الجـمهوريــة الجزائريــة الديـمقراطية الشعبيـــة
Democratic and Popular Republic of Algeria
وزارة التعليــم العــالي و البحــث العــلمي
Ministry of Higher Education and Scientific Research
جامعة قسنطينة 3 – صالح بوبنيدر
University of Constantine 3 Salah BOUBNIDER
معهد تسيير التقنيات الحضرية
Institute of Urban Technology Management

Laboratory of Geo-prospective, Environment and Development (LAGED)
In partnership with:
The Territory Planning Research Center (CRAT)

Organize an international seminar on:

WATER, CLIMATE CHANGE, ENVIRONMENT AND SUSTAINABILITY CHALLENGES AND PROSPECTS

October 13 and 14 2025

Book of Abstracts

Preamble

Welcome to the 1st INTERNATIONAL SEMINAR ON WATER, CLIMATE CHANGE, THE ENVIRONMENT AND SUSTAINABILITY organised by the Laboratory of Geoprospectics and Environment (LAGED) at the Institute of Urban Management Techniques (IGTU) at Constantine 3 University.

The aim of our seminar is to present scientific topics of broad interest to climate change and the environment, offering the opportunity to present their work in the form of oral presentations or posters and to exchange ideas through national and international networking. Our aim was to bring together science, research and the socio-economic sector in a friendly environment in Constantine to share their interests and ideas and benefit from interacting with each other.

ECCED 2025 was organised with broad participation both in person and online and saw the organisation of a round table on 14 October with the socio-economic sector, which was widely represented and did not hesitate to respond to our invitations to attend this seminar.

I would like to thank all our guests who attended the conference opening ceremony on the 13th:

- ✓ Professor Chaabane BAITICHE, Rector of the University Constantine 3
- ✓ Vices-Rector, each by name
- ✓ Deans of the faculties, each by name

1. Mr Badreddine Kharashi, Director of Agricultural Services for the Wilaya of Constantine (DSA)
2. Mr Slimane Deribine, National Secretary of the National Union of Agricultural Producers (UNPA)
3. Ms Doria Admen, from the German Agency for International Cooperation (GIZ) and representative of the URBA-CLIM project
4. Mr Bahaeddine HAMIDA, representative of the National Office for Rural Studies (BNEDER)
5. Mr Abdelkrim MAANSER, Dean of the Faculty of Architecture at the University of Oum El Bouaghi
6. Mr TAOUIL, environmental studies office
7. Representative of the Constantine Wilaya Forestry Department
8. Dr Lotfi BENDAHMANE, representative of the ECO-CIRTA association, which participated in the fair with a stand.

As well as those who attended the round table on 14 October:

1. Mr Hicham CHENIKER, President of the National Union of Environmental Scientists, Professor at the National Forestry School of Khenchela and representative of the Arab Organisation For Environmental Protection.
2. Ms Grin, representative of the National Centre for Environmental Training in the province of Constantine (CNFPE)
3. Ms Belkadi, representative of the National Water Management Agency (AGIRE).
4. Representative of national protection.
5. Ms Asma Yousfi, representative of the ANRH.

We would all like to thank you for participating in this conference and we would also like to give a special thank you to our officials, speakers, sponsors and participants for giving us great support in organising this event.

Dr Latifa BOULAHIA
International Seminar Chairman: Water, Climate Change, Environment and Sustainability, Challenges and
October 13th and 14th 2025

Dr. Latifa BOULAHIA
President of seminar ECCED 2025

Seminar Overview

Honorary President of the Seminar	
	**Prof Chaabane BAITICHE -** Rector of the University of Constantine 3 Salah BOUBNIDE
	**Prof Chaouki BENABBAS** – Director of the Territory Development Research Center (CRAT)
	**President of the seminar**: **Dr Latifa BOULAHIA** – Director of the LAGED Laboratory

Argument

Cradle of civilizations for millennia, the Mediterranean basin brought together 522 million inhabitants in 2020, which represents 6.7% of the world population where two thirds live in territories undergoing perpetual urbanization, particularly in cities. (https://planbleu.org/wp-content/uploads/2020/10/Note-de-synthese-38-Tendances-demographiques-Plan-Bleu.pdf).

The latter, which have spread rapidly, are faced with a range of risks including natural disasters (earthquakes, floods, volcanic eruptions) or those caused by human activities such as forest fires, pollution, etc. all of these actions that the biosphere undergoes interact with climate change, threatening the balance of hydrospheric, lithospheric and atmospheric ecosystems.

Climate experts, such as those from the Intergovernmental Panel on Climate Change (IPCC), point to human activities, especially those that release greenhouse gases, as the main cause of this warming. Industry, agriculture, road transport and housing would therefore be the main culprits, and a change in our behavior is essential to slow it down.

Against this backdrop, the Geo-prospecting, Environment and Development Laboratory (LAGED), in collaboration with the Territory Planning Research Center (CRAT) and the Bioclimatic Architecture Laboratory (ABE), are organizing the international seminar about, Climate Change, Environment and Sustainability (ECCED), Challenges and Prospects, on 15 and 16 June 2025.

Seminar objectives

The overall objective of the seminar is to design and implement a more sustainable and particularly effective model for addressing socio-economic and socio-environmental issues. It will serve as an essential platform to bridge the gap between experts, scientists, practitioners and decision-makers in order to mobilize innovations, knowledge and skills as well as disseminate the most recent scientific knowledge.

It seeks to achieve a number of specific objectives, such as:

1. Open a scientific debate and a space for the exchange of experiences on the reality of environmental problems in Algeria and the Mediterranean.
2. Identify adaptation processes and instruments for sustainable management based on the evaluation of adaptation strategies.
3. Analyze, diagnose and manage global environmental changes

4. Work on a scientific and systematic approach to sustainable development to acquire the expertise, skills and tools necessary to solve the above-mentioned problems.

5. Use geomatics techniques, including GIS and remote sensing to manage these problems.

Axes (themes) of the seminar

AXIS 1: EXTREME EVENTS AND CLIMATE CHANGE, IMPACTS AND ACTIONS

- Anticipate natural risks linked to flooding, desertification, erosion, climate change, forest fires and others...

AXIS 2: IMPACT OF CLIMATE CHANGE ON THE ENVIRONMENT

- Impact of soil, air and water pollution.
- Impact of industrial pollution on the urban environment
- Recovery of natural substances
- Impact on animal and plant biodiversity.
- Biogeography and biodiversity management

AXIS 3. HYDROLOGY, HYDROGEOLOGY AND WATER. CURRENT RESOURCE ISSUES AND CHALLENGES

- Urban water resource management
- Groundwater and climate change
- Hydrogeological modeling and decision support

AXIS 4. DATA ACQUISITION, ARTIFICIAL INTELLIGENCE, REMOTE SENSING, ENVIRONMENTAL MONITORING AND GEOSPATIAL ANALYSIS

- Use artificial intelligence and geometrics (GIS and remote sensing) to map natural resources and build up a database over time.
- Mapping the spatiotemporal chronology of land use
- Mapping and monitoring urban heat islands
- Use of index approaches to study various natural phenomena for future simulations.

AXIS 5: DEVELOPMENT OF RENEWABLE ENERGIES (OR ENERGY TRANSITION)

Fossil fuels are by far the biggest contributors to global climate change, responsible for over 75% of global greenhouse gas emissions and almost 90% of all carbon dioxide

emissions. As a result, experts agree that the transition to low-carbon energies is one of the main solutions for mitigating climate change.

(https://www.un.org/fr/climatechange/science/causes-effects-climate-change).

Despite this, the region bordering the Mediterranean basin is experiencing a steady 1.7% increase in energy demand, driven by demographic pressure, economic growth and changing climatic conditions. Similarly, fossil fuels remain the dominant component of the energy mix, despite the fact that the region holds just 5% of the world's oil and gas reserves, 98% of which are located on the southern shore. (https://planbleu.org/wp-content/uploads/2020/10/Note-de-synthese-38-Tendances-demographiques-Plan-Bleu.pdf).

In view of all this, it is crucial to discuss the reasons why the region is lagging behind in the development of renewable energies, to identify alternatives, assess potential and identify the keys to a successful energy transition to mitigate climate change.

AXIS 6. URBAN HEAT ISLANDS: PROSPECTS, CHALLENGES AND POTENTIAL

- Infrastructure and built environment: Analysis of the effects of UHIs on urban infrastructure, including increased energy demand for cooling, pressure on power grids, material degradation and implications for urban planning and design.
- Ecological and environmental impacts: Exploration of the impact of UHI on local ecosystems, biodiversity, water resources and urban green spaces, as well as the potential for eco-system services such as cooling, air purification and flood mitigation.
- Mitigation strategies and innovative solutions: Highlighting effective measures to mitigate UHI, such as green roofs, reflective roofs, urban forestry, reflective pavements and the integration of natural elements into urban landscapes.

AXIS 7. SOCIO-ECONOMIC APPROACH AND BLUE ECONOMY

- Impacts on society and the environment
- Social and environmental adaptations
- Impact on agriculture
- Impact on human health
- Policy and governance

Target population

- Teacher-researchers and researchers in the field of geography, ecology, town planning, land use planning and the environment;

- Experts and specialists in environmental issues;
- Local authorities, different directorates and specialized organizations in the field;
- Civil society organizations interested in the theme of environmental protection.

Scientific Committee

President of the Scientific Committee: Dr. Salim BRAGUI

- Prof Hamza AMIRECHE- IGTU- Constantine 3 University (Algeria)
- Prof Djamel DAKOUMI- IGTU- Constantine 3 University (Algeria)
- Prof Chaouki BENABBAS- LAGED Laboratory - Constantine 3 University and (CRAT) (Algérie)
- Prof BOUADAM Roukia – LAGED Laboratory - Constantine 3 University
- Prof Saliha ABDOU- ABE Laboratory - Constantine 3 University
- Prof Samira LOUAFI-BELLARA- ABE Laboratory - Constantine 3 University (Algérie)
- Prof Toufik MOSTEFAOUI – (CRAT) (Algérie)
- Prof Saïfi MERDAS- (CRAT) (Algérie)
- Prof Nacira CHOURGHAL – Bordj Bou Arreridj university-(Algérie)
- Prof Faiza ALLOUCHE- Sousse University (Tunisie)
- Prof Rejouane MEJDOUB- Sousse University (Tunisie)
- Prof. Ismail Dabanli-Istanbul Technical University (Turkey)
- Prof Alessandra Casu- Degli Studi University of Sassari (Italy)
- Prof Josep VILA SUBEROS- University of Girona (Spain)
- Prof Carlo PREVIL- (UQAT) (Canada)
- Dr Stéphane Desruelles - University of SORBONNE (France)
- Dr Latifa BOULAHIA– LAGED Laboratory - Constantine 3 University
- Dr.Aicha BENAZOUZ – LAGED Laboratory -
- Dr Fatima Zahra CHAFI– IGTU- Constantine 3 University (Algérie)
- Dr. Foued BOUZAHZAH– IGTU- Constantine 3 University (Algérie)
- Dr. Nedjoua BOUARROUDJ – IGTU- Constantine 3 University (Algérie)
- Dr. Oualid MEDDOUR– IGTU- Constantine 3 University (Algérie)
- Dr. REDJAL Omar – IGTU- Constantine 3 University (Algérie)
- Dr. Aicha DJEGHAR – IGTU- Constantine 3 University (Algérie)
- Dr. Abdelhafid BOUGUESSA – IGTU-University Constantine 3 (Algérie)
- Dr Anouar BOUCHEHAM–Constantine 3University (Algérie)
- Dr Fouad BOUAICHA- Constantine1University (Algérie)
- Dr Ammar LAKHDAR- Constantine1University (Algérie)
- Dr Rabiaa DEBBACHE - Constantine1University (Algérie)
- Dr Asma BAKIRI- Constantine 1University (Algérie)
- Dr Chourouk HAMLA- Constantine 1 University, (Algérie)
- Dr Nabil MENCHAR- University of Oum BOUAGUI, (Algérie)
- Dr Aïssa BOULKAIBET- University of Oum BOUAGUI, (Algérie)
- Dr Aissa BENHAMADA- University of Oum BOUAGUI, (Algérie)
- Dr Brahim DJEBNOUNE- University of Tébessa, (Algérie)
- Dr Takiedine HESSAINIA- University of Tébessa,

Constantine 3 University

- Dr Foudil KHALED - LAGED Laboratory - Constantine 3 University
- Dr Sarah BENHARKAT- ABE Laboratory - Constantine 3 University
- Dr Radia BOUARROUDJ- ABE Laboratory - Constantine 3 University (Algérie)
- Dr Sara SAHNOUNEABE Laboratory - Constantine 3 University (Algérie)
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- Dr Hani BOUYAHMED- (CRBT) (Algérie)
- Dr Oussama BELAHMADI-(CRBT) (Algérie)
- Dr Meriem BOULTIF- (CRSTRA) (Algérie)

(Algérie)

- Dr Ali HADJLA- University of Tébessa, (Algérie)
- Dr Abdelhafid BOUZEKRI- Ecole des forêts Khenchela(Algérie)
- Dr Hicham CHENIKER- Ecole des forêts Khenchela(Algérie)
- Dr Mohamed SERBAH-ENS Bouzaréah, Alger.
- Dr Lyes BELAID- USTHB University - Alger.
- Dr. Habib Yahyaoui - Batna 2 University (Algérie)
- Dr Fouzia BOUDJEMLINE -ENS-Sétif.
- Dr Wafa MEDJITNA- Alger 2 University.
- Dr Amir AMAR- Bejaia University

Organization committee

President of Organization committee Dr Foudil KHALED

Mr. Toufik AMIRECHE -(IGTU)	Mr. Karim KAOUA- Constantine 3University (Algérie)
Mme Amina BENAMIRA-(IGTU)	Dr Sara SAHNOUNE Constantine 3University (Algérie)
Mr Haidar ABDELATIF(IGTU)	Dr Radia BOUARROUDJ- Constantine 3University (Algérie)
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Mme Aziza DRIF (IGTU)	Ms Sara KEBLOUTI (CRAT)

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

جامعة قسنطينة 3 – صالح بوبنيدر

معهد تسيير التقنيات الحضرية

مخبر الاستشراف الجغرافي والبيئة والتنمية (LAGED)

بالشراكة مع

مركز البحث في تهيئة الإقليم (CRAT)

ينظمان مؤتمرا دوليا حول:

المياه، تغير المناخ، البيئة والاستدامة - التحديات والآفاق

ECCED

13 و14 أكتوبر2025

اليوم العالمي للوقاية من الكوارث الطبيعية

برنامج المؤتمر

Democratic and Popular Republic of Algeria
Ministry of Higher Education and Scientific Research
University of Constantine 3 Salah BOUBNIDER
Urban Technical Management Institute

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Organize an international seminar on:

WATER, CLIMATE CHANGE, ENVIRONMENT AND SUSTAINABILITY CHALLENGES AND PROSPECTS
October 13 and 14 2025

PROGRAMME

Monday 13th October 2025

Timing		Event
8:00	8:30	**Welcome and Registration of participants** **Link:** :meet.google.com/mmy-nmvc-pir **Location: Bernslitane conference room (IGTU)**
8:30	9:00	**Opening ceremony and official speeches** **Recitation of some verses from the Holy Quran** Speech by Mr. The Rector of the University Salah BOUBNIDER, Constantine 3 **Prof Chaabane BEAITICHE** Speech by Mr. The Director of the IGTU **Dr. Salim BRAGDI** Speech by Ms. The President of the Symposium **Dr Latifa BOULAHIA**
Moderators: Dr Nabil MENCHAR **Reporter: Dr Oussama Med Sedik BELEHMADI**		
9:00	9:30	**1st Plenary** **Prof Farès KESSASRA,** University of JIJEL **"GROUNDWATER NITRATE POLLUTION: NUMERICAL MODELING AND VULNERABILITY IN THE NORTH-EAST PART OF ALGERIA"**
9:30	10:00	**2nd Plenary** **Prof Sonia Dridi-DHAOUADI,** University of Monastir- IPEIM **" REINVENTER LA TEINTURE TEXTILE FACE AUX DEFIS CLIMATIQUES ET HYDRIQUES : LA VOIE DU CO_2 SUPERCRITIQUE"**

10:00	10:30	**3th Plenary** **Dr. Ismail DABANLI,** Istanbul Technical University (Turkey) **CLIMATE CHANGE IMPACTS EVALUATION OF UNESCO-LISTED CULTURAL HERITAGE IN TÜRKIYE**
10:30	11:00	**DEBATE AND COFFEE BREAK**
Moderators: Prof Rokia BOUADAM, **Reporter: Dr Foued BOUZEHZEH**		
11:00	11:30	**4th Plenary** **Djamal BENGUESMIA** **framework of studies at the National Office for Studies and Rural Development (BNEDER Algeria)** **CLIMATE CHANGE AND ITS IMPACT ON FOOD SECURITY IN ALGERIA**
11:30	12:00	**5th Plenary** **Mme Doria ADMAN** **(GIZ Algeria).** **"Assessing Climate Risks with GIS : A Use Case from the UrbA-CliMa Project "**
12:00	12:30	**6th Plenary (on line)** **Prof Carlo Prévil, PhD** MAPDATA Laboratory (Methodologies for Assisting the Decision-Making Process in Spatial Planning and Applications) UQAT, Canada **REFLEXIONS SUR LES ENJEUX DE LA RECHERCHE EN SCIENCES DU TERRITOIRE :** **PERSPECTIVES POUR L'AIDE A LA DECISION TERRITORIALE**
12:30	13.00	**DEBATE**
13.00	14:00	**LUNCH**
ORAL SESSIONS		

مدير المخبر

AXIS 1: EXTREME EVENTS AND CLIMATE CHANGE, IMPACTS AND ACTIONS
SESSION 1:
Moderator: Dr. Oualid MEDDOUR
Reporter : Mme Halima ZAIDI
Amphi 300
meet.google.com/mmy-nmvc-pir

N°	Timing		Authors	Titles	Affiliation
01	14:00	14:10	**Sonia MAKHLOUFI 1, Roukia BOUADAM 2 ,**	RECYCLING INERT WASTE: A SUSTAINABLE STRATEGY TO PRESERVE NATURAL RESOURC 89ES THE CASE OF INERT WASTE IN THE TOWN OF ALI MENDJELI	1 2 LAGED laboratory, IGTU, UC3 University, Algeria **sonia.makhloufi@univ-constantine3.dz**
02	14:10	14:20	**Aissa BENHAMMDA 1**	NATURAL HAZARDS ASSOCIATED WITH CLIMATE CHANGE CASE STUDY: FLOODS IN THE CITY OF TEBESSA (ALGERIA): BETWEEN PROACTIVE MEASURES AND IMPLEMENTATION EFFECTIVENESS	IGTU, Oum el bouaghi. Algeria benhammada.aissa@gmail.com
03	14:30	14:40	**Roubila CHAOUCHE TEYARA Rabia CHEROUANA Oumaima BENHAMMOU**	ALGERIAN URBAN TERRITORIES FACING THE CHALLENGE OF CLIMATE CHANGE	Centre for Research in Spatial Planning (CRAT)/ FSTGAT, Constantine 1 university **roubila.chaouche.t@crat.dz**
04	14:40	14:50	**Nadjet BOURAGBA 1 , Mohamed KACIMI 2**	STUDY OF LANDSLIDE MECHANISMS AT THE SITE OF 440 OPGI HOUSING UNITS IN DELLYS, BOUMERDÈS: IMPACT OF DROUGHT AND HUMIDITY VARIATIONS ON CLAYEY MARL.	Département de géologie, Université Sétif 1, Sétif. 2 Département des sciences Géologiques, FSTGAT, Université Constantine 1 bngeologie@gmail.com

