluations the structural assessment, this study rigorously examines the geometric implications and their influence on load distribution within the ram system. Through rigorous analytical computations, the effects of bending moments (M), shear forces (V), and axial loads (N) are meticulously evaluated to discern their impact on the structural stability and performance of the ram system. Moreover, the research extends its focus towards evaluating the efficacy of FRP application methods in Improving the load-bearing capacity of the frame system. In scope of the analyses nowadays used the different software, but in this case is applied the HORSE software, the study conducts simulations and analyses to gauge the feasibility and effectiveness of FRP reinforcement techniques. This paper reviews and identifies gaps in knowledge of use the FRP materials in confinement and retrofitting the frame system, focused on joints and applications in new or existing constructions in achieve the targeting values of load bearing capacity.

Keywords: *Load-bearing capacity, Frame system, FRP application, Structural integrity, Bending moments, HORSE Software.*



Comparative Analysis of Displacement in Dual Systems with Shear Walls: Utilizing Finite Element Method, Software, and Approximate Expression

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Structural analysis for buildings in seismic zones involves the consideration of numerous parameters that significantly influence the final values of structural dimensions. Structural analysis has progressed to various professional software platforms, where engineers often may not be aware of the input values and calculated results because of the speed up of the demands. Comparing the calculated values obtained from different software and the finite element analysis with the approximate calculations would be a possibility for assessing the performance of the structure. This paper endeavors to tackle a fundamental challenge in the realm of reinforced concrete structure design: the accurate assessment of displacements within a towering structure standing at a height of 26.6 meters. With a targeted focus on a six-story building (ground plus six levels), this investigation is dedicated to guaranteeing structural robustness and safety amidst a spectrum of dead loads, temporary and seismic loads. To evaluate the structural performance values in this study, the lateral displacement values at the top of the structure obtained from software, finite element analysis, and approximate calculation methods will be compared. For the structure, the design parameters have been incorporated: soil acceleration of 0.25, concrete class C35/45, and reinforcement type B500C. Considering that the most common type of structural system used in seismic zones, especially for taller buildings, is the frame dual system, this is the rationale behind conducting the analysis in this study. The structural analysis of frame system with dual vertical members is focused on the seismic wall contribution to horizontal displacement. This entails using Finite Element Method (FEM) analyses, advanced software simulations, and precise approximate expressions to evaluate the structural performance and identify potential variations across different approaches. This study aims to enhance our understanding of how structures perform by using advanced numerical methods and approximations.

Keywords: *Comparative Analysis, Displacement, Dual Systems, Shear Walls, Finite Element Method, Structural Optimization.*



2D vs 3D Models for the Seismic Response Assessment of Reinforced Concrete Buildings

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Earthquakes are a serious threat to human lives and infrastructure. 6.4 magnitude earthquake that struck Albania in November 2019, where 51 people lost their lives and thousands got injured, is a reminder of the tragic impact that the seismic events have on the community. Proper seismic designing of structures in earthquake-prone countries is very important. Engineers aspire to new designing methods that shorten the time and reduce the amount of work. In this context, this study will focus on assessing the seismic behavior of three low-to-mid-rise reinforced concrete buildings, ranging from 5 to 12 stories. These structures will be represented using three-dimensional (3D) frame elements in ETABS, without incorporating shear walls. Additionally, two-dimensional (2D) models will be generated from the internal frames along two orthogonal directions of the 3D models. Initially, the study will compare displacement demands obtained from linear and nonlinear time history analyses of both 2D and 3D models to explore the reliability of 2D models in reflecting the behavior of their 3D counterparts. In the subsequent part of the investigation, estimates from linear and 2D nonlinear models will be compared with those from 3D nonlinear models to assess the accuracy of linear and 2D nonlinear models in predicting seismic displacements in RC buildings.

Keywords: *Displacement demand, time history analysis, 2D and 3D models, linear analysis, nonlinear analysis.*



Advanced Modeling Techniques in Structural Analysis using Finite Element Method

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This study provides a comprehensive overview of Finite Element Method (FEM), covering fundamental aspects such as concepts, applications, types of elements, and degrees of freedom. The research explores how FEM plays a crucial role in predicting structural behavior, emphasizing its application for robust structural analysis. The study delves into practical examples, including structures featuring 2D and 3D truss elements, 2D and 3D frame elements, shell and plate elements. Additionally, it examines advanced concepts such as Semi Rigid Connections, End Length Offset, Beams and Shells on Elastic Foundation using the well-established Winkler model, and the analysis of Structures on Elastic Foundation with Rectangular Finite Elements using advanced concept of discretizing elastic half space into 2D Soil elements, employing SAP 2000 software. The study also includes a comparative analysis between SAP 2000 output results and solutions obtained through analytical methods. Through this in-depth exploration, the research aims to contribute valuable insights towards optimizing FEM for precise and efficient structural assessments.

Keywords: *Finite Elements, Structural Analysis, Elastic Foundations, Semi Rigid Connections, End Length Offset.*



Optimization of Dimensional Parameters for Structural Elements in Frame Systems

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Reinforced concrete structural systems represent a widely utilized and versatile approach in modern construction, offering a robust and durable framework for a variety of building types and applications. These systems typically consist of reinforced concrete elements such as columns, beams, slabs, and walls, integrated within a cohesive framework to support and distribute loads throughout a structure. The inherent strength and adaptability of reinforced concrete make it an ideal choice for withstanding various forces, including gravity loads, lateral loads (such as wind and seismic forces), and environmental factors. The integration of steel reinforcement within concrete elements enhances their tensile strength, allowing for efficient load transfer and structural stability. In the frame of a reinforced concrete structural system, the design and optimization of dimensional parameters play a critical role in ensuring structural integrity, performance, and efficiency. These parameters include the dimensions of individual structural elements (such as column cross-sections and beam depths), reinforcement detailing, spacing, and arrangement, as well as overall system configuration and layout. Through careful analysis, design, and optimization of dimensional parameters, engineers can achieve an optimal balance between structural strength, durability, and economy, tailored to the specific requirements and constraints of each project. This process involves considering factors such as loading conditions, material properties, construction techniques, and applicable design codes and standards. An essential consideration in determining these dimensions is the ductility class chosen for the structural design. Structures featuring larger cross-sectional dimensions, under similar soil conditions to those with smaller dimensions, have exhibited greater stiffness. Overall, reinforced concrete structural systems offer a reliable and versatile solution for constructing a wide range of buildings and infrastructure, with the optimization of dimensional parameters playing a crucial role in achieving safe, efficient, and cost-effective designs.

Keywords: *Structural frame system, optimization, seismic force, ductility.*



Implementation of Partial Fixities Using Existing Stiffness Equations in Finite Element Models

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Finite Element (FE) models are crucial tools used in solving various complex engineering problems, and their effectiveness often depends on the ability of the model to accommodate different types of end-connections such as releases and partial-fixities. Traditionally, incorporating these features into an FE model demands extra theoretical work during the element creation phase. This study demonstrates that the standard stiffness equations of any FE model, originally designed for rigid connections, can be adapted to include end-releases and partial-fixities without additional complex theoretical work on the element. In this study, a simple three-step matrix-equation modification technique to add and releases and partial-fixities to a finite element model is presented. These steps include isolation of the element from the rest of the system-mesh by introducing new degrees of freedoms (DOFs); introduction of elastic springs to link the isolated element with the rest of the system-mesh again and lastly, re-integration of the element into the system equation by removing the newly added DOFs from the resulting equations. Demonstrated through examples, the application of this method involves only simple matrix operations and is broadly applicable not only to 1D bar-type structures but also to a wider range of elements, including elasticity elements of 2D and 3D types.

Keywords: *Finite elements, Partial-fixities, End-releases, Practical approach, Matrix-equation modification.*



Analysis of vertical structural elements for varying class of ductility in Dual Systems with Shear Walls: Utilizing seismic design standards, specifically Eurocode 8

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The importance of ductility class for seismic structural walls lies in its ability to withstand and absorb seismic forces while maintaining structural integrity and preventing catastrophic failure during earthquakes. Ductility refers to the capacity of a material or structure to deform plastically before failure, which allows it to dissipate energy and reduce seismic damage. The ductility class of a seismic structural wall determines its ability to undergo controlled deformation without collapse, thus enhancing the resilience of the overall structure against seismic events. Choosing an appropriate ductility class is crucial in seismic design to ensure the safety and stability of buildings and infrastructure in earthquake-prone regions. It influences the design parameters, reinforcement detailing, and overall performance of the structural system under seismic loading, as specified by seismic design codes and standards such as Eurocode 8. The paper presents a comprehensive analysis of vertical elements, centering on their response to seismic loading conditions across varying classes of ductility. Ductility serves as a cornerstone in enabling structures to effectively absorb energy during seismic events, thereby reducing the risk of damage and collapse. Also, the commences with an exploration of the significance of ductility in seismic design and its ramifications for the performance of columns and shear walls are explained in the paper. By referencing established seismic design standards such as Eurocode 8, the research outlines the categorization of ductility class and elucidates their importance in structural engineering. The paper conducts a seismic analysis of vertical elements in a tall structure standing 24 meters high (ground plus five levels), considering different class of ductility for specific material properties (Concrete grade of C40/50 and B500C reinforcement) under an assumed ground acceleration of 0.22g. The analysis of the structure was done with Tower software. The research analyzes the performance of columns and shear walls across multiple ductility class, with the goal of improving understanding and design practices for seismic-resistant structures.

Keywords: *Seismic action, ductility class, column, shear walls.*



Potential of Double Skin Façades

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Double facades are an opportunity to improve thermal comfort in modern buildings. These facades, covered with a multiple glass structure, are showing an increase in use, especially in tall buildings. This analysis examines their use and role in sustainable architecture, addressing challenges such as high energy consumption. The methodology of this study uses case studies and descriptive, analytical, and comparative methodologies. The influence and application of double facades in the regulation of internal temperature in buildings is investigated. Technology improvement and current trends are also part of the analysis. In case studies such as Capital Gate in Abu Dhabi and Plaza Hotel in Tirana, the use of double facades is compared. This analysis provides a deeper understanding of the benefits and challenges of this technology in sustainable architecture. Through this study, we become better acquainted with the benefits of double facades, such as their use for energy efficiency and the improvement of interior spaces in modern architecture.

Keywords: *Double Skin Façade, Façade, Energy Efficiency, Ventilation.*



The Debut of Base Isolators in Albania.

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Albania, situated in the Alpine-Mediterranean seismic belt, faces seismic challenges accentuated by its geological and tectonic structure. Despite implementing seismic provisions, historical earthquakes exposed vulnerabilities due to inadequate enforcement. The seismic hazard map aids earthquake-resistant design, illustrating Peak Ground Acceleration for a 475-year return period. The presentation introduces base isolators—a seismic protection method separating structures from foundations. Albania's inaugural use of this technology in Tirana exemplifies an irregular plan shape with a dual system reinforced concrete structure. Initially designed as a fixed base, it transitioned to isolation, marking a pioneering example in the country. Exploring two isolator types, elastomeric bearings and frictional pendulum bearings, reveals their unique mechanisms. Elastomeric bearings use rubber-like materials for flexibility, while frictional pendulum bearings employ sliding surfaces and pendulum mechanisms for controlled rocking. The study case, Albania's first base-isolated building, falls within the category of residential and service-oriented civil constructions. The load-bearing structure comprises a dual-system reinforced concrete skeleton, featuring two basement levels for car parking, two above-ground floors for service spaces, and 6-7 subsequent residential floors. This application highlights seismic resilience and innovation in Albania's structural engineering, considering essential parameters in isolator selection. Load calculations adhere to European standards, considering dead loads, live loads, and seismic masses. The presentation concludes by showcasing tables and diagrams illustrating vibration modes, displacements, inertial forces, and moment distributions on fixed and isolated bases. These visuals highlight the practical benefits of base isolators, contributing to increased seismic resilience and safety in Albanian constructions.

Keywords: *Seismic Innovation, Base Isolation, Resilient Albania, Tirana Case Study, Structural Safety, Earthquake Protection.*



An analysis of (group and individual) Tensioning Techniques in Post Tensioned Concrete, Mechanical Insights and Practical Implications

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This paper has to do with tensioning techniques in post tension concrete focusing on a 30- meter long prestressed/post tensioned beam as a subject. Grouped cable tensioning and/or individual cable tensioning are also discussed. Comparison of the simultaneous force application in a group of prestressing cables vs one by one, or individual sequential tensioning of post tension tendons is also a subject of this paper. The study investigates the mechanical behavior, structural performance, and practical implications of these two tensioning methods. An attempt has been made to examine the load distribution, stress concentrations, and the construction efficiency aiming to explain the advantages and limitations of the hereby-mentioned techniques. Data on hand, whether empirically or theoretically derived, or other that are found out of practical applications are also used to provide an insight to the operational performance of methodologies. Some of the findings reveal distinct differences between group and individual tensioning. Group tensioning may be considered to have shown some superior load distribution characteristics, resulting in more uniform stress propagation along the beam. On the other hand, individual tensioning provides perhaps a better control over the tendon placement and tensioning sequence, minimizing the risk of tendon damage during the construction phase.

Keywords: *Prestressed concrete, collective tensioning, individual tensioning, structural engineering, load distribution.*



Comparative Assessment of Glulam Design Methodologies: Finite Element Analysis, Software Tools, and Approximate Formulations

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This paper presents an extensive comparative analysis of design methodologies for glulam structures, encompassing Finite Element Analysis (FEA), specialized software applications, and simplified analytical formulations. Glued laminated timber (glulam) constructions have surged in popularity due to their sustainability and structural efficacy. The Finite Element Method (FEM) offers a detailed and versatile approach, allowing for intricate modeling of glulam structures and comprehensive analysis of their behavior under various loading conditions. However, its implementation requires substantial computational resources and specialized expertise. Conversely, specialized software tools provide a more user-friendly and streamlined approach to glulam design, offering pre-defined templates and automated processes for structural analysis and optimization. While these tools may sacrifice some level of flexibility and precision compared to FEM, they offer significant advantages in terms of efficiency and ease of use. Additionally, approximate analytical formulations offer a simplified yet expedient means of estimating key design parameters for glulam structures. These expressions, often derived from empirical relationships or design codes, provide quick estimations of structural capacities and member sizes, making them particularly useful for preliminary design stages or rapid assessments. Through a series of case studies and comparisons, this study aims to elucidate the strengths and weaknesses of each design methodology, providing engineers and designers with valuable insights to guide their decision-making process. By understanding the trade-offs inherent in each approach, practitioners can make informed choices to achieve optimal and efficient glulam structure designs.

Keywords: *Glued laminated timber (glulam), Structural design, Comparative analysis, Finite Element Method (FEM).*



Membrane and Bending Behavior of Plates and Shells using FEM approach focusing on Form Finding Concept

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This research focuses on the membrane and bending behavior of plates and shells, employing a Finite Element Method (FEM) approach with a primary focus on the Form Finding concept. The study begins by presenting general information about shells, encompassing their fundamental characteristics, geometrical considerations, and the exploration of diverse shapes in shell structures, providing insights into their behavior. Another aspect of this study is the Concept of Form Finding, where the exploration of shapes and structural configurations takes center stage. The application of Form Finding in the context of FEM is explored, emphasizing its significance in optimizing the structural performance of shell structures. Furthermore, it discussed distribution of forces on shell structures, employing both analytical and numerical methods using SAP2000 software under various loading conditions. In essence, this research provides a holistic exploration of membrane and bending behavior in plates and shells, emphasizing the Form Finding concept. The integration of analytical and numerical methods, particularly with SAP2000, enhances the understanding of force distribution, contributing valuable insights to the optimization of shell structures in practical applications.

Keywords: *Finite Elements, Membrane Behavior, Bending Behavior, Form Finding, Shell Structures.*



Influence of Moisture Content on Physical and Mechanical Properties of Wood in Constructions

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Since wood is a highly hygroscopic material, most of its properties are considerably influenced by the moisture content. The purpose of the project work is how a wood of the same size but with changes in the percentage of moisture behaves to physical and mechanical actions, as well as how it should be used in constructions. The examinations were done on standard samples of wood with higher humidity compared to those with lower humidity with tests that are focused in compressive parallel to grain and perpendicular to grain, flexural tests. The results showed that wood with a higher percentage of moisture gives significantly lower resistance values during the action of forces than those with a lower percentage of moisture, in any type of wood. Moisture after cutting wood does not have any positive effect on its use in construction, moisture significantly reduces the load-bearing capacity of wood, therefore it is attempted to remove as much moisture as possible through the process of drying it and to protect it after is put to work as a structural material.

