وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture
Kingdom of Saudi Arabia المملكة العربية السعودية

جامعة نجران
NAJRAN UNIVERSITY
كليـــة الهندســـة

تقريرالمشاركة في أسبوع البيئة 28- ابريل - 2024

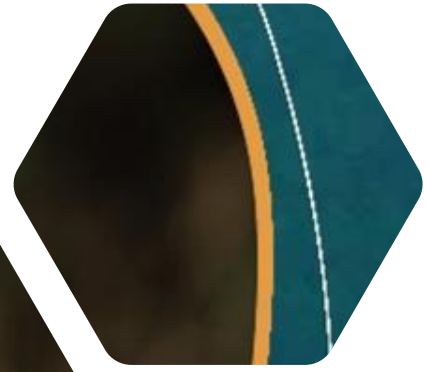
كلية الهندسة

قسم الهندسة المدنية

2024 May 4 - April 28

تعرف بيئتك؟

مبادرة التوعية البيئية | أسبوع البيئة 2024



مبادرة التوعية البيئية هي إحدى مبادرات برنامج التحول الوطني والسعودية الخضراء التابعة لوزارة البيئة والمياه والزراعة

مسارات المبادرة:

01 المشاركات المجتمعية

02 التوعية والإدارة البيئية

03 توعية أجيال المستقبل

04 التوعية البيئية المجتمعية

مبادرة التوعية البيئية | أسبوع البيئة 2024

نظرة عامة

أسبوع البيئة هو مناسبة وطنية بيئية تهدف إلى نشر الوعي البيئي المجتمعي وتحقيق الاستدامة البيئية والمحافظة على الموارد الطبيعية والحد من التلوث بمختلف أنواعه

قال تعالى: [وهُو الَّذِي جعلكُم خلائِف الأرض] سورة الأنعام - ١٦٥

وقال رسول الله صلى الله عليه وسلم: [ما من مسلم يغرس غرساً أو يزرع زرعاً فيأكل منه طير أو إنسان أو بهيمة إلا كان له به صدقة] رواه مسلم

يساهم أسبوع البيئة في دعم وتحقيق مستهدفات رؤية المملكة ٢٠٣٠ من خلال:

- رفع مستوى الوعي البيئي لدى كافة فئات المجتمع والقطاعات المختلفة
- نشر المعرفة بأهمية القضايا البيئية بالمملكة العربية السعودية
- تحفيز الالتزام البيئي ورفع حس المسؤولية لتصحيح السلوكيات الخاطئة تجاه البيئة
- تعزيز السلوكيات الإيجابية تجاه البيئة

الجهات المشاركة

- القطاع الحكومي
- القطاع الخاص
- القطاع غير الربحي


مبادرة التوعية البيئية | أسبوع البيئة 2024
أهداف أسبوع البيئة
1 نشر الوعي البيئي
2 تعزيز الاستدامة البيئية
3 التوعية بأهمية الحد من التلوث البيئي
4 التوعية بأهمية الحفاظ على الموارد الطبيعية

مشاركة جامعة نجران
كلية الهندسة
قسم الهندسة المدنية


Recycling of Agricultural and Industrial Waste Materials to Produce Sustainable and Environmentally Friendly Concrete
Ibrahim Hakeem
أسبوع البيئة 2024
مبادرة التوعية البيئية


Landfill site selection Using Multi-Criteria Decision Analysis, Remote Sensing Data and Geographic Information System Tools in Najran City, Saudi Arabia
جامعة نجران
NAJRAN UNIVERSITY