05	14:50	15:00	**Malika LARGAT 1 Meriem BENLAHRECHE 2 Soumia DJOUABLIA 3**	THE ENVIRONMENT IN THE FACE OF URBAN ACTIVITY	IGTU, Oum el bouaghi. University/ Labo LAUTES Constantine 3 University, Algeria meriem.benlahreche@univ-oeb.dz
06	15:00	15:10	**Rabiaa DEBBACHE 1, Khaled Abed Alfettah GASSI 2**	ASSESSMENT OF THE FLOOD RISK AND ITS PREDICTABILITY: CASE OF THE COMMUNE OF FOUKA ON MAY 25, 2023	Constantine 1 university Direction Météorologique Région Est debbacherabiaa@yahoo.fr
07	15:10	15:20	**Amel Bourahla Hadjer Laoufi Sihem Ziouche**	IMPACT OF CLIMATE CHANGE ON AGRICULTURE IN THE SEMI-ARID REGIONS OF ALGERIA (1901-2020)	**Online** Department of Agronomic Sciences & LCVRN Laboratory, University of Bordj Bou Arreridj, Algeria amel.bourahla@univ-bba.dz
15:20		**15:30**	**DEBATE**		
15:30		**15:40**	**COFFEE BREAK AND SESSION POSTER**		
AXIS 2: IMPACT OF CLIMATE CHANGE ON THE ENVIRONMENT **SESSION 1** **Moderator: Prof Fares KESSASRA** **Reporter : Dr Adel DAIKH** Location: Bernslitane conference room **meet.google.com/mmy-nmvc-pir**					
N°	**Timing**		**Authors**	**Titles**	**Affiliation**

مدير المخبر

01	14:00	14:10	**Hafida ACHOURI, D,jamila DJAGHROURI Moussadek BENABBAS**	SYSTEMATIC LITERATURE REVIEW : OUTDOOR THERMAL COMFORT IN PUBLIC SPACES IN ALGERIA	LACOMOFA Laboratory, University of Mohamed Khider Biskra, Algeria hafidha.achouri@univ-biskra.dz
02	14:10	14:20	**Mohamed DASSAMIOUR 1 Rédha BOUSTILA 2 Mahrez BOULABEIZ 3**	ÉTUDE STATISTIQUE DE LA GÉOCHIMIE DU CADMIUM ASSOCIÉ AUX ; PHOSPHATES SÉDIMENTAIRES	LGE laboratory, Constantine 1 university/ University of Ferhat Abbas Sétif 1/3 University of Abbas Laghrour Khenchela, Algérie mohamed.dassamiour@umc.edu.dz
03	14:30	14:40	**Noura DJAMAA 1.2 Seyf Eddine MERZOUG 2.3 Chaima LABADLA**	L'ETUDE DE LA QUALITE PHYSICOCHIMIQUE ET BACTERIOLOGIQUES DES EAUX ISSUES (LIXIVIAT) AU NIVEAU DE CENTRE D'ENFOUISSEMENT TECHNIQUE MILA	Centre universitaire Abd El Hafid Boussouf Mila/Université 8 mai 1945 Guelma n.djamaa@centre-univ-mila.dz
04	14:40	14:50	**Malika LARGAT 1 Soumia DJOUABLIA2 &. Meriem BENLAHRECHE3**	URBAN VULNERABILITY TO CLIMATE CHANGE: STUDY OF FLOOD RISK IN THE NEW TOWN OF ALI MENDJELI	IGTU, Oum el bouaghi. University/ Labo LAUTES Constantine 3 University, Algeria **soumia.djouablia@univ-constantine3.dz**
05	14:50	15:00	**Imen SOUKEHAL 1 Roukia BOUADAM 2 Halima ZAIDI3**	SNGID 2035 IN ALGERIA: A LEVER FOR CLIMATE CHANGE MITIGATION	LAGED laboratory, IGTU, Constantine 3 University, Algeria imen.soukehal@univ-constantine3.dz
06	15:00	15:10	**Sihem GHERFI 1 Souad HAOUARI 2**	THE IMPACT OF HOUSEHOLD WASTE ON THE ENVIRONMENT IN THE CITY OF CONSTANTINE	Urban Planning Laboratory FSTGAT, University of Constantine1 gherfi.sihem@gmail.com

مدير المخبر

07	15H10	15H20	**Sandra BOUSSETTI** 1	TERRITORIAL STRATEGIES FOR SUSTAINABLE MANAGEMENT OF WATER RESOURCES IN THE FACE OF CLIMATE CHANGE IN SEMI-ARID ENVIRONMENT IN ALGERIA: THE CASE OF THE WILAYA OF CONSTANTINE.	IGTU, Oum el bouaghi. University, Algeria boussetti.sandra@yahoo.fr
15:20		**15:30**	**DEBATE**		
15:30		**15:40**	**COFFEE BREAK AND SESSION POSTER**		
SESSION 2 **Moderator : Dr.Nedjoua BOUARROUDJ,** **Reporter : Mr.Toufik AMIRECHE** Location: Bernslitane conference room meet.google.com/mmy-nmvc-pir					
01	15H40	15H50	**Laala Ahmed 1,** **Adimi Amina 2**	MODELLING THE POTENTIAL DISTRIBUTION OF A THREATENED ALGERIAN ENDEMIC SPECIES (CEDRUS ATLANTICA) UNDER DIFFERENT CLIMATE CHANGE SCENARIOS: IMPLICATIONS FOR CONSERVATION	**Online** 1 Laboratory (LSNM), University Center, Mila 2 Department of Plant Biology and Ecology, University, Sétif a.laala@centre-univ-mila.dz
02	15H50	16h00	**Abderahim El Mehdi BELLAREDJ**	THE EFFECTS OF CLIMATE CHANGE ON GROUNDWATER QUALITY IN SEMI-ARID ZONES-CASE STUDY FROM THE TAFRAOUI-TLELAT PLAIN OF ORAN (NORTHWESTERN ALGERIA).	**Online** Laboratory SNMASAZ, Institute of Sciences, University Center Salhi Ahmed of Naâma (Ctr Univ Naama), Algeria. bellaredj.a@cuniv-naama.dz
03	16h10	16h20	**Wafa MEDJITNA,** **Ali SAIDOU,**	POLLUTION MARINE DANS LA VILLE PORTUAIRE DE SKIKDA, MULTIPLES ALEAS ET ENJEUX.	**Online** université d'Alger2 Ecole normale supérieure, Bouzareah wafa.medjitna@univ-alger2.dz

04	16h20	16h30	**Mohammed RABHI 1, Sidi Mohamed GHOMARI 1**	SURFACE WATER EXTENT OF A NORTHWESTERN SALT LAKES IN ALGERIA AND EVALUATION FOR ITS SUITABILITY FOR ARTEMIA BRINE SHRIMP PRODUCTION OVER 2016-2025.	**Online** Abdelhamid Ibn Badis University, Mostaganem, Algeria. rabhi.mohammed.etu@univ-mosta.dz
05	16h30	16h40	**Karima YOUNICI 1, Anissa KHELLADI 2, Nacera MAHFOUD 3**	PLANETARY LIMITS AND THE CHALLENGES OF SUSTAINABLE DEVELOPMENT	**Online** Université Abderrahmane Mira de Bejaia. karima.benhattab@univ-usto.dz
06	16h40	16h50	**Foudil KHALED 1, Oualid MEDDOUR 2, Amar AMIR 3 Fatiha SAMAI 4,**	CHANGEMENTS CLIMATIQUES EN ALGÉRIE, COMPRENDRE LES ENJEUX ET GÉRER LES CONSÉQUENCES: ÉLÉMENTS DE RÉFLEXION	1LAGED/IGTU/UC3 2 LABTERDIR/IGTY/ UC 3 3 LAGED/IGTU/UC3 4 (GAT) Université Batna 2. foudil.khaled@univ-constantine3.dz
07	16h50	17h00	**Abdelhafid BOUGASSA**	LE LITTORALE DE LA WILAYA DE JIJEL : DEVELOPPEMENT SOCIOECONOMIQUE ET PERSPECTIVES DE RESILIENCE	Institut de Gestion des Techniques Urbaines, Université Constantine 3, Algérie. abdelhafid.bougassa@univ-constantine3.dz
DEBATE					

AXIS 3: HYDROLOGY, HYDROGEOLOGY AND WATER. CURRENT RESOURCE ISSUES AND CHALLENGES
Moderator : Dr. Omar REDJAL
Reporters : Mme Amina BENAMIRA
Location : AMPHI 2
meet.google.com/mmy-nmvc-pir

N°	Timing	Authors	Titles	Affiliation

01	14:00	14:10	**M S O BELAHMADI, Ala ABDESSEMED, Nabil CHARCHAR, Abdelfettah GHERIB.**	EVALUATION DE LA CONTAMINATION DES EAUX MARINE DE LA BAIE DE SKIKDA (ALGÉRIE) PAR LES REJETS D'UNE RAFFINERIE PÉTROLIÈRE	Centre de recherche en biotechnologie (C.R.Bt), Constantine, Algérie. msobelahmadi@gmail.com
02	14:10	14:20	**Naama KACHA 1, Mahrez BOULABEIZ 2 Laiche AOUIDANE 2, Nesrin LAKHZOUM 3**	HYDROGEOCHEMICAL CHARACTERIZATION AND WATER RESOURCE CHALLENGES IN THE EL MAHMEL PLAIN AQUIFER, NORTHEASTERN ALGERIA	Abbes Laghrour University, Khenchela/, Laboratory of Functional Ecology and Environment, University Larbi Ben Mhidi of Oum El Bouaghi, Algeria. naama.kacha@univ-khenchela.dz
03	14 :30	14 :40	**Ahmed ALLIOUCHE (1), Mohamed Ikbal FARAH (1)**	PROTECTION OF WATER RESOURCES AND ENVIRONMENTAL PRESERVATION IN THE CONTEXT OF CLIMATE CHANGE: THE CONTRIBUTION OF GEOMATICS TO THE SUSTAINABLE PLANNING OF TECHNICAL LANDFILL SITES IN CONSTANTINE	Centre de Recherche en Aménagement du Territoire (CRAT), Algérie. allioucheahmed1982@gmail.com
04	14:40	14:50	**Zakarya MAOU(1), Ahmed BOUGHERARA(2), Yahiaoui HABIBI(3)**	LES ZIBAN: UN MILIEU RICHE ET VULNERABLE (POTENTIALITES ET CONTRAINTES)	1.2 LASTERNE Laboratory, Constantine 1 university/ 3 LRNAT Laboratory, Batna-2, Algeria zakiapc83@gmail.com
05	14:50	15:00	**Lotfi KEBAILI, Lydia OGAL**	INTEGRATING AND REHABILITATING WATERWAYS IN URBAN ENVIRONMENTS: A STRATEGIC IMPERATIVE FOR A SUSTAINABLE CITY	Department of Geography and Regional Planning, University of Oum El Bouaghi, Algeria. lotfikebaili@gmail.com

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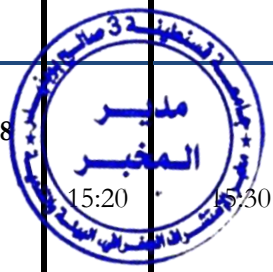
06	15:00	15:10	**Rayene LAMRI**	URBANIZATION AND THE WATER CYCLE	LAGED laboratory, IGTU, UC 3 University, Algeria rayene.lamri@univ-constantine3.dz
07	15 :10	15 :20	**Bahaedine HAMIDA (1), Ahmed ALLIOUCHE (2), Mohamed Ikbal FARAH (2)**	MONITORING THE DYNAMIC OF ATLAS CEDAR FORESTS IN THE HODNA REGION USING MACHINE LEARNING AND TIME SERIES ANALYSIS	1 Laboratoire d'Ecologie Fonctionnelle et Environnement Université Oum El Bouaghi. hamida.bahaedine@univ-oeb.dz 2 Centre de Recherche en Aménagement du Territoire (CRAT), Algérie.
DEBATE					
COFFEE BREAK AND SESSION POSTER					
AXIS 4. DATA ACQUISITION, ARTIFICIAL INTELLIGENCE, REMOTE SENSING, ENVIRONMENTAL MONITORING AND GEOSPATIAL ANALYSIS **Moderators: Prof Sonia DRIDI-DHAOUADI** **Reporter : Dr. Ahmed ALLIOUCHE** AMPHI 2					
N°	**Timing**		**Authors**	**Titles**	**Affiliation**
01	14:00	14:10	**Nabil MANCHAR [1], Mohamed Kacimi[2] Badreddine SAADALI[1]**	ASSESSMENT OF THE NEOTECTONIC ACTIVITY IN THE RHUMEL-MERZOUG BASIN IN NORTHEASTERN ALGERIA USING GEOMORPHIC INDICES.	1Department of Geology, Faculty of Earth Sciences and Architecture, Oum El Bouaghi University Algeria. 2Dadeo of Geological Sciences, Faculty of Earth Sciences of Geography and Spatial Planning, University Frères Mentouri, Constantine 1, Algeria.
02	14:10	14:20	**Zohra NEMILI 1 Houria BAAZI 2**	USE OF GEOGRAPHIC INFORMATION SYSTEMS AND SPATIAL ANALYSIS FOR GROUNDWATER QUALITY MAPPING: CASE OF THE KHENCHLA WILAYA, ALGERIA.	Laboratory (LRNAT), Faculty of Technology, Department of Hydraulic, University of Batna 2, Algeria. z.nemili@univ-batna2.dz

03	14:30	14:40	**Radia BOUARROUDJ[1], Imen BENDJMILA[2], Kenza BOUARROUDJ[3]**	L'IA ET L'APPRENTISSAGE AUTOMATIQUE DANS LA SCIENCE CLIMATIQUE	UC3 University, Faculty of Architecture and Urban Planning of Architecture / [2]UC3 University, Faculty of Architecture and Urban Planning of Architecture/ [3] University, Abdel Hamid Mehri Constantine 2 radia.bouarroudj@univ-constantine3.dz
04	14:40	14:50	**Omar REDJAL 1 Adel DAIKH 2 Djamel ALKMA 3**	DATA ACQUISITION AND ARTIFICIAL INTELLIGENCE (IA) FOR INTELLIGENT URBAN WASTE MANAGEMENT: THE EXAMPLE OF THE NEW CITY OF ALI MENDJELI (CONSTANTINE)	IGTU/ LAEEE & LAGED laboratorys, UC3 University/ Guelma university omar.redjal@univ-constantine3.dz
05	14:50	15:00	**Faicel TOUT 1 Nouh REBOUH 2 Haythem DINAR 3 Yacine BENZID 4**	ASSESSING THE ROLE OF ANNUAL RAINFALL MAPS IN MULTI-CRITERIA ANALYSIS FOR IDENTIFYING FLOOD-PRONE AREAS	Centre for Research in Spatial Planning (CRAT) tout.faicel@gmail.com
06	15:00	15:10	**Adel DAIKH 1 Omar REDJAL 2 Samira DEBACHE 3 Larbi MEDDOUR 4**	MONITORING THE AGGLOMERATION OF CONSTANTINE THROUGH REMOTE SENSING AND GEOSPATIAL ANALYSIS	1.3 LAGED Laboratory/ 2.AEEE Labortaory/4. Guelma university adel.daikh@univ-constantine3.dz
07	15:10	15:20	**Latifa BOULAHIA 1 Ahmed ALLIOUCHE 2 Haithem BERGUELLAH 3**	MACHINE LEARNING APPROACH FOR SOIL EROSION MODELING BASED ON RUSLE IN SKIKDA WILAYA, NORTHEAST ALGERIA	1LAGED Laboratory 2CRAT center 3LAGED Laboratory
08	15:20	15:30	**Badreddine SAADALI 1,2 Derradji El Fadel 3 Nabil MANCHAR 1 Benslama Marwa 1,2**	ASSESSMENT OF GROUNDWATER QUALITY AND NITRATE HEALTH RISKS IN A SEMI-ARID REGION (AIN BEIDA, NE ALGERIA)	1Department of Geology, Oum El Bouaghi University Algeria. 2 Natural Resources and Management of Sensitive Environments Laboratory, Oum El Bouaghi University, Algeri 3 Department of Geology, Annaba University, Algeria badreddine.saadali@univ-oeb.dz



DEBATE					
COFFEE BREAK AND SESSION POSTER					
AXIS 5 : DEVELOPMENT OF RENEWABLE ENERGIES (OR ENERGY TRANSITION) **Moderator: Dr Ismail DABANLI,** **Reporter : Dr Yasser BENZAGOUTA** Localisation: Ahcen BENMICI room					
N°	**Timing**		**Authors**	**Titles**	**Affiliation**
01	14:00	14:10	**Leila BENSMAIN 1, Noureddine YASSAA 2, Meryem SABER 3**	DES DECHETS VERS L'ENERGIE	Houari Boumediene university (USTHB), STAT department/ faculty of chemistry. (USTHB)/ 3 Center for the development of renewable energies, Algiers, Algeria lbensmain@yahoo.fr
02	14:10	14:20	**Islam BOUKHELKHAL 1, Rafik BOUDJADJA 2, Imene BENSID 3**	VALORISATION DU PATRIMOINE ARCHITECTURAL A TRAVERS LA MODELISATION DES STRATEGIES BIOCLIMATIQUES TRADITIONNELLES DANS LE SUD ALGERIEN	1 Département d'architecture, UC 3 University, Algérie. /2 Département d'architecture, Université Larbi Ben Mhidi, Oum El Bouaghi, Algérie. 3 IGTU, UC 3 University, Algérie. islam.boukhelkhal@univ-constantine3.dz
03	14:20	14:30	**Aicha BENAZZOZ 1 Narjes BENANI 2**	THE ROLE OF THE PRIVATE SECTOR IN THE ENERGY TRANSITION IN ALGERIA: MANAGEMENT OF LANDFILL CENTERS AND BIOGAS RECOVERY FROM WASTE	LAGED laboratory, IGTU, UC 3 University, Algeria aicha.benazzouz@univ-constantine3.dz
04	14:30	14:40	**Sara SAHNOUNE 1, Sarah BENHARKAT 1, Ahmed Mohamed Salah CHERIET 2**	SEASONAL VARIATIONS IN THE CORRELATIONS BETWEEN LAND SURFACE TEMPERATURE AND VEGETATION COVER IN CONSTANTINE, ALGERIA	ABE Laboratory/ IGTU, ²UC3 University, , Algeria sara.sahnoune@univ-constantine3.dz

05	14:40	14:50	**Sarah BENHARKAT 1 Rabeh Borhane Eddine BENAISSA 2**	ASSESSMENT OF THE ENERGY POTENTIAL OF AGRICULTURAL BIOMASS IN ALGERIA	ABE Laboratory/LAGED Laboratory, UC3, Constantine sarah.benharkat@univ-constantine3.dz
06	14:50	15:00	**Karima YOUNICI 1, Anissa KHELLADI 2, Nacera MAHFOUD 3**	HUBBERTS PEAK AND PLANETARY LIMITS: CHALLENGES FOR A SUSTAINABLE DEVELOPMENT MODEL	**Online** Université Abderrahmane Mira de Bejaia. younici anissa.khelladi@univ-bejaia.dz karima.younici@univ-bejaia.dz
DEBATE					
COFFEE BREAK AND SESSION POSTER					
AXIS 6. URBAN HEAT ISLANDS: PROSPECTS, CHALLENGES AND POTENTIAL **Moderator: Dr Aicha DJEGHAR** **Reporter : Dr Soumia MOSBAH** **Library room** **meet.google.com/mmy-nmvc-pir**					
N°	**Timing**		**Authors**	**Titles**	**Affiliation**
01	14:00	14:10	**Fouzia BOUCHERIBA**	RAPPORT ENTRE L'ILOT DE CHALEUR URBAIN ET LA GEOMETRIE URBAINECONSTAT, INVESTIGATIONS ET RESULTATS	ABE Laboratory, Constantine 3 university fouzia.boucheriba@univ-constantine3.dz
02	14:10	14:20	**Samira LOUAFI 1 Anouar Khallil BELMILI 2**	ASSESSMENT OF THE INFLUENCE OF VARIOUS GREEN SPACE CONFIGURATIONS ON THE URBAN HEAT ISLAND AND URBAN CLIMATE IN A SEMI-ARID REGION: THE CASE OF AIN SMARA (ALGERIA)	ABE Laboratory/Department of Urban Technology and Environment, Constantine 3 university samira.louafi@univ-constantine3.dz