Keywords: *Moisture content, wood, mechanical properties, physical properties, tests, resistance.*



AutoCAD Scripting for Efficient Spatial Design and Drafting

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This study aims to extend an automated computational design process by bridging the gap between initial spatial planning and detailed CAD drafting. Building on a foundation that merges computational algorithms with human-centric inputs to generate spatial layouts, this research will introduce a novel approach to transform Graphical User Interface (GUI) generated layouts into precise CAD drawings through AutoCAD scripting. This progression tackles the prevalent challenge architects encounter in moving from conceptual visualization to detailed drafting phases. The developed AutoCAD scripts are designed to translate GUI outputs into CAD drawings that meet architectural drawing standards. This automation significantly enhances the architectural design workflow by allowing architects and users to effortlessly export and download ready-to-use CAD drawings directly from the GUI-based interface, thereby eliminating manual drafting errors and saving substantial time. The seamless integration of computational design tools with CAD drafting underscores the potential of technology to foster a dynamic, participatory feedback loop between designers and stakeholders, including non-designers. This ensures that the design process is more inclusive, collaborative, and responsive to user needs. By facilitating a smoother transition from conceptualization to detailed implementation, this research will provide a tangible solution to the demand for efficient and rapid design workflows, especially critical under stringent time constraints. This study not only will close a significant gap between computational design and CAD drafting but will also mark a major leap forward in the realm of automated design processes within architecture. It will enhance both accessibility and usability for a broad spectrum of users, from professional designers to enthusiasts, thereby democratizing architectural design and encouraging broader participation in the design process.

Keywords: *AutoCAD Scripting, Automated Design Process, Workflow Optimization, Python.*



Practical deformation determination of slim floor constructions with the total cross-section method

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The aim of this master's thesis is to develop an analytical calculation model for the practical determination of the deformation of slim floor beams using an FEM-Software and hand calculations. Slim floor beams, also known as composite flat slab beams, are one of the three design variants of composite beams. In contrast to the normal height composite beams, the steel section of a Slim Floor beam is integrated into the concrete slab. Due to their shallow height, the cross-section cracks even under low loads. This early cracking of the concrete slab leads to a loss of stiffness, which has a very strong effect on the deformation and load-bearing behavior of the composite beam. There are currently no normative regulations explicitly for Slim-Floor beams. The design regulations from DIN EN 1994-1-1 can only be applied to a limited extent. Thus, the SlimAPP research project was carried out by the University of Bradford in cooperation with the University of Stuttgart to investigate the load-bearing behavior of slim-floor beams. It aimed to research the load-bearing behavior of a total of 17 single-span beams, including eight shear beams and nine flexural beams with different composite materials and degrees of anchoring. These tests were used as a reference point to develop the analytical calculation model for the evaluation of the behavior of Slim Floor beams in the Serviceability Limit State. The focus of the calculation model was based on the reduction of the beam stiffness due to cracking in the concrete slab. The reduction in stiffness was taken into consideration by introducing a reduction factor " α_c ", which took into account the influencing factors of the concrete and the shear connectors. Using the mathematical software MATLAB and Microsoft Excel, several empirical parameters were varied until the best possible representation of the load-bearing behavior according to the SlimAPP tests was achieved. The linear-elastic approach developed is combined with the total cross-section method to calculate the effective stiffness, which replaces the beam stiffness over the entire length.

Keywords: *Slim Floor Beams, Deformations, SLS, SlimAPP, Total Cross Section Method.*



Construction Technology and Management





Comparative Cost Analysis of Warehouse Construction Using Different Structural Materials

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This abstract presents a scholarly examination of the cost considerations inherent in the construction of warehouses utilizing distinct structural materials, including steel, cold-formed steel, wood, and concrete. The analysis encompasses a comprehensive assessment of various factors influencing overall expenditure, such as material procurement expenses, labor costs, site preparation requisites, and the anticipated expenditures associated with long-term maintenance. Steel-based structures, renowned for their commendable strength-to-weight ratios and expeditious construction timelines, may incur elevated initial material outlays. Conversely, cold-formed steel offers comparable advantages to conventional steel frameworks but potentially at diminished costs due to its streamlined manufacturing procedures. Wood-based construction emerges as a compelling cost-effective alternative, characterized by the ubiquity of its constituent materials and simplified construction methodologies, notwithstanding the possibility of heightened maintenance demands. Concrete structures, renowned for their durability and longevity, often necessitate protracted construction durations and sizable initial investments. This academic inquiry engages in a systematic comparative analysis of these disparate materials, thus furnishing invaluable insights into the optimal selection for warehouse construction, contingent upon the specific exigencies of the project and prevailing budgetary constraints.

Keywords: *Warehouse construction, structural materials, cost analysis, steel, cold-formed steel, concrete.*



The silent struggle of mental, physical and emotional health in the construction industry

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The construction industry plays a crucial role in the development and functioning of societies. Based on this, it faces a variety of challenges, which can be attributed to a combination of internal and external factors. One of these factors, which often is not paid attention to, is related to health issues. While focusing on getting the work done, physical and mental wellness is left behind. As we all know, working in a dynamic environment such as construction, is physically demanding. Safety risks, long hours or weather conditions leave their mark on workers' well-being. In Albania, workers face a heightened risk of injuries daily, primarily attributed to inadequate safety management practices at their workplaces. Despite meticulous documentation of each accident, minimal actions with limited effectiveness are undertaken to enhance the safety of the workers. This paper aims to identify the risks faced, their consequences and strategies or recommendations to improve this situation. To achieve the objectives of this study, a survey was developed and distributed among workers and employees. The collected data was analyzed, and the results were used to enhance health and safety of workers.

Building itself is undoubtedly challenging, but do not health and happiness pose an even greater challenge? Setting the stigma aside, can we attribute these health issues to a lack of awareness or limited access to opportunities?

Keywords: *Health and safety, Workers, Statistics, Challenges, Construction Industry, Well-Being.*



From Drafting Tables to Digital Models: The Revolution of Civil Engineering in Albania

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This research paper presents a comprehensive comparative analysis of building projects pre and post the adoption of Building Information Modeling (BIM) in Albania. The study aims to shed light on the transformative impacts of BIM on architecture, engineering, and construction processes by examining a diverse range of buildings. Through rigorous evaluation of efficiency, accuracy, and overall effectiveness, this research compares BIM against traditional methods prevalent in design and construction phases. Moreover, a survey among 100 Albanian engineers is conducted to gauge their proficiency in various BIM software packages. The objectives of this study include identifying and analyzing differences in project outcomes, efficiency, and design quality between traditionally designed buildings and those leveraging BIM. Additionally, the research evaluates the advantages of BIM in project management, stakeholder collaboration, and sustainable design practices. Furthermore, potential disadvantages or challenges associated with BIM implementation are identified, including barriers to adoption, and learning curves. This paper contributes to the growing body of knowledge on BIM's impact on the built environment and offers insights for practitioners, policymakers, and educators seeking to optimize building project workflows in Albania and beyond.

Keywords: *Building Information Modeling (BIM), Construction Efficiency, Design Accuracy, BIM Adoption Challenges, Sustainable Design Practices.*



Concrete Saving New Technology U-BOOT SLABS

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Buildings are composed of various structure elements such as footings, columns, beams, slabs, and walls. Each of these structural members play a certain role against loads in a structure. Slab is an important structural element and requires a large amount of concrete. For this reason, we want to reduce weight without affecting the slab function. The U-BOOT Technology is the ideal solution to create a large span slab and to accommodate heavy loads. This technology provides a reduced quantity of concrete and steel. U-BOOT is a recycled polypropylene formwork technology used for construction purposes, which means it is environmentally green and economic. In Albania, this technology was used for the first time in residential villas located in Mullet, Tirana. After this successful application, U-BOOT will be an important part of construction in Albania.

Keywords: *U-BOOT, Construction, Slab, Concrete, Load, Economic.*



Time Programming and Cost Control in Construction Projects

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In the dynamic field of construction project management, the interplay between time programming and cost control is of paramount importance. Time programming, a systematic approach to scheduling tasks and activities, often visualized through tools such as Gantt charts, serves as the backbone of project execution. It provides a clear roadmap for the project, facilitating efficient resource allocation and timely completion of tasks. On the other hand, cost control is a strategic process that involves monitoring, analyzing, and adjusting project costs to prevent budget overruns and ensure financial viability. The correlation between time and cost, often referred to as the time-cost trade-off, is a fundamental concept in project management. It suggests that any change in the project's timeline will have a direct impact on the project's cost and vice versa. This paper examines the intricate relationship between time programming and cost control in construction projects. It explores how effective time programming can aid in cost control by ensuring efficient resource utilization and preventing costly delays. Vice versa, also discusses how diligent cost control can inform time programming, leading to more accurate and realistic schedules. The paper draws on recent research and case studies to illustrate these concepts, providing valuable insights for construction project managers, stakeholders, and researchers.

Keywords: *Project Management, Timely Completion, Monitoring Cost, Resource Allocation, Realistic Schedules, Financial Viability.*





Construction Materials





Rheological Characterization of Different Clay Minerals for Sustainable Pourable Clay Concrete

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Cement production contributes around 6% to 10 % of global CO₂ emissions, fueling the exploration of alternatives with lower environmental footprints. This study focuses on revitalizing an age-old building material, clay, due to its minimal environmental impact and positive attributes such as practically infinite recyclability and favorable hygro-thermal behavior. However, different challenges are faced when working with clay, particularly the physically demanding, labor-intensive nature of raw earth construction, predominantly seen in regions with low-cost labor, notably developing countries. To make clay as versatile as traditional cement-based concrete, it must be pourable. Additionally, the diverse behavior of clay, influenced by its origin and mineral composition, significantly impacts pourability, water absorption, and consequently, the drying behavior. This complex relationship highlights the importance of fully understanding its rheological properties, especially with the method of small amplitude oscillatory shear (SAOS), to investigate the nature of interactions (short range or long range colloidal) of each clay mineral or clay mix. To address these challenges, this study investigates locally sourced clays with varying chemical and mineralogical compositions, focusing on tailoring the fresh properties of pourable clay concrete. Firstly, mini-cone spread tests have been conducted to define the water demand of the different clay minerals for a range of water-to-solid ratios (w/s) for which a workable and stable paste is obtained. Then, the results were correlated with their chemical composition as well as their particle size distribution. Secondly, the same clay minerals at different w/s were investigated with small oscillatory rheological tests. This approach enables rapid assessment of clay paste performances within the initial hours, supporting the selection of promising compositions for subsequent mechanical evaluations in the solid state.

Keywords: *Clay, Basalt Fibers, Concrete, Rheology.*



Experimental Analysis of Partial Replacement of Cement with Glass Powder in Concrete and Impacts on Structural and Environmental Aspects

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This paper delves into the dynamic interplay between structural integrity and environmental sustainability by investigating the effects of partially replacing cement with recycled glass powder in concrete formulations. The study employs a comprehensive laboratory experimentation approach, systematically evaluating various mechanical, durability, and microstructural aspects of concrete mixtures incorporating different proportions of cement replaced by finely ground recycled glass powder. The experiment involving the partial replacement of cement with glass powder in concrete is conducted in a controlled laboratory setting. Initially, concrete mixtures are prepared with varying proportions of glass powder substituted for cement. Subsequently, the concrete samples undergo a series of tests, such as compressive strength, to evaluate their mechanical properties. The data collected from these tests is analyzed to assess the impact of incorporating recycled glass powder on the performance of the concrete. This systematic approach allows for a detailed examination of the experimental variables and their effects on the overall behavior of the concrete mixtures. Through meticulous analysis, the research aims to provide a deeper understanding of how these alternative mixtures perform under different loading conditions, shedding light on their structural viability in construction applications. Beyond structural considerations, this study delves into the environmental implications of incorporating recycled glass in concrete. A comprehensive lifecycle analysis is conducted to quantify the environmental benefits, including reduced carbon emissions and a diminished reliance on traditional cement production. The findings from this study hold significant implications for the construction engineering community, offering a nuanced perspective on the potential of recycled glass powder as a sustainable alternative to traditional cement. This research aims to empower decision-makers in the construction industry to make informed choices that align with the principles of circular economy and sustainable development.

Keywords: *Glass Powder, Concrete Mixtures, Laboratory Investigation, Structural Integrity, Eco-Concrete, Environmental Impact.*



Alkali Silica Reaction and its Impact on the Durability of Concrete

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In this paper, we will be presenting the influence of the Alkali-Silica Reaction (ASR) phenomenon on the durability of concrete. In concrete, the alkali-silica reaction (ASR) is the result of a reaction between some silicious aggregate elements and the hydroxides of potassium and sodium that are generated when Portland cement hydrates. The result is a gelatinous substance that absorbs pore fluid, and by doing this, the concrete expands and experiences internal tension. Concerns about the safety of ASR-damaged reinforced concrete structures have driven the demand for studying the effects of ASR on residual load capacity of the deteriorated structure. ASR causes severe damages that manifest as extensive expansion, cracking, aggregate pop-out, gel exudation, and harmful white deposits on the concrete surfaces. There is a continuous need to review ASR mechanisms due to the associated complex sequential reactions, severe effects on concrete life span, and the inconsistencies of evaluation techniques. Furthermore, recent problems and research continue to abound in ASR. Therefore, this study provides an explicit explanation of the ASR mechanism and its numerous effects on civil infrastructure, such as highway pavement and bridges. A full description of the test procedures used to determine aggregate susceptibility to ASR is also discussed, including results from recent publications. The focus is on determining the mechanisms and factors influencing the speed and intensity of the ASR reaction, including the analysis of the chemical characteristics of concrete constituent materials. Additionally, possible ways to prevent or manage the detrimental effects of ASR are explored. The results of this research provide a profound understanding of the impact of ASR on concrete performance, identify potential challenges, and propose innovative solutions and measures to avoid this phenomenon.

Keywords: *Alkali-Silica Reaction (ASR), silicates, alkali solutions, alkali-silica gel.*



Physical and Chemical Characterization on Durability of Basalt Fibers

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Extensive research has been conducted on alternative binders due to the significant carbon emissions produced during the production of conventional Portland cement. Textiles made of basalt fibers emerge as a superior choice over other reinforcements, not only for their exceptional strength, corrosion resistance and durability but also for their environmentally friendly attributes, contributing to sustainable construction practices. Employing them as non-impregnated (dry) basalt yarns can offer environmental benefits, but it presents challenges from chemical and physical perspectives. These textiles are often impregnated with a polymeric matrix to enhance their performance. It is conducted as part of a multidisciplinary project named BasaltClayCrete, which aims to develop an accessible basalt-reinforced clay building material that will not be a one-to-one substitute to cement-based concrete but is tailored for low to moderate performance levels while focusing on lower environmental impact. Dry basalt fibers are thus prioritized, even though the polymeric layer of impregnated yarns provides protection for the fibers from chemical aggression. The durability of dry basalt fibers is therefore investigated over one month, by immersing them in solutions with different pH levels: tap water, kaolinite filtrated solution, and OPC filtrated solution with the starting pH of 7, 7.7, and 12.7, respectively. The damage progression is determined by the mass loss over time and measured uniaxial tensile strength of yarns. While some sources claim a good resistance against alkaline attack, others report a complete degradation of the fibers over a short period of time. It was observed that the corrosion of basalt fibers in alkaline solutions is a continuous and cyclic process, which is dependent on the chemical composition of the fibers itself. Pristine fibers have pre-existing defects that originate from the filament spinning process that hampers strength and durability further. The results of this study indicate that the yarns immersed in kaolinite filtrated solution had the highest strength retention rate.

