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**Spatial-temporal analysis of the impact of climate change
on vegetation cover: Case study of the city of Biskra,
Algeria.**

Presented by: **BETATACHE Amani.**

- **Supervised by:**

Encadrant : Dr. BOULAHIA Latifa, Université Salah Boubnider Constantine 3.

Co-Encadrant : Dr. BOULTIF Meriem, Centre de recherches scientifiques et techniques des regions arides CRSTRA.

- **Chairperson :** Dr. ALLIOUCHE Ahmed, Centre de recherches en aménagement du territoire CRAT

- **Examiner :** Prof. ABDOU-OUTTAS, université Salah Boubnider, Constantine 3.

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ABSTRACT

A viable solution to the sustainability of the earth system requires careful consideration of land use/land cover change (LULCC) and its effects on the environment. One of the main issues now plaguing Algeria's Low-Saharan oasis is urban sprawl. Any effort aimed at the oasis city's sustainable development must continue to track and comprehend its spatial progression. For efficient management and spatial planning, local governments lack current and pertinent instruments. Geographic Information Systems (GIS) and remote sensing offer ways around these challenges. This paper's primary goal is to draw attention to the process of urban expansion and the changes it causes to land cover and land use in specific areas. In this study, four Landsat images taken in 1995, 2005, 2015 and 2024 are used to map and quantify Biskra City, Algeria's spatiotemporal sprawl using a change detection technique. Following classification, a comparison of land use and land cover maps has shown a notable increase in the built-up regions outside of the municipality, conurbating with the Chetma agglomeration, in contrast to a steady drop in the palm grove. Its surface has continued to be fragmented and converted by unchecked urbanization, which has resulted in the loss of the city's unique oasis identity while underscoring the significance of El-Hadjeb's agricultural areas and their effects on the quality of the soil. This study also demonstrates the value of geographic information systems and change detection techniques for tracking urbanization trends and evaluating their effects on oasis ecosystems.

RESUME

Une solution viable à la durabilité du système de la terre exige une considération attentive de l'utilisation des terres et du changement de couverture et de ses effets sur l'environnement. L'un des principaux problèmes qui pèsent actuellement sur l'oasis bas-saharienne de l'Algérie est l'expansion urbaine. Tout effort visant au développement durable de la ville de l'oasis doit continuer de suivre et de comprendre sa progression spatiale. Pour une gestion et une planification spatiales efficaces, les gouvernements locaux manquent d'instruments actuels et pertinents. Les systèmes d'information géographique (SIG) et la télédétection offrent des solutions à ces défis. Dans cette étude, quatre images de Landsat prises en 1995, 2005, 2015 et 2024 sont utilisées pour cartographier et quantifier la ville de Biskra, l'étendue spatiotemporelle de l'Algérie en utilisant une technique de détection des changements. Après la classification, une comparaison des cartes d'utilisation des terres et de couverture a montré une augmentation notable des régions construites à l'extérieur de la municipalité, conurbant avec l'agglomération de Chetma, par opposition à une baisse constante des palmiers. Sa surface a continué d'être fragmentée et transformée par une urbanisation incontrôlée, ce qui a entraîné la perte de l'identité oasis unique de la ville tout en soulignant l'importance des zones agricoles d'El-Hadjeb et leurs effets sur la qualité du sol. L'objectif principal de ce document est d'attirer l'attention sur le processus d'expansion urbaine et les changements qu'elle entraîne dans la couverture et l'utilisation des terres dans des zones spécifiques. Cette étude démontre également la valeur des systèmes d'information géographique et des techniques de détection des changements pour suivre les tendances d'urbanisation et évaluer leurs effets sur les écosystèmes oasis.

ملخص

حل مستدام لنظام الأرض يتطلب النظر بعناية في استخدام الأراضي وتغير الغطاء الأرضي (LULCC) وآثاره على البيئة. أحد المشاكل الرئيسية التي تؤثر حاليًا على الواحات في المناطق المنخفضة من الصحراء الجزائرية هو التوسع الحضري. يجب على أي جهد يهدف إلى التنمية المستدامة لمدينة الواحات أن يستمر في متابعة وفهم تطورها المكاني. من أجل إدارة وتخطيط مكاني فعالين، تفنقر الحكومات المحلية إلى الأدوات الحديثة والملائمة. توفر أنظمة المعلومات الجغرافية (GIS) والاستشعار عن بعد حلولًا لهذه التحديات. في هذه الدراسة، تم استخدام أربع صور من Landsat مأخوذة في الأعوام 1995، 2005، 2015، و2024 لرسم خرائط وتحديد كمية التمدد الزمني المكاني لمدينة بسكرة في الجزائر باستخدام تقنية اكتشاف التغيرات. أظهرت المقارنة بعد التصنيف بين خرائط استخدام الأراضي وتغطية الأرض زيادة ملحوظة في المناطق المبنية خارج حدود البلدية، متصلة بتكتل شتمة، مقابل انخفاض مستمر في بساتين النخيل. استمرت مساحتها في التفتت والتحول بسبب التوسع العمراني غير المنضبط، مما أدى إلى فقدان هوية الواحة الفريدة للمدينة، مع التأكيد على أهمية الأراضي الزراعية في الحاجب وتأثيراتها على جودة التربة. الهدف الرئيسي من هذا البحث هو تسليط الضوء على عملية التوسع الحضري والتغيرات التي تؤدي إليها في تغطية واستخدام الأراضي في مناطق محددة. كما تُظهر هذه الدراسة قيمة أنظمة المعلومات الجغرافية وتقنيات اكتشاف التغيرات في متابعة أنماط التحضر وتقييم تأثيراتها على النظم البيئية للواحات .