03	14:20	14:30	**Amira SOUALAH 1 Louiza SOUALAH 2 Mouatez Billah BOUSSOUF 3**	THE SPATIAL CIRCULARITY INDEX: A DECISION-SUPPORT TOOL FOR THE REDEVELOPMENT OF UNDERUSED URBAN AREAS WITHIN A CIRCULAR ECONOMY FRAMEWORK	1 Faculty of Architecture and Urbanism, AVMF Laboratory. University of Constantine 3, 2 LAGED Laboratory. 3 Faculty of Architecture and Urbanism, AVMF Laboratory. University of Constantine 3, Amira.soualah@univ-constantine 3.dz
04	14:30	14:40	**Lamia MANSOURI [1], Radia BOUARROUDJ [2], Kenza BOUARROUDJ [3]**	ÎLOTS DE CHALEUR URBAINS EN CLIMAT SEMI-ARIDE : CADRE THEORIQUE ET STRATEGIES D'ATTENUATION – CAS D'ETUDE CONCEPTUEL DE CONSTANTINE	[1]Alger 1 University, Department of Architecture/ UC3 University, Faculty of Architecture and Urban Planning of Architecture / [3] University, Abdel Hamid Mehri Constantine 2 radia.bouarroudj@univ-constantine3.dz
05	14:40	14:50	**Darda BENCHEIKH Lina CHAOUI**	PARKLETS AS URBAN COOL SPOTS: A TACTICAL URBANISM INTERVENTION TO MITIGATE URBAN HEAT ISLANDS.	**Online** Department of Architecture, University of Amar Telidji Laghouat/ETAP laboratory, Architecture and urbanism institute, University of Saad Dahleb, Blida,Algeria. d.bencheikh@lagh-univ.dz
06	14:50	15 : 00	**Taous KADDOUR 1, Nassima CHAHER-BAZIZI 1, Samir ZEGGANE 2 , Achour CHERGUI 3,**	VALORIZATION OF SARDINE DIGESTIVE PROTEASES FOR SUSTAINABLE AQUACULTURE IN ALGERIA	1, 2 SNVI, University of / 3 University of Bouira/ 4 Mouloud Mammeri University, Tizi-Ouzou taous.kad4@gmail.com
DEBATE					
COFFEE BREAK AND SESSION POSTER					

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ORAL SESSION ONLINE
Link: https://meet.google.com/csf-ewbg-nhx
President: Dr Nabil CHARCHAR
Reporter : Dr Rayene LAMRI
video conference room

AXIS 3: HYDROLOGY, HYDROGEOLOGY AND WATER. CURRENT RESOURCE ISSUES AND CHALLENGES

N°	Timing		Authors	Titles	Affiliation
01	14:00	14:10	**Souad MOUASSA 1** **Souad BENKEROURA 2** **Mansour ZAAGANE 2**	ÉVALUATION DE LA POLLUTION ORGANIQUE, MICROBIOLOGIQUE, DEGRE D'EUTROPHISATION ET RISQUE SANITAIRE DES EAUX DU BARRAGE DE CHEURFAS II (NORD –OUEST ALGERIEN)	Université de Mascara, Algerie, Laboratopire de Géomatique, Ecologie et Environnement souad.mouassa75@gmail.com
02	14:10	14:20	**Souad BENKEROURA 1** **Souad MOUASSA 2** **Sabria BEKOUSSA 3**	EVALUATION OF POLLUTION DEGREE BY NEMEROW INDEX AND HEALTH RISK FOR NITRATES AND PHOSPHATES IN CHEURFFAS II DAM WATERS.	Université de Mascara, Algerie, Laboratopire de Géomatique, Ecologie et Environnement benkerouras@gmail.com.
03	14:20	14:30	**Fatiha DILMI 1** **Djamila MESSEKINE 1** **Chentouf Khadidja 1** **Khadidja SENOUCI-REZKALLAH 2** **souad MOUASSA 1** **Bengarnia BENMERINE 1**	APPLICATION OF THE CANADIAN INDEX AND THE WATER QUALITY INDEX TO ASSESS THE WATER QUALITY OF THE BAKHADDA DAM (WESTERN ALGERIA).	University of, Mascara, Faculty of Natural and Life Sciences, Geomatics, Ecology and Environment Laboratory. 2. Département de sciences naturelles Université de Quebec en Autaouais. E-mail : fatiha_dilmi@yahoo.com
04	14:30	14:40	**Manal DJEMA,** **Abdelmadjid DROUICHE**	MAPPING THE SENSITIVITY OF GROUNDWATER IN THE NADOR PLAIN TO NITRATE POLLUTION USING AN AHP-GIS APPROACH	Mouloud Mammeri university of Tizi Ouzou. manal.djema.hydro@gmail.com

05	14:40	14:50	**Zohra ABDELKRIM 1**	HYDROLOGICAL MODELING OF THE KÉBIR-RHUMEL BASIN USING GEOGRAPHIC INFORMATION SYSTEMS (GIS)	IGTU, University of M'sila zohra.abdelkrim@univ-msila.dz
06	14:50	15 : 00	**Yousra MANADI 1, Ali BELMEZITI 1, Bernard DE GOUVELLO 2**	MANAGING INTERMITTENT WATER SUPPLY: HOUSEHOLD COPING STRATEGIES AND CO-PRODUCTION OF DRINKING WATER	1Laboratory O.V.A.M.U.S, University of Blida, Algeria/ 2Center for Studies and Expertise on Risks, Environment, Mobility, and Planning (Cerema), Territorial Directorate for Île-de-France, Trappes, France yousra20161997@gmail.com
07	15H00	15H10	**Zahra FERHI 1 Abdelmalek BEKKOUCHE 2**	TOWARDS SUSTAINABLE AND INTEGRATED WATER RESOURCES MANAGEMENT IN ALGERIA: CHALLENGES, OPPORTUNITIES AND FUTURE PATHWAYS	Abou Bekr Belkaid University, Tlemcen, Algeria. zahraafer@gmail.com
15H10		**15H20**	**DEBATE**		
15H20		**15H40**	**COFFEE BREAK AND SESSION POSTER**		
ORAL SESSION ONLINE **AXIS 4. DATA ACQUISITION, ARTIFICIAL INTELLIGENCE, REMOTE SENSING, ENVIRONMENTAL MONITORING AND GEOSPATIAL ANALYSIS** **Moderators: Dr Nabil CHARCHAR** **Reporter 1: Dr Sonia MAKHLOUFI** **video conference room** https://meet.google.com/csf-ewbg-nhx					
01	15H40	15h50	**Amina MAZIGHI, Mohamed MEDDI[1], Hind MEDDI[1].**	ADVANCING INFILTRATION MODELING IN THE MITIDJA PLAIN: A COMPARATIVE STUDY OF TRANSFORMER-BASED, ANN, AND ELM MODELS	[1] Higher National School of Hydraulics of Blida, Algeria a.mazighi@ensh.dz

02	15h50	16h00	**Fatiha NADIR 1** **Ali BELMEZITI 1**	GIS AS AN ESSENTIAL TOOL FOR INTELLIGENT AND SUSTAINABLEMANAGEMENT OF URBAN WATER	Laboratory O.V.A.M.U.S, University of Blida, Algeria **nadirfatiha1990@gmail.com**
03	16h00	16h10	**Hayet BOUZAR-YAGOUNI 1, Rabah ALLEM** **Si Hamoud Samy BELKADI**	WHEN URBANIZATION THREATENS AGRICULTURAL LAND IN THE MITIDJA PLAIN	Houari Boumediene university (USTHB) STAT department. **bouzarhayet@gmail.com**
04	16h10	16h20	**Imene SENADI 1*,** **Ayoub ZEROUAL 1,** **Hind MEDDI 1**	PREDICTING LAND USE AND LAND COVER CHANGES IN THE MITIDJA PLAIN USING MACHINE LEARNING TECHNIQUES AND SENTINEL-2 IMAGERY.	1Higher National School for Hydraulics, Waterand Environmental Engineering Laboratory (GEE), Blida Algeria i.senadi@ensh.dz
05	16h20	16h40	**Serine BELHANI**	AI and Remote Sensing for Port Flood and Sea-Level Rise Risk Assessment	LAGED Laboratory, UC3/ University of Paris 8 **Serinebelhani2@gmail.com**
06	16h40	16h50	**Hanane BOUTAGHANE 1 Chourouk BOUTTABA**	URBAN EXPANSION AND ITS IMPACT ON URBAN LAND USE THE CASE OF BORDJ BOUARRÉRIDJ, ALGERIA	IGTU, University of M'sila hananeboutaghane71@gmail.com
ORAL SESSION ONLINE **AXIS 5 : DEVELOPMENT OF RENEWABLE ENERGIES (OR ENERGY TRANSITION)**					

07	16h50	17h00	**Younes SAHLI 1, Leila BOUCHAMA 2, Ouahiba BOUCHAMA 3**	MODELING URBAN ENERGY TRANSITION: A SPATIAL AND SCENARIO-BASED APPROACH FOR HYDRA, ALGIERS	1 ZIANE ACHOUR University of Djelfa 2 Université USTHB- Alger 3 ENS Bouzareah ,Alger l.bouchama@yahoo.fr
DEBATE					
Session 2 (POSTER ONLINE) Link: https://meet.google.com/ehc-terv-gie **Moderator: Dr Aicha BENAZOUZ Reporter : Mme Hanane HAZMOUN Multi Media room**					
01	14:00	14:10	**Jihène KHALIFA**	ANALYZING THE ASYMMETRIC EFFECT OF RENEWABLE ENERGY CONSUMPTION ON ENVIRONMENTAL QUALITY IN TUNISIA : A NARDL APPROACH	Faculty of Economics and Management of Sousse, University of Sousse, Tunisia. jihenekhalifa.jk@gmail.com
02	14:10	14:20	**Zohra EL FARES**	MAPPING AND ANALYSIS OF SOIL SALINITY IN NORTHERN ALGERIA USING REMOTE SENSING: AN INNOVATIVE APPROACH WITH SENTINEL-2 IMAGERY	Department of Rural Hydraulics, National Higher School of Agronomy, EL HARRACH, Algiers zahraelfares94@gmail.com
03	14:20	14:30	**Khadidja SENOUCI 1, Fatiha DILMI 2, Amira CHENTOUF 3.**	BIOLOGICAL TREATMENT OF WASTEWATER AND THE PRODUCTION OF HYDROGEN, BIOGAS, AND GREEN ELECTRICITY IN WASTEWATER TREATMENT	1UQO- Gatineau- Quebec- Canada./ 2 University of Mostaganem/ 3University of Mascara, Algeria khadidja.senouci@icloud.com
04	14:30	14:40	**Abderrahmane MEBARKI 1 Tayeb SITAYEB 2, Yahia DJELLOULI 3**	ASSESSING THE IMPACT OF CLIMATE CHANGE ON DESERTIFICATION IN THE NAÂMA REGION (2010–2023): A GIS AND REMOTE SENSING APPROACH	*Faculty of Natural Science and Life, University of Saida* fadi0161@gmail.com

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05	14:50	15:00	**Yahia DJELLOULI 1, Abdelkrimr KEFIFA 2 Abderrahmane MEBARKI 3**	UTILISATION DES SCRIPTS DE GOOGLE EARTH ENGINE POUR LA CREATION D'UNE CARTE DE SENSIBILITE A L'EROSION DE LA CHENAIE VERTE D'EL HASASSNA, DANS LE CADRE D'UN PROGRAMME DE PLANIFICATION DE LA RESTAURATION.	*Faculty of Natural Science and Life, University of Saida* djellouliyahia00@gmail.com
06	15:00	15:10	**Sabrina BENDOUMA 1* , Mahmoud ZAIDI 2**	IMPACT OF THE MANUFACTURING OF BUILDING MATERIALS ON CLIMATE CHANGE AND GLOBAL WARMING ACCORDING TO ISO 14040-44 STANDARDS.	1* Badji Mokhtar University, earth sciences faculty, mining engineering department. 2 Applied Hydraulics and Environment Research Laboratory, University of Bejaia, Algeria. sabrinabenmining@gmail.com
07	15:10	15:20	**Asmaa BEMMOUSSAT 1 Amina BELLATRECHE 2 Adel BEREZZOUG 3 Yacine MAHDAD 4**	SALINITY AND ITS EFFECTS ON WHEAT UNDER CLIMATE CHANGE: ENVIRONMENTAL AND GENETIC PERSPECTIVES	(SNV), Tlemcen University, Laboratory of Functional Agrosystems and Technology of Agronomic Sectors (AFTAGRO), Algeria. bemmoussatassouma1997@gmail.com
08	15:20	15:30	**Chaimaa KHADIR 1, Yasmine HALFAOUI 2 mohamed mahmoud ELGHADY AMAR 2**	EFFECTS OF CLIMATE CHANGE ON ECOSYSTEMS AND NATURAL HAZARDS IN THE SAÏDA REGION	Faculty of Sciences, University of Saïda/ Laboratory of Water Resources and Environment (RHE), chaimaakhadir1998@gmail.com
DEBATE					
COFFEE BREAK					

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Tuesday 14th October 2025		
Timing		**ROUND TABLE** **Feedback/ Crossed perspectives** **Moderator: Prof Saifi MERDAS (CRAT)** **Rapporteurs: Mohamed BOUAOUD** Location: Multimedia room
09: 00	**11:00**	**Guests: Prof Farès KESSASRA** (University of Jijel), **Prof Sonia Dridi & Hatem -DHAOUADI** (University of Monastir- IPEIM), **Dr. Ismail DABANLI** (Istanbul Technical University, Turkey), **Dr Hicham CHENAKER** (National Federation Of The Environment And School Of Forests Of Khenchela), **Mrs. BELKADI** (AGIRE Constantine), **Mrs. GRINE** house of the environment, - Socio-economic sector, representatives of associations - Representative of the University – Speakers, students, etc.
11:00	**11: 30**	**COFFEE BREAK**
11: 30	**12: 00**	**Summary and closing of the conference** Dr. Latifa BOULAHIA, President of the seminar
12: 00	**13:00**	**LUNCH**
Visit of Constantine		

POSTERS session on October 13

Moderators : Dr. Dounia KEDDARI, Dr. Ahmed ALLIOUCHE
Reporters: Dr Med Ikbal FARAH, D Chaima TOUABA, Dr Sara KEBLOUTI (CRAT Team)

	N°	Nom & prénoms	Titles	Affiliations	E-mail
AXE 1 EXTREME EVENTS AND CLIMATE CHANGE, IMPACTS AND ACTIONS	01	**Moussa DJERAFA 1** **Yasser AZIZI 1**	LES CHANGEMENTS CLIMATIQUES OBSERVES EN ALGERIE : ETUDE DES VARIATIONS TEMPERATURES	1 Laboratory of Materials Interaction and Environment (LIME), Faculty of Exact Sciences and Computer Science, University of Jijel,	djerafamoussa23@gmail.com
	02	**Ahmed KHELOUFI ATTOU 1** **Kamila BABA-HAMED 1** **Abderrazak BOUANANI 1**	RELATIONSHIPS BETWEEN REGIONAL ATMOSPHERIC CIRCULATION AND EXTREME RAINFALL IN NORTHERN ALGERIA	Laboratory Promotion of Water, Mineral and Soil Resources. Environmental Legislation and Technological Choices, Tlemcen University , Algeria	ahmedgeooran2014@gmail.com
	03	**Hocine BOUGRINE 1 ,** **Salah HADJOUT 1 ,** **Mohamed ZOUIDI 1 , Abdeldjalil BELKENDIL 1 , Amar MEBARKIA 2**	CARACTERISATION MORPHOLOGIQUE ET AGRONOMIQUE DE QUELQUES ACCESSIONS SPONTANEES DE LA VESCE COMMUNE COLLECTEES A PARTIR DE LA PROVINCE DE SETIF ET SES REGIONS LIMITROPHES	Centre for Research in Spatial Planning (CRAT)	bougrinehoucine77@gmail.com
	04	**Manel YAKHLEFOUNE[1],** **Chaouki BENABBAS[1],** **Florina GRECU[2],** **Abdeljalil BELKENDIL[1]**	IMPACT DES EVENEMENTS EXTREMES ET DU CHANGEMENT CLIMATIQUE SUR LE RISQUE D'INONDATION A CONSTANTINE	Centre for Research in Spatial Planning (CRAT)	***manel.yakhlefoune@crat.dz***

AXE 2 IMPACT OF CLIMATE CHANGE ON THE ENVIRONMENT	**05**	**Nabil CHARCHAR**	BIOTECHNOLOGY'S ROLE IN CLIMATE CRISIS COMBAT	CRBT Constantine	n.charchar@crbt.dz
	06	**Hani BOUYAHMED**	REHABILITATION DES SITES ET DES SOLS PAR PHYTOREMEDIATION	CRBT Constantine	h.bouyahmed@crbt.dz, hanibouyahmed@gmail.com
	07	**Mohamed ZOUIDI1, Salah HADJOUT1, Hocine BOUGRINE1, Abdeldjalil BELKENDIL1, Dounia KEDDARI1, Chaima TOUABA1**	IMPACT OF CLIMATE CHANGE AND DROUGHT ON LAND PRODUCTIVITY IN WESTERN ALGERIA: CURRENT STATUS AND SUSTAINABLE MANAGEMENT PERSPECTIVES	Centre for Research in Spatial Planning (CRAT)	mohamed.zouidi@crat.dz
	08	**Chaima TOUABA 1 , Mohamed ZOUIDI 2 , Mohamed Ikba FARAH [3]**	IMPACT DE CHANGEMENT CLIMATIQUE SUR LA DIVERSITE DES ESPACES VERTS URBAIN – CAS VILLE DE CONSTANTINE	Centre for Research in Spatial Planning (CRAT)	chaima.touaba@crat.dz
	09	**Abdelkrim ARAR[1, 2, 3] Amel Dhikra MEGHERBI[1], Dounia BENDJOUDJA[1], Amani KHLOUFI[1], Aya BENBRAHIM[1]**	MODELLING APPROACH TO ASSESS THE STATE AND DYNAMICS OF NORTH ALGERIAN BIODIVERSITY UNDER ENVIRONMENTAL FORCING: A CASE STUDY OF QUERCUS ILEx	1Department of Ecology and Environment, Faculty SNV Batna University 2 2Laboratory "Biodiversity, Biotechnology and Sustainable Development", Faculty of Nature and Life Sciences, University Mostefa Benboulaid Batna 2, Batna, Algeria [3] Laboratory of Functional Ecology and Environment, University of Oum El Bouaghi.	a.arar@univ-batna2.dz

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"WATER, CLIMATE CHANGE, ENVIRONMENT AND SUSTAINABILITY
CHALLENGES AND PROSPECTS"
October 13 and 14 2025
"المياه ، تغير المناخ ، البيئة والاستدامة
التحديات و الآفاق"
13 و 14 أكتوبر 2025


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Salah Boubnider
مخبر الاستشراف الجغرافي والبيئة والتنمية (LAGED)
بالشراكة مع :
مركز البحث في تهيئة الإقليم (CRAT)
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المياه، تغير المناخ، البيئة والاستدامة
التحديات والآفاق
13 و 14 اكتوبر2025

Book of Abstracts

PLENARY SESSION

GROUNDWATER NITRATE POLLUTION: MODELING AND VULNERABILITY IN THE NORTH-EAST PART OF ALGERIA

Farès Kessasra [1], Dounyazad Benabbes [1], Zineb Khemissa [1], Amal Foughalia[1]

1 Geological Engineering Laboratory, University of Jijel, PO Box 98, 18 000 Jijel, Algeria

email: f.kessasra@univ-jijel.dz

Abstract

Groundwater resources emerged as the most reliable source for human supply. However, its prone to anthropogenic pressures and pollution. Contamination with *Nitrate* was highlighted in many watersheds in Algeria, NO3– is considered one of the most serious water quality problems. *This Conference presents the assessment of* NO3– pollution in some alluvial aquifers in the North-East of Algeria, their numerical modeling and vulnerability to pollution. *Its* differs in their hydrogeological settings, occupation land and the used chemical inputs. *Results demonstrate that nitrate concentrations reached 360 mg/l and* largely exceeded *WHO guidelines (50 mg/l). It was mainly resulting from fertilizer inputs in agricultural areas and wastewater discharges from urban areas. Then, Nitrate concentrations were integrated in a contaminant transport model and coupled with a hydrodynamic model. The aim was to highlight the fate of nitrate in the aquifer* through three simulated scenarios (2011-2050). *Prediction show a gradual decline in NO3 in some simulated wells, when other increased. Simulations revealed that the NO3 transport was m*ore influenced by the initial geochemical parameters than the hydrodynamic conditions, the nature of the aquifer (unconfined or confined) and the non-saturated zone. Finally, v*ulnerability cartography delimited Nitrate Vulnerable Zones (NVZ).* Areas with higher inherent vulnerability are expected to cause severe nitrate pollution in groundwater. Our research insights facilitate the implementation of a protection strategy of our groundwater heritage.