Keywords: *Basalt Fibers; Clay; Concrete; Durability; Reinforcement.*



Understanding the eight-channel isothermal calorimeter and its outcomes

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An isothermal calorimeter is typically used to measure the heat production associated with cement hydration on a sample maintained at a constant temperature. The produced heat is considered proportional to the reaction rate between unhydrated cement and water. Therefore, the degree of hydration of a cement paste can be precisely tracked as a function of time. In this study, we first aimed to understand the limitations of the instrument, mainly in terms of isothermal conditions. We focused on the isothermal assumption by studying the effects of heat capacity and initial temperature differences of the reference and studied samples, that play a role at early time. Next, cement pastes were tested. Both in-situ and external mixing protocols were adopted, and heat flow measurements were monitored for cement pastes prepared at initial water-to-cement mass ratios (w/c) of 0.35, 0.40, 0.42, 0.45, and 0.55. The first peak appeared immediately after the cement was mixed with water. The second peak appeared at about 6 to 9 hours. The initial water-to-cement mass ratio influenced the time of the second value of peak heat flow. At w/c=0.35, the time was shorter than that at w/c=0.55. Finally, we recommend a protocol that reduces the influence of thermal disturbances, including guidance for sample loading and heat capacity matching.

Keywords: *Iso-thermal calorimetry, cement hydration, thermal process, heat capacity.*



Spherical balls settling through a quiescent cement paste.

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Fresh cement pastes are complex suspensions of micron-size cement particles (ground clinker) and nano-size C-S-H particles that result from a dissolution-precipitation process. They exhibit colloidal behavior due to interactions between charged particles through an interstitial solution of high ionic strength, giving rise to a macroscopic yield stress, that increases with time at rest. Upon flow, this multiscale network is broken down (fluidized). In this study, we investigate the evolving rheology properties of a cement paste in quiescent conditions by measuring the velocity of metallic balls settling in the paste using high speed X-ray CT imaging (TESCAN UniTOM XL). Once the cement is mixed with water, it is allowed to rest to develop the yields stress for a given amount of time in a cylinder of diameter 7 cm. We look at the influence of resting time on the velocity of steel balls falling through it. We vary the parameters of rest time, ball size (diameter 5 and 10 mm), ball weight and time interval between two successive ball drops. In parallel, an extensive rheological characterization of the paste, capturing the rheological properties “at rest” and under flow, focusing on the effect of time and shear history, is performed. Compiled results are then compared with literature of non-aging and aging yield stress fluids.

Keywords: *Cement paste, falling ball, rheology, high speed CT scan, ageing and yield stress.*



Characterization of Restrained Shrinkage in UHPC-NC Composites Using a Distributed Fiber Optic Sensing System

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Thin-bonded ultra-high-performance concrete (UHPC) overlays offer a protective layer to extend the service life of civil infrastructures, such as bridge decks and road pavements. In the outlined applications, a sloped overlay is commonly required to facilitate the drainage of the surface water and mitigate the risk of vehicles skidding, especially in curves. The restrained shrinkage in bonded concrete systems, however, can cause stresses that eventually lead to overlay surface cracks and interface debonding failures. While a transition from NC to UHPC overlays has helped address several performance issues in bonded concrete composites, questions regarding the characteristic of restrained shrinkage in sloped UHPC-NC composites remain. For this purpose, non-proprietary UHPC mixtures with specified rheological and mechanical properties were developed, enabling casting slopes up to 20%. The experimental tests systematically covered the effects of key overlay properties, including geometric details (e.g., thickness and slope) and mixture characteristics (e.g., fiber inclusion and binder alternatives). A set of UHPC-NC specimens were cast with the overall dimensions of 180×75×15 cm³ and slopes up to 8%. Integrated distributed fiber optic sensors (DFOS) have been employed to monitor the progressive deformations inside the bonded UHPC overlays. The collected data provided firsthand information on the magnitude and spatial distribution of restrained shrinkage in the sloped UHPC-NC composites over time. By addressing the potential early-age shrinkage issues, this study's outcome is expected to help maximize the benefits of thin-bonded UHPC overlays.

Keywords: *Ultra-high-performance concrete, layered composites, restrained shrinkage, distributed fiber optic sensing system.*



Improvement of the properties of concrete with fibers' addition

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Concrete is among the most widely used building materials, with its excellent physical and mechanical properties. Part of its disadvantages are its low tensile strength, cracks that appear throughout the lifespan. Cracked concrete is a problem due to several factors, such as poor maintenance, insufficient reinforcement, or steel corrosion leading to crack propagation. There is a need to increase the load-bearing capacity of concrete slabs and increase their life span. The use of different fibers, in this case polypropylene fibers in concrete can help in the improvement of the properties such as tensile strength and crack propagation, including the failure and durability of concrete elements in a structure. In the scope of the optimization of fibers percentage in concrete mixture, we will be using different percentages to achieve successful results regarding the improvement of concrete properties. In this paper the focus will be oriented in flexural strength using prismatic concrete samples, and preliminary investigations in compressive strength, where fibers will show no effect at all. With a certain number of polypropylene fibers, we will have reached higher values of tensile strength, leading to the proper fiber percentage which will eventually be recommended in the improvement of the properties and durability of concrete.

Keywords: *Fibers, tensile strength, optimizations, mix design, polypropylene.*



Design Requirements and Applications when Considering Structural Strengthening with FRP Composites

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Sika Corporation

Fiber Reinforced Polymers (FRP's) have become a viable and accepted means of upgrading, strengthening, and rehabilitating structures throughout the world. Typical applications include external reinforcement, seismic upgrades, change in use, building alterations and innovative anchoring techniques. This presentation will discuss why structures need to be strengthened, design considerations, along with available industry guidelines, highlight FRP materials that are used for structural strengthening, and fire protection considerations.

Keywords: *Structural strengthening, FRP, externally bonded reinforcement, bridge strengthening, FRP design guidelines.*



Workability Assessment Methods in Beltic Calcium Sulfoaluminate Concrete Mixtures

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Beltic Calcium Sulfoaluminate (BCSA) cement has emerged as a compelling substitute for traditional Portland cement owing to its distinctive characteristics and environmental benefits. This review offers an extensive examination of BCSA cement, encompassing its synthesis, attributes, and diverse applications. The discussion delves into the synthesis methodologies, encompassing factors such as raw material selection, processing conditions, and hydration mechanisms, which significantly influence its performance. Notably, the mineralogical composition of BCSA cement, dominated by belite, ye'elite, and gypsum phases, facilitates rapid setting and early strength development, distinguishing it from conventional alternatives. Furthermore, BCSA cement showcases remarkable resistance against sulfate attack, rendering it suitable for use in hostile environments. The versatility of BCSA cement is underscored through its varied applications, spanning from concrete production to repair materials and specialty grouts, all of which contribute to sustainable construction practices. Additionally, the environmental advantages, including reduced carbon footprint and energy consumption compared to Portland cement, highlight its potential in mitigating ecological impacts. Despite its promising attributes, challenges such as limited raw material availability and potential durability concerns necessitate further research and development endeavors. In conclusion, this review accentuates the pivotal role of BCSA cement as a viable alternative in fostering the advancement of sustainable and resilient construction materials.

Keywords: *Beltic calcium sulfoaluminate (BCSA), applications, synthesis methods, rapid setting, sustainable construction, durability issues.*



Impact of Aging and Storage on Wood Chips for Cement Binding Particle Boards: Exploring Hydration Kinetics of Cement

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In this study, the impact of ageing and storage conditions on wood chips used in the production of cement-bonded particleboard is investigated. In particular, the focus is on the impact on the mechanical properties of cement-bonded particleboard, i.e., flexural strength and hydration kinetics of the cement. Cement particle boards are produced in lab conditions by mixing wood chips with water, accelerators, and cement. They are then pressed and cured in an oven at 40 °C for 4 hours. To further investigate the impact of wood extractives on cement hydration, wood chips are immersed for 4 hours in a solution with a pH value of 12.5. Subsequently, the liquid (water and wood extractives) is collected by pressing the mixture. Once extracted, the liquid is mixed with cement and placed in an isothermal calorimeter. The kinetics of cement hydration can then be studied from the heat generation as a function of time. Furthermore, the effects of accelerators, namely sodium silicate and calcium chloride, on the cement-bonded particleboards and the hydration kinetics of the cement are investigated. Ultimately, this study contributes to a better understanding of the complex relationships between the materials used in cementitious particleboard, focusing on the effects of wood sugars on the mechanical properties and hydration kinetics of cement mixtures.

Keywords: *Cement-bonded particleboards, mechanical properties, wood chips, hydration kinetics of cement.*





Geotechnical Engineering





Enhancing Dam Protection and Stability through Optimized Construction Material Selection in Geotechnical Context.

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The meticulous analysis and selection of construction materials play a pivotal role in safeguarding the longevity and safety of dams within geotechnical frameworks. This research delves into the geotechnical intricacies surrounding dam construction, aiming to recommend optimal materials that bolster both protection and stability. By conducting a thorough examination of site-specific conditions encompassing soil attributes, groundwater levels, and erosion potential, this study discerns the prerequisites for ensuring dam integrity. A range of construction materials, such as concrete, rockfill, geomembranes, and geotextiles, undergo scrutiny to ascertain their efficacy in combatting erosion, curbing seepage, and upholding structural robustness. The methodology entails a comparative evaluation of mechanical properties, durability, and environmental ramifications across different materials, considering factors like cost efficiency and sustainability. Furthermore, the study integrates risk assessment methodologies to pinpoint potential failure modes and optimize material selection for bolstered dam performance. These insights gleaned from the research shed light on tailoring construction material choices to the unique geotechnical demands of dam projects. By amalgamating engineering principles with environmental considerations, this study contributes to the development of resilient dam structures that adhere to safety standards while minimizing ecological footprints.

Keywords: *Dams, Geotechnical frameworks, Construction materials, Geotechnical demands, Environmental impact.*



A case study or probabilistic laboratory of soil liquefaction

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Soil liquefaction is a major problem for structures built onto sandy soils. The probability of liquefaction is evaluated in those cases when these types of soils lie below the level of underground water. In our country this phenomenon is mostly present in the western part of Albania, especially in the areas along the coastline of the Adriatic Sea, mainly composed of soils with low plasticity such as dust, sandy dust or sand. The purpose of this research is the probabilistic assessment of soil liquefaction in the coastal area of Akarnia, Vlora. Probabilistic and deterministic liquefaction assessment procedures were used to define whether this phenomenon occurs or not. The evaluation of the probability of liquefaction was carried out according to the method of JUANG et alii (2002). This method determines the evaluation probability as a function of the safety factor, which is defined as the ratio of the coefficient of cyclic resistance (CRR) at a given depth to the coefficient of cyclic stresses (CSR) induced by the earthquake at this depth for an earthquake case. The evaluation of the safety factor according to the method of NCEER (1998), is based on the data obtained from the CPTU test. The liquefaction potential evaluation combined according to the two methods that evaluates SF and PL gives us a much more accurate information for the evaluation of this phenomenon in our study area and shows that this phenomenon should obviously be taken into consideration for the design of different structures.

Keywords: *Soil liquefaction, safety factor, probabilistic liquefaction, cyclic stresses, cyclic resistance, CPT.*



Comparison Between Static Cone Penetration Test and Borehole

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The purpose of field work is to know the nature of the soils, their physico-mechanical properties, layers, and parameters, as well as groundwater conditions. Advancement in technology gives the opportunity to investigate the underground by various site explorations, two of which are: Static Cone Penetration Test (CPT) and Borehole. The Static Cone Penetration Test is an extremely efficient method for extracting the layers and parameters of the soils taken into consideration. This test gives us a quick and continuous profile as well as reliable data. The theoretical bases built on this test are numerous and the interpretation is fast and accurate. Underground investigation and characterization through Boreholes are a process of drilling, logging and taking samples (carrots) which are tested in the laboratory in order to gather geological data. Site exploration through Static Cone Penetration Test and Borehole gives general characteristics of the site, which we can use to estimate bearing capacity, settlement, liquefaction etc. A comparison is made between CPT and BH to show the differences in performance of each test and the accuracy of the results derived from them.

Keywords: *CPT, Borehole (BH), bearing capacity, settlement, comparison.*



General limit equilibrium analysis in 2d and 3d of a large landslide in Italian Alps

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This scientific research describes the study of an extremely slow, active, continuous, and submerged landslide in the Isarco Valley, Eastern Alps, Italy. The slide interacts with the viaducts on the E45 motorway. Due to the special importance of the highway, due to the fact that it connected two neighboring countries, Italy-Austria, partners in the economy and in many other fields, it turned out to be uneconomical to move the railway and the highway and this project was entrusted to the University of Trento, with the aim of studying and solving the problem of the landslide which damaged the piles of the bridges on this slope. Extensive multi-method field investigation, surface and subsurface displacement monitoring and limit equilibrium analyses were adopted to fully characterize the slope dynamics. To overcome the limitations due to systematic errors affecting every single monitoring system and analysis method, a solution based on additional and coherent tests was presented to check the reliability of data and results. In this framework, the geological and geotechnical models on the investigated slopes were progressively refined. This allowed the evaluation of the type of interaction between the slope and the highway viaducts. In this scientific research, the laboratory data of drillings carried out in 2023 were compared with those carried out in 2010 to evaluate the shear resistance of the soil. Then, by means of inclinometric, stratigraphic, geomorphological and piezometric data, the pore water pressure was constructed, and the sliding surface was hypothesized. In the following, slope stability calculations were performed to determine the factor of safety in the RocScience program, in two- and three-dimensional analyses.

Keywords: *Viaducts, railway, highway, geological & geotechnical models, water pressure, two & three-dimensional analyses.*



Evidence of soil liquefaction and impacts on infrastructure following the 2019 earthquake in Albania: A case study in Durres and Lalëzi bays.

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The 26 November 2019 earthquake of magnitude 6.3 with epicenter in Lalëzi Bay, Albania, caused significant structural damage in Durres, Vore, Thumane, Shijak and Tirana. A thorough investigation conducted from November 26 to December 5, 2019, covered Durres, and Lalëzi Bays, covering an area of about 75 km². Field surveys focused on mapping liquefaction evidence to understand spatial distribution and collect data for further analysis, including geotechnical boreholes and Cone Penetration Testing (CPTU). Notable manifestations of liquefaction were observed in Juba, Rrushkulli, and Hamallaj areas, consisting in line-arranged sand boils, lateral spreading cracks, differentiated settlements, and road pavement deformations. Additionally, a continuous coring borehole, accompanied by Standard Penetration Tests (SPT), provided insights into soil profiles and liquefaction occurrences. Comparative analyses of grain size distributions and mineralogical compositions confirmed liquefaction occurrences within the studied soil column. This study offers valuable insights into the geological characteristics and stress history of liquefied soils, emphasizing the widespread implications of the seismic event on infrastructure and environmental stability.

Keywords: *Soil liquefaction, earthquake, infrastructure, Durres, Albania.*



Compaction of Cohesive and Granular Soils

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Compaction is one of the main processes of Geotechnical Engineering that aims to improve the engineering properties of soils for various construction applications. This abstract presents an examination of cohesive and granular soils, soil compaction has been tried to be explained by the Proctor test. We have achieved suitable results with increased properties such as shear strength and density, considering the different water content for two soil categories (cohesive and granular soils). We conclude that compaction increases the bearing capacity of the soil and reduce its settlements. Also, we have found that two soil categories behave differently during their compaction, because of their inner structure.

Keywords: *Soil compaction, cohesive soils, granular soils, Proctor test.*



Structural and earthquake engineering

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Structural and Earthquake Engineering focuses on the analysis, design, construction of structures resilient to earthquakes and safe constructions for human use in earthquake scenarios. Engineering methods include seismic analysis, modeling, and simulating the behavior of structures under earthquake actions. Sophisticated numerical and scientific techniques are used to understand how structures will be affected by earthquakes and to develop appropriate designs. Our research includes the development of resilient structures, minimization of damage in earthquakes, improvement of construction safety, laboratory, and field testing to verify the behavior of structures under earthquake stress. Structural Engineering and earthquakes are complex challenges that require deep scientific knowledge and advanced technology to ensure resilient and safe constructions for citizens and infrastructure. Conclusions from research in this field help to improve construction practices and prepare for future earthquakes.