Sustainable Impact of Coarse Aggregate Crushing Waste (CACW) in Decreasing Carbon Footprint and Enhancing Geotechnical Properties of Silty Sand Soil
جامعة نجران
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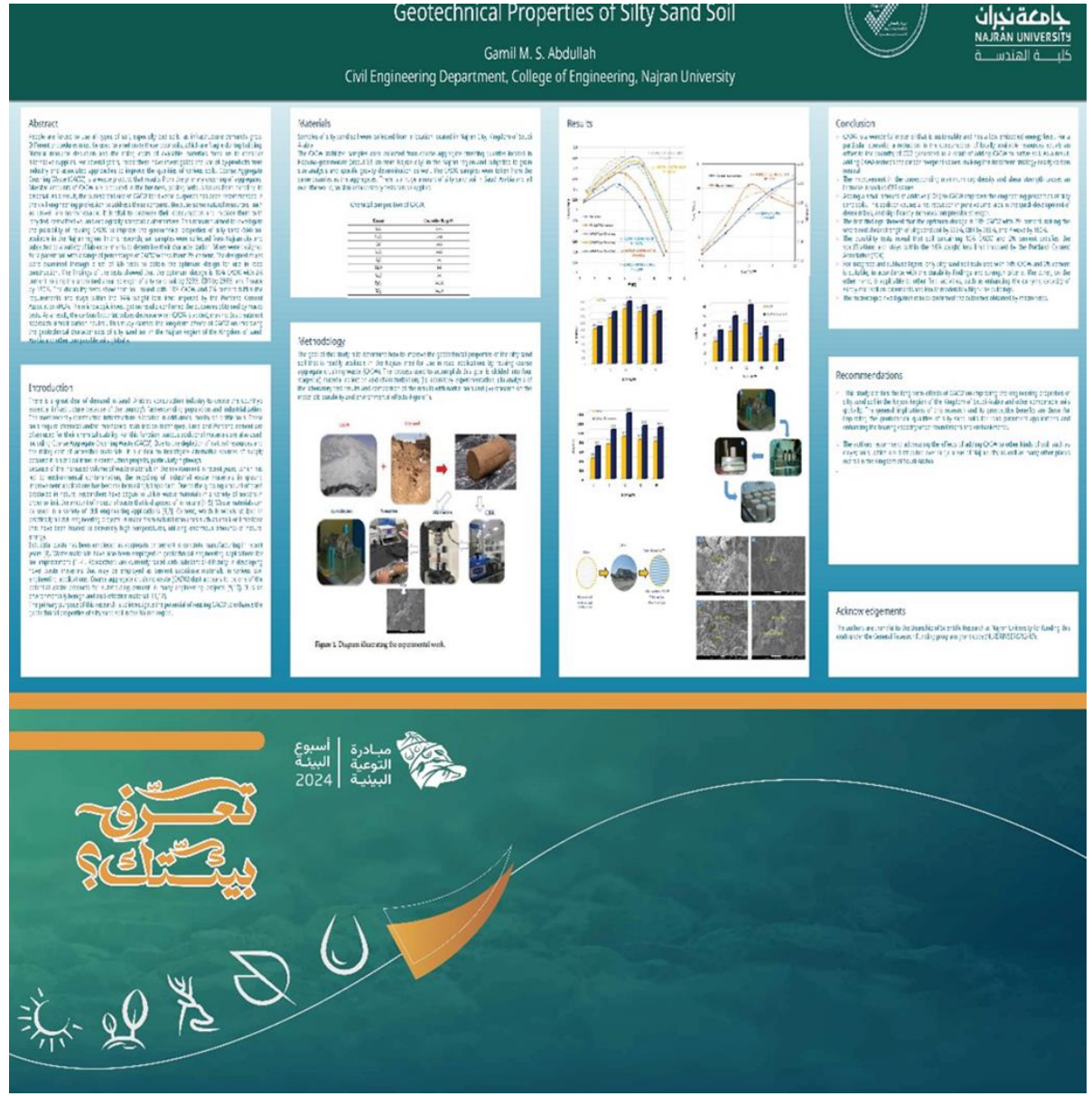
Geotechnical Properties of Silty Sand Soil
Gamil M. S. Abdullah
Civil Engineering Department, College of Engineering, Najran University
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NAJRAN UNIVERSITY
كلية الهندسة
Abstract
Introduction
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Acknowledgements
أسبوع البيئة 2024
صادرة التوعية البيئية
تعرّف بيئتك؟