Keywords: Nitrate, Groundwater pollution, Transport modeling, Vulnerability, Algeria

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REINVENTING TEXTILE DYEING IN THE FACE OF CLIMATE AND WATER CHALLENGES: THE SUPERCRITICAL CO_2 APPROACH

Sonia Dridi-Dhaouadi & Hatem Dhaouadi, Noureddine Baaka, Nedra Dhouibi

University of MONASTIR – IPEIM LR21ES04 'Environmental Chemistry and Clean Processes'

Abstract

Textile dyeing is one of the most water- and energy-intensive processes in the textile industry, generating significant chemical pollution. In the context of climate change and water scarcity, the development of cleaner and more sustainable dyeing technologies is becoming urgent. This presentation explores the potential of supercritical carbon dioxide (SC-CO_2) as an alternative medium for both the extraction of natural dyes and textile dyeing. The results from our SC-CO_2 pilot project are presented, including the extraction of bio-based dyes from acacia and tomato processing residues. These extracts were first applied to a multifibre fabric using conventional aqueous dyeing, which served as a reference. We then highlight CO_2-SC dyeing tests on cotton, carried out with a natural acacia extract and a synthetic dye supplied by our industrial partner, SARTEX. Finally, a life cycle assessment (LCA) comparing CO_2-SC dyeing and conventional water-based dyeing demonstrates the environmental benefits of this emerging process in terms of water, energy and chemical consumption. This work illustrates how textile dyeing can be reinvented using innovative green technologies to meet current climate and water challenges.

KEY WORDS: Supercritical CO2, dyeing, physical properties, colorimetric properties, comparison

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CLIMATE CHANGE IMPACTS EVALUATION OF UNESCO-LISTED CULTURAL HERITAGE IN TÜRKIYE

Ismail DABANLI2*, Omer DABANLI1

1Istanbul Technical University, Civil Engineering Faculty, Civil Engineering Department, Istanbul, Türkiye

2Istanbul Technical University, Architecture Faculty, Architecture Department, Istanbul, Türkiye

*Corresponding author: E-mail address: dabanli@itu.edu.tr

Abstract

The escalating pace of climate change is hastening the degradation of our historical heritage. This necessitates both the adaptation of current technologies and the creation of novel solutions. Typically, these climate impacts lead to irreversible harm, despite preventative measures being implemented in some areas. The climate-induced factors that threaten cultural heritage can be categorized as water, temperature, wind, and pollution. Damaging agents linked to water comprise intense precipitation, fluctuations in humidity, and altered seasonal rain cycles. Those associated with temperature involve freeze-thaw cycles, severe heatwaves, and aridity. Damaging factors from wind encompass high-velocity gusts and the wind-driven transport of moisture, sand, and salt; pollution-related threats, meanwhile, involve acidic deposition and shifts in pH levels. This research assesses the vulnerabilities and risks for 21 UNESCO World Heritage sites in Türkiye by evaluating 16 potential factors. To accomplish this, the study utilized the analytical hierarchy process (AHP) and the technique for order of preference by similarity to ideal solution (TOPSIS). The findings indicate that the UNESCO sites at greatest risk from climate change are, in order: the Historic Areas of Istanbul (Performance Score: 60.20%), Göreme National Park and the Rock Sites of Cappadocia (Performance Score: 60.05%), and Diyarbakır Fortress and Hevsel Gardens Cultural Landscape (Performance Score: 54.77%).

Keywords: Climate change, Cultural heritage, UNESCO, AHP, TOPSIS, Türkiye

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CLIMATE CHANGE AND ITS IMPACT ON FOOD SECURITY IN ALGERIA

Djamal BENGUESMIA

National Office for Studies and Rural Development (BNEDER Algeria)

Abstract

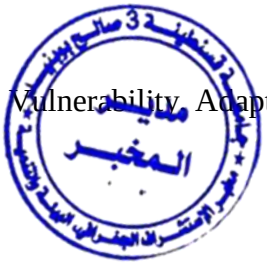
Like other countries in the region, Algeria faces severe challenges linked to desertification, land degradation, and climate change. Areas receiving more than 400 mm of annual rainfall are confined to a narrow coastal strip. Climate variability and extreme weather events pose serious threats to food security and socio-economic development.

Climate projections indicate rising temperatures, decreasing precipitation, and increased evaporation, leading to greater water stress and affecting key sectors such as agriculture, industry,

health, and tourism.

Under the supervision of the Ministry of Environment and Renewable Energies (MEER) and with support from the German Cooperation (GIZ), the Climate Risk and Vulnerability Assessment Project aims to strengthen the understanding of climate risks, enhance adaptation capacities, and develop a national climate vulnerability mapping to support decision-making and sustainable development strategies.

Keywords: Climate change, Desertification, Climate risk, Vulnerability, Adaptation



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ASSESSING CLIMATE RISKS WITH GIS: A USE CASE FROM THE URBA-CLIMA PROJECT

Mme Doria ADMAN

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ Algérie)

Abstract

Climate change poses increasing risks to socio-economic and environmental systems, especially in North African countries with limited and inconsistent data. This presentation showcases a climate risk assessment conducted within the UrbA-CliMa project, focusing on the Maghreb region. A GIS-based framework integrating hazard, exposure, and vulnerability components, such as the urban heat island effect. The analysis reveals that data scarcity and inconsistency remain major barriers to precise and comparable risk estimation. To address these challenges, Algerian municipalities need to leverage the potential of open climate data. Drawing on GIZ experience and project outcomes, the presentation highlights best practices for conducting spatially explicit climate risk assessments in data-scarce environments.

Keywords: Climate change, risk, assessment, UrbA-CliMa, environments.

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REFLECTIONS ON RESEARCH CHALLENGES IN TERRITORIAL SCIENCES: PERSPECTIVES FOR TERRITORIAL DECISION-MAKING SUPPORT

Prof Carlo Prévil, PhD

MAPDATA Laboratory (Methodologies for Assisting the Decision-Making Process in Spatial Planning and Applications)

UQAT, Canada

Abstract

Territorial dimensions are increasingly central to understanding contemporary societal challenges shaped by globalization, technological change, and recent socioterritorial crises. This contribution reflects on territorial sciences as an emerging interdisciplinary field that informs governance and decision-making. It highlights three key issues: collective and identity-based representations, the articulation of factual territorial knowledge with methodological tools, and the adequacy of governance systems facing complex and sometimes conflicting demands. By proposing a relational ontology of territory, the presentation underscores the need to integrate social identities, spatial dynamics, and networks of power in order to better support decision-making and guide public action.

Keywords: Territorial sciences; Territorial governance; spatial identities; Decision-making support; Territorial ontology

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AXIS 01: EXTREME EVENTS AND CLIMATE CHANGE, IMPACTS AND ACTIONS

RECYCLING INERT WASTE: A SUSTAINABLE STRATEGY TO PRESERVE NATURAL RESOURCES THE CASE OF INERT WASTE IN THE TOWN OF ALI MENDJELI

Sonia MAKHLOUFI 1,
Roukia BOUADAM 2,

Sonia MAKHLOUFI [1], Roukia BOUADAM [2],

Institute for management and urban techniques, LAGED (Geoperspective, environment and development laboratory)
Institute for management and urban techniques, LAGED (Geoperspective, environment and development laboratory)
sonia.makhloufi@univ-constantine3.dz[1],roukia.bouadam@univ-constantine3.dz[2]

Abstract

In today's context of growing industrialisation, increased globalisation of trade and rising consumption patterns, natural resources are being intensively exploited. As a result, their renewal and the stability of ecosystems are under threat. At the same time, the production of waste generated by human activities is growing exponentially. Waste management is increasingly becoming a strategic lever for limiting the excessive exploitation of raw materials.The processes involved in producing, using and disposing of goods require large quantities of energy and materials, contributing to climate change, particularly through the extraction and combustion of fossil fuels.In this context, waste recovery is a promising solution, reconciling economic development, environmental protection and the responsible use of available materials.By adopting a circular economy, waste is given a second life through recycling, reuse and reallocation. This has the effect of reducing demand for raw materials, cutting energy consumption and, consequently, limiting the greenhouse gas emissions associated with the resource extraction and production processes. Recycling inert waste also has ecological benefits. By encouraging the reuse of these materials in production processes, it avoids the need for further extraction of materials such as sand, gravel or rock. This approach is in line with our desire to preserve natural environments, which are often endangered by intensive extraction practices. These activities are causing major changes to landscapes, destroying habitats and seriously disrupting biodiversity, and are at the root of current environmental concerns. In addition, the extraction, processing and transport of materials require large quantities of energy, generally from fossil sources. By promoting energy recovery, it is possible to limit the use of combustion, thereby reducing overall energy consumption in the building and public works sectors. This process has two beneficial effects: fewer extraction operations and a significant reduction in energy requirements. These two effects combined result in a significant reduction in greenhouse gas emissions. It is undeniable that the industrial processes associated with the extraction of raw materials are a significant source of carbon dioxide emissions. This responsibility is mainly attributable to transport activities and the use of heavy machinery.

The process of recycling and recovering waste transforms it into a genuine resource, while helping to protect the environment. The building and public works sector is characterised by its high consumption of raw materials.

The purpose of this paper is to highlight practices that optimise the use of inert waste from the construction and public works sector. The study is based on a hybrid methodology combining a qualitative approach and documentary research. Its aim is to identify the recovery practices deployed in the construction and public works sectors, using recycled materials. The recovery of inert waste is of major international environmental importance. Inert waste plays a significant role, not least because of its sheer volume. Case studies have highlighted the potential for inert waste recovery, particularly in the context of a circular economy. This research shows the effectiveness of the relevant policies for the recovery of these residues, which can then be converted into materials for use in construction and public works.

As part of this research, we have attempted to apply this principle to the new town of Ali Mendjeli, which has benefited from upgrading operations within its neighbourhood units in response to the gradual deterioration of public spaces. In response to the gradual deterioration of public spaces, the town has benefited from upgrading operations in its neighbourhood units, as part of a programme to improve the quality of life of its citizens. These operations have been carried out as part of a programme to improve the quality of life of citizens. As part of urban infrastructure work, particular attention is paid to traffic infrastructure such as pavements and pavements. In addition, crossroads, footpaths and walkways in recreational areas and playgrounds are also taken into account. A proposal has been submitted to introduce recycled aggregates from inert waste in landscaping work. The aim of this proposal is to demonstrate, empirically, the feasibility of replacing traditional materials, such as natural aggregates, with recycled materials derived from the processing of inert waste generated by building sites. By way of example, the result of this approach is that 20% of materials (aggregates) can be replaced by recycled aggregates from inert waste as part of the study for the development of outdoor spaces, and recycled aggregates can be incorporated into various components of the project, such as roads, pavements and the surfacing of footpaths. This initiative is part of an eco-responsible approach aimed at reconciling technical performance, a reduced environmental footprint and a circular economy in the construction sector.

In this sense, the recovery of inert waste is part of a proactive approach to combating climate change, and a fundamental pillar of sustainable management of natural resources. This approach aims both to minimise the ecological footprint of our consumption activities and to encourage a circular economy that generates jobs and innovation. However, its effective implementation remains dependent on the development and implementation of bold public policies, as well as sustained collective mobilisation on the part of the players involved.

Key words: inert waste, natural resources, Ali Mendjeli, recovery, sustainable strategy.

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NATURAL HAZARDS ASSOCIATED WITH CLIMATE CHANGE CASE STUDY: FLOODS IN THE CITY OF TEBESSA (ALGERIA): BETWEEN PROACTIVE MEASURES AND IMPLEMENTATION EFFECTIVENESS

Aissa BENHAMMDA[1],
[1]Institute of urban techniques Management, University of Oum El Bouaghi – Algeria
aissa.benhammada@univ-oeb.dz[1]

Abstract:

Algerian cities are experiencing rapid demographic growth, resulting in increasing demand for services and the emergence of numerous environmental issues that hinder the requirements for sustainable urban development. With the onset of climate change affecting most cities around the world, Algerian cities have become increasingly vulnerable to the threat of floods caused by sudden and unseasonal rainfall. These floods lead to significant material and human losses and affect the urban life of residents across various social and economic categories. This research aims to shed light on the city of Tebessa, which has faced recurring flood risks in recent decades. In addition to climate change, the city's topographical and climatic characteristics contribute to the occurrence of these floods. The consequences have been felt across multiple spatial levels within the city, exacerbated by shortcomings in urban planning and the deterioration of its infrastructure. This situation highlights the urgent need for proactive measures and effective on-the-ground implementation to prevent such disasters.

Keywords: Climate change, natural hazards, floods, proactive measures, city of Tebessa.

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ALGERIAN URBAN TERRITORIES FACING THE CHALLENGE OF CLIMATE CHANGE

Roubila CHAOUCHE TEYARA
Centre de Recherche en Aménagement du Territoire (CRAT) - Constantine
Rabiaa CHEROUANA
Faculté des Sciences de la Terre, de la Géographie et de l'Aménagement du Territoire
Oumaima BENHAMMOU
Faculté des Sciences de la Terre, de la Géographie et de l'Aménagement du Territoire

Abstract - Climate change represents a major challenge for Algerian cities, exacerbating extreme phenomena such as floods, droughts, and urban heat islands. These manifestations have direct consequences on residents' quality of life and the organization of urban space. Despite these challenges, local and national policies struggle to anticipate and mitigate the impacts of climate change, highlighting the need for strategic actions to strengthen territorial resilience in the face of increasing environmental risks.

This study explores adaptation strategies that enable urban spaces to better cope with extreme weather events while transitioning towards a sustainable development model. The objective is to analyze the current urban planning policy in Algeria, assess the effectiveness of regulatory frameworks and planning tools in addressing environmental challenges, and propose innovative approaches. These include the integration of green infrastructure, nature-based solutions, and the use of digital tools such as Geographic Information Systems (GIS) and territorial intelligence.

The results highlight the vulnerability of Algerian cities to climate change impacts, mainly due to rapid and often uncoordinated urbanization, inadequate infrastructure, and fragmented urban governance. However, promising initiatives are gradually emerging, especially in flood risk management and the incorporation of ecological solutions. International experiences show that adopting new planning approaches can significantly enhance urban resilience. The transition towards climate-resilient cities in Algeria requires a comprehensive and proactive approach. It involves a thorough reform of planning policies, improved coordination among institutional actors, and greater integration of technological and ecological innovations. This study underscores the urgency of adapting urban planning to new climate challenges to ensure more sustainable and harmonious territorial development.

Keywords: climate change, urban resilience, sustainable urbanism, urban territory, planning policies.

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STUDY OF LANDSLIDE MECHANISMS AT THE SITE OF 440 OPGI HOUSING UNITS IN DELLYS, BOUMERDÈS: IMPACT OF DROUGHT AND HUMIDITY VARIATIONS ON CLAYEY MARL

Nadjet BOURAGBA[1], Mohamed KACIMI[2]

[1]Département de géologie, Institut d'architecture et des sciences de la terre, Université Sétif 1, Sétif.
[2] Département des sciences Géologiques, FSTGAT, Université Constantine 1- Frères Mentouri, Constantine.
Email[1] : bngeologie@gmail.com Email[2] : kacimi.mohamed@umc.edu.dz

Abstract:

The wilaya of Boumerdès, located in northern Algeria, is a region particularly prone to landslides due to its rugged terrain, its clayey-marly geological formations that are susceptible to weathering, and its high seismic activity. Dellys, a municipality in the Boumerdès province, is a good example of this vulnerability, as it is frequently affected by landslides that threaten the population and infrastructure. The site of the 440 OPGI housing units, located northeast of the town of Dellys, is affected by a landslide. The formation in question consists of a layer of fill resting on schistose marl, which has been altered to form clayey marl that is particularly sensitive to moisture variations. This study aims to characterize the factors controlling the dynamics of the landslide through an approach integrating a seismo-geological synthesis, in situ and laboratory geotechnical tests, and mineralogical reconnaissance by X-ray diffraction of the formations involved.

The results obtained showed that the clays contained in marl lose water during periods of drought and shrink, creating cracks and fractures in the substratum. Drought reduces soil cohesion by decreasing water content, and during periods of rainfall, water infiltrates the cracks and pores, causing a sudden increase in pore pressure. This rapid increase reduces the shear strength of the material and triggers movement. Stability calculations performed using Geo-Slope 2018 software showed that the site is prone to landslides, as the safety factor obtained is 1.189 in the presence of water, which is lower than the normal value of 1.5. The landslide study in this area showed that drought can increase the risk of landslides on weathered marl substrate by creating favorable conditions. These include clay shrinkage and swelling, crack formation, and changes in pore pressure.

Keywords: Boumerdès, dryness, interstitial pressure, safety factor, landslide

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THE ENVIRONMENT IN THE FACE OF URBAN ACTIVITY

Malika LARGAT 1, Meriem BENLAHRECHE 2, Soumia DJOUABLIA 3

1 Senior Lecturer A, Institute of Urban Technology Management, University of Oum el Bouaghi
2 Doctor in management of urban techniques from the University of Oum el bouaghi
3 Doctoral student at Constantine 3 University
mlargat@yahoo.fr1, ***meriem.benlahreche@univ-oeb.dz2***,
soumia.djouablia@univ-constantine3.dz 3

Abstract:

Since the 1990s, urban development has been strongly influenced by environmental changes caused by human consumption of natural resources such as water, air and soil. This development highlights the complex relationship between society and nature, as well as the interdependence between urban areas and their environment. Contemporary social sciences are taking an increasing interest in environmental issues, raising critical questions about the impact of human activities and urban development on the environment. Indeed, Algerian cities are seriously affected by environmental degradation, which is caused by a variety of social, economic and political problems. The initial question is therefore: what is the impact of urban development on the environment? Environmental assessment is seen as a response to the environmental challenges posed by human activities and urbanisation, thereby promoting more efficient management of natural resources. In Algeria, regulatory approaches to environmental assessment are aligned with international standards, although most assessment processes are implicit. Life cycle assessment is particularly popular among scientific researchers. The DPSIR model is a widely recognised analytical framework and cyclical conceptual indicator that highlights the interactions between different environmental components. The integration of DPSIR analytical methods aims to describe the environmental assessment of human activities in order to highlight indicators of interactions between socio-economic and environmental systems. This cycle model is also suitable for simulating environmental change. describe the environmental assessment of human activities in order to highlight indicators of interactions between socio-economic and environmental systems. This cycle model is also suitable for simulating environmental change.