Keywords: *Seismic, safety, resilient, improvement.*



The importance of engineering measures for the prevention of landslides caused by human activity in the area of Cfaka, Gjirokaster

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The city of Gjirokastra lies on rugged terrain, thus giving the city a dynamic character. The diversity of the relief has caused, from the compositional point of view, the neighborhoods to stand as separate units and the problems with the stability of the slopes are very widespread. The causes related to slope failure can be natural or artificial, caused by human activity. During the 1990s and before, a negligence in the geological and geotechnical studies of construction sites for multi-story buildings was found. In many cases, people not being specialists, especially geotechnical, do not understand the strained condition of the ground. People with their activity provoke and activate slope failure. In both cases the damage can be irreparable and not infrequently catastrophic. On the eastern-northeastern slope of the Cfaka hill, phenomena of segmented landslides of the rock mass are found, at different times. In this area, the state of critical balance is predisposed to slip without warning, bringing about the destruction of buildings and endangering the lives of the residents who live there. Therefore, the purpose of this study is to present a solution to this problem with pile walls and stabilization of the slope with Geocell material.

Keywords: *Landslides, slope failure, pile wall, Geocell material, Cfaka.*



Hydraulic and Coastal Engineering





Proposing contemporary measures to prevent the phenomenon of erosion (Korthpula-Puke)

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Soil erosion represents one of the destructive phenomena of the earth's relief, both through surface and deep erosion. The visible activity of water erosion, typical for watersheds, observed in our country, is favored by many factors such as relief, geological composition, soil, climate, etc. Precisely the inhibition or prevention of this phenomenon, present in water catchment basins, especially in those with a substantial risk of erosion, brings to attention and instructs as necessary the performance of works of a biological, biotechnical, and engineering nature. In this binomial of bio-engineering works, the primary role, for the systematization of ponds and mountain streams, takes the vegetative cover, especially the forest cover, with the gradual installation of which its protective function also increases, but in parallel with the performance of such works, it is also recommended performing other works, of a biotechnical and engineering nature, with the function of holding solid materials, strengthening the bed and directing water flows. This project, which has as its theme the systematization of a forest area in the area of Korthpula in the Puka District is approaching this goal through biotechnical and engineering work. The practical realization of this project will have a positive effect on the protection of the soil from erosion and the prevention of sediments created by this phenomenon, which appears mainly during the period of the rains. Also, this project will lead us to the improvement and sustainable management of this ecosystem. For the effect of the measures to be as great as possible, it is proposed to do a combination of the biotechnical works with the engineering works provided for in the project, namely in the upper parts of the ravines, fences with single and double reinforcements will be built and in the lower parts of the ravines, ambushes with stone masonry will be built.

Keywords: *Soil, erosion, watersheds, bioengineering, ravines.*



Application of the Erosion Potential Method in Lumbardhi i Deçanit Watershed

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Soil erosion is a gradual process that occurs when the impact of water or wind detaches and removes soil particles, leading to the deterioration of the soil. Understanding future conditions related to soil erosion is essential for sustainable management of water resources, especially watersheds in general. Calculating the amount of eroded and deposited soil in the watershed of the Lumbardhi i Deçanit using the Soil Erosion Potential Method (SEP) is considered cost-effective, as it allows us to establish direct connections between land use, current watershed management practices, and their impacts on water flows and soil erosion. The main objective of this study has been to assess the potential amount of eroded and deposited material in the watershed of Lumbardhi i Deçanit. About 53% of the watershed area is under erosion. The Lumbardhi i Deçanit watershed consists of 8 sub-watersheds. Using the Soil Erosion Potential Method (SEP), the calculation of the amount of eroded and deposited material has been carried out for these 8 sub-watersheds. The results of the calculations have determined the vegetation cover coefficient, soil resistance coefficient to erosion, and the type and degree of erosion in each sub-watershed. The point of this work is to draw conclusions about the necessary interventions with various biological and engineering works to enable the control and minimization of the amount of eroded and sedimented material in the sub-watersheds of the Lumbardhi i Deçanit Watershed.

Keywords: *Erosion potential method, Lumbardhi I Deçanit, watershed, soil erosion.*



Impact of Sustainable Urban Drainage Systems on Stormwater Management: A Case Study of the Mat Neighborhood in Prishtina, Kosovo

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Urban stormwater management presents a critical challenge globally, exacerbated by urbanization, land use changes, and climate impacts. Conventional drainage systems struggle to handle increasing surface runoff, prompting the adoption of Sustainable Urban Drainage Systems (SUDS) as natural alternatives. This paper introduces SUDS to Kosovo, evaluating their impact on stormwater management and broader water resources. The research focuses on a 21.8-hectare area in Prishtina, which faces threats from outdated conventional drainage systems ill-equipped to handle urban expansion. In this specified area, the Mann-Kendall statistical test is utilized to evaluate trends in the cumulative monthly rainfall across a period of seventeen years. The aim of employing this test was to examine variations in rainfall levels for each month between 2001 and 2018. Statistical significance was assigned to a p-value below 0.05. The statistical examination unveils notable rainfall patterns, indicating a decrease in July precipitation and an increase in October rainfall. These findings underscore challenges in water resource management. Moreover, the results showcase the Sustainable Urban Drainage Systems' (SUDS) efficacy in reducing surface runoff during October, mitigating pressure on sewerage systems, and augmenting water supply through rainwater reuse in July. Detailed assessments were conducted for each proposed SUDS technique, such as Green Roofs and Rainwater Harvesting Systems, tailored for implementation in the studied area, while considering Kosovo's unique natural conditions. The recommendations put forth in the research advocate for the widespread incorporation of SUDS in future construction endeavors, emphasizing the imperative for collaborative engagement among policymakers, engineers, planners, and environmentalists. In conclusion, SUDS represents a vital step towards addressing stormwater challenges and fostering a culture of water conservation.

Keywords: *Stormwater, Sustainable Urban Drainage System, Water Regime, Green roof, Swales, RHW.*



Exploring The Design and Effectiveness of Nature-Inspired Wave Breakers for Coastal Protection

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This paper delves into the innovative realm of nature-inspired wave breakers as a sustainable solution for coastal protection. Through a comprehensive literature review, we investigate the efficacy of traditional engineering solutions alongside the burgeoning field of nature-inspired design. Our exploration encompasses a multidisciplinary approach, scrutinizing hydrodynamic principles and engineering mimicry to understand the underlying mechanisms behind natural coastal features such as coral reefs and sand dunes. Utilizing hydrodynamic modeling, we evaluate the wave reduction capabilities and efficiency of engineered structures, while also conducting environmental impact assessments to gauge their ecological implications. Furthermore, our research integrates these nature-inspired wave breakers with traditional coastal engineering methods, assessing their compatibility and potential synergies. Through sustainability and resilience analyses, we investigate the long-term viability of these solutions amidst changing climatic conditions and sea level rise. Real-world case studies provide invaluable insights into successful implementations, highlighting adaptability and offering practical recommendations for future endeavors. Moreover, our study includes a comprehensive cost-benefit analysis, considering economic implications and environmental restoration benefits. Finally, we delve into the social aspects of community engagement, assessing perceptions, acceptance, and potential conflicts surrounding the implementation of nature-inspired solutions. Our findings affirm that nature-inspired wave breakers offer an effective and sustainable means of dissipating wave energy, complementing traditional methods while minimizing ecological impact. With positive community acceptance and a favorable cost-benefit ratio, these solutions present a promising avenue for coastal protection, underscored by real-world success stories and providing a blueprint for future research and implementation efforts.

Keywords: *Wave Breakers, Nature-Inspired Coastal Protection, Hydrodynamic Modeling, Integration Strategies, Community Acceptance, Cost-Benefit Analysis.*



Hydrology, Flooding and Resource Management





Hydrological modeling of the Fersina River

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Due to their ability to sustain nutrient cycles, regulate water flow, support a variety of species, and enhance biodiversity, rivers are crucial to the maintenance of ecosystems. The purpose of the research is to hydrologically model the Fersina River basin in Trento, Italy. The basin, which covers roughly 164.5 square kilometers, varies in elevation from 371 meters to a peak of 1981 meters. Seasonal changes and patterns of precipitation have a significant impact on its hydrological behavior. Twenty-five monitoring stations were set up around the basin to collect hydro-meteorological data; data collection started in January 2012 and ended in June 2023. The focus is on using an Embedded Reservoir Model (ERM) along with temperature, radiation, evapotranspiration, discharge, and other data to create a complete hydrological model. Based on statistical data analysis, the greatest discharge peak for the Fersina River was found to occur in late 2018, with a recorded flow rate of +100 cubic meters per second over the study period. We carried out calibration and validation procedures using modern methods, including Kriging for interpolation and the GEOframe-New Age modeling system. It is significant, therefore, that reservoirs and the corresponding changes in hydropower are not taken into consideration in our model. Considering these findings, integrating machine learning and statistical methodologies based on data from dam authorities emerges as a promising avenue for further research and refinement.

Keywords: *River, rainfall, discharge, temperature, evapotranspiration, reservoir.*



Sustainable Water Resource Management in Albania

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Water resources are considerable in Albania. Elements of natural water resources systems include the atmosphere, watersheds (drainage basins), stream channels, wetlands, floodplains, aquifers, lakes, estuaries, seas, and the ocean. Water resources management involves the monitoring and management of water quality as much as the monitoring and management of water quantity. The most fundamental human needs of water are for drinking, cooking and personal hygiene. In order to fulfill these needs, the quality of the water used should cause no risk to human health. The quality of the water in nature also affects the condition of ecosystems all living organisms depend on. Various models have been developed to assist in predicting the water quality impacts of alternative land and water management policies and practices. This research provides a pricing framework for decision-makers that will help in the development of strategies for water quality management. However, trading schemes can be complex to set up with factors such as the number of facilities involved in the scheme and the variety of the pollutants discharged influencing the complexity. Success depends upon achieving a balance between the environmental benefits of improving water quality and administration costs. In Europe the drive to improve water quality under the EU Water Framework Directive (WFD) encourages European citizens to get involved in improving water quality. Following recommendations from the IPCC3, the WFD aims to prevent and control emissions into water. Implementation of trading schemes could contribute to these goals.

Keywords: *Mathematical models, Tirana-Ishmi, basin, TDML, environmental protection, GIS.*



Transportation Engineering





Evolution of materials movement: A journey through construction transportation innovations

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The transportation of construction materials plays a significant role in the successful execution of infrastructure projects worldwide. This process has not always been easy, because throughout the years humanity has faced a lot of challenges and uncertainties. Therefore, they have come up with innovative solutions employed to enhance the efficiency and sustainability of transportation. It starts with ancient methods like manual labor and animal transport, highlighting their essential roles in early construction. The narrative then covers key milestones, from steam-powered locomotives to modern vehicles, revolutionizing efficiency for global construction. The diverse range of materials involved each require a unique transportation requirement and logistical thought. Also, a lot of factors need to be taken into consideration such as distance, mode of transport, environmental impacts, and financial possibilities. The development of technology of the moving process has made a colossal change on the duration of different constructions. By tracing materials movement from ancient times to today, this abstract provides insights into the dynamic relationship between technology, sustainability, and efficiency in construction. It emphasizes the importance of ongoing innovation to meet the evolving demands of modern projects while promoting a more sustainable future.

Keywords: *Transportation, materials, technology, environmental.*





Environmental Quality and Management





Education For Waste Management

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The issue of poor waste management is prevalent in many developing countries, primarily due to inadequate infrastructure, insufficient technical expertise, and a lack of environmental education and awareness. This paper proposes a multifaceted approach to improving waste management, by focusing on education and awareness-raising programs. Waste management and environmental education are essential components of sustainable development goals and including them in high school curricula can promote the knowledge and skills necessary for a sustainable future. Proper waste management practices can lead to economic benefits and reduce negative environmental impacts, while environmental education can foster critical thinking and problem-solving skills among students. Educators have a vital role in creating a positive educational environment that promotes waste management and environmental awareness to prepare students for a sustainable future. By developing environmentally conscious citizens who understand the importance of protecting the environment, we can achieve a more sustainable future while promoting critical thinking skills among students.

Keywords: *Environmental education, waste management, Albania, sustainable future, environmental awareness.*



Optimizing existing municipal waste management systems: a case study of Deçan

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Waste management is one of the main challenges facing communities today. In a context where environmental concerns and the need for a sustainable approach are becoming more and more important, Deçani is facing a big challenge to improve and adapt its waste management system. This study aims to address and offer concrete solutions for the improvement of the current waste management system in the municipality of Deçan. Through a deep analysis of the situation, we have now managed to identify the main challenges, as well as compile recommendations and sustainable strategies to address the needs and increase the overall efficiency of waste management. Thus, the efficient solution includes: a combined system on waste management in the Municipality of Deçan, divided into rural and urban systems. The solution in the rural area is a combined system of door-to-door collection and composting where each village will have a common composting machine, while the solution in the urban area is an underground management system based on a system with collection points and separation with recycling in frequented areas of the city. The collection in the rural part will be done once a week on a specific day for each village, while in the city the waste will be collected daily. Their transportation will be done with a special truck for each type of management system. This phase of defining the waste management system is a critical step towards creating an appropriate and functional model that will contribute to a cleaner environment and a community more aware of the impact of their actions on the local environment and global environment.

Keywords: *Solid Waste Management System, Municipal Waste, Waste Collection, System Design.*



Optimizing Waste Management in Gjilan Municipality: Challenges and Solutions

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This study assesses the current waste management system in Gjilan Municipality, examining collection, transportation, sorting, recycling, and disposal infrastructure. It evaluates service coverage, waste disposal assets, and generation rates, mapping collection points and methods. Analysis extends to transportation vehicles, sorting facilities, and operational plans. Recommendations include efficient recycling methods, container suggestions, and improved collaboration with recycling companies. The study underscores the importance of technology and transparent strategies to enhance system performance and sustainability, emphasizing the potential of reusing recyclable waste for a cleaner environment. The study's conclusions encompass possible solutions to the challenges faced in waste management. Efficient recycling methods are proposed along with recommendations for the types of containers that can be used.

Keywords: *Waste Management, Gjilan, Recycling, Infrastructure, Sustainability.*



Navigating Environmental Legislation: A Comparative Analysis of Kosovo and Turkey

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This study thoroughly examines environmental protection legislation in Kosovo and Turkey, tracing its historical evolution and dissecting legislative areas such as air quality, water resources, biodiversity preservation, and waste management. It provides detailed insights into current regulations and legal frameworks governing environmental policies in both nations. Emphasizing shared objectives of environmental protection and sustainable development, the study analyzes the purpose and key definitions within the legislation of Kosovo and Turkey, highlighting punitive measures for environmental offenders. Furthermore, it scrutinizes renewable energy projects, including wind, hydro, and geothermal energy, to assess efforts towards sustainable energy practices. Additionally, the study evaluates Kosovo and Turkey's commitment to the United Nations Framework Convention on Climate Change, alongside their financial expenditures on environmental conservation. Overall, this comprehensive exploration aims to enhance understanding of legal frameworks, initiatives, and challenges in environmental protection in Kosovo and Turkey.

Keywords: *Environmental legislation, Kosovo, Turkey, Comparative analysis, Sustainable development, Renewable energy.*



Enhancing Municipal Solid Waste Management: A Case Study of Istog Municipality, Kosovo

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This paper presents a comprehensive analysis of the existing solid waste management system in the Municipality of Istog, Kosovo. Through an in-depth examination of various facets of the waste management process, including waste collection services, coverage, disposal methods, and recycling initiatives, the study aims to evaluate the efficiency and effectiveness of the current system. The analysis begins with an overview of the waste collection service's status, highlighting aspects such as coverage and the form of garbage collection service employed in the municipality. Additionally, it delves into the municipality's waste management plan, emphasizing its role as a guiding document for waste management activities. Furthermore, the study examines key findings in waste management, including recycling efforts, composting initiatives, and the administration of bulky waste and other currents. It also scrutinizes waste disposal methods, such as truck and container utilization, while exploring patterns of waste generation and the schedule for waste collection and disposal. Through this analysis, the paper offers insights into the strengths and weaknesses of the current waste management system in Istog Municipality. It concludes by underscoring the necessity of transforming the existing system into an integrated waste management framework to address emerging challenges and ensure sustainable waste management practices in the future. Considering the study's findings, recommendations are proposed to enhance the efficiency and effectiveness of municipal solid waste management in Istog Municipality. These recommendations encompass strategic interventions aimed at optimizing waste collection, transportation, and disposal processes, thereby fostering a more sustainable and resilient waste management system for the municipality in the years ahead.