Landfill site selection Using Multi-Criteria Decision Analysis, Remote Sensing Data and Geographic Information System Tools in Najran City, Saudi Arabia

Ismail Elkhrachy, Ali Alhamami and Saleh H Alyami
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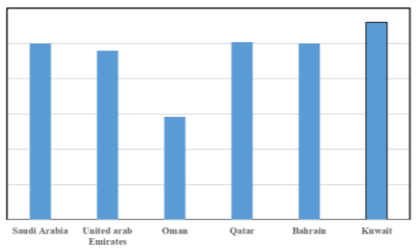
جامعة نجران NAJRAN UNIVERSITY كلية الهندسة

Abstract

ctical issues arise when dealing with solid waste management, and also environmental effects to be considered. Selecting landfill sites xtra care with respect to many factors such as the environment, zards for people, and the cost of transportation. Furthermore, cities own rules, methods, and practices for managing and selecting the tions for collecting solid waste. In this research, multi-criteria analysis (MCDA) was presented and used to evaluate the teness of and suggest the best locations for landfill sites in Najran, e remote sensing data and the ArcGis software were used to prepare natic layers, including drainage density, groundwater depth, land ype, road network, surface elevation, surface slope, distance from l areas, and distance from protected areas.

Introduction

nt of municipal solid waste (MSW) being produced worldwide has ificantly. The World Bank has estimated that due to a fast-growing pulation, the generation of municipal waste is likely to increase to tons by the year 2025. The generated volumes of MSW in Saudi ve been increasing at an alarming rate, with a currently estimated over 15 million tons per year [1]. This trend is expected to continue increase in population growth and urbanization, highlighting the ed for effective waste management strategies to be implemented. generation rate varies across the Arab Gulf countries, with Kuwait e highest rate of 1.4 to 1.8 kg/person/day and Oman having the e of 0.7 to 1 kg/person/day. However, regardless of the specific rate, ulf countries face significant challenges when it comes to managing nicipal solid waste[2]. Figure 1 shows the MSW generation rate for Arab Gulf countries.



e rate of MSW generation in the Arab Gulf countries.

Methods and Materials

Some remote sensing data (Drainage density (C_1) , Groundwater depth (C_2), Land use (C_3), Soil type classification (C_4), Road network (C_5), Surface elevations (C_6), Surface Slope (C_7), Distance from residential areas (C_8), Distance from protected areas (C_9)) and the ArcGis software were used to prepare nine thematic layers, including drainage density, groundwater depth, land use, soil type, road network, surface elevation, surface slope, distance from residential areas, and distance from protected areas. To evaluate the layer weightings, a questionnaire with pairwise comparisons was distributed among experts and analyzed using the analytical hierarchy process (AHP) and fuzzy set technique.

Fig. 2. Methodology of landfill site selection.

Results

Table 1 shows the results of the FAHP process based on the first expert opinion, Geometric means, fuzzy weighting, average eight, and normalized weightings were used for each criterion.

Table 1. The nine criteria weightings used based on the FAHP method

	Geometric means r_i			Fuzzy weighting w_i			Averaged weight	Normalized weight
C_1	3.617	4.479	5.232	0.218	0.331	0.491	0.347	0.325
C_2	2.340	2.957	3.563	0.141	0.219	0.335	0.231	0.217
C_3	1.661	2.138	2.706	0.100	0.158	0.254	0.171	0.160
C_4	0.956	1.206	1.533	0.058	0.089	0.144	0.097	0.091
C_5	0.682	0.956	1.262	0.041	0.071	0.118	0.077	0.072
C_6	0.449	0.584	0.735	0.027	0.043	0.069	0.046	0.044
C_7	0.424	0.544	0.705	0.026	0.040	0.066	0.044	0.041
C_8	0.324	0.418	0.596	0.019	0.031	0.056	0.035	0.033
C_9	0.198	0.231	0.281	0.012	0.017	0.026	0.018	0.017
Sum	10.649	13.513	16.613				1.067	1.000
Reverse	0.094	0.074	0.060					
Inc. order	0.060	0.074	0.094					

Fig 3 shows The resulting index values ranged between 1.39 and 4.66. These values were categorized into five suitability areas based on their level of suitability: limited suitability, least suitable, relatively suitable, suitable, and most suitable.