Describe the environmental assessment of human activities in order to highlight indicators of interactions between socio-economic and environmental systems. This cycle model is also suitable for simulating environmental change. Urban production processes in Algeria are mainly driven by uncontrolled urbanisation, which, while a key driver of development, also generates a great deal of pollution, creating enormous environmental pressures and exacerbating the impacts of climate change on the national territory. In Algeria, urban production processes are mainly shaped by the phenomenon of uncontrolled urbanisation. This rapid urban growth can be attributed to a multitude of factors, including the rural exodus, population growth and the search for better economic opportunities. As more and more people

flock to urban centres in search of better jobs, education and healthcare, cities such as Algiers, Oran and Constantine are experiencing unprecedented expansion. The environment encompasses physical, biological and human aspects that are of growing concern to the international community, not least because of the negative impacts of human activities, particularly urban ones. Since independence, Algeria has faced an ecological crisis characterised by rapid urbanisation and environmental degradation, particularly in Constantine, where the quality of the air, water and soil has deteriorated. This situation calls for an in-depth assessment of various environmental indicators in order to understand the current state of the built environment and its implications for human health and natural ecosystems. Applying the DPSIR model to Constantine reveals a complex environmental dynamic associated with urbanisation: the driving force behind population growth is natural growth and the continuing rural exodus, particularly from neighbouring rural areas, and the concentration of economic and educational opportunities in Constantine, which attracts migrants seeking employment or access to services. The driving force generates pressure to pollute the air, soil and water (discharges, wastewater). This growth has been accompanied by an acceleration in urbanisation, as evidenced by the expansion of new towns such as Ali Mendjeli. This demographic dynamic has exerted enormous pressure on natural resources and urban infrastructures, leading to land degradation (60% of suburban areas have become built-up areas), over-consumption of water resources (availability has fallen to 500 m3/person/year) and an increase in waste production, exacerbating environmental challenges in the context of climate change, with a 20% drop in rainfall over the last three decades. climate change, with a 20% drop in rainfall over the last three decades. Constantine has implemented a number of measures to meet environmental challenges, but their impact remains limited. A wastewater treatment plant at Hamma Bouzian is responsible for treating industrial wastewater, but due to insufficient treatment capacity, a considerable amount of wastewater remains untreated. The tramways, which opened in 2013, have helped to reduce emissions in the city centre, but the effect is small compared with industrial pollution. Reforestation efforts under the Green Dam programme aim to protect wetlands and limit erosion, but local monitoring is inadequate. Despite awareness campaigns on waste, the problem of indiscriminate dumping remains unresolved due to the lack of modern infrastructure. An integrated strategy is needed, involving clean technologies, sustainable urban planning (e.g. green corridors) and greater citizen participation.

Keywords: Environment, urban development, city, impact, human activity

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ÉVALUATION DU RISUE DE CRUE ET DE SA PREVISIBILITE : CAS DE LA COMMUNE DE FOUKA LE 25 MAI 2023

Rabiaa DEBBACHE [1], Khaled Abed Alfettah GASSI [2]

1 Faculté des sciences de la terre, Géographie et Aménagement du territoire
2 Direction Météorologique Région Est (DMRE), Office National de la Météorologie Algérie

k.gassi@meteo.dz [1],

Résumé

Cette étude propose une analyse multidisciplinaire du risque de crue éclair ayant touché la commune de Fouka (wilaya de Tipaza, Algérie) le 25 mai 2023, caractérisée par des précipitations extrêmes dépassant 168 mm en 12 heures. En combinant des approches topographiques, hydrologiques et météorologiques, l'étude évalue la vulnérabilité de la région et la prévisibilité de l'événement à l'aide du modèle WRF-ARW (version 4.4.2). Deux paradigmes de prévision sont explorés : la prévision déterministe (immédiate) et la prévision probabiliste (d'ensembles). Les résultats révèlent que la topographie accidentée, avec une pente maximale de 26,8 %, et l'urbanisation dense dans le bassin versant de l'Oued Mazafran ont amplifié les impacts de l'inondation. Une cellule orageuse convective, alimentée par une humidité relative supérieure à 90 %, un cisaillement vertical des vents et un resserrement des isobares (pression minimale de 1008 hPa), a été identifiée comme le principal déclencheur. Neuf configurations du modèle, combinant trois schémas de microphysique (SBU-YLin, WSM6, New Thompson) et trois schémas de convection (Kain-Fritsch, Betts-Miller-Janjić, Grell- Freitas), montrent que les configurations KL, KW, GL et GF prédisent des cumuls significatifs (jusqu'à 70 mm), bien que des écarts subsistent par rapport aux observations. Ces résultats soulignent la supériorité des prévisions d'ensembles pour quantifier l'incertitude, tout en mettant en évidence la nécessité d'améliorer les modèles pour une anticipation précise des crues extrêmes. L'étude propose des recommandations pour optimiser les systèmes d'alerte précoce et la planification urbaine face aux risques climatiques croissants.

Mots-clés : Inondations, Crue éclair, Fouka, Prévision d'ensembles, WRF-ARW, Vulnérabilité

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IMPACT OF CLIMATE CHANGE ON AGRICULTURE IN THE SEMI-ARID REGIONS OF ALGERIA (1901-2020)

Amel BOURAHLA *, Hadjer LAOUFI, Sihem ZIOUCHE

Department of Agronomic Sciences & LCVRN Laboratory,
University of Bordj Bou Arreridj, Algeria,
amel.bourahla@univ-bba.dz

ABSTRACT

The global agricultural sector faces significant challenges due to climate change, with far-reaching consequences for food security. This research examines the effects of climate change on agriculture in Algeria, with a specific focus on the semi-arid regions of Bordj Bou Arreridj and Sétif, spanning a 119-year period from 1901 to 2020. The study reveals alarming trends of rising temperatures and erratic precipitation patterns, resulting in diminished crop yields and increased water scarcity. Utilizing data from the Climatic Research Unit (CRU TS), the research conducts a comprehensive analysis of temperature and rainfall trends. The findings indicate a persistent upward trajectory in temperatures and a notable decline in precipitation, particularly pronounced in eastern Algeria. Projections suggest that by 2050, these climatic shifts could lead to a substantial decrease in agricultural productivity, potentially exacerbating food insecurity and jeopardizing the livelihoods of local communities. The study not only highlights the challenges but also explores potential adaptation strategies to mitigate the adverse impacts of climate change on agriculture. These include the development of climate-resilient crop varieties and the implementation of advanced water-management techniques. The research underscores the critical need for immediate and proactive measures to enhance the resilience of agricultural systems in the face of ongoing and future climatic challenges. This comprehensive analysis serves as an important resource for policymakers, agricultural experts, and stakeholders, emphasizing the urgency of addressing climate-change impacts on agriculture in semi-arid regions.

Keywords: Climate Change, Agriculture, Algeria, Semi-Arid Regions, Temperature, Precipitation, Adaptation Strategies, Food Security

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AXIS 2: IMPACT OF CLIMATE CHANGE ON THE ENVIRONMENT

SYSTEMATIC LITERATURE REVIEW: OUTDOOR THERMAL COMFORT IN PUBLIC SPACES IN ALGERIA

Hafida ACHOURI *, Dr. Djamila DJAGHROURI *, Pr. Moussadek BENABBAS *

* LACOMOFA Laboratory, University of Mohamed Khider Biskra, Algeria
E-mail: hafidha.achouri@univ-biskra.dz

Abstract

Public spaces are fundamental components of urban environments, offering places for social interaction, cultural expression, and everyday activities that define the identity and functionality of cities. In Algeria, these spaces carry historical and social significance, acting not only as physical environments but as social agents. However, they are increasingly vulnerable to the combined impacts of climate change and urban heat island effects—particularly in regions already characterized by hot climates. This thermal stress threatens the usability, attractiveness, and overall livability of outdoor urban areas, reducing their capacity to fulfill their intended roles.

Within this context, the issue of outdoor thermal comfort emerges as a key concern for urban planners, architects, and local authorities. Numerous studies have emphasized the role of various factors influencing humans' thermal comfort such as climatic conditions, urban design strategies as well as psychological factors in shaping thermal perception. Among these factors, climatic conditions have been consistently highlighted as a crucial component in moderating thermal stress. Empirical and simulation-based research across Algerian cities reveals a strong correlation between both climate conditions and morphological elements and improved comfort levels, especially in dense urban areas and during peak summer periods.

Despite these studies, existing literature also exhibits certain limitations. Most studies focus on studying the impact of microclimatic conditions, urban geometry, use varying comfort indices (such as PET or UTCI), and often lack the study of psychological factors and peoples subjective experience and perception of these public spaces. Moreover, the findings remain scattered, with limited synthesis across different climatic zones, urban typologies, or design interventions. This fragmentation makes it difficult to draw generalizable conclusions or to formulate practical, adaptable design guidelines for Algerian public spaces.

Thus, a comprehensive understanding of the factors influencing outdoor thermal comfort, grounded in a systematic review of past studies, is essential. This research seeks to synthesize current knowledge, establish coherent tendencies in urban design and evaluate the

effectiveness of specific design strategies—particularly those related to vegetation and urban morphology—in mitigating heat stress and enhancing thermal comfort. By doing so, it aims to contribute to the development of more resilient, inclusive, and climate-responsive public spaces in Algeria.

This systematic review was realised based on the collection of previous studies from various databases concerning outdoor thermal comfort in Algeria, using keywords such as outdoor thermal comfort, public spaces, algeria ...etc. filtering the results according to their types, year, used methods and results and excluding unrelevant studies or those who don't concern the requested region. Then the extraction, the analysis and then the interpretation of the results. To finally extract the implications of these studies and the limitations of this review. Concluding with a summary of main findings and suggestions for future research.

Keywords: climate change, urban, Algerian cities, thermal comfort, thermal perception.

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ÉTUDE STATISTIQUE DE LA GEOCHIMIE DU CADMIUM ASSOCIE AUX PHOSPHATES SEDIMENTAIRES

Mohamed DASSAMIOUR[1], Rédha BOUSTILA[2], Mahrez BOULABEIZ[3]

[1]Département des Sciences géologiques, Faculté des Sciences de la Terre de la Géographie et de l'Aménagement du Territoire, Université Frères Mentouri-Constantine 1, Algérie. LGE (Laboratoire de Géologie Et Environnement)
[2]Département des Sciences de la Terre, institut d'Architecture et des Sciences de la Terre, Université Ferhat Abbas Sétif 1, Algérie
[3]Département d'écologie et environnement, Faculté des Sciences de la Nature et de la Vie, Université Abbas Laghrour Khenchela, Algérie

mohamed.dassamiour@umc.edu.dz [1],*r.boustila@yahoo.fr* [2], *fboulabeiz@gmail.com*[3]

Résumé

La présence de cadmium dans les phosphates sédimentaires représente un enjeu environnemental majeur en raison de sa toxicité et de sa capacité à migrer vers les écosystèmes. Ces phosphates, exploités massivement pour la fabrication d'engrais agricoles, renferment naturellement des éléments traces métalliques, dont le cadmium. Une analyse statistique multivariée des données géochimiques de 291 échantillons issus de 16 gisements et formations de phosphates sédimentaires à l'échelle mondiale a permis d'étudier les relations entre les oxydes majeurs (P_2O_5, CaO, MgO, SiO_2, Al_2O_3, Fe_2O_3, K_2O, Na_2O) et le cadmium (Cd). Les résultats révèlent une association significative du cadmium avec les carbonates de calcium ($CaCO_3$), suggérant une adsorption ou coprécipitation préférentielle avec cette phase minérale. Ce résultat souligne l'importance d'intégrer un traitement des minerais phosphatés visant à éliminer les carbonates, afin de réduire la teneur en cadmium dans les produits finaux et d'atténuer les risques écologiques.

Mots-clés : Phosphates sédimentaires ; Cadmium ; engrais ; Statistique multivariée ; Carbonates

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L'EVALUATION DE LA QUALITE PHYSICOCHIMIQUE ET BACTERIOLOGIQUES DES EAUX (LIXIVIAT) ISSUES DE DECHARGE PUBLIQUE DE MILA

Noura DJAMAA 1.2*, Seyf Eddine MERZOUG 2.3, Chaima LABADLA 1.2, Hafid BRAHMIA 1.2, Mouslim BARA 3 et Moussa HOUHAMDI 3

1. Laboratoire des sciences naturelles et matériaux, centre universitaire Abd El Hafid Boussouf Mila
2. Département d'Ecologie Institue des sciences et de la nature et de la vie universitaire Abd El Hafid Boussouf Mla
3. Laboratoire Biologie, eau et environnement Université 8 mai 1945 Guelma

Résumer

En Algérie, la gestion des déchets ménagers est problématique en raison de l'augmentation de la population et de la consommation, combinée à une organisation et une planification urbaines insuffisantes. L'objectif du notre étude est axé sur l'étude de la qualité physico-chimique et bactériologique des eaux issus de la décharge publique de la wilaya de Mila (lixiviat), L'un est situé dans la zone Oulad Bouhlouf dans la région sud du Mila , L'ensemble de nos résultats physico-chimiques ont montrés une qualité médiocre à normale car les valeursn obtenue de la température sont favorables pour le développement des mésophiles qui provoque la présence de pollution, d'un autre coté le développement des mésophiles provoque une diminution de l'oxygène dissous provoque une diminution de la teneur de l'ortophosphate qui décomposé la matière organique dans le milieu , En ce qui concerne les résultats des analyses bactériologiques ; on a dénombré un taux très élevé des bactéries indicatrices de contamination fécale (coliformes et streptocoques fécaux et les anaérobies sulfito-réducteurs) ainsi qu'une grande variété de germes pathogènes dans le lixiviat car la décharge est chargé par les déchets domestique, les rejets des hôpitaux et industrielles dangereux et autres effluents et qui sont versés directement sans aucune traitement préalable. Cependant on peu dire que la décharge est fortement polluee

Mots clés : Centre d'enfouissement technique Mila, pollution, Analyse physico-chimique, Analyse bactériologique, Lixiviat, Santé humaine,

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URBAN VULNERABILITY TO CLIMATE CHANGE: STUDY OF FLOOD RISK IN THE NEW TOWN OF ALI MENDJELI

Dr. Malika LARGAT, Somia DJOUABLIA & Dr. Meriem BENLAHRECHE

1 LARGAT Malika, Senior Lecturer A, Institute of Urban Engineering Management, University of Oum el bouaghi.
2 DJOUABLIA Somia, PhD student, LAUTES laboratory, Faculty of Architecture and Urban Planning, Salah Boubnider University, Constantine3.
3 BENLAHRECHE Meriem, Doctorate in urban engineering management from the University of Oum el bouaghi.
Email1 malika.largat@univ-oeb.dz,Email2soumia.djouablia@univ-constantine3.dz , Email3 meriem.benlahreche@univ-oeb.dz

Summary

The new town of Ali Mendjeli, some 15 kilometers from Constantine, was designed to respond to the housing crisis and relieve congestion in the city center. However, its construction has been marked by rapid urban growth, which brings with it numerous challenges, particularly in terms of natural risk management. Against a backdrop of climate change, marked by an increase in the frequency and intensity of extreme events, the risk of flooding is becoming a major issue for this developing city. The aim of this study is to analyze the urban vulnerability of the new town to flooding, taking into account climatic, topographical, socio-economic and urban planning factors. It highlights the inadequacy of drainage infrastructures, the increasing waterproofing of soils due to uncontrolled urbanization, and the absence of urban planning that takes climatic risks into account.

The results show that certain neighborhoods, particularly those located downstream or near wadis (watercourses), are particularly exposed to flooding. Vulnerability is heightened by population density, precarious housing and a lack of awareness among residents.

The study highlights the urgent need for an integrated approach to risk management, combining prevention, appropriate urban planning, infrastructure reinforcement and public education. It also recommends setting up early warning systems and mobilizing local players in climate change resilience.

Keywords: Flood risk, Urban vulnerability, Drainage infrastructure, Soil sealing.

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SNGID 2035 IN ALGERIA: A LEVER FOR CLIMATE CHANGE MITIGATION

Dr. Imen SOUKEHAL1, Prof Roukia BOUADAM 2, Dr. Halima ZAIDI 3

1- 2- 3 Urban Techniques Management Institute, University Salah Boubnider Constantine 3. Algeria.
LAGED Laboratory: (Perspective, Environment and Development Laboratory).
imen.soukehal@univ-constantine3.dz 1, roukia.bouadam@univ-constantine3.dz 2, halima.zaidi@univ-constantine3.dz 3,

Abstract

Waste management constitutes a critical challenge for Algeria, where accelerated urbanization and linear consumption patterns exacerbate environmental pressures. Despite a household waste collection rate nearing 90% in urban areas, the country remains confronted with a predominance of uncontrolled landfilling, responsible for 85% of methane (CH_4) emissions from the waste sector. These emissions, possessing a global warming potential 28 times greater than CO_2 over a century, position the waste sector as a major contributor to climate change in Algeria. Within this context, the National Integrated Waste Management Strategy 2035 (SNGID 2035) emerges as a holistic strategic framework, aligned with the Paris Agreement and the 2030 Agenda, aiming to transform the waste management system into a pillar of the circular economy.

The SNGID 2035 is structured around four pillars. The first pillar focuses on infrastructure modernization: installation of biogas capture systems in 95% of technical landfill centres (TLCs) and systematic treatment of leachate to limit soil and groundwater pollution. The second pillar concerns the rehabilitation of uncontrolled dumpsites: remediation of 1,700 sites, combined with ecological restoration measures to rehabilitate degraded ecosystems. The third pillar involves the development of valorization pathways: structuring recycling chains (plastic, paper, metals) and promoting the composting of organic waste, which represents 60% of municipal solid waste. Finally, the fourth pillar aims for energy recovery: conversion of residual waste into energy via incinerators equipped with particulate filters and cogeneration systems. Furthermore, the SNGID 2035 is fully aligned with the achievement of three key Sustainable Development Goals (SDGs), articulating its actions around specific targets. Firstly, it contributes to SDG 11 (Sustainable Cities and Communities) by improving air quality through the rehabilitation of uncontrolled dumpsites located on urban peripheries, thereby reducing health and environmental hazards. Secondly, it contributes to SDG 12 (Responsible Consumption and Production) by promoting a circular economy, aiming for a 35% reduction in food waste through awareness campaigns and support for product eco-design, thus limiting waste generation at the source. Finally, it strengthens SDG 13 (Climate Action) by enabling a 7% reduction in national greenhouse gas (GHG) emissions by2035, consistent with Algeria's climate commitments outlined in its Nationally Determined Contributions (NDCs). This triple convergence illustrates the capacity of the SNGID 2035 to

integrate local development imperatives and international commitments, positioning sustainable waste management as a cross-cutting pillar of the ecological transition.

The objective of this study is to assess the potential of the SNGID 2035 to reduce greenhouse gas (GHG) emissions and realize Algeria's climate commitments. The methodology relies on a comprehensive review of data from the Synthesis Report of Mission 1 of the SNGID 2035, focusing on Scenario 4, deemed optimal for reconciling environmental viability and financial balance. This scenario advocates for increasing the recycling rate to 25%, generalizing composting to 50%, and integrating energy recovery for non-recyclable waste. Simulations for Scenario 4 indicate a cumulative reduction of 71 million tonnes of CO_2e by 2035, equivalent to 8.7 years of the sector's current emissions. Methane capture in CETs alone would avoid 52% of these emissions, while recycling and composting would contribute 30% and 18% of the reductions, respectively. Concurrently, the production of 2,000 GWh/year of green electricity would meet the annual needs of 600,000 households, reducing dependence on hydrocarbons. Economically, waste valorisation would generate 44.3 billion Algerian dinars (DA) per year in revenue, notably from the sale of agricultural compost (12 billion DA/year) and secondary raw materials (22 billion DA/year). Subsequently, a qualitative analysis of implementation challenges complements the assessment.