Keywords: *Solid Waste Management, Istog, Waste Collection, Efficiency, Integrated Waste Management.*



Rehabilitation and Revitalization of Surface Mining Areas through the Integrated Waste Management System for Spoils and Constructions

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The territory of the Republic of Albania, as a consequence of demographic movements, welfare demands, market economy, urban development of the territory, and industrial development, has undergone significant changes, with particular importance placed on the construction sector. The utilization of natural resources in a manner that meets current needs while preserving the environment without compromising the ability of future generations to meet their own needs remains among the key challenges in environmental protection policies. Data obtained from environmental permits issued by the National Environmental Agency for the period 2014-2020 indicate that the mining sector has experienced an increase in economic operators, mainly in the field of mineral extraction (surface mining, etc.). As a result of territorial planning, there is an increase in the number of constructions permits and areas made available for residential and non-residential sectors. The development of the construction sector has been accompanied by an increase in the quantity of waste generated from demolitions and construction activities. The data published in the Environmental State Report for the year 2022 ranks this sector as the second major contributor to the amount of solid waste generated. This sector is one of the main contributors to the exploitation of natural resources, primarily in the supply of raw materials (construction minerals). If not managed according to environmental principles, the natural resources used for the extraction of construction minerals can threaten the balance and values of the natural landscape. Public authorities at central and local levels, together with economic operators in the construction field, are responsible for implementing the integrated waste management system generated from demolitions/construction efficiently. Proper management of these waste materials best satisfies the requirements for the rehabilitation and revitalization of surface mining areas, restoring their territory to a satisfactory condition.

Keywords: *Quarry, Natural Resources, Construction Sector, Waste, Rehabilitation, Revitalization.*



Towards Sustainable Waste Management: Challenges, Solutions, and Priorities for the Municipality of Prishtina

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Waste management stands as one of the paramount challenges confronting humanity, with ramifications spanning health, environmental integrity, and socioeconomic stability. This paper delves into the multifaceted dimensions of waste management, highlighting its profound impacts on human health, ecosystems, and climate. The rampant emission of greenhouse gases from waste processes not only exacerbates global warming but also contributes to significant air pollution-related fatalities. Moreover, the indiscriminate disposal and burning of waste engenders hazardous chemical compounds, perpetuating soil contamination and jeopardizing biodiversity. As the global populace burgeons, exacerbating waste generation, the imperative for effective waste management grows ever more urgent. Technological advancements offer a plethora of waste treatment methods, necessitating a discerning evaluation of their economic, environmental, and social implications. Tailoring waste management strategies to the unique characteristics of each locale, including population dynamics and waste composition, is imperative. The case study of waste management in the Municipality of Prishtina underscores the exigency of prioritizing and revamping existing systems to mitigate adverse environmental and public health outcomes. Emphasizing data-driven decision-making and proactive waste prevention measures, such as source separation and recycling, emerges as pivotal strategies. In this context, waste-to-energy incineration emerges as a pragmatic solution for Prishtina, promising both waste reduction and energy generation. Moreover, concerted efforts towards fostering public awareness and behavioral change are indispensable for cultivating sustainable waste management practices and mitigating future waste burdens. By elucidating the complexities of waste management and advocating for integrated, proactive solutions, this paper aims to inform policy discourse and galvanize action towards a more sustainable waste management paradigm.

Keywords: *Waste Management, Sustainability, Integrated Systems, Waste-to-Energy, Public Awareness.*



Principles of Circular Economy as an instrument to increase the environmental responsibility of businesses.

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Climate disruptions nowadays have become a common thing, and the planet is becoming more aware of the fact that the continuous pumping of CO₂ into the atmosphere should decrease significantly to reach by 2050 the carbon neutrality target. We have extended the overuse of the planet's resources without giving proper thought to how our waste is being disposed of. At these circumstances, for the sake of people across the planet we must act now to protect and preserve our environment for this generation and be able to provide a safer and livable environment for the next ones. Environmental responsibility is our duty to protect and improve our environment. As a common understanding, being responsible toward the environment, for an individual, industry, community, or government, it means to assesses their environmental sustainability and apply this knowledge to their decision-making, through complying with the followings: i) Comply with environmental legislation; ii) Hazardous substances covered by environmental legislation; iii) Waste and recycling; iv) Conservation and biodiversity issues for businesses; v) Prevent and remedy pollution incidents. From this perspective being responsible for the environment is essential for businesses due to ethical benefits from planet protection and sustainable development, cost savings, brand reputation boosting, application innovation strategies and obtaining advantages over the competitive market. In this framework, the application of the principles of Circular Economy in a business, are becoming more and more as common understanding of being environmentally responsible. This study relates to the introduction of a practical methodology to identify and evaluate the level of recognition of businesses toward circular economy principles, how can they benefit from their application, how they can evaluate how circular and sustainable their daily activities are, and how potentially to increase their devotion toward embracing the principles.

Keywords: *Circular economy principles, environmental responsibility, renewable energy sources, resources protection, water circularity, cost saving, circularity assessment.*



Green Buildings

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In the context of our rapidly evolving world, the escalation of environmental pollution underscores the growing significance of green buildings. This study explores the multifaceted benefits of green buildings, encompassing economic advantages, sustainability, and ecosystem protection. Economically, green buildings are identified as favorable due to their efficient use of resources, cost-effectiveness, and sustainable construction materials. From a sustainability perspective, these structures emphasize optimal site planning and waste management, contributing to environmental conservation. Furthermore, green buildings play a crucial role in safeguarding the ecosystem by mitigating habitat destruction and supporting biodiversity, addressing the urgent need for environmental protection. Comprehensive research validates the pivotal role of green buildings in securing a sustainable future, predicting a surge in their integration within the construction industry. This necessitates the advancement of construction technologies and an acceleration of construction firms' efforts towards green building projects. Additionally, the paper highlights the importance of enhancing public awareness regarding sustainable practices. It advocates for a collaborative approach among engineers and architects to meticulously plan green projects, ensuring the maintenance of ecosystem balance. This study concludes that green buildings are essential for a sustainable future, recommending a concerted effort towards their development and widespread adoption.

Keywords: *Sustainability, Construction, Green, Ecosystem, Economic, Future.*



Sustainable Solutions Exploring Eco-Friendly Building Materials

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As our planet faces environmental challenges, it's important to find ways to build homes and buildings without harming the Earth. Traditional materials like concrete and steel are harmful because they use a lot of energy and resources to make. In contrast, eco-friendly alternatives involve a wide array of materials, including recycled, renewable, and low-impact options. Recycled materials, like r wood, steel, and glass, offer the benefits of waste reduction and resource protection. Renewable materials, such as bamboo, straw bales, and cork, are sourced from renewable natural sources, reducing dependence on non-renewable resources. Additionally, low-impact materials prioritize energy efficiency and minimal environmental impact throughout their lifecycle. To make eco-friendly materials more popular, architects, builders, and governments need to collaborate. They can implement rules and promote the use of these materials in construction. Additionally, educating people about the benefits of eco-friendly buildings can help generate demand for them. In conclusion, using eco-friendly building materials is a big step forward in protecting the environment. By making smart choices, we can build a greener future for everyone.

Keywords: *Environment, Eco-friendly materials, Recycle, Renewable, Construction.*



Deforestation In Pakistan: An Overview of Causes & Impacts

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Pakistan is a country characterized by an extremely high rate of deforestation. This paper is a review and attempts to analyze the trends of deforestation and their impacts using statistical information about the amount of deforestation, the loss of important vegetation, and the ecological consequences of these events. This review paper consolidates and analyzes existing research on deforestation in Pakistan, drawing insights from two distinct case studies. One case study, conducted by (Waseem & Khayyam, 2019) explores the deforestation dynamics within the capital city, Islamabad, while the other, by (Qamer et al., 2016) scrutinizes the Northern Himalayan region of Pakistan which is a significant contributor about 67% of Pakistan's total forest cover. The primary objective of this review is to synthesize and critically assess the findings from these studies. Special attention is given to quantifying the rate of forest cover loss specifically in Islamabad and the northern regions of Pakistan. Additionally, the research aims to quantify the rate of forest cover loss specifically in Islamabad and the northern regions of Pakistan. The methodology involves a thorough examination of various research papers to construct a comprehensive review, offering insights into the state of deforestation and environmental degradation in Pakistan using six reputable academic databases, namely Scopus, Web of Science, Google Scholar, Science Direct, PubMed, and Springer Nature. In conclusion, the study reveals alarming trends of deforestation in Pakistan, as evidenced by the intricate examination of the distinct cases of Islamabad and the Northern Himalayan region. These findings underscore the imperative for immediate attention and the formulation of sustainable forest management policies to counteract the identified impacts leading to environmental degradation.

Keywords: *Deforestation, Climate Change, Urbanization, NDVI, Remote Sensing.*



Integrated Network of Collection and Transportation of Construction and Demolition Waste

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Over the last three decades, urban development within the Republic of Albania has led to an increase in the volume of solid waste produced by the construction sector due to its operational activities. Legal requirements aimed at protecting the environment as a whole have established obligations to ensure proper waste management. To facilitate the integrated management of solid waste from construction and demolition generated by this sector, it is mandatory for waste collection and transportation from the source to disposal/recovery facilities to be conducted by licensed operators. These operators must be registered through the National Business Center and hold a subcategory III.2.B license titled "Other professional activities related to environmental impact." Waste classification is done based on the Albanian and European waste catalogs, identifying the construction sector's waste under code 17, which pertains to construction and demolition waste. This classification is further detailed with a six-digit code to precisely identify the type of waste. According to records from the national register of licenses, authorizations, and permits managed by the QKB from 2012 to 2023, 500 operators have been licensed to collect and transport various types of waste. The majority of these operators are located in the Tirana district, followed by the Durrës district. Out of the total number of operators licensed under III.2.B, 202 are involved in collecting and transporting waste associated with at least one of the codes from the construction sector. This has enabled the development of an integrated network for the collection and transportation of waste from construction and demolition.

Keywords: *Waste from construction and demolition, waste code, construction sector, license III.2.B, collection, transportation.*



Formaldehyde as an Indoor Pollutant: Origins, Impacts, and Remedial Strategies. A case study of Kosovo

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This abstract delves into the issue of formaldehyde as an indoor pollutant shedding light on its origins, impacts, and potential solutions. Kosovo specifically faces challenges in maintaining indoor air quality due to industrial activities, household practices, and vehicular emissions. The combustion of fossil fuels, suboptimal waste management, and the prevalent use of solid fuels for heating contribute significantly to elevated levels of formaldehyde, exacerbating health risks. The ramifications of indoor formaldehyde pollution extend beyond environmental concerns, profoundly affecting public health, agriculture, and societal well-being. Prolonged exposure to formaldehyde-laden air poses significant threats to respiratory and cardiovascular health, particularly impacting vulnerable populations. Furthermore, the repercussions extend to ecosystems, agricultural yields, and the broader issue of climate change, necessitating a comprehensive approach for effective resolution. This paper studies the importance of strict indoor air quality monitoring, and preventive and mitigation measures involving institutions, industries, and local communities. Through the drafting and implementation of strategies aimed at formaldehyde emission reduction, advocacy for sustainable practices, and awareness raising on usage, presence and effects of Formaldehyde, Kosovo can ensure that attention is paid to indoor air quality and the creation of a healthier living environment for its populace.

Keywords: *Air Pollution, Kosovo, Formaldehyde, Impacts, Awareness Raising, Public Health.*



Tackling Indoor Air Pollution in Kosovo: Sources, Impacts, and Mitigation Strategies for Lead

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This abstract offers an overview of indoor air pollution in Kosovo, specifically on lead, focusing on its sources, impacts, and potential mitigation strategies. As a developing nation in Southeast Europe, Kosovo grapples with the challenges of maintaining air quality due to a combination of industrial activities, domestic practices, and vehicular emissions. Combustion of fossil fuels for energy production, inadequate waste management, and the prevalent use of solid fuels for heating contribute to heightened levels of particulate matter, nitrogen oxides, and sulfur dioxide. The consequences of indoor air pollution in Kosovo extend beyond environmental concerns, impacting public health, agriculture, and overall well-being. Respiratory illnesses, cardiovascular problems and adverse effects on vulnerable populations are notable health risks associated with prolonged exposure to polluted air. Additionally, the repercussions extend to ecosystems, agricultural productivity, and climate change, necessitating comprehensive efforts to address the issue. This abstract underscores the importance of thorough air quality monitoring, policy development and collaborative initiatives involving government agencies, industries, and local communities. By implementing effective strategies to reduce emissions, promoting sustainable practices, and fostering awareness, Kosovo can work towards improving air quality and ensuring a healthier environment for its citizens.

Keywords: *Air Pollution, Kosovo, Sources, Mitigation Strategies, Public Health, Lead.*



Water and Wastewater Treatment





Membrane Bioreactor in Wastewater Treatment- Case study: WWTP in the Cement Factory “Antea Titan “

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Membrane bioreactor (MBR) technology is an efficient technology for municipal and industrial wastewater treatment. It is a novel technology due to its divergent advantages over conventional bioreactors. With significant removal rates of contaminants, MBR has been considered as a simple, reliable and cost-effective process for wastewater treatment. However, the major drawback hindering wider application of MBRs is membrane fouling, which significantly reduces membrane performance and lifespan, resulting in a significant increase in maintenance and operating costs. In Albania it seems to be a rare technology. Only one cement fabric uses this technology which is taken as a case study in this paper.

Keywords: *Environmental education, wastewater, Albania, sustainable future, membranes.*



Energy Production Through Treating Wastewater

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In addition to their primary function of ensuring public health and safety through the treatment of wastewater, as well as protecting the environment, wastewater treatment plants (WWTPs) can be considered essential cells of energy resources. The paper treats the corresponding topic with detailed descriptions of processes from wastewater treatment to energy production. Flow pumping, mechanical pretreatment, digestion, sludge thickening, drainage, and energy extraction are some of the processes addressed throughout this research. Biogas obtained from the sludge of wastewater is the main product of these plants for energy production, and so are solar panels and wind turbines too. An example of using this method for energy production is the WWTP in Austria. Austrian institutes conclude that the heat potential in WWTPs from the digester gas and the extraction from the wastewater effluent can be estimated at 3375 GWh/a and the potential for energy production at a dimension of 115.5 GWh/a. This production turned out to be sufficient for the plant's own requirements; furthermore, it managed to supply the surrounding area, not small areas in Austria, which proves the great capacities that this "industry" has. The last part of this paper introduces recommendations and conclusions for this form of energy production in Kosovo that are crucial for the energy transition in our country.

Keywords: *Wastewater treatment plant, energy, potential, sewage, sludge, biogas.*



Impact of Antibiotics in Wastewater Treatment Plants and Optimal Configurations for Kosovo

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The ability to fight bacterial infections with antibiotics has been one of the greatest achievements of modern medicine. However, the widespread misuse and inappropriate use of antibiotics have resulted in unwanted consequences, which today are considered a global crisis for both public health and the environment. Today, sewage treatment plants are considered reservoirs and environmental suppliers of a relatively new problem in the world, which is known as antibiotic resistance. This study addresses this critical issue by assessing the presence and effects of antibiotic residues in wastewater treatment in Kosovo, a young country where rapid urbanization and industrialization presents a significant challenge for water quality management. The research aims to identify the most efficient and appropriate measures, considering the resources and current conditions in Kosovo, to increase the efficiency of the removal of antibiotics, thus minimizing their release in aquatic ecosystems. Through a comparative analysis, this article identifies currently used wastewater treatment methods, and advanced treatment technologies that can be integrated into existing treatments to reduce antibiotic residues. The findings highlight the inadequacy of conventional treatment methods in addressing this pollutant, therefore the combination of enhanced primary treatment, advanced biological processes and tertiary treatments is important as an optimal configuration for Kosovo. Through a specifically more local approach, this research influences the global discourse on wastewater management by providing tailored solutions to this emerging challenge of antibiotic pollution, promoting environmental sustainability, and protecting public health in Kosovo and potentially in similar contexts worldwide.