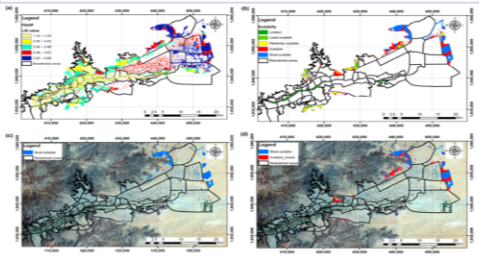


Fig. 3. Landfill site suitability map: (a) before removing residential areas, (b) after removing residen-tial areas, (c) overlay of the most suitable landfill locations with the Sentinel-2 satellite image, (d) the final landfill locations for the study area within the most suitable and suitable categories.

Discussion

The current study successfully integrated AHP and fuzzy AHP methods with various geospatial features to determine appropriate landfill site locations. Expert information was used to calculate criteria weightings, while satellite images and numerical data were collected to create nine thematic layers including drainage density, groundwater depth, land use, soil type, road network, surface elevation, and surface slope, as well as distance from residential areas and protected regions. Each layer was divided into five classes that were rated based on their suitability for a landfill site, ranging from one (restricted region) to five (most suitable location).

Conclusions

The current study included a variety of remote sensing datasets and decision-making approaches in order to provide an integrated framework for the landfill suitability site map for a portion of Najran city, Saudi Arabia. Six remote sensing datasets, including soil data, surface slope, drainage density, airport distance, road distance, land use/cover, were chosen for this study after an extensive literature review and gathering expert opinions.

Future Work

It is recommended to overlay the current landfill site with a final finding map to educate and inform the public regarding the selection process and the factors taken into consideration when identifying the optimal landfill site location.

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References

1. E. S. Gharaibeh, N. M. Hamour, and B. A. Akash, "Evaluation of current municipal solid waste practice and management for Al-Ahsa, Saudi Arabia," Int. J. Sustain. Water Environ. Syst., vol. 2, no. 2, pp. 103–110, 2011.
2. O. K. M. Ouda, S. A. Raza, R. Al-Waked, J. F. Al-Asad, and A. S. Nizami, "Waste-to-energy potential in the Western Province of Saudi Arabia," J. King Saud Univ. Sci., vol. 29, no. 3, pp. 212–220, 2017.
3. M. H. Ghobadi, R. Babazadeh, and V. Bagheri, "Siting MSW landfills by combining AHP with GIS in Hamedan province, western Iran," Environ. earth Sci., vol. 70, no. 4, pp. 1823–1840, 2013.
4. H. I. Abdel-Shafy and M. S. Mansour, "Solid waste issue: sources, composition, disposal, recycling, and valorization. Egypt J Petrol 27 (4): 1275–1290." 2018.
5. B. Ozkan, E. Ozceylan, and I. Sarıçiçek, "GIS-based MCDM modeling for landfill site suitability analysis: a comprehensive review of the literature," *Environ. Sci. Pollut. es.*, vol. 26, no. 30, pp. 30711–30730, 2019.
6. V. M. Adamović, O. Ž. Antanasijević, M. D. Ristić, A. A. Perić-Grujić, and V. V Pocajt, "Prediction of municipal solid waste generation using artificial neural network approach enhanced by structural break analysis," *Environ. Sci. Pollut. Res.*, vol. 24, no. 1, pp. 299–311, 2017.

قسم الهندسة المدنية
Civil Engineering Dep.