The findings demonstrate that despite its transformative potential, the SNGID 2035 encounters multidimensional challenges that could impede its optimal deployment. Regarding "governance," enhanced coordination between sectoral ministries (Environment, Industry, Agriculture) and local authorities proves crucial to harmonize actions and avoid institutional overlaps. "Financing" constitutes another major pitfall, with estimated needs of 200 billion Algerian dinars (DA), requiring a combined mobilization of public-private partnerships, state subsidies, and international climate funds, such as the Green Climate Fund, to bridge the investment gap. On the "technical" level, a lack of local expertise in managing technical landfill centres (TLCs) and adopting energy recovery technologies limits the operational efficiency of infrastructure. Finally, the "social dimension" reveals cultural resistance, notably public opposition to TLC, lack of motivation for source-segregation, and persistent mistrust towards waste-to-energy projects, sometimes perceived as sources of pollution or nuisance. These obstacles, although significant, call for an integrated approach combining institutional strengthening, financial innovation, technology transfer, and citizen awareness to ensure the strategy's success – a success with which Algeria could establish itself as a model for MENA (Middle East and North Africa) countries in their fight against climate change.

Keywords: Algeria, SNGID 2035, Integrated Waste Management, SDGs, Climate Change.

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مدير المخبر

THE IMPACT OF HOUSEHOLD WASTE ON THE ENVIRONMENT IN THECITY OF CONSTANTINE

Sihem GHERFI, Souad HAOUARI

University of Constantine 01 - Mentouri Brothers - Faculty of Earth Sciences, Geography and Urban Planning Laboratory.
haouari.souad@umc.edu.dz, gherfi.sihem@gmail.com

Abstract:

Pollution caused by household waste is considered one of the most prominent problems that harm ecosystems, distort the aesthetic appearance of cities, and negatively affect public health. To address its adverse effects, the world today faces significant challenges in managing and treating waste using sustainable methods aimed at protecting the environment and public health, while ensuring that these methods are economically and socially viable.

Algeria is among the countries facing many challenges in managing and treating household waste, especially in its major cities such as Constantine, where there is a noticeable shortage in this field. To overcome these issues, Algeria has adopted a sustainable waste management policy by issuing legislation and laws, supported by the establishment of specialized public institutions and the launch of national programs and local plans. This has resulted in the emergence of projects aimed at managing household waste sustainably and treating it using scientific and environmentally safe methods. However, the city of Constantine still relies on traditional methods for treating household waste, despite the emergence of many modern projects. This has led to a range of problems that have negatively impacted the environment. Based on this, we have reached a set of recommendations, the most prominent of which is the need to enhance interaction between local authorities and residents to clarify the concept of sustainable development in waste management, in order to ensure the effective achievement of its goals at the city level.

Keywords: Environment, Sustainable Development, Household Waste, Indicators, City

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TERRITORIAL STRATEGIES FOR SUSTAINABLE MANAGEMENT OF WATER RESOURCES IN THE FACE OF CLIMATE CHANGE IN SEMI-ARID ENVIRONMENT IN ALGERIA: THE CASE OF THE WILAYA OF CONSTANTINE

Dr. Sandra BOUSSETTI 1

Department of Urban Technology Management, University L'Arbi Ben M'Hidi Oum El Baoughi.

Summary

The wilaya of Constantine, located in a semi-arid region, is particularly vulnerable to the effects of climate change, which amplifies the challenges related to urban water resource management. Recent data indicate a significant decline in water availability, as evidenced by the gradual drying up of several dams and reservoirs (Ben Badis dam), directly affecting the supply of drinking water. In 2024, the average daily water production of the wilaya is estimated at 319,707 m 3/day, of which 15,420 m3 are intended for industries. These volumes increased significantly between 2009, when production was 85 million m 3, and 2024, reaching 119 million m 3. More than 70% of these resources come from surface water, the rest being groundwater. The drinking water needs for the year 2024 amount to 234,661.6 m 3/day and are expected to increase to 438,465.5 m 3/day by 2050, with a projected population of more than 1.8 million inhabitants. This water deficit is attributable to several factors, including the decrease in precipitation, the increase in evaporation and the strong population and urban growth. In addition to the reduction of water resources, water quality is another major challenge. Extreme climatic events, notably intense rains, generate significant runoff of urban pollutants, aggravating the contamination of water sources. Despite notable progress in the development of hydraulic infrastructure, urban areas continue to face difficulties in supplying drinking water. This highlights the need to address existing deficits to ensure an equitable distribution of water resources and ensure optimal access to drinking water for all populations.

Keywords: Wilaya of Constantine, climate change, available water resources, water management and urban water needs.

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MODELLING THE POTENTIAL DISTRIBUTION OF A THREATENED ALGERIAN ENDEMIC SPECIES (CEDRUS ATLANTICA) UNDER DIFFERENT CLIMATE CHANGE SCENARIOS: IMPLICATIONS FOR CONSERVATION

Ahmed LAALA 1, Amina ADIMI 2

1 Laboratory of Natural Sciences and Materials (LSNM), Institute of Natural and Life Sciences, Department of Ecology and Environment, Abdelhafid Boussouf University Center, Mila
2Department of Plant Biology and Ecology, Ferhat Abbas University, Sétif a.laala@centre-univ-mila.dz 1, a.Adimi@univ-setif.dz2

Abstract

Abstract: Algeria is characterized by its geographic and climatic diversity, hosting a wide range of flora and endemic species, making it one of the biodiversity hotspots in the Mediterranean region. Among these endemic species is the Atlas cedar (Cedrus atlantica), which is listed as a threatened species on the International Union for Conservation of Nature (IUCN) Red List. Its endemism, along with the dramatic decline in its populations over the past four decades, justifies this classification. Predicting the potential impacts of climate change on the distribution of this species may contribute to the development of effective conservation strategies. In this context, the present study aims to simulate the current distribution of suitable habitats for C. atlantica in Algeria and to assess the influence of climate change on its range by the years 2050, 2070, and 2090. Species distribution was modeled using the Maximum Entropy software (MaxEnt), based on location data from 103 occurrence sites and nine environmental variables. Model results indicate that mean annual temperature and elevation are the most influential environmental factors shaping the distribution of C. atlantica in Algeria. Currently, suitable habitats cover a total area of 1,837 km², although this distribution remains relatively restricted and fragmented. Under all future climate change scenarios, this area is projected to decline, with a spatial shift toward the northwest and higher altitudes, where environmental conditions are expected to remain favorable for the species' expansion. Our results demonstrate that C. atlantica is particularly vulnerable to the effects of climate change in low-altitude and low-latitude areas, significantly increasing the risk of extinction under various climate scenarios. This research provides valuable insights for more effective conservation and sustainable management of C. atlantica in the face of climate change challenges. Keywords: Suitable habitat; Climate change; Cedrus atlantica; MaxEnt; Algeria

Keywords: Suitable habitat; Climate change; Cedrus atlantica; MaxEnt; Algeria

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THE EFFECTS OF CLIMATE CHANGE ON GROUNDWATER QUALITY IN SEMI-ARID ZONES-CASE STUDY FROM THE TAFRAOUI-TLELAT PLAIN OF ORAN (NORTHWESTERN ALGERIA

Abderahim El Mehdi BELLAREDJ

Laboratory for Sustainable Management of Natural Resources in Arid and Semi-arid Zones, Institute of Sciences, University Center Salhi Ahmed of Naâma (Ctr Univ Naama), 45000, Naâma, Algeria.

Abstract

In the semi-arid Tafraoui-Tlelat plain of Oran, groundwater is a reliable source of fresh water. However, the quality of this resource continues to deteriorate due to climate change, overexploitation and pollution. In this study, groundwater quality is evaluated, both in time and space, based on two sets of data, over 25 years (1986 & 2011). Groundwater quality is assessed using the Electrical Conductivity (EC), the Hardness (TH), the Cation ratio of structural stability (CROSS) and the Gibbs & Chadha diagrams. The spatiotemporal variation of groundwater salinity is studied using the information geographic system (SIG) ArcGis. The results show a degradation of the quality of groundwater from 1986 to 2011. An overall increase of around 1 g/l in total dissolved solid (TDS) is registered between the two periods. The same trends are observed for the predominant ions Cl^- and Na^+, indicating an increased salinity tendency. The result also highlights the contribution of climate change (increased evapotranspiration), silicate weathering (ion exchange) and pollution (wastewaters and fertilizers) in the deterioration of groundwater quality.

Keywords: Groundwater quality, Salinity, Climate change, Pollution. SIG

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POLLUTION MARINE DANS LA VILLE PORTUAIRE DE SKIKDA, MULTIPLES ALEAS ET ENJEUX

Dr. Wafa MEDJITNA, Dr. Ali SAIDOU,

Université d'Alger2,

Ecole normale supérieure, Bouzareah

Résumé

Skikda, ville algérienne littorale, connue pour sa fragilité vis-à-vis des différents facteurs tant naturels qu'anthropiques. Elle résume la question du risque majeur dans les villes littorales algériennes et présente une gamme bien diversifiée de risques naturels et technologiques, avec une multitude d'aléas, d'enjeux et des niveaux différents de vulnérabilité. Skikda, a connu un fort développement économique suivi d'un essor démographique très important, en un temps accéléré, est bien marquée par l'aléa industriel. Souvent qualifiée de capitale de la pétrochimie, elle est également devenue une capitale des risques majeurs industriels. En plus des risques naturels, notamment les inondations qui ont marqué l'histoire de la ville. Les risques liés à l'industrie des hydrocarbures et l'activité portuaire sont devenus aussi une marque pour la ville. Par leur diversité, ces risques technologiques vont de l'incendie à l'explosion ou à la pollution, laquelle a un impact durable et chronique sur l'environnement ainsi que sur la population. Cette pollution, générée par les complexes de la zone industrielle et le transport maritime, est de formes multiples: eaux usées, déchets solides et émissions atmosphériques. La situation environnementale préoccupante à Skikda nous motive à aborder ce sujet inquiétant pour la ville, la région et le pays en general.

Mots clés : environnement, risque majeur, pollution, ville littorale, ville portuaire, port,Skikda.

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SURFACE WATER EXTENT OF A NORTHWESTERN SALT LAKES IN ALGERIA AND EVALUATION FOR ITS SUITABILITY FOR ARTEMIA BRINE SHRIMP PRODUCTION OVER 2016-2025

Mohammed RABHI 1, Sidi Mohamed GHOMARI 1

1 Laboratory for the Protection and Valorization of Marine and Coastal Resources and Molecular Systematics (PVRMLSM). Abdelhamid Ibn Badis University, Faculty of Natural and Life Sciences, Marine Sciences and Aquaculture Department, 27000, POBox227, Mostaganem, Algeria.

rabhi.mohammed.etu@univ-mosta.dz, ghomarisidimohamed@gmail.com

Abstract

Artemia Brine Shrimp, is a small anostracan crustacean that lives in hypersaline environments, valued as an irreplaceable live food in aquaculture. Algeria has more than 24 sites (sebkha, chott, salt pans, etc.) that host two strains of Artemia: Artemia salina (sexual) and Artemia parthenogenetica. To support selection of suitable sites for production or exploitation of Artemia, it is essential to obtain more information on the potential of Algerian salt lakes to guarantee supply of this natural resource to the national market, where considering its high commercial value. The aim of this study is to determine the variation in water extent and its vulnerability to climatic conditions in northwestern Algerian lake, through the use of remote sensing platforms, which provide temperature, rainfall databases.

The NDWI and MNDWI were the main indexes used to extract water bodies, SPI and CMI indexes were also calculated to assess the meteorological drought in our study, where the combination between different factors influencing Artemia and their production sustainability was evaluated the potential of three different salt lakes in north-west Algeria.

A decline in water masses observed in time series of water extent on the basis of the NDWI and MNDWI, where maximum value was observed in March 2017 with a water surface area of approximately 14.01 km2. Selected lakes are under threat not only from drought conditions but also from water shortages and pollution, where the recorded patterns of low rainfall illustrated by negative values in SPI index IN several months of the years.

As long as Lakes were filled with water, Artemia biomass was present, once environmental conditions were favorable. The growth conditions were all reunited simultaneously in two lakes, marked by the presence of all the developmental stages (successive stages: nauplii, juveniles through to the adult stage), However, the total Artemia biomass collected is constrained and has declined over time, where it disappeared completely after the wet months in both lakes.

In the face of these unfavorable conditions against the development of Artemia, the northwestern Algerian Salt Lake may only contribute a negligible quantity of its cysts, thereby compromising its sustainability if these conditions persist, which interfere the proper development and production of Artemia for the Algerian market.

Maintaining a balanced ecosystem for all fauna and flora species become necessary for sustainability in Algerian wetlands.

Keywords: Salt Lake; climatic conditions; remote sensing, Artemia Brine Shrimp; Algeria.

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PLANETARY LIMITS AND THE CHALLENGES OF SUSTAINABLE DEVELOPMENT

Karima YOUNICI [1], Anissa KHELLADI [2], Nacera MAHFOUD [3]

[1 2 3] Faculté des Sciences Economiques, Commerciales et des Sciences de Gestion, Université Abderrahmane Mira de Bejaia. 06000 Bejaia, Algérie

karima.younici@univ-bejaia.dz[1], anissa.khelladi@univ-bejaia.dz[2], nacera.mahfoud@univ-bejaia.dz[3]

Summary

Our civilization is totally dependent on the proper functioning of the biosphere. Any alteration to this natural balance would jeopardize the well-being of mankind, and even its very existence. Faced with the intensification of anthropogenic pressures on the environment, the concept of planetary limits, proposed by Rockström et al (2009), offers a scientific framework for assessing the critical thresholds that must not be exceeded to preserve the Earth's stability and prevent any brutal and potentially devastating behavior on the planet.

This paper will first analyze the planetary limits identified, focusing on the main environmental degradations for which the threshold limits have already been exceeded, such as climate change, biodiversity erosion and disruption of biogeochemical cycles. We will then look at the challenges and implications of these exceedances for ecosystems and human societies. In order to better grasp the scope, gravity and scale of environmental problems and the need for urgent action to protect and preserve nature's various environments and resources, we will illustrate our argument with case studies on a global and national scale.

Finally, we will discuss possible solutions for adapting our development models to the planet's capacity for resilience. The aim is to rethink the relationship between man and nature, in particular by integrating systemic approaches and sustainable development strategies that reconcile economic prosperity with respect for ecological balances.

Key words: Planetary limits, climate change, sustainable development, resilience, ecological transition.

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CHANGEMENTS CLIMATIQUES EN ALGÉRIE, COMPRENDRE LES ENJEUX ET GÉRER LES CONSÉQUENCES : ÉLÉMENTS DE RÉFLEXION

Dr. Foudil KHALED 1, Dr. Oualid MEDDOUR 2, 3 Dr. Amar AMIR, Dr. Fatiha SAMAI

1Institut de Gestion des techniques urbaines Université de Constantine 3 (Laboratoire Géo prospective, Environnement et Développement, LAGED),
2 Institut de Gestion des techniques urbaines Université de Constantine 3, (Laboratoire territoires dynamiques intelligents et résilients, LABTERDIR)
3 Faculté de Technologie, Université Abderrahmane Mira, Bejaia (Laboratoire Géoprospective, Environnementet Développement, LAGED),
Département de Géographie et Aménagement du Territoire (GAT). Université Batna 2.

foudil.khaled@univ-constantine3.dz, oualid.meddour@univ-constantine3.dz et amar.amir@univ-bejaia.dz

Abstract

Scientists have demonstrated that human activity is overwhelmingly responsible for global warming over the past 200 years. Human-induced activities are the main cause of greenhouse gas emissions, which are warming the planet faster than at any time in the last two millennia (UN, 2020). The United Nations Framework Convention on Climate Change (UNFCCC), in its first article, defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.” The UNFCCC thus establishes a distinction between climate change attributable to human activities and natural climate variability. See also Climate change inertia; detection and attribution (IPCC, 2023). In a particularly challenging context marked by the COVID-19 pandemic, under the auspices of the National Climate Committee (CNC) and after more than four years of sustained work,

Algeria finalized its Biennial Update Report (BUR), prepared in accordance with the guidelines set by the UNFCCC Conference of the Parties. For the first time, Algeria produced National Inventory Report (NIR) as part of its third national greenhouse gas inventory, annexed to the first Biennial Update Report (BUR1) submitted to the UNFCCC Secretariat. Overall, climate change exacerbates the frequency, duration, and intensity of extreme weather events. Droughts are a major climate risk affecting almost the entire Algerian territory. Over the past 25 years, Algeria has experienced severe and persistent droughts characterized by a30% rainfall deficit nationwide. This has resulted in the progressive degradation of land due

to the combined effects of natural factors and human activity, and an accelerating process of desertification. More than 27 million hectares across twelve steppe provinces are classified as highly vulnerable to desertification (DGF, 2013). Each year, thousands of hectares of viable land are lost. Heat waves (three consecutive days with temperatures above 36°C) are increasing, posing a threat to public health, particularly among the elderly and infants. This scientific contribution sheds light on key reflections concerning climate change in Algeria. It addresses the current state of challenges and issues, as well as the impacts andconsequences on the most vulnerable sectors, namely: agriculture, forests, water resources, and health.

Keywords: Climate change, Algeria, Environment, Agriculture, Forests, Health

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LE LITTORALE DE LA WILAYA DE JIJEL : DEVELOPPEMENT SOCIOECONOMIQUE ET PERSPECTIVES DE RESILIENCE

Dr Abdelhafid BOUGASSA

Institut de Gestion des Techniques Urbaines, Université Constantine 3, Algérie.

abdelhafid.bougassa@univ-constantine3.dz

Résumé

L'engagement de l'Algérie pour la protection de l'environnement et des espaces littoraux depuis le début des années 1980, se décline clairement à la promulgation d'un arsenal juridique et des orientations anticipatives et restrictives d'aménagement du territoire. Cependant, malgré des mesures juridiques, techniques et administratives prometteuses en faveur du développement durable de la zone littorale de la wilaya de Jijel, les pratiques anthropiques motivées par des incitations économiques génèrent des impacts négatifs sur l'environnement et les écosystèmes. Le patrimoine naturel et environnemental unique qui marque la zone littorale de la wilaya de Jijel, est soumis à des défis environnementaux et sociétaux de plus en plus préoccupants. Certes, l'amélioration des indicateurs socioéconomiques est perceptibles sur plus d'un plan, statistique que descriptive, mais les couts environnementaux qui en résultent donnent désormais à réfléchir sur les stratégies et moyens à mettre en œuvre pour la restauration et la protection des paysages et des ressources naturelles et foncières encore disponibles. Cela soulève en réalité l'approche d'identification, évaluation et correction des pratiques nuisibles pour cette région intrinsèquement et extrinsèquement vulnérable. Notre contribution dans ce séminaire consacre aux impacts environnementaux, au développement et aux changement et aléas climatiques, se veut un diagnostic, une compréhension des enjeux de développement durable ainsi que les modalités de gouvernance susceptibles de garantir les conditions de résilience ajustées aux contextes et aux secteurs les plus déterminant du territoire d'etude notamment l'environnement, l'agriculture,

l'urbanisation, l'industrie, le tourisme, la gestion de l'eau, la pollution et la gestion des déchets.

A l'effet d'une mise en relief plus approfondie des éléments sus indiquées, le cadre d'etude est cerné dans la frange littorale qui abrite les agglomérations de Tassoust, Bazoul, Elkennar et Sidi-Abdelaziz.

Mots clés : Bande littorale, changement climatique, ressources foncières, environnement, Impact, Gouvernance.

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AXIS 03: HYDROLOGY, HYDROGEOLOGY AND WATER, RESOURCES, ISSUES AND CURRENT CHALLENGES

EVALUATION DE LA CONTAMINATION DES EAUX MARINE DE LA BAIE DE SKIKDA (ALGERIE) PAR LES REJETS D'UNE RAFFINERIE PETROLIERE

Dr. M.S.O BELAHMADI *, Dr. Ala ABDESSEMED, Dr. Nabil CHARCHAR, Dr. Abdelfettah GHERIB.