Keywords: *Antibiotics, resistance, treatment, wastewater, environment, pollution.*



Advancements in Wastewater Treatment: A Comprehensive Analysis of Technological Processes and Industrial Practices

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This research will analyze wastewater treatment, especially the technological process. The main topics will include the importance of water, an introduction to wastewater in general and its technological processes, methods for wastewater treatment, and monthly data reports from industrial operators such as New Co Ferronikeli on emissions discharged into water. The introduction provides a comprehensive overview of wastewater, elucidating its sources, composition, and environmental implications. Following this, the study explores various methods employed in wastewater treatment, emphasizing primary, secondary, and tertiary treatment, as well as the most advanced methods of wastewater treatment. A critical analysis of the advantages and limitations of these methods is presented to underscore the evolving landscape of wastewater treatment technologies. In addition to technological processes, the research investigates the significance of monthly data reports from New Co Ferronikeli on emissions discharged into water bodies. By examining the content and implications of these reports, the study sheds light on the environmental impact of industrial activities and the effectiveness of existing wastewater treatment practices. Insights derived from the analysis provide a basis for evaluating the ecological sustainability of industrial operations and identifying areas for improvement in wastewater management. The findings aim to contribute to the ongoing discourse on sustainable wastewater management, fostering a balance between industrial development and environmental preservation.

Keywords: *Water, Wastewater, Technological Process, New Co Ferronikeli, Emissions.*



Comprehensive Analysis of Wastewater Treatment Processes and Environmental Impacts: A Case Study of Tirana Water Treatment Plant

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This paper offers a comprehensive exploration of the wastewater treatment processes employed at the Water Treatment Plant in Tirana, focusing on technical intricacies, environmental ramifications, and societal implications. The study delves into the treatment procedures implemented at the plant, scrutinizes both adverse and beneficial environmental and social effects encountered during project development and operation phases, examines physicochemical parameters, and anticipates enhancements in water quality within the project's ambit. The discharge of untreated wastewater into aquatic ecosystems constitutes a severe threat to water quality and public health, manifesting in recurring instances of water pollution and subsequent health hazards. To address this pressing issue, wastewater treatment plants are being established not only in Tirana but across the nation. These facilities, utilizing biological pathways, aim to elevate water treatment to a secondary level, thereby mitigating the detrimental effects of wastewater discharge. The Tirana Water Treatment Plant employs trickling filters for wastewater treatment and employs mechanical dehydration for sludge management post-thickening and digestion processes. Strategically located in Kashar, southwest of Tirana, the plant serves a populace of 850,000 individuals. The chosen site offers optimal conditions for construction and operation, including proximity to infrastructure networks and water bodies for treated water discharge. The collection and treatment of untreated sewage prior to discharge can substantially enhance river water quality and ecosystem health. Secondly, appropriate sewage handling and disposal practices are pivotal in averting contamination of ground and surface water sources. Thirdly, ensuring quality control of construction materials is imperative for the longevity and efficacy of plant operations. Lastly, while acknowledging the temporary negative environmental and social impacts during the construction phase, the long-term benefits of improved water quality outweigh these concerns.

Keywords: *Wastewater treatment, Environmental impacts, Water quality, Tirana, Sustainability, Infrastructure networks.*



Use of Activated Carbon for Drinking Water Treatment Case study: Bovilla Water Supply and Purification Plant

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The research focuses on the water treatment processes at the Bovilla Plant in Albania, specifically highlighting the use of activated carbon. The plant is designed to treat up to 1800l/s of surface water, following European standards for water quality. Water treatment at the plant involves different categories based on the required level of processing, with processes like coagulation, flocculation, sedimentation, and filtration being utilized stages to treat water, with rapid sand filters playing a crucial role. The plant utilizes chemical dosing pumps for the accurate dosing of chemicals, with a dedicated chemical department storing chemicals used in water treatment. The treated water undergoes various stages, including rapid sand filtration, with automatic backwashing systems to maintain filter efficiency. The plant is equipped with electronic monitoring systems for parameters like pH, temperature, turbidity, and free chlorine, ensuring optimal water treatment. Upgrades were made in 2010-2011 to enhance the plant's efficiency, particularly in the chemical department, filters, flocculators, control systems, and laboratory. The Bovilla Reservoir, formed by damming the Tërkuze River, collects water for treatment, with fluctuations in water levels throughout the year. The research also discusses taste and odor issues in drinking water, emphasizing the importance of identifying compounds causing these problems. Microorganisms, algae, and treatment processes are explored in relation to taste and odor issues, with a focus on the challenges of using powdered activated carbon in water treatment. Overall, the research provides a comprehensive overview of the water treatment processes, quality monitoring, reservoir characteristics, taste and odor issues, and the use of activated carbon at the Bovilla Plant, showcasing the plant's commitment to ensuring safe and high-quality drinking water for the region. This comprehensive analysis underscores the plant's unwavering commitment to delivering safe and superior-quality drinking water to the local populace.

Keywords: *Bovilla Plant, drinking water treatment, activated carbon.*



Efficiency and Renewable Energy





Structural Facades. Case of “Forever Green Tower” in Tirana

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The modern construction field has seen significant advancements in city design and city skyline with the facade playing a crucial role in both aesthetics and functionality. The relationship between facade and tall buildings is conditioned by several factors such as climatic conditions, construction material, structural stability, and architectural aesthetics. Tirana as the capital of Albania, has undergone rapid growth in recent years which has influenced its vertical development, aiming to efficiently utilize the territory for various functions and facilitating the accommodation of people migrating within the territory of the Albanian state towards the capital city, Tirana. The aforementioned factors will play a key role in achieving the aim of this study, which will identify issues in the design of external cladding of tall buildings. Given that, the facade is a structural element that faces external forces, earthquakes, building movements, sudden temperature changes, the impact force of rain, atmospheric pollution, and corrosion. This paper provides a general overview of the literature on this topic and offers a thorough analysis of the factors that need to be considered during the selection of the facade typology to be used. The objective of this study will be achieved through the collection and analysis of various factors that are primary in the behavior of facades. Through modeling and extracting results from computer programs such as ETABS, the influence of the structural facade on the structure of the "4 Ever Green Tower" located in Tirana will be analyzed. This object is one of the tallest in the Balkans. Comparative analysis of the modeled building without facade load and with its load will provide us with the results we expect from this study. The results of this study are particularly important in terms of the design and construction of tall buildings with very good structural, architectural performance, and comfort that the facade offers to the buildings.

Keywords: *Structural facade, tall buildings, external forces, structural stability, architectural aesthetics, comparative analysis.*



Revitalization of an Old Mine Gallery

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The revitalization of old mine galleries is a topic of increasing importance in the field of cultural heritage preservation and sustainable development. This concept study explores the potential of sustainable building practices in repurposing old mining galleries. In order to create a self-sufficient environment inside the mine pit, the plan primarily focuses on building a large structure with multiple compartment chambers to be utilized as data servers and developing a novel energy-generating process. The building is designed to collect the generated energy. The energy production units and internal chambers are designed to be constructed with reinforced concrete, and the unit's height extends above the pit. This height is needed to take advantage of the wind. To allow ample space for the turbines, the internal chambers' floor height is intended to reach up to ten meters. The tubes are designed to collect air from outside the structure. The distance between each other is half the building's radius. Placing a large sphere atop the structure will be one of the project's most difficult tasks. Furthermore, mirrors will be erected around the building to collect additional solar electricity, as beta radiation is capable of absorbing both solar energy and water heat. The concept also includes collecting rainwater inside the mine. Since the superstructure will be higher than the mine pit, the water circulation is intended to take advantage of gravity, the head differential inside the structure's height, the atmospheric pressure, and the vortex surrounding the structure.

Keywords: *Mine Revitalization, Renewable Energy source, Servers, Superstructure.*



Analysis and Design of 5-MW Onshore Wind Turbine Under Wind Load

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As the world struggles with the pressing need for sustainable energy solutions, renewable sources like wind energy have emerged as promising alternatives to fossil fuels. Using wind energy to create clean electricity, onshore wind turbines are an important component of the renewable energy industry. In this regard, careful consideration must be given to the design and analysis of wind turbines to ensure both structural integrity and maximum performance. One of the most important elements in the functionality of wind turbines is foundation design, as it transfers and distributes structural loads safely to the ground. From blade design to tower construction, every element must be finely tuned to withstand environmental forces while maximizing energy output. With careful planning and innovation, these turbines can continue to play a pivotal role in meeting the world's growing energy needs while advancing towards a cleaner, more sustainable future. Investigating the performance of onshore wind turbine structures, this study aims to understand their response to various environmental and operational factors. Throughout their lifespan, wind turbine structures are subjected to dead load itself, seismic loads, aerodynamic loads, and operational loads. Understanding the loads is crucial for effective design, construction, and ongoing performance. Hence, this study focuses on the analysis of onshore wind turbine structures by using FAST (Fatigue, Aerodynamics, Structures, and Turbulence), an open-source software developed by the National Renewable Energy Laboratory (NREL). By integrating various physical domains such as aerodynamics, and structural dynamics into a comprehensive simulation by using FAST, it aims to gain insights into the dynamic behavior of a 5 MW onshore wind turbine structure by incorporating the effects of wind turbulence on the structure.

Keywords: *Wind turbine, Renewable energy, FAST.*



Embracing energy efficiency processes for a neighborhood building

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The building sector is ranked as the highest energy demand and consumable sectors followed by the public lightening in a classic dwelling neighborhood. High energy consumption in these sectors is related to their poor performance and lack of constant interventions to the updated technology in place. Buildings account for nearly 40% of global CO₂ emissions, with operational emissions (from energy used to heat, cool, and light buildings) comprising the majority. The trend towards carbon neutrality in the building sector is gaining momentum, driven by technological advancements, shifting policy landscapes, and a growing recognition of the urgent need for sustainability in the face of climate change. Concrete buildings in Albania are one of the worst energy performance ones, where dwellers should deal with a too hot inner environment during the summertime and a too cold environment during wintertime. Most concrete buildings are completely not plastered, and apart from the extra heat and cold, the presence of humidity is a constant disturbance for the community living in them. This is translated into building facade not being thermo-insulated, with poor windows frames, and not adequately oriented by lacking natural ventilation, and a public lightening system in place that consumes high energy to provide very few hours of proper lightening in the neighborhoods. Energy-efficient buildings provide healthier and more comfortable. Better insulation reduces the number of pollutants and allergens that can come into the home, which can result in better indoor air quality. Adopting energy-efficient practices and technology is essential to reduce energy use, prevent climate change, and guarantee a cleaner, healthier future as societies work toward sustainable development. This article seeks to understand the energy performance of concrete buildings that go under a process of façade refurbishment through analyzing the construction of the building and the possible insulation technology that would improve the energy performance.

Keywords: *Energy usage, insulation, energy efficiency, refurbishment of the building, energy savings, energy auditing.*



Moving toward a Circular and Sustainable Energy Paradigm

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The 21st century climatic development has driven the initiation of the new transition era toward a circular and sustainable energy paradigm, which will direct the shifting from a linear model of energy production and consumption to the one that prioritizes and promotes the usage of renewable sources, energy efficiency, and waste reduction. Practically, this movement would require the embracement of technologies embrace technologies like solar, wind, and hydroelectric power, promoting energy conservation, and implementing policies to support a circular economy where resources are used more efficiently, and waste is minimized through recycling and reuse initiatives. This article will try to bring a holistic overview of the main instruments that have started and will drive this transition toward a carbon neutrality future. One of the leading instruments that has found strong grounds of implementation in many western countries is the investment in promoting the application of low-carbon, and nuclear-free energy system by increasing the share of renewable energy sources like wind and solar power. On the other hand, another driver that has spread its effects in different areas and lifestyles is the implementation of policies and practices to improve energy efficiency in buildings, transportation, and industry. Moreover, the study will try to tackle other drivers as developing smart grid infrastructure and energy storage technologies to integrate renewable energy sources efficiently into the grid, and adaptation of circular economy principles to minimize resource consumption, promote recycling and reuse of materials, and reduce waste generation throughout the energy value chain. This article will try analyzing at the end, which are the concrete steps that may ensure this transition toward a circular and sustainable energy paradigm through a multi-dimensional approach and ongoing evaluation.

Keywords: *Low carbon economy, carbon neutrality, sustainable and circular energy paradigm, circular economy, renewable energy sources, energy efficiency.*



Integration of Renewable Energy in Urban Environments

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At a time when environmental challenges and pollution are becoming increasingly concerning for modern cities, the integration of renewable energy resources becomes a fundamental challenge and a great opportunity to address these issues. This study aims to explore the importance and advantages of integrating renewable energy in urban environments, focusing on the analysis of various renewable energy technologies and their potential to contribute to a cleaner environment and more sustainable development of cities. Through an in-depth literature review and a critical examination of previous research in the field of renewable energy in cities, this study will identify the key advantages of using renewable energy resources, including reducing air pollution, improving air quality, and enhancing energy supply security at the local level. At the same time, a wide range of challenges that may arise during the integration process of these technologies in the urban environment will be examined, including technical limitations, infrastructure challenges, and administrative barriers. To illustrate the potential benefits of renewable energy integration in modern cities, the study will include the analysis of several case studies and practical examples of this process on a global scale. Through these cases, successful applications of renewable energy technologies in current urbanization and their role in improving urban life quality will be examined. Finally, the study will propose recommendations and guidelines for policymakers, urban planners, and other stakeholders to facilitate and promote the integration of renewable energy resources in modern cities, thus creating a more sustainable environment and greater progress towards future cities.

Keywords: *Renewable Energy, Benefits, Environmental Challenges, Urban Development, Pollution.*



Climate Changes, Adaptation & Mitigation





Climate Change Effects on the Coastal Line of Albania. Case Study of Durresi seaside

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The purpose of combating coastal erosion is to protect and preserve the coast and coastal zone from the accelerated destruction of land and seabed, habitat protection of coastal ecosystems, preservation of infrastructure and human assets, protection of natural resources and resources, cultural and tourist protection and maintaining the stability of the coast and the marine environment. The methodology that was followed for the identification of environmental problems in coastal areas was collection of data, identification of main problematic areas, geographic mapping, and prioritization of key issues. Climate change has a significant impact on the speed and intensity of coastal erosion. Ways climate change causes and accelerates coastal erosion include: Sea level rise: Sea level rise causes water to recede on the coast, causing coastal erosion and impacting the low-lying coast; Changing wind and rainfall patterns: Intense wind and rainfall can cause coastal erosion by causing material and rocks to move along the coast; Exacerbation of extreme weather: Extreme weather, such as storms and landslides, which cause extensive damage to the coast and accelerate erosion processes; Melting of the polar ice caps: Melting of the polar ice caps results in rising sea levels and affects the formation of powerful coastal currents. These powerful currents can cause coastal erosion on an area's coast; and changing coastal habitat and vegetation: Loss of natural coastal protection, such as through deforestation and polar bear melting, increases coastal erosion.

Keywords: *Climate change, Durresi, Sea level change, Carbon emission reduction.*



Integrating Adaptation and Mitigation Strategies for Climate Resilience and Sustainable Development: Challenges and Opportunities

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Climate change is a global challenge with profound implications for ecosystems, economies, and human well-being. Addressing this challenge requires a combination of adaptation and mitigation strategies. Adaptation focuses on reducing vulnerability and building resilience to the impacts of climate change, while mitigation aims to reduce greenhouse gas emissions to limit future climate change. Adaptation strategies encompass a range of actions aimed at reducing the adverse effects of climate change on communities and ecosystems. Nature-based solutions, such as restoring mangroves and wetlands, can help protect coastal areas from sea-level rise and storm surges while providing habitats for biodiversity. Infrastructure improvements, such as building resilient water management systems and designing heat-resilient buildings, can enhance urban resilience to climate change impacts. Additionally, promoting sustainable agricultural practices, such as crop diversification and agroforestry, can help farmers adapt to changing climate conditions while reducing emissions. Mitigation strategies focus on reducing greenhouse gas emissions to mitigate the severity of climate change. Transitioning to renewable energy sources, such as solar and wind power, can reduce reliance on fossil fuels and lower emissions. Improving energy efficiency in buildings, transportation, and industry can also contribute to emission reductions. Furthermore, reducing emissions from deforestation and forest degradation through sustainable forest management and conservation efforts can help sequester carbon and mitigate climate change. Additionally, uncertainties in climate projections and the complex interactions between social, economic, and environmental factors can pose challenges to effective decision-making. To address these challenges, a holistic approach is needed that integrates adaptation and mitigation strategies into broader sustainable development goals. By implementing effective adaptation and mitigation strategies, we can build more resilient and sustainable communities and contribute to global efforts to address climate change.