Recycling of Agricultural and Industrial Waste Materials to Produce Sustainable and Environmentally Friendly Concrete

Ibrahim Hakeem

Civil Engineering Department , College of Engineering , Najran University, Saudi Arabia

Abstract

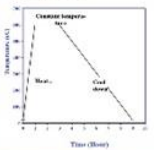
In order to protect the environment and reduce pollution, it is necessary to properly dispose of the various types of agricultural waste that are generated during date production. A significant quantity of cement is necessary for the production of ultra-high-performance concrete (UHPC). However, some environmental issues are associated with cement production. The worldwide agricultural growth increases ash from agricultural waste (AW). Furthermore, industrial waste (IW) generated throughout the stone-cutting and processing has increased due to the growing demand for granite stone in construction. A new study has explored the potential of using date palm fibers (DPF), which are one of the waste materials, to fabricate sustainable ultra high performance concrete (UHPC). UHPC has unique engineering properties that make it suitable for various structural applications. The aim of the study was to create environmentally friendly, cost-effective, and sustainable UHPC by replacing traditional steel fibers with DPF. The study involved creating multiple UHPC samples with different levels of DPF substitution for steel fibers (ranging from 0% to 100%).

Research significance

This study is the first to combine and use RHA and OWA as a construction material, that is, as a partial substitute for cement in high-strength concrete (HSC) production. In this research, the effect of utilizing a combination of RHA and OWA at different proportions as a partial substitute of cement on HSC's fresh, mechanical, and microstructural characteristics is investigated. Twenty-one mixes were prepared for this purpose.

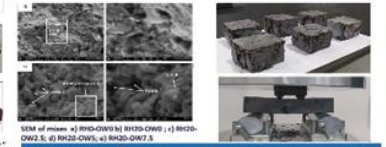
Properties	Cement	RHA	OWA
Chemical characteristics			
CaO	62.34	-	26.17
SiO_2	20	87.05	27.20
Al_2O_3	6.25	-	1.19
Fe_2O_3	3.55	-	1.18
SO_3	2.42	-	1.55
MgO	2.12	0.75	1.80
K_2O	0.75	5.71	13.01
Na_2O	0.81	-	6.38
P_2O_5	-	1.75	4.10
CuO	-	2.49	0.21
Cl	-	-	1.85
C	-	2.25	15.34
LOI	1.67	-	-
Physical characteristics			
Surface area (cm^2/gm)	3610	18790	16998
	Grey	Dark Grey	Light Grey

The RHA and the OWA were subjected to a heating temperature of 600 °C for 2 h. The heating protocol used in this study is consistent with the method used by [46-60].



Methods and Materials

Results



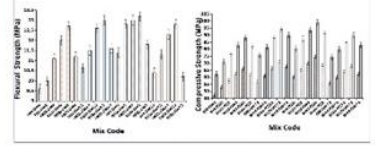
Discussion and Conclusion:

According to the above experimental results, the following conclusions can be obtained:

•As a result of increasing the replacement percentage ratios of RHA and OWA (i.e. **0%, 5%, 10%, 15%, 20%, and 25% for RHA and 0%, 2.5%, 5%, and 7.5% for OWA)** as a partial replacement of cement mass, the slump values and workability decreased due to fine particles and the small size of RHA and OWA compared with cement. Therefore, the volume fraction and surface area of the binder increase with the RHA and OWA contents; thus, an additional amount of water is absorbed due to high surface areas, and free water quantity is mitigated in concrete.

•Increasing the replacement ratios of cement with OWA and RHA (i.e. 0%, 5%, 10%, 15%, 20%, and 25% for RHA and 0%, 2.5%, 5%, and 7.5% for OWA) as a partial replacement of cement improves the mechanical properties gradually up to a certain level. Furthermore, the HSC mixture, including 5% OWA with 20% HRA, produced high mechanical properties, probably because the high fineness of the particles contributed to the increased activity of pozzolanic materials, and a part of RHA and OWA interacted with CH to produce an additional CSH. The residual part creates a filling material to fulfil fulfil the pores.

Results



Flexural Strength results

Compressive strength at 7 and 28 day

Future Recommendation

There are future recommendations that can be studied by many researchers on HSC properties containing a combination of rice husk and olive waste ashes like studying the effect of elevated temperature on mechanical properties, investigating the durability properties, and studying its structural behavior under static or cyclic loading.

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