Centre de recherche en biotechnologie (C.R.Bt), Constantine, Algérie. Division Biotechnologie et Environnement,

msobelahmadi@gmail.com

Résumé

De nos jours, la contamination résultant des activités liées à l'industrie pétrochimique et au processus de raffinage du charbon devient un problème environnemental sérieux en raison de leurs eaux usées, qui contiennent couramment des substances considérées comme des polluants organiques persistants (POP) tels que les hydrocarbures aromatiques polycycliques (HAP) qui sont des composés toxiques et certains d'entre eux présentent un potentiel carcinogène, génotoxique et / ou mutagène pour plusieurs organismes et ils peuvent être transportés sur de longues distances et se bioaccumuler dans la chaîne alimentaire. Les objectifs de cette étude sont l'évaluation spatio-temporelle et le suivi de la contamination des eaux marines, estuariennes et côtières de la baie de Skikda (Algérie) par les hydrocarbures, suite à la présence d'eaux usées industrielles rejetées par un complexe de raffinage de pétrole dans la zone. Des échantillons d'eau ont été prélevés sur six sites différents au cours des quatre saisons dans la zone d'étude. Les hydrocarbures totaux (THC) ont été déterminés par une méthode gravimétrique, tandis que les hydrocarbures aromatiques polycycliques (HAP) (anthracène, pyrène et benzo (a) pyrène) ont été déterminés en utilisant la chromatographie liquide à haute performance (HPLC-UV/Vis). Les résultats obtenus ont indiqué une forte contamination par les hydrocarbures dans les échantillons d'eau de mer estuarienne et côtière des sites exposés à la raffinerie industrielle. Les concentrations de THC, Anthracène, Pyrène et Benzo (a) pyrène relevées dans l'eau au cours des quatre saisons étaient de cet ordre : 78 - 9457 µg/L ; < LOD Anthracène -157,1 µg/L ; < LOD Pyrène - 188,6 µg/L ; < LOD Benzo (a) pyrène - 2224,45 µg/L respectivement, avec des moyennes de : 1209,14 µg/L ; 16,03 µg/L ; 22,98 µg/L ; 119,03 µg/L respectivement. Un impact saisonnier important dans l'eau de mer a été mis en évidence par les trois composés retenus pour cette analyse (Anthracene, Pyrène et Benzo(a)pyrène). Cette variation peut être attribuée à l'influence des paramètres physico-chimiques, de la charge microbienne, du débit de rejet et du type d'hydrocarbure étudié. Ainsi, les eaux usées de la raffinerie doivent être bien traitées pour protéger la vie marine et la sécurité humaine.

Mots-clés : Baie de Skikda, Pollution côtière, Raffinerie pétrolière, HAP, Eaux usées, THC.

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HYDROGEOCHEMICAL CHARACTERIZATION AND WATER RESOURCE CHALLENGES IN THE EL MAHMEL PLAIN AQUIFER, NORTHEASTERN ALGERIA

Naama KACHA[1], Mahrez BOULABEIZ[2], Laiche AOUIDANE [2], Nesrin LAKHZOUM [3]

[1] Biotechnology, Water, Environment and Health Laboratory, Abbes Laghrour University, Khenchela, Algeria.
[2] Laboratory of Management, Conservation and Valorization of Agricultural and Natural Resources, Abbes Laghrour University Khenchela, Algeria.
[3] Laboratory of Functional Ecology and Environment, Department of Biology, University Larbi Ben Mhidi of Oum El Bouaghi, Algeria.
naama.kacha@univ-khenchela.dz

Abstract

In semi-arid regions such as northeastern Algeria, groundwater remains the primary and often sole source of water for drinking, agriculture, and economic development. However, the Mahmel Basin is increasingly threatened by groundwater salinization due to unregulated extraction, poor irrigation practices, and proximity to saline environments. Despite its strategic importance, there is a lack of detailed hydrogeochemical studies that can explain the origin, evolution, and current degradation of groundwater quality in this basin. This raises a critical question: What are the dominant geochemical processes influencing groundwater quality in the Mahmel Basin, and how can their spatial patterns inform sustainable water management?

To address this problem, 60 groundwater samples were collected and analyzed for major ions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, HCO_3^{-}, Cl^{-}, SO_4^{2-}, NO_3^{-}). Hydrochemical facies were interpreted using Piper and Schoeller diagrams, and GIS tools were employed to map spatial variations in water quality and identify zones of concern. Results reveal two dominant water types—calcium bicarbonate and sodium chloride—reflecting complex interactions such as rock-water dissolution, cation exchange, and saline intrusion from Chott Tinsilt. Elevated salinity in the north and northeast parts of the basin confirms localized degradation linked to natural and anthropogenic drivers. This study not only clarifies the mechanisms behind salinization but also provides a scientific foundation for improving groundwater management in the region. It highlights the urgent need for regulated extraction, improved irrigation methods, and continuous quality monitoring in order to ensure the long-term sustainability of groundwater resources.

Keywords: Groundwater, Hydrogeochemistry, Salinity, GIS, Water Management

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PROTECTION OF WATER RESOURCES AND ENVIRONMENTAL PRESERVATION IN THE CONTEXT OF CLIMATE CHANGE : THE CONTRIBUTION OF GEOMATICS TO THE SUSTAINABLE PLANNING OF TECHNICAL LANDFILL SITES IN CONSTANTINE

Dr. Ahmed ALLIOUCHE*1, Dr. Mohamed Ikbal FARAH1

1Centre de Recherche en Aménagement du Territoire (CRAT), Campus Zouaghi Slimane, Route de Ain el Bey, 25000 Constantine, Algérie.

E-mail* : alliouchеahmed1982@gmail.com

Abstract

Sustainable management of household waste represents a major environmental challenge, particularly in the context of climate change, where water resources are becoming increasingly vulnerable. Technical landfill sites (CETs) play a crucial role in solid waste management; however, their inappropriate siting can lead to severe risks of groundwater and surface water pollution. The Wilaya of Constantine, characterized by rapid urban expansion and inefficient waste management practices, faces a significant shortage of adequately located CETs.

This study applies geomatics tools combined with the Analytic Hierarchy Process (AHP) multicriteria spatial analysis method to identify optimal sites for the establishment of new technical landfill facilities in Constantine. The approach integrates multiple layers of information—including topographic, geological, hydrological, climatic, and socio-economic data—derived from thematic maps and satellite imagery. Results indicate that only 25% of Constantine's total area demonstrates high suitability for CET installation, while 17% shows moderate suitability and 58% is classified as unsuitable or poorly suitable.

These findings highlight the effectiveness of geomatics-based approaches in supporting decision-making for environmentally sustainable land-use planning. The geomatic optimization of landfill site selection, aligned with environmental standards and climate constraints, provides a strategic solution for the long-term protection of water resources and the promotion of sustainable environmental development in the face of climate change.

Keywords: Geomatics, AHP, Technical Landfill Sites, Water Resources, Environment, Climate Change, Sustainable Development, Constantine.

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LES ZIBAN: UN MILIEU RICHE ET VULNERABLE (POTENTIALITES ET CONTRAINTES)

Zakarya MAOU(1), Dr. Ahmed BOUGHERARA(2), Dr. Yahiaoui HABIBI(3)

[1, 2]Département GAT, Faculté des sciences de la terre, de la géographie et de l'aménagement du territoire, Université de Constantine 1, "LASTERNE" (Laboratoire des Sciences du Territoire Et Ressources Naturelles et Environnement)

[3]Institut des sciences de la terre et de l'univers, Université de Batna-2, LRNAT (Laboratoire des risques naturels et aménagement du territoire)

zakarya.maou@doc.umc.edu.dz1, bougherara.ahmed@umc.edu.dz2, y.habibi@univ-batna2.dz3

Résumé

Les Ziban, situés au Nord du Bas-Sahara, sont subdivisés en Ziban oriental et Ziban occidental selon la diversité des richesses et des contraintes qui ont souvent conditionnés les aménagements et l'exploitation qui caractérisent chaque zone. Au milieu des années 2000, le Zab occidental avec les palmeraies de Biskra, Tolga, Doucen et Ouled Djellal concentre les trois-quarts des palmeraies. Il doit cette orientation à la pauvreté de ses sols et la présence d'une série de grosses sources artésiennes du système aquifère du Sahara Septentrionale (SASS). Le développement de la plasticulture à El Ghrous et la phoeniciculture à Tolga irriguées à partir des eaux de forages captant les eaux du continental intercalaire (CI) et du complexe terminal (CT) a provoqué un rabattement important (5 m) dû à un renouvellement très lent du SASS qui a entrainé le tarissement de certaines sources. Par ailleurs la construction du barrage fontaine des gazelles d'une capacité de 55 Hm3, a privé les nappes phréatiques de Biskra qui étaient alimentées par les eaux en provenance du flanc Sud-Ouest des Aurès (Oueds El-Hai et Abdi). Ainsi, un nouveau barrage a été mis en eau en 2021 dans la vallée de l'Oued Abdi (commune de Bouzina), qui va aggraver le rabattement de la nappe phréatique de Biskra. En revanche, Le Zab oriental (autour de Sidi Okba) se caractérise par sa pauvreté en eau et sa richesse en sol. Avant l'implantation des forages profonds (à partir de 2000), le Zab Chergui dépendait uniquement des eaux du barrage de Foum el Gherza). Cependant, en raison de l'envasement très avancée de la retenue du barrage (80%), l'apport des eaux de surface a largement diminué. Aujourd'hui, l'apport des forages profonds répond aux besoins en eau des différents secteurs du Zab oriental. Néanmoins, le barrage de Foum El-Gherza, avant son envasement, assurait la protection de la partie aval (agglomérations et agriculture) des inondations de l'Oued Labiod. En effet, durant ces dernières décennies, plusieurs événements hydrologiques extrêmes ont été enregistrés (Septembre 1989, Avril 2004, Mai 2006 et Octobre 2011). Ces inondations représentent à nouveau un risque majeur pour le développement économique et social de cette zone.

Mots clés : Ziban, forages, nappe phréatique, rabattement, inondations, barrage.

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INTEGRATING AND REHABILITATING WATERWAYS IN URBAN ENVIRONMENTS: A STRATEGIC IMPERATIVE FOR A SUSTAINABLE CITY

1 Dr Lotfi KEBAILI, 2 Lydia OGAL

[1, 2] Department of Geography and Regional Planning, University of Oum El Bouaghi, Algeria.
lotfi.kebaili@univ-oeb.dz lotfikebaili@gmail.com

Abstract

Natural waterways are an essential environmental element that has always played a pivotal role in the emergence and development of cities throughout history. The development of many major metropolises has been linked to their location adjacent to a waterway, which provides natural resources and strategic advantages. Despite significant urbanization during the 20th century and increasing neglect of these elements, modern urban planning has begun to recognize the environmental, social and economic role of waterways within cities. This involves adapting these spaces and integrating them into the urban structure in a balanced manner. In this context, river and valley banks are now considered vital spaces for sustainable urban development, as they can achieve several complementary objectives, such as flood protection, strengthening the city's resilience to climate change and enhancing its image.

From a modern urban planning perspective, developing riverbanks represents an opportunity to rethink the city's relationship with its natural heritage. It can reconnect the city and its inhabitants, and the city and its environment, by bringing nature back to the city (Urban denaturation) and by providing high-quality public spaces that promote spatial and social justice. Pioneering projects in Europe and Asia demonstrate that riverbanks can be transformed into catalysts for sustainable urban renewal. Many Algerian cities, such as Algiers and Constantine, have undergone riverbanks rehabilitation with the main objective of cleansing and managing their waters. This has involved taking care of sewage networks and preparing the riverbanks to improve the area's appearance, environment, and to create public spaces for rest and recreation. This is part of the public authorities' interest in improving cities and their environment, as well as managing flood risk. This study will assess the current situation of these valleys and evaluate the rehabilitation works carried out by reviewing the literature, studying some of these examples, and using various approaches, including descriptive and quantitative methods. The study will then evaluate the extent to which these works achieve modern objectives related to the sustainability of the urban environment in its

multiple dimensions, as well as modern recommendations in the field of rehabilitation and restoration of urban waterways, inspired by international reference experiences.

The preliminary results of the study revealed that the studied rehabilitation processes are often limited to traditional engineering interventions directed at water drainage, relying heavily on cement. The ecological and social dimension is given secondary and limited importance due to the absence of prior studies dedicated to them.

The study definitively found that the appearance resulting from these operations is characterized by the absence of design and visual design, and the limited green spaces resulting from them.

This is because it relies on limited types of plants, namely grass that repeats the same shape and thus gives a sense of monotony. The management of this development is clearly inadequate. This is distorting its image and leading to the deterioration of some elements of urban furnishing. It is also hindering its proper use. The project was not studied with the community involved, and there has been no community involvement in its current management. The development is not being used to its full potential because there has been no participatory approach.

On the positive side, we note the exploitation of the banks of the studied valleys (especially Oued El Rimal and Boumerzoug) for hiking and recreational activities by creating pedestrian and bicycle paths, but they are little used by visitors. The current development has undoubtedly improved the management of wastewater and rainwater, as well as reducing the issue of solid waste that used to disfigure the cities and reducing the risk of flooding.

In conclusion, riverbanks must be integrated into urban planning strategies through legal and practical tools. This should be a strategic priority to address environmental and climate challenges in cities and as a means of urban and environmental rehabilitation. This requires the adoption of participatory, multidisciplinary approaches. These approaches must take into account the natural dynamics of waterways and integrate them into urban visions. These visions must be based on sustainability, resilience, and environmental and social balance.

Keywords: Water management, development of riverbanks, ecological corridors, sustainable cities.

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URBANIZATION AND THE WATER CYCLE

Dr. Rayene LAMRI [1]

[1]Department of Urban and Environmental Techniques, Institute of Urban Techniques Management, University of Constantine 3, Algeria

(E-mail: rayene.lamri@univ-constantine3.dz)

Abstract

This study focuses on the emblematic case of Oued El Harrach, a major watercourse traversing the metropolitan area of Algiers, Algeria. The research investigates the dual impact of soil impermeability and sanitation system failures, which together contribute to the deterioration of water quality and ecosystem health in the region.

Employing a documentary analysis complemented by field data collection, the study uncovers alarming levels of pollution in the Oued El Harrach basin. The findings point to widespread contamination from untreated domestic sewage and industrial effluents, which are discharged directly into the waterway without adequate treatment. These pollutants not only degrade the aquatic environment but also pose serious risks to surrounding communities, particularly those relying on the river for various uses.

The results underscore the urgent need to integrate water management into urban planning frameworks. Current urban development practices often overlook hydrological considerations, leading to fragmented and ineffective responses to water-related challenges. To address this, the study proposes a set of strategic interventions:

Reinforcement of sanitation and drainage infrastructure to handle increased runoff and prevent direct discharge of pollutants.

Integrated territorial planning that incorporates hydrological data, land use dynamics, and environmental constraints to guide sustainable urban expansion.

Community engagement and awareness campaigns aimed at educating local stakeholders—including residents, industries, and municipal authorities—about the importance of responsible water use and pollution prevention.

By adopting a holistic and participatory approach, urban planners and policymakers can work toward reversing the current trend of water system degradation and fostering a more resilient and environmentally sound urban future for Algiers and similar rapidly urbanizing regions.

Keywords: urbanization; water cycle; water management; impermeability; Oued El Harrach.

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MONITORING THE DYNAMIC OF ATLAS CEDAR FORESTS IN THE HODNA REGION USING MACHINE LEARNING AND TIME SERIES ANALYSIS

Dr. Bahaedine HAMIDA [1*], Dr. Ahmed ALLIOUCHE [2], Dr. Mohamed Ikbal FARAH [2]

1 Laboratoire d'Ecologie Fonctionnelle et Environnement Université Oum El Bouaghi

2 Centre de Recherche en Aménagement du Territoire (CRAT), Constantine. Algérie;

E-mail * : hamida.bahaedine@univ-oeb.dz

Abstract

The Hodna region is renowned for its rich and diverse forest ecosystem, characterized by theprominent presence of Cedrus atlantica (Endl), alongside other tree species such as Pinus halepensis Mill, Quercus ilex L, and Juniperus aggr. phoenicea L. In light of the importance of Cedrus forests for biodiversity conservation and sustainable forest management, gaining insights into their dynamics and effective management strategies is imperative. This research aims to examine the spatiotemporal changes in Cedrus forests within the Hodna region, specifically focusing on forest degradation as a crucial indicator of global change. Utilizing state-of-the-art deep learning methods in conjunction with remote sensing data, the study seeks to provide a comprehensive understanding of Cedrus forest degradation and its implications on the broader landscape. The integration of Convolutional Neural Networks (CNNs), a cutting-edge deep learning technique, will facilitate the exploration of spectral indices, including the widely used Normalized Difference Vegetation Index (NDVI), to discern the conditions favoring Cedrus growth. Employing a dynamic classification approach, the study aims to generate precise maps of forest cover evolution over time, allowing for the identification of trends associated with degradation. Preliminary findings indicate that areas boasting healthy Cedrus forests exhibit higher NDVI annual values, suggesting conducive growth conditions. Nevertheless, the research uncovers a concerning trend of declining Cedrus forest cover over time, emphasizing the urgency of addressing land degradation issues. Leveraging the advanced capabilities of CNNs, a novel model will be developed to ascertain the intricate relationship between machine learning methods, the research endeavors to demonstrate the superiority and robustness of the CNN approach in predicting the spatial distribution of Cedrus forests. Through this comprehensive investigation into Cedrus forest degradation in the Hodna region, the research underscores the imperative of conserving these invaluable ecosystems, given their ecological and socio-economic significance amid the context of global change. By employing advanced deep learning techniques, the study advocates for a more nuanced understanding of land degradation, which is essential for informed decision making in sustainable forest management and biodiversity conservation efforts.

Keywords: Cedrus Atlantica, Forest, Classification, Machine Learning, Deep Learning, CNN, Biodiversity, Hodna, Algeria.

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ÉVALUATION DE LA POLLUTION ORGANIQUE, MICROBIOLOGIQUE, DEGRE D'EUTROPHISATION ET RISQUE SANITAIRE DES EAUX DU BARRAGE DE CHEURFAS II (NORD - OUEST ALGERIEN)

Souad MOUASSA [1], Souad BENKEROURA [2], Mansour ZAAGANE [2]

[1] Département des Sciences agronomiques, Faculté des Sciences de la Nature et de la Vie. Université de Mascara , Algerie, *Laboratopire de Géomatique, Ecologie et Environnement*

[2] Département des Sciences agronomiques, Faculté des Sciences de la Nature et de la Vie. Université de Mascara, Algérie.[2]*Laboratoire des Recherche sur les Systèmes biologiques et la Géomatique.*

souad.mouassa@univ-mascara.dz[1], *souad.benkeroura@univ-mascara.dz*[2],

Résumé

La qualité des eaux de surface est l'un des facteurs clé utilisé dans la gestion et l' aménagement des ressources en eau, elle est caractérisée par les diverses substances qu'elle contient, leur quantité et l'effet qu'elles ont sur l'écosystème et sur l'être humain. Le phosphore et l'azote sont les éléments responsables du phénomène d'eutrophisation des milieux aquatiques. Ce phénomène environnemental constitue un problème d'actualité mondial réduisant la qualité des milieux aquatiques. Des solutions urgentes et durables sont nécessaires pour protéger les milieux qui ne peuvent apparaitre que si les processus d'eutrophisation sont bien identifiés et appréhender qualitativement et quantitativement. Cette étude est destinée à évaluer l'impact des eaux usées, de l'industrie et de l'agriculture sur la qualité des eaux de surface du barrage de Cheurfa II et leurs impacts environnementaux et sanitaires. Les résultats obtenus montrent que l'état trophique des eaux étudiées est eutrophe à hyper-eutrophe selon l'indice de l'état trophique de Carlson et la classification de l'OCDE respectivement. Le degré de la pollution organique estimé par le calcul de l'indice de pollution organique (IPO) traduit une pollution modérée à forte. Concernant l'évaluation des risques sanitaire par des nutriments et l'estimation du risque non cancérigène et la contamination de l'eau par les nitrates qui pourrait être inquiétante pour le public et les responsables, les apports journaliers chroniques (CDI : chronic daily intake) en nitrate et en phosphate ont été calculés pour les adultes et les enfants dans le plan d'eau via les voies de digestion/orale et dermique/cutané. Les résultats de cette étude ont montré que la voie dermique a généralement montré un faible apport chronique et que l'apport total pour les enfants généralement plus élevé que celui des adultes. Le risque sanitaire en utilisant le quotient de danger (HQ) a été calculé respectivement pour l'ingestion orale et le contact cutané avec l'eau. Les résultats obtenus pour l'année 2019, montrent que les valeurs du HQ oral des nitrates pour les adultes et les valeurs du HQ dermique pour les phosphates étaient très élevés, indiquant des risques cancérigènes très élevés pour la santé. L'indice de pollution microbiologique indique que toutes les stations des eaux de barrage cheurfa II, représentent une contamination fécale nulle, et peuvent être utilisée pour l'irrigation de toutes spéculations agricoles même les cultures maraichères consommées crues.