Keywords: *Mitigation / adaptation strategies, environmental impacts, climate change, resiliency.*



Carbon Footprint and Carbon Emission Reduction of Higher Education Institution Buildings: Case of Faculty of Civil Engineering Building, Tirana

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Climate change is one of the most serious global environmental problems. Due to this concern, the assessment of emissions and the calculation of a carbon footprint have continuously gained attention, especially as a starting point for reduction of environmental impact and eventually achieving carbon neutrality. Reducing the carbon footprint helps to meet the targets of the sustainable development goals (SDGs), with an emphasis on SDG13, which seeks urgent measures to combat climate change and its consequences. The objective of this paper is to calculate the carbon footprint of the Civil Engineering Faculty in Tirana. The calculation includes direct and indirect emissions of scope. This means that the data will refer to water and energy consumption, transportation mode and waste production regarding the total number of students and professors. All the data mentioned here will be used in ClearPath software program that will do the calculation of the carbon footprint. This paper will show the importance of higher education institutions in undertaking research towards a sustainable future and to present different approaches to reducing carbon emissions.

Keywords: *Climate change, carbon footprint, carbon neutrality, emissions.*



Building the Resilience of Protected Areas to Climate Change, Case Study Protected Area Baks Rrjoll, Shkoder

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Human activities have had a huge impact on climate change, which has become one of the most important phenomena in the last decades. Because of its negative effects in the sustainable development on our planet, taking effective measures to protect the planet has become one of the main goals for many countries. In the last year, the Agenda for Sustainable Development 2023 painted an alarming picture for the future of the planet, where the measurements of its 17 goals showed a decrease in many of the targets which are directly connected to climate change. That is why the need to take quick measures has become very important. The aim of this paper is to show the importance of taking actions and applying effective measures in an area where the human impact should be on a smaller scale. The case study of this paper is Baks Rrjoll, a protected area near Shkoder, which has a great potential to transform it into the next popular tourist spot. The main goal of this transformation of Baks Rrjoll is to become an example for other protected areas or areas that have the potential to become one. In this paper the focus will be on measures that affect the fields of water conservation, water efficiency, energy efficiency, waste management and most importantly protecting the biodiversity of species.

Keywords: *Climate change, sustainable development, protected area.*



Climate Change: Effects, Contributors and Actions Taken - Case Studies of Kosovo and Japan

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Climate change poses a significant threat to global ecosystems and human societies, manifesting through diverse impacts on different regions. This study conducts a comparative analysis of climate change in two geographically distinct nations, Japan and Kosovo, to shed light on the unique challenges each faces, and the strategies employed to mitigate and adapt to these changes. Japan, an industrialized island nation, experiences a wide range of climate-related issues, including rising temperatures, increased frequency of extreme weather events, and sea-level rise. The nation's vulnerability is exacerbated by its dense population and extensive coastline. Mitigation efforts in Japan focus on technological advancements, renewable energy adoption, and stringent emission reduction targets, reflecting the nation's commitment to the global fight against climate change. On the other side, Kosovo, a country in Southeast Europe, faces its own set of climate challenges. While not a major contributor to global greenhouse gas emissions, Kosovo is susceptible to temperature fluctuations, changing precipitation patterns, and the associated impacts on agriculture and water resources. The nation's mitigation and adaptation strategies are influenced by its economic constraints, relying on international collaborations, reforestation initiatives, and sustainable land management practices. This study employs a comprehensive approach, integrating climate models, satellite data, and socio-economic indicators to assess the current and projected climate scenarios for both Japan and Kosovo. Additionally, it explores the effectiveness of policy measures and community-based initiatives in addressing the specific vulnerabilities of each region.

Keywords: *Environment, Japan, Kosovo, climate changes, pollution.*



Climate Change Effects, Contributors and Measures: A Case Study of India and Kosovo

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This paper aims to provide an essential analysis on climate change, including its impact at the global level and the main causes that influence this phenomenon. Climate change has declared a serious challenge for the international community, bringing great consequences for the environment, economy and society. To understand this challenge, the main causes of climate change will be examined, including the impact of human activity and natural processes. In addition, we will analyze sea level rise, changes in rainfall patterns, global warming and droughts. These changes have a direct impact on terrestrial and marine ecosystems, with consequences for biodiversity and human life. Through a sustainable approach and international cooperation, it is possible to reduce pollution, promote renewable energy, and take effective actions to adapt and mitigate the negative impacts of climate change. It then focuses on the analysis of climate change in the context of India and the country's efforts to address its challenges. India, as a country with a large population and a growing economy, is experiencing major impacts from this global crisis. In this part of the paper, we will examine the main causes of climate change in India and their impact. Also, we will analyze the impact of these changes on key sectors of the Indian economy, including agriculture, the energy sector and public health. We will then focus on India's efforts and strategies to cope with climate change. For this reason, we will analyze India's current plans and policies related to reducing emissions, increasing public awareness and improving adaptation capacities. Finally, we will draw conclusions and recommendations to improve India's current efforts in the fight against these changes and the comparison of India with the Republic of Kosovo.

Keywords: *Climate Change, Impacts, India, Measures, Effects.*



Climate change impacts on different stages of waste management system

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Global warming is becoming one of the greatest challenges of the century, bringing significant impacts on all aspects of human life and the environment. The waste management system emerges as one of the most affected and sensitive aspects to global temperature rise, changes in precipitation patterns, and extreme weather events. The increase in temperature complicates the waste collection processes, causing equipment to overheat and increasing the risk of fires in landfills. Additionally, it also increases energy consumption for recycling processes, making it more difficult to control carbon emissions. Furthermore, the sea level rise also poses significant challenges too. Coastal flooding impacts waste collection routes inaccessible, hindering the movement and transportation of waste, which consequently may damage the recycling facilities and generate large volumes of household waste in affected areas. Extreme precipitation events and extreme droughts seasons have caused low stability in land structures by massive flooding events and unexpected land erosion, which may affect waste collection routes. The escalation of risk also comes from strong winds, cyclones, and hurricanes, which can cause considerable damage to waste management infrastructure and pose the risk of dispersing hazardous objects or toxic materials into the environment. This article tries to analyze the complex relationship between climate change and waste management, highlighting their interaction and explaining the challenges and opportunities to address how the climate change effects as temperature increase, sea level rise and extreme precipitation. The study tries to present several measures beyond the effects of climate change that can be taken to improve and prevent negative effects into the waste management system, followed by the development of risk management plans to prevent damage and ensure safety at waste landfill sites.

Keywords: *Climate change, waste management, temperature rise, precipitation, extreme weather, sea level rise.*



Climate Change: Effects, Contributors and Actions Taken - Case Studies of Kosovo and Germany

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Climate change is a global challenge that affects all spheres of our lives, including the countries of Germany and Kosovo. In this abstract, we will examine the effects of climate change in these two countries and make a comparison between them in the main aspects of their impact. First, we will analyze the current climate situation in Germany and Kosovo, including average temperatures, precipitation levels and changes in natural ecosystems. After that, we will examine the causes of climate change in each of these countries, including greenhouse gas emissions, energy resource use, and agricultural practices. Next, we will analyze the consequences of climate change in Germany and Kosovo in social, economic and environmental aspects. We will discuss the effects of escalating global warming on public health, food security, the economy and their natural biodiversity. Finally, we will include a detailed analysis of the policies and measures that have been taken in each of these countries to address climate change and mitigate its negative impact. In comparison, we will assess the effectiveness and variability of these policies and measures, identifying best practices and common challenges through which Germany and Kosovo can collaborate to improve their response to the climate crisis.

Keywords: *Environment, Germany, Kosovo, climate changes, pollution, biodiversity.*



Strategies for mitigation and adaptation of climate change

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Human-induced climate change poses a growing threat to life on Earth, primarily fueled by increasing greenhouse gas emissions, notably from burning fossil fuels. This perilous shift in Earth's climate, driven by rising carbon dioxide and greenhouse gas (GHG) levels, foresees a worsening impact of climate change over the next two to three decades. Heatwaves, wildfires, droughts, storms, and floods are expected to rise, posing greater risks to both human health and global stability. This paper explores different perspectives, presenting evidence of climate change across Earth's spheres, from altering emission pathways to understanding the drivers of climate change. It critically examines the current and future state of global climate change, emphasizing mitigation and adaptation strategies. Urgent action is needed to combat the acceleration of climate change, highlighting the crucial shift to renewable energy sources and enhancing carbon sinks. These steps are identified as vital measures to mitigate the adverse impacts of climate change and align with the global imperative to reduce greenhouse gas emissions. The report emphasizes the significance of advancements in carbon quantification, modeling, and pricing as essential tools for effective climate change mitigation. Adaptation strategies, fostering resilience in local communities and ecosystems, emerge as essential components of a comprehensive response. To pave the way for a sustainable future, the report delves into a detailed analysis of the impacts of climate change on environmental and human health. It explores evolving strategies for mitigation and adaptation, underscoring the critical need to confront and overcome key challenges in reversing and adapting to global climate change. This comprehensive exploration acts as a call to action, urging collaborative efforts on a global scale to safeguard the future of our planet and its diverse life forms.

Keywords: *Climate change, GHG emissions, Sustainability, Mitigation, Adaptation.*





Geodesy, Cartography, Photogrammetry and RS





The integration of Unmanned Aircraft Systems for the 3D surveying of rural areas

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This abstract explores the integration of Unmanned Aircraft Systems (UAS) in the field of 3D surveying, with a specific focus on applications in rural areas. The burgeoning capabilities of UAS have significantly influenced the landscape of surveying practices, providing an agile and efficient means to capture accurate spatial data. In rural settings, characterized by vast expanses and diverse topography, UAS offers a transformative solution for acquiring high-resolution imagery, LiDAR data, and other geospatial information. The integration of UAS in 3D surveying processes brings forth a multitude of benefits, ranging from increased survey efficiency and reduced operational costs to enhanced safety measures. This abstract delves into the technical aspects of UAS, emphasizing their adaptability to diverse terrains and their capacity to generate detailed 3D models. Real-world applications of UAS in rural surveying scenarios, such as precision agriculture, environmental monitoring, and infrastructure development, are explored to illustrate the practical implications of this technology. Furthermore, the abstract addresses key considerations associated with UAS integration, including regulatory compliance, ethical considerations, and challenges related to data processing and interpretation. As UAS technology continues to evolve, its role in 3D surveying becomes increasingly pivotal for informed decision-making and sustainable development in rural areas. This overview contributes to the understanding of the integration of UAS in rural 3D surveying, highlighting its potential to revolutionize traditional surveying methodologies and pave the way for more effective land management and resource planning.

Keywords: *UAS, 3D surveying, accuracy, rural areas.*



Exploring the connection between State Leveling Networks and Tide Gauges for Geodetic and Oceanographic Applications

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The integration of state leveling networks with tide gauge observations presents a promising avenue for enhancing geodetic and oceanographic studies. This abstract investigates the connection between these two instrumental systems and explores their combined potential for various scientific endeavors. State leveling networks, primarily designed for precise determination of elevations across terrestrial surfaces, offer a stable reference frame crucial for geodetic analyses. Tide gauges, on the other hand, provide continuous measurements of sea level variations, essential for understanding oceanographic processes and assessing coastal vulnerabilities. Leveraging the complementary nature of these datasets enables comprehensive assessments of land subsidence, sea level rise, and crustal deformations, crucial for addressing climate change impacts and coastal management strategies. Furthermore, the integration of state leveling networks with tide gauge observations facilitates the calibration and validation of satellite altimetry data, enhancing the precision of global sea level reconstructions. Additionally, this synergy offers insights into regional geoid modeling and improves the accuracy of geodetic positioning systems, benefiting diverse applications such as navigation, land surveying, and infrastructure development. Case studies and practical examples illustrate the significance of combining state leveling networks and tide gauge data in geodetic and oceanographic research. These include monitoring coastal subsidence in regions prone to land-level changes, assessing tidal variations and storm surges for hazard mitigation, and validating numerical models simulating sea level dynamics. In conclusion, the integration of state leveling networks with tide gauges represents a promising approach for advancing our understanding of Earth's dynamic processes.

Keywords: *Tide gauges, leveling, sea level, tides.*



Drone Usage in Civil Engineering. A case study of the Prishtina-Gjilan Highway

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The use of drones in civil engineering has gained increasing attention in recent years due to its potential to revolutionize the industry. Drones offer the ability to capture high-resolution aerial imagery and collect data that was previously difficult or impossible to obtain. The integration of drones in civil engineering presents opportunities for accurate data collection, analysis and visualization, which can improve decision-making processes and improve project outcomes. For example, drones equipped with GIS technology can be used to capture high-resolution aerial images of construction sites, allowing engineers to monitor progress, identify potential issues, and make informed adjustments as needed. By harnessing drones, civil engineers in the civil engineering field can potentially optimize project planning, design and execution while minimizing risks and costs. The work of this topic examines the case of the use of Drones combined with GIS in civil engineering. During this study, aerial photography of a certain segment of the Prishtina-Gjilan Highway was taken. The results generated by the processing of aerial photos have been compared with the project. However, further research is needed to fully understand the capabilities and limitations of these technologies in this specific context, as well as to explore any potential challenges and barriers to their widespread adoption.

Keywords: *Drone, GIS, Engineering, Infrastructure, Aerial Images, Technology, Data Visualization.*



Implementation and Impact of the CORS Network "GeoNet-Kosova"

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Geodetic surveying and positioning have undergone a revolution due to the establishment of Continuously Operating Reference Stations (CORS), which provide high-precision, real-time data for a variety of applications. This abstract describes the CORS network "GeoNet-Kosova," as an essential infrastructure in Kosovo's geospatial landscape. This study aims to clarify the implementation process, technical specifications, and the socio-economic impact of GeoNet-Kosova. Comprehensive planning, including site selection, equipment installation, and network setup, was required for the GeoNet-Kosova implementation. By using advanced GNSS technology, the network contains strategically positioned reference stations that provide accurate positioning data across Kosovo. These stations provide accurate positioning even in challenging environments since they make use of multi-constellation GNSS receivers. GeoNet-Kosova provides a fundamental resource for a wide range of uses, such as scientific research, infrastructure development, mapping, land surveying, and disaster management. By providing reliable and real-time positioning data, the network enhances efficiency, accuracy, and safety in various sectors. Furthermore, GeoNet-Kosova's socio-economic effects go beyond the domain of geographic technology. Improved land administration accuracy encourages openness, makes property rights management easier, boosts investor trust, and stimulates economic growth. In addition, the network's involvement in disaster management helps with prompt reaction and mitigation, protecting people and property in times of need. In conclusion, Kosovo's dedication to utilizing cutting-edge technology for societal progress is demonstrated by the existence of the CORS network "GeoNet-Kosova". This abstract sets the stage for a comprehensive examination of GeoNet-Kosova, highlighting its technical intricacies and transformative impact on Kosovo's geospatial landscape.

Keywords: *CORS, GNSS, GeoNet, reference stations, accuracy.*



Creation of a tourist map using GIS applications for the municipality of Gjakova

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This paper outlines the methodology and data required to create a tourist map of a municipality using GIS software. While the main purpose of creating a tourist map is to provide an accessible and informative guide to the city’s attractions, amenities, and points of interest, the procedure includes various key steps such as collecting data and selecting only the data that is useful and should be featured in our map, map designing and user testing. The collected data used in creating the tourist map for the municipality of Gjakova belongs to different resources including topographic maps for said location, orthophotos, and basemaps provided by the software. The map also includes additional information about each official tourist location featured on the map, with the simple intention of making the map as informative as possible. Map designing and user testing are two components closely intertwined because while designing the map we should always aim to keep the content as simple and as easy to understand as we can. This is when user testing comes in handy. Doing as many user tests as we could helped us understand how helpful and effective our map design to different groups of people with different professional backgrounds is. The contents of this map are designed in both languages: Albanian and English. This speaks of its bilingual character, which makes it very useful for both local and international tourists.

