ABSTRACT

This thesis aims to estimate the solid waste by using GIS in evaluating the situation of the landfills in Khartoum, and then plan and select the most suitable sites for such landfills on the basis of specific conditions and criteria.

It estimates the rate of solid waste for five years on the basis of the gross domestic production (GDP) and the physical components of solid waste in Khartoum. By the application of the typical densities of those components, the researcher has got the volume of the solid waste to be disposed of taking into consideration the relationship between solid waste volume and population growth and concluded that the volume of solid waste in Khartoum will be about 3.257.921 m3 a year in 2018. The accumulated volume of the waste during five years will be about 14.216.731 m3, whereas the reduction rate will be about 46% if sound recirculation operations are used.

As regards determining the landfills, the researcher has used the available data of the case study and applied GIS technique and a set of criteria such as (distance from urban and rural areas, distance from road, valleys, surface water, rainfall rate, underground water, land slope and land uses) and derived the required criteria reverting them to maps and giving them ranks as per every criterion starting from rank-1 which represents the unsuitable areas and rank-10 which represents the suitable areas. Then, the researcher has given the effective criterion a greater weight than the less effective criterion. By collecting those weights, the Model Builder has been built, deriving a map representing the most suitable locations for landfill in Khartoum.

The researcher has concluded that the existing landfills in Khartoum (Teiba and Abu Walidat) are unstable because they do not observe the health and environmental standards, exempt for Hattab landfill. After the application of various criteria by using GIS, the researcher has concluded that there are 11 suitable locations for landfills which are shown on the suitable maps where number 5 and 6 represent the most suitable locations according to their distance from the city center. The researcher has recommended that GIS must be used in waste management and health and environmental standards must be applied in the planning of landfills

المستخلص

تهدف الدراسة الى تقييم النفايات الصلبة في ولاية الخرطوم وكذلك استخدام نظم المعلومات الجغرافية في تقييم واقع مكبات النفايات في الخرطوم ، ومن ثم تخطيط واختيار افضل المواقع الصالحة لاقامة مكبات النفايات اعتماداً على مجموعة من الشروط والمعايير.

وقد تضمنت الدراسة تخمين نسبة انتاج النفايات الصلبة على مدى (5) خمس سنوات وبالاعتماد على معيار الناتج المحلي الاجمالي (GDP) ومعرفة المكونات الفيزيائية للنفايات الصلبة في ولاية الخرطوم وبتطبيق الكثافات النموذجية لهذه المكونات تم الحصول على حجم النفايات الصلبة المراد التخلص منها وقد تم الاخذ بنظر الاعتبار علاقة النفايات الصلبة بنمو السكان ، وقد توصلت الدراسة الى ان حجم النفايات الصلبة في الخرطوم يصل الى(3.257.921) م^3 لسنة 2018 ، وان الحجم المتراكم للنفايات وعلى مدى خمس سنوات هو (14.216.731) م^3 ، وأن نسبة التخفيض للنفايات هي 46% في حالة استخدام عمليات التدوير الصحيحة .

فيما يخص تحديد مواقع الطمر فباستخدام البيانات المتوفرة عن منطقة الدراسة وبالاعتماد على تقنية نظم المعلومات الجغرافية ، تم تطبيق جملة من المعايير (البعد عن المناطق الحضرية والريفية ، البعد عن الطرق ، البعد عن الأودية ، المياه السطحية ، معدل تساقط الامطار ، المياه الجوفية ، البعد عن الأودية ، الانحدار ، استخدامات الارض) واشتقاق هذه المعايير وتحويلها الى خرائط واعطائها رتب الملاءمة الخاصة بكل معيار ابتداءاً من الرتبة (1) التي تمثل المناطق غير الملائمة والرتبة (10) التي تمثل المناطق الملاءمة ومن ثم اعطاء المعيار المؤثر وزنا اكبر من المعيار الذي يكون تأثيره أقل وبجمع هذه الأوزان تم بناء النموذج الهيكلي (Model Builder) واستخراج خارطة تمثل أكثر المواقع ملاءمة لاقامة مكبات النفايات الأكثر ملاءمة في الخرطوم .

توصل الباحث إلى أن المكبات الحالية الموجودة في الخرطوم (مكب طيبة ومكب أبو وليدات) غير ملائمة حيث أنها لا تراعي الشروط الصحية والبيئية باستثناء مكب حطاب ، وكذلك توصلت الدراسة وبعد تطبيق المعايير المختلفة باستخدام تقنية GIS الى (11) احد عشر موقعاً ملائماً لاقامة مكبات النفايات والتي تم تمثيلها بخرائط الملاءمة ، حيث تمثل الأرقام 5 ،6 أكثر المواقع ملاءمة حسب بعدها عن مركز المدينة . أوصت الدراسة بضرورة تفعيل دور نظم المعلومات الجغرافية في مجال الادارة السليمة للنفايات واتباع الاسس الصحية والبيئية في تخطيط مكبات النفايات.

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List of Abbreviation

Symbol	Definition
GIS	Geographic Information System
MCDA	Multi criteria Decision Analysis
MSW	Municipal Solid Waste
WHO	World Health Organization
SW	Solid Waste
GNI	Gross National Income
MRF	Material Recovery Facility
CET	Central of Ecology Technology
ONP	Old Newspaper
OCC	Old Corrugated Containers
PET	Polyethylene Terephthalate
EDPE	High Density Polyethylene
PVC	Polyvinyl Chloride
LDPE	Low Density Polyethylene
PP	Polypropylene
PS	Polystyrene
UBCS	Used Beverage Containers
AHP	Analytical Hierarchy Process
ISI	Indian Statistical Institute
CBS	Central Bureau Statistics
ELOT	Estimated Landfill Operation Time
GDP	Gross Domestic Product
EPA	Environmental Protection Agency
MODM	Multi objective Decision Making
MADM	Multi attribute Decision Making
SAW	Simple Additive Weighting
DEM	Digital Elevation Model
NOAA	National Oceanic and Atmospheric Administration