Mots-clés : Barrage, Pollution organique, Phosphates, Nitrates, Eutrophisation, Risque sanitaire.

EVALUATION DE DEGRE DE POLLUTION PAR L'INDICE DE NEMEROW ET RISQUE SANITAIRE POUR LES NITRATES ET LES PHOSPHATES DANS LES EAUX DU BARRAGE DE CHEURFAS II.

Souad BENKEROURA[1], Souad MOUASSA[2], Sabrina BEKOUSSA [3]

[1] Université Mustapha Stambouli de Mascara, Faculté des Sciences de la Nature et de la Vie, Laboratoire LRSBG, Algérie.

[2] Université Mustapha Stambouli de Mascara Faculté des Sciences de la Nature et de la Vie, *Laboratoire de Géomatique, Ecologie et Environnement,* Algérie.

[3] Université Mustapha Stambouli de Mascara, Faculté des Sciences de la Nature et de la Vie, Laboratoire LRSBG, Algérie.

Email : Souad.benkeroura@univ-mascara.dz , benkerouras@gmail.com

Résumé

La pollution des eaux de surface représente une menace croissante pour les écosystèmes aquatiques et la santé humaine, exacerbée par l'intensification des activités anthropiques. L'utilisation accrue de produits chimiques, tels que les engrais en agriculture, les détergents domestiques et les effluents industriels, contribue significativement à la dégradation de la qualité des milieux naturels. Parmi les polluants préoccupants, les concentrations élevées en nutriments, notamment les nitrates et les phosphates, sont reconnues pour leurs incidences néfastes sur la santé humaine. L'ingestion de nitrates, par exemple, est associée à un risque accru de cancer et, en particulier chez les nourrissons, à la méthémoglobinémie, une condition potentiellement mortelle ou pouvant entraîner un retard mental en cas de survie (Moshoeshoe et Obuseng, 2018). De plus, les nitrates peuvent être réduits en nitrites (NO2 --), dans l'organisme, lesquels réagissent avec les amines pour former des nitrosamines, des composés reconnus pour leurs propriétés cancérigènes(Moshoeshoe et Obuseng, 2018). Face à ce contexte préoccupant, cette étude s'est focalisée sur la caractérisation de la qualité des eaux du barrage Cheurffa II, un important réservoir situé dans l'ouest algérien, au niveau de la wilaya de Mascara. L'objectif principal de cette recherche était double : d'une part, évaluer le degré de pollution des eaux du barrage Cheurffa II en utilisant l'indice de pollution de Nemerow (IPN), un outil reconnu pour son efficacité dans l'évaluation de la qualité des eaux, introduit par Neme (Rathod et.al. 2011); et d'autre part, estimer le risque sanitaire potentiel lié à la présence de phosphates et de nitrates dans ces eaux. Le choix de ce barrage spécifique est motivé par le fait qu'il reçoit les eaux de l'oued Mabtouh, un cours d'eau qui draine les rejets domestiques des villages avoisinants ainsi que les eaux de ruissellement des terres agricoles environnantes, sources potentielles de contamination.

Pour atteindre ces objectifs, nous avons exploité une série de données analytiques portant sur divers paramètres physico-chimiques des eaux du barrage Cheurffa II, collectées sur une période s'étendant de 2007 à 2023. Cette base de données temporelle étendue a permis une évaluation conséquente de la qualité de l'eau et des tendances potentielles en matière de pollution.L'application de l'indice de pollution de Nemerow (IPN) à différents paramètres physico-chimiques a révélé une légère pollution des eaux du barrage Cheurffa II concernant la conductivité électrique, le calcium, le magnésium, les chlorures, le sodium et la dureté totale.

Les valeurs de l'IPN pour ces paramètres, comprises entre 1 et 2, suggèrent que ces eaux ne devraient pas être consommées sans un traitement adéquat permettant la réduction des concentrations de ces éléments.En ce qui concerne l'utilisation des eaux du barrage Cheurffa II pour l'irrigation, l'analyse basée sur l'IPN a mis en évidence une forte pollution vis-à-vis du calcium, des sulfates, du potassium et du sodium, avec des valeurs de l'IPN supérieures à 3 pour ces paramètres. Ces niveaux de pollution impliquent un risque significatif d'alcalinisation des sols irrigués et un risque de toxicité pour les cultures sensibles à ces éléments, soulignant la nécessité d'une gestion attentive de l'utilisation de ces eaux en agriculture. Concernant l'évaluation du risque sanitaire spécifiquement lié à la présence de phosphates et de nitrates, nous avons calculé un indice de pollution par les nutriments (IPN), adapté (Isiuku et Enyoh, 2020). Ce calcul a été réalisé en considérant deux voies d'exposition des populations à ces nutriments : l'ingestion (consommation d'eau) et le contact dermique. De plus, l'évaluation du risque a été différenciée pour les adultes et les enfants, reconnaissant la vulnérabilité potentiellement accrue de cette dernière catégorie. Pour quantifier l'exposition, l'apport quotidien chronique (CDI) oral et dermique a été calculé pour chaque groupe d'âge et chaque voie d'exposition. Ces valeurs de CDI ont ensuite été utilisées pour déterminer le quotient de risque (HQ) pour chaque nutriment et chaque voie d'exposition, ainsi que l'indice de risque (HI), qui représente la somme des HQ pour l'ensemble des nutriments considérés. Les résultats de l'indice de pollution par les nutriments (IPN) pour les phosphates et les nitrates se sont avérés inférieurs à 1, indiquant une absence de pollution par ces éléments dans les eaux du barrage Cheurffa II selon cet indice spécifique. De manière cohérente, les valeurs obtenues pour les CDI oraux et dermiques, ainsi que les quotients de risque (HQ) et les indices de risque (HI) pour les adultes et les enfants, étaient toutes inférieures à 1. Cette observation cruciale suggère l'absence de risque sanitaire significatif pour les populations exposées à ces eaux via la consommation ou le contact dermique, et implique que les eaux du barrage Cheurffa II pourraient être utilisées pour la consommation humaine, du moins en ce qui concerne les concentrations de phosphates et de nitrates.

En conclusion, cette étude détaillée de la qualité des eaux du barrage Cheurffa II, basée sur une analyse temporelle étendue et l'application d'indices de pollution pertinents, met en lumière une pollution légère à modérée par certains paramètres physico-chimiques, nécessitant un traitement pour la consommation humaine et présentant des risques pour l'irrigation. Cependant, l'évaluation spécifique du risque sanitaire lié aux phosphates et aux nitrates indique une absence de danger pour la santé des populations, suggérant une potabilité possible de l'eau en ce qui concerne ces nutriments. Ces résultats soulignent l'importance d'une surveillance continue de la qualité de l'eau des barrages, compte tenu des pressions anthropiques croissantes, afin de garantir la protection des écosystèmes et la santé publique.

Mots clés : degré de pollution, indice de pollution de Nemerow (IPN), indice de pollution de nutriments (IPN), risque sanitaire des phosphates et des nitrates, indice de risque (HI), irrigation, barrage Cheurffa II, Mascara, Algérie.

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APPLICATION DE L'INDICE CANADIEN ET L'INDICE DE LA QUALITE DE L'EAU POUR EVALUER LA QUALITE DE L'EAU DU BARRAGE BAKHADDA (OUEST ALGERIEN)

Fatiha DILMI * 1, Khadidja SENOUCI-REZKALLAH 2, Djamila MESSEKINE 1, Khadidja CHENTOUF 1

1. Université Mustapha STAMBOULI, Mascara, Faculté des Sciences Naturelles et de la Vie, Laboratoire de Géomatique, d&#39 ; Écologie et d&#39 ; Environnement.

2 . Département de sciences naturelles, Université de Quebec en Autaouais (UQO) Professeur associe.

E-mail : *fatihadilmi@yahoo.com.(*Corresponding author's email)

Résumé

L'eau est indispensable à la vie humaine, à la nutrition et à l'agriculture, elle est l'élément vital des écosystèmes (Melghit *et al*., 2015; Habila, 2002). L'Algérie comme tout autre pays en voie de développement, son climat est semi-aride, soufre de problème de la rareté de l'eau (Habila, 2002 ; Kadi, 1997; Zaid-Chertouk, 2011), la sécheresse s'étant accrue, la mobilisation des eaux superficielles par la construction des barrages devient indispensable (Habila, 2002). Certaines substances de nature physicochimique (sels minéraux, matières en suspension, micropolluants organiques et minéraux) et de nature biologique (bactéries, virus, parasites, …), peuvent non seulement dégrader la qualité organoleptique de ces eaux mais aussi créer des problèmes de santé publique (Beaudry, 1984).

Dans ce contexte, notre recherche a été basée sur l'évaluation de la qualité physicochimique et bactériologique de l'eau brute du barrage de Bakhadda à Machraa Esfa wilaya de Tiaret pour une durée de 3 mois (février, mars et avril 2024).

Le présent travail renferme d'une part l'analyse de certains paramètres physicochimiques des eaux tels que la température,le pH,CE, salinité,TDS,turbidité, NO, Na, K, Cl^-, Ca, TDS, O_2 dissous, DBO et matiére en suspension et d'autre part une éventuelle recherche de germes indésirables tels que les germes totaux, coliformes totaux et fécaux,streptocoques fécaux ainsi que les *Clostridium* sulfito-réducteurs et les germes photogènes tels que la *Salmonelle* et le *Vibrion Cholérique*. L'indice du Conseil canadien (IQE-CCME) et l'indice de la qualité de l'eau (IQE-WA) est utilisé pour évaluer la qualité globale de l'eau brute du barrage à partir des paramètres analysés.

La qualité physico-chimique de l'eau brute du barrage Bakhadda est globalement acceptable selon les normes, sauf pour la DBO5 et le potassium qui dépassent les normes algériennes. La qualité bactériologique montre une conformité avec les normes de l'OMS pour le nombre de

germes totaux, mais révèle une forte contamination d'origine fécale, indiquant une pollution humaine.

La présence de Clostridium sulfito-réducteurs dans presque tous les prélèvements (sauf en avril) nécessite un traitement approprié pour éviter des maladies graves. L'absence de germes pathogènes est conforme aux normes algériennes.Le résultat de l'application de l'IQE-CCME montre que les eaux de barrage ont une qualité moyenne, d'autre part l'IQE-WA montre que la qualité des eaux est impropre à la consommation. Des traitements simples sont nécessaires pour certains paramètres, et des mesures doivent être prises pour réduire les sources de pollution, sensibiliser les agriculteurs à l'utilisation réglementée des engrais, et exiger le traitement des rejets industriels pour protéger et améliorer la qualité de l'eau.

Mots clés : L'eau, barrage Bakhadda, IQE-CCME, IQE-WA, pollution.

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MAPPING THE SENSITIVITY OF GROUNDWATER IN THE NADOR PLAIN TO NITRATE POLLUTION USING AN AHP-GIS APPROACH

Manal DJEMA[1], Abdelmadjid DROUICHE[2]

[1]PhD in hydrogeology, Free researcher

[2]Department of geology sciences. FSBSA/ Mouloud Mammeri university of Tizi Ouzou.

manal.djema.hydro@gmail.com, *abdelmadjid.drouiche@ummto.dz.*

Abstract

The Nador plain belongs to the Sahel sub-basin (0203), characterized by a Mediterranean climate. The study area is home to a large, shallow aquifer of plio-quaternary age, vulnerable to all types of pollution.

This plain is used for agricultural purposes, and groundwater quality is particularly affected by high nitrate concentrations (over 50 mg/L), resulting from the intensive use of nitrogen fertilizers, the return of irrigation water to the water table, and the infiltration of untreated wastewater.

Although nitrate contamination of water resources has been widely recognized as a major environmental problem since the early 1970s, the processes governing the dynamics of this pollution and the mechanisms of nitrate transfer within the soil and to groundwater remain insufficiently studied. With this in mind, a multi-criteria modeling approach, integrating Hierarchical Process Analysis (HPA) with a Geographic Information System (GIS), was adopted to analyze and better define nitrate transfer mechanisms.

This combination enabled us to identify and map the main factors contributing to the transfer of nitrates to groundwater, taking into account the essential role of climate and soil, as well as the nature of the pollutant and its physico-chemical characteristics, in order to build a model of nitrate transfer to groundwater. The sensitivity map obtained by the model revealed five different sensitivity classes, describing the degree of protection of the Nador aquifer from nitrate pollution and the areas that favor nitrate transfer. The “very high” suitability class is the most predominant in the plain. It represents 72% of the total surface area, and is located mainly in the center and east of the study area.

The susceptibility map was validated by comparing the sensitivity classes determined with the nitrate concentrations measured at the various water points. The results revealed a 92% coincidence rate between areas classified as “very sensitive” and points with high nitrate concentrations. This high level of concordance highlights the consistency between the data observed in the field and the risk zones identified by the model, confirming the reliability of the map drawn up.

Keywords: Groundwater, pollution, multi-criteria analysis, Hierarchical Process Analysis (AHP), Geographic Information System (GIS), nitrates, cartography.

HYDROLOGICAL MODELING OF THE KÉBIR-RHUMEL BASIN USING GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Zohra ABDELKRIM

Institute of Urban Techniques Management
University of M'sila Algeria.

zohra.abdelkrim@univ-msila.dz

Abstract

This contribution falls within the framework of hydrological modeling of the KÉBIR-RHUMEL basin using Geographic Information Systems (GIS), by leveraging the capabilities of GIS to accurately model and analyze the KÉBIR-RHUMEL watershed based on the Digital Elevation Model (DEM). A series of methodological steps were carried out using hydrological analysis tools available in the ArcGIS environment, including: Fill, Flow Direction, Flow Accumulation, Raster Calculation, Stream Order, Stream to Feature, Stream to Feature Dissolve, Basin Mapping, Resample, Raster to Point, Snap Pour Point, and Watershed.

The results of this work demonstrate the effectiveness of Geographic Information Systems (GIS) in modeling and analyzing the KÉBIR–RHUMEL watershed through a series of analytical tools. The use of the Digital Elevation Model (DEM), combined with tools such as Fill, Flow Direction, and Flow Accumulation, enabled the establishment of a precise foundation for understanding surface water flow directions and accumulation patterns. Through the application of Raster Calculation, an appropriate threshold was defined for generating the stream network, which was subsequently classified using Stream Order. The network was then converted into a vector format using Stream to Feature and simplified using Stream to Feature Dissolve. The generation of the Basin Mapping allowed for the subdivision of the watershed into hydrological sub-units. The Resample tool improved layer alignment, while Raster to Point and Snap Pour Point helped refine the positioning of hydrological features. Finally, the use of the Watershed tool enabled the production of an accurate watershed delineation map. This study confirms that the integration of GIS tools in hydrological modeling represents an effective scientific approach for watershed assessment and for guiding preventive policies against flood hazards

Keywords: Hydrological modeling, KÉBIR-RHUMEL basin, Geographic Information Systems (GIS), Digital Elevation Model (DEM), hydrological analysis tools.

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MANAGING INTERMITTENT WATER SUPPLY: HOUSEHOLD COPING STRATEGIES AND CO-PRODUCTION OF DRINKING WATER

Yousra MANADI[1], Ali BELMEZITI[1], Bernard DE GOUVELLO[2]

1Laboratory O.V.A.M.U.S, Institute of Architecture and Urban Planning, Saad Dahleb University of Blida 1, BP 270 Soumâa Road – BLIDA –, Algeria

2Center for Studies and Expertise on Risks, Environment, Mobility, and Planning (Cerema), Territorial Directorate for Île-de-France, Trappes, France

yousramanadi@outlook.com[1], *belmeziti@gmail.com[1], bernard.de-gouvello@cerema.fr[2]*

Abstract

The Supplying people intermittently are a drinking water distribution approach, widely used in countries facing water stress, particularly in developing countries like Algeria. The Algerian Ministry of Water Resources estimates that in 2013, 78% of urban households were affected by this problem, and that one in four Algerians receives water every two days, illustrating the prevalence of intermittent water supply for the majority of the population. This intermittency reveals the manager's inability to ensure continuous, reliable access to water for all. Intermittency is often used deliberately to ration water supply and conserve water resources, making it a formal water supply strategy (Carlo Loubser et al., 2020). However, Kumpel & Nelson (2016) point out that no centralized urban drinking water distribution system was initially designed to operate intermittently. Rather, it is an adaptation approach. International water supply standards for urban utilities and World Bank recommendations do not apply to intermittency (Ray et al., 2018). Indeed, service reliability is a central requirement of these standards and is expressed through several attributes. In particular, Majuru et al. (2016) identify regularity of distribution (daily, continuous or partial), predictability of supply schedules, and pressure stability as essential components of this reliability. From a complementary perspective, Kudat et al (1993) and Madanat & Humplick (1993) consider that, like any basic good, water must meet three fundamental criteria: sufficient quantity, sanitary quality and adequate pressure. When these parameters are not met, the supply is considered unreliable. Algerian cities are experiencing various forms of intermittency, due to the diversity of water resources context and local management approaches. As a result, households are increasingly adopting adaptive behaviors. These adaptive behaviors illustrate the daily compromises made in the face of an increasingly uncertain resource, enabling households to meet their drinking water needs; they are commonly referred to as "coping strategies". Kudat et al (1993) categorize these coping strategies as an extension of Hirschman's theory of "exit, voice and loyalty" (Hirschman, 1970), which describes consumer responses to the deterioration of thequality of goods or

services. Faced with uncertain reliability of water supplies, households may adopt a variety of strategies, including drilling wells or installing large-capacity reservoirs to replicate a continuous supply, installing rainwater harvesting systems, or even moving to areas with more reliable water supplies. These actions can be referred to as "exit" strategies from the system. Other households may opt for the "voice" strategy, by expressing their complaints and protesting to water services providers or local authorities. Finally, some households choose to remain "loyal" by adapting to existing constraints. They reorganize their activities according to the actual availability of water, and reduce their consumption to cope with the system's limitations. In the case of intermittent drinking water supplies, these coping strategies do not represent a real exit from the formal system, but rather a complementary approach enabling households to compensate the piped distribution's inadequacies.

Water supply intermittency in Algeria is not a recent issue, the first water rationing program was established in the late 1970s and involved supplying the population of Algiers with water for an average of six hours a day (Chikhr Saïdi, 2001). The phenomenon started spreading in the 1980s, when urban demographic pressure exceeded the technical and institutional capacities of water utilities. Faced with growing demand and an ageing infrastructure, the state adopted an intermittent distribution model, aimed at mitigating shortages while ensuring a minimum level of service for the entire population.

In the Algerian context, marked by chronic intermittency in the drinking water supply, it becomes essential to question the effects of this intermittency on the reliability of the public service. By compromising the regularity, predictability and equity of access to water, intermittency undermines the foundations of a service that is supposed to guarantee an essential right. Faced with this instability, Algerian households develop various coping strategies to deal with recurrent water cuts. However, these strategies, while effective at the domestic level, are not without longer-term consequences for the public drinking water supply service. To what extent do these individual responses influence the operation of the public service itself; do they help to alleviate a failing service, or on the contrary, reinforce its gradual weakening?

This work is based on a directed literature review, focusing on relevant works related to the intermittency of