Keywords: *Tourist map, GIS software, Municipality, Data collection, Orthophoto, Map design.*



Land coverage and the changes occurred between years 2006 and 2018 - case study Gjakova Municipality

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The main purpose of this paper is to present the ways in which we can analyze the data from open sources on land coverage for certain surfaces and in different periods of time using GIS software. In this case study, we used QGIS software and land cover data from CORINE Land Cover with 100m resolution. Land cover is defined as the observed physical cover on the earth's surface, including vegetation (natural or planted) and human constructions. The data from CORINE Land Cover is classified into 44 different land cover classes, which we received in raster format. Using the tools and functions provided by the software, we have analyzed this data for the municipality of Gjakova, producing coverage maps for the years 2006 and 2018, accompanied by diagrams and tables that present the area and the percentage of coverage of each type, compared to the total area of the municipality. Also, with the help of geoprocessing tools, we have extracted the surfaces where there was a change in the type of coverage to obtain a map of the changes that occurred during these time periods. To make a comparison of the results, we also analyzed the land cover from satellite images by means of supervised classification based on the colors of the features, in a smaller number of classes but at a higher resolution. The products obtained from this study will be able to be used by different municipal, state or private institutions for different purposes, analysis, and planning.

Keywords: *Land Cover, GIS, QGIS, Map, Raster, Municipality.*



Types of Mobile Mapping Approaches Compared to Static Terrestrial Scanning

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This article evaluates and compares two modern spatial data acquisition technologies, mobile mapping, and static terrestrial scanning, in terms of data collection and processing effort, accuracy, and integrity of the resulting point clouds. Mobile mapping contains a group of tools that use moving media such as vehicles or pedestrian surveys to collect data. Three types of mobile mapping devices were tested: spherical imaging followed by reconstruction using SfM (Structure from Motion) to create point clouds; the Faro Orbis mobile laser scanner that rapidly collects data indoors and outdoors using a combination of laser scanning, an inertial unit (INS), and SLAM (Simultaneous Localisation and Mapping); and the VMX-2HA vehicle-mounted mobile mapping system using the Global Navigation Satellite System (GNSS), INS, and SLAM for mass data collection in exterior. A Trimble X7 scanning system was used for static scanning, and the resulting reference point clouds were created by combining several survey stations. The results show the differences between the types of mobile mapping methods and their advantages, also compared to static scanning. SfM from spherical imagery is suitable for creating models with lower accuracy and density requirements for point clouds, while Faro Orbis and VMX-2HA provide the flexibility to collect data with varying levels of accuracy and detail in interiors and exteriors. The choice between these methods depends on the specific requirements of the project. This paper provides an overview and comparison of key parameters to facilitate the selection of the appropriate technology for a given application.

Keywords: *Mobile mapping, SfM, SLAM, GNSS/INS.*



Automatic transformation of map projection with QGIS. Case study: RKS's borders in different Map Projections

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The cartographic representation of country borders is the most crucial aspect of mapping, decision making processes and spatial understanding. With the Republic of Kosova's rather complex geopolitical history, it provides a compelling plane of study for examining the transformation of the border across different map projections. This study tends to analyze the different variations of Kosova's border when portrayed on diverse map projections and evaluating the implications for special perception. While utilizing Quantum Geographic Information Systems (QGIS) software, this research compares Kosova's borders, their Municipalities, and their Cadastral Zones within, undergone different map projections. The study elucidates linear distortions, angular deformations and area discrepancies that arise from each projection's background mathematical framework. The findings of this research contribute to cartographic theory and practical use for applications, filling the need for critical engagement with map projections in spatial analysis and decision-making processes.

Keywords: *Cartography, Transformation, Republic of Kosova, Map projections, QGIS.*



Geo-information and NSDI





Utilization of the QGIS Platform with OSGEO for Publishing and Analyzing Geospatial Data of River and Road Networks in the Municipality of Vushtrri

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In this paper will be shown how has been established a Web GIS (Geography Information System) platform for publication and analysis of river and road networks in the municipality of Vushtrri. The main aim of this project is to enable a sustainable source of geospatial information, including important details on the characteristics of rivers and roads networks, as well as to make an easy working environment for performing spatial analysis by all stakeholders as an integrated database for the river and road network analysis. Developed platform could facilitate local administration for monitoring, management and maintenance of geospatial data which are under responsibilities. This platform will be able to assist not only the municipality but also other responsible institutions such as MESPI (Ministry of Environment, Spatial Planning, and Infrastructure), which are involved in the analysis and planning of road and hydrographic networks, also all stakeholders. The presentation and paper will present the developed platform and its usage by various user levels, as well as its updates and maintenance.

Keywords: *Web GIS, geospatial data, river, road, spatial analysis.*



Potential flood-prone areas identification and mapping using GIS-based multi-criteria decision making and analytical hierarchy process for the territory of Kosovo.

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This study will give a view of flood-prone areas for the territory of Kosovo. As we all know, floods are one of the most common natural disasters, with dangerous risks that can affect ecosystems, threats to human life and negative impact on the state's economics. Also, floods are becoming even more common natural disasters every day as a cause of climate change. This study will show how to establish a model for flood-prone areas in Kosovo. To show these areas (flood-prone areas) were used: GIS software, Multi-Criteria Decision-Making, and Analytical Hierarchy Process. Using Analytical Hierarchy Process or AHP were calculated the weights of each factor based on importance in relation to flood risk. Using Multi-Criteria Decision-Making were compare the layers based on the weights generated from AHP to get as a result a layer (that will be shown in a map) that represents the risk from floods in all of Kosovo. The data that we will use to create this model will be gathered from sources that offer free and open geospatial data, such as the data for elevation, rainfall, etc. As the result of this study, it will be shown a map with a layer classified in five categories that covers the territory of Kosovo and represent the level of risk from floods. These risk levels are very high, high, moderate, low, very low.

Keywords: *Geographic information system, multi criteria decision making, analytical hierarchy process.*



Developing and usage of Mobile GIS Applications

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The presentation completes an application of how mobile GIS applications make geography knowledge in everyday life and in special projects. Through them, users can have immediate access to geographic information from anywhere, adding a dimension of understanding of awareness about products and the environment around them. Mobile GIS applications are platforms that allow users to explore, analyze and share geographic information through mobile devices, such as smartphones and tablets. These applications are built based on geographic information systems and use Internet technologies to provide quick and easy access to maps and geographic data. The content of these applications may include interactive maps, location information, and interaction with geographic data. Users can browse geographic space, perform various analyses, and share geographic information with others from their mobile devices. This also brings a new dimension to everyday life, integrating geographic information into daily activities and making it a valuable tool for many different fields, including urbanism, environment, territorial development, and many others. In this paper, contents such improving mobility, suitable functionalities for mobile devices, information sharing, security and integrity, built-in functions, intuitiveness of usage, filtering, and analyses, using of social links, application development process, technologies and programming languages, mobile application design, as well as core technologies for developing and using of mobile GIS applications will be presented in conference presentation and described in full manuscript.

Keywords: *Mobile GIS, graphical user interface, user interface, user experience, virtual reality, security certificates SSL&TLS.*





Historical and Monumental Buildings





Application of Geodetic Technologies in the preservation of Butrint Archeologic Site

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Archaeological sites, monumental and historical buildings play a very important role as they shed light on the relationships between different populations and contribute to the increase of knowledge of the development of different cultures around the world. Currently geoinformation science and geodetic technologies are offering extraordinary opportunities to benefit from representations of these historical objects not only with authenticity but also with great opportunities to establish relationships between objects within these archaeological works and helping archeologists create a better representation of the sites. The archaeological site of Butrint, (called Ancient Buthrotum), which lies on Ksamil hill in the south of Albania, is the first archaeological settlement of the Republic of Albania on the UNESCO World Heritage list. The National Park of Butrint is one of the most important areas of our cultural, archaeological, environmental, and touristic diversity of the country. Due to the importance of the objects and ruins, where in addition to the priority of the geodetic works, I have tried to obtain 2 and 3 dimensional products from all measurements and PointClouds to adapt in H-BIM, which I think will increase the interpretation of the archeology of Butrint Archaeological Site by the relevant specialists themselves. This paper is focused on the assistance provided by geodetic techniques that may have an application in archaeology, with knowledge on the use of photogrammetric and remote sensing methods. Giving these sites the right importance is essential in the protection and preservation of the Albanian cultural heritage.

Keywords: *Archaeological Site, PointCloud to BIM, Phogrammetry, Remote Sensing, H-BIM.*



The Restoration and Preservation of Albania's Mati Bridge

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The Mati Bridge, also known as the Zogu Bridge, is one of the first construction works in Europe to have applied precast concrete technology. Built in May 1927, this engineering marvel features six arches and is the only bridge of its kind in Albania and one of the most important Albanian engineers Gjovalin Gjadri following the design of Prof. Emil Mörsch, and together with Eng. Erwin Schnitter, applied innovative techniques as the pre-method of prestressed concrete. With a span of 54 meters, the bridge employs a unique arch supporting structure with two hinges, while the tie-beam acts as a horizontal spin absorber. Today, faced with decay due to corrosion and theft, restoring the Mati Bridge presents both technical and economic challenges. However, preserving this historic landmark not only safeguards its architectural significance but also honors the ingenuity of past generations and ensures a legacy for future ones. In January 2021, leg number 5 of the bridge experienced a sudden decrease in height, causing damage to adjacent arch spans and raising concerns about the stability of leg number 6. Despite this, the bridge maintained its structural integrity but displayed noticeable movement. Until July of the same year, the bridge continued to exhibit movement until leg number 5 stabilized without external intervention, despite a total subsidence of 201 cm over six months. However, in December 2022, the subsidence of leg number 5 doubled, reaching a settlement of 384 cm, resulting in substantial damage to the superstructure. Despite growing concerns, the bridge, this special monument of our cultural heritage, faces every day the high risk of collapse, but what are the measures expected to be taken for its restoration and preservation?

Keywords: *Mati Bridge, Prestressed Concrete, Structural Integrity, Restoration, Risk of Collapse.*



Gjirokastra: A Heritage Preservation Perspective.

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The historic town of Gjirokastra in southern Albania is a rare example of a well-preserved Ottoman town, built by farmers of large estates. Gjirokastra was declared “Museum City” in 1961. It is noted that this concept could best be translated as “urban 176 conservation area”. This presentation aims to bring into light aspects of architecture and engineering that have impacted adding this city to the UNESCO World Heritage Site list in 2005. Gjirokastra’s buildings occupy a special place in the housing typology of Albanian popular dwellings in the feudal period. The heritage of the city is at risk for a wide variety of reasons and strategies must be designed to safeguard the role of its historic areas in the ongoing economic activity of the town whilst ensuring this does not dilute the worth of the underlying heritage asset. This necessitates the identification, protection, conservation, and restoration of buildings that are considered part of the museum system of Gjirokastra. The purpose of this part of the article is to identify the existing depreciated situation, the problems, and unauthorized interventions, and to present the best possible solution for improving conditions and infrastructure. These changes are expected to significantly improve the conditions in which the facilities are and positively impact the increase in visitor numbers. In conclusion, we think that creating all the institutions and associated mechanisms needed to support the renewal of this city is a massive task. Schemes need to be undertaken that support the process of renewal and establish good practice. Gjirokastra is one of the most important assets of our Albania and we must treat it as such.

Keywords: *UNESCO, aspects of architecture and engineering, conservation area, protection, restoration.*



History of Architecture Renaissance to Modern, British Museum London by Robert Smirke

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Based on the architectural style, the period which the structural elements belong to, and the manner of design, we aim to showcase the architectural genius of the British Museum, thus providing a deep understanding of its importance and influence on English architecture. Asymmetric elements, the art of light and shadow, the dramatic effects, and the use of natural materials, such as wood and stone, are just some of the characteristics of romantic architecture, while eclectic architecture, on the other hand, reappeared in the world of art, bringing with it a new way of understanding creativity in relation to history. As an English architect, Robert Smirke worked mainly in the neoclassical style, which was popular at the end of the 18th and 19th centuries and had an important role in the development of English neoclassical architecture, still admired for its elegance. He was a pioneer of using both concrete and cast iron, a preeminent innovation in construction. Even today, the British Museum is recognized as an important cultural institution that houses a large collection of artefacts and works of art from different cultures and time periods. The first phase of the museum's construction began in 1823 and ended in 1827, and over the years it has undergone several changes by an array of architects. The last intervention was in 2000 by Norman Foster, who designed the spectacular glass roof called " the Great Court", which covers the public space, while making continuous efforts to preserve its historic architecture. The construction of the Museum includes the use of numerous and various materials to achieve its greatness and durability; from Portland stone and brick that was used to build the walls for stability and resistance, to cast iron that was used as a decorative material. Thus, this analysis shows in particular the work of the masters' and the neoclassical principles that influenced the design of the British Museum. The dedication and intellectual ability that presents itself in the combination of new construction methods for that time shows the architects' talent and deep knowledge of classical architecture.

Keywords: *Romanticism and eclecticism, Concrete and cast iron, Durability, Glass roof.*



Architecture of Restaurants and Cafes in Prishtina

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The architecture of restaurants and cafes in Prishtina expresses an adaptability between urban design and the cultural aspects of gastronomy in the city. Our study analyzes the changes over the years and the main characteristics of the architecture of restaurants and cafes in Prishtina. By means of this research we managed to make an analysis of the architecture of restaurants and cafes in Prishtina, but with a focus on the two most popular restaurants, both in the center of the city, analyzing how two different restaurants, in one place the same manage to be ac popular, each in its own way. The conclusions drawn from this research aim to provide an overview of the architecture of restaurants and cafes in Prishtina, emphasizing the importance of design and their impact on the city's culture and visitor experience. Through a detailed analysis of the structures, the materials used and the interior, this research includes an analysis of the historical development of the architecture of these premises, reflecting the changes in their style and architecture. These changes come because of the current situation in Kosovo, but also because of the influences of culture and history over the years. Also, our research focuses on the influence of urban and cultural factors in the design of restaurants and cafes, evaluating how this architecture reflects the cultural heritage and urban identity of Prishtina. With a greater focus on the analysis of the interior and exterior of restaurants and cafes in Prishtina. In addition, through the questionnaires we have made, we have analyzed the preferences of the customers, reaching a conclusion about what influences them to choose certain bars in Prishtina, what influences them to feel more comfortable, etc. Through these analyses, we manage to find out what is "new in Prishtina" and what is its impact today. The purpose of this research has been achieved mainly through the implementation of practical research by conducting interviews with citizens of Prishtina, with professors, gastronomes, etc. since there are not many official documents or research done before on this topic.

Keywords: *History, Coffee Culture, City, Architecture, Customers.*



History of Architecture Renaissance to Modern, Baroque in Austria, XVIII century – Lucas Von Hildebrandt, Belvedere Palace, Vienna

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The awakening of Baroque in Austria during the XVIII century marked a bright period in an art and history of architecture, from other eras which are a spirit, baroque comes with courage, openness, dynamic character and as a cause of exploration around the world, colonization, and scientific research. At the center of this era of splendor was the eminent architect Johann Lucas von Hildebrandt, who with his construction filled Vienna with grandiose and amazing sights. In this study, we focus on the mystery and charm of the Baroque in Austria, examining it in the work of von Hildebrandt and the open Belvedere Palace in Vienna. Starting from a hidden journey in the time and space of that period, we shed light on a world where architecture is not just a structure, but an image of power and elegance. In these colorful analyses, we dive into the details of the Baroque style that Hildebrand used to create Belvedere Palace. Materials and material techniques related to the walls of the Belvedere Palace are limestone, where the external dressings, decorative elements were made of stone, giving the palace its large and beautiful appearance. Stucco, a mixture of lime, sand, and water, was used extensively in the interior and exterior decoration of the palace, the wood material used for doors, windows, and floors, and often carved and adorned with decorative interior motifs. Iron played an attacking role for structural elements such as beams, columns, and frames, while the roofs of ordinary palaces were covered with clay or ceramic tiles. These security systems from the elements and contribute to the overall aesthetics of the building. Construction of the Belvedere Palace began in 1712 and was completed in 1924. In 1717 after the completion of the Lower Belvedere, construction work began on the Upper Belvedere. The museum in the Upper Belvedere was finally closed in 1896 and renovated as the main residence for the last heir, Franz Ferdinand.

Keywords: *Baroque, Limestone, Stucco, Clay or ceramic tiles, Durability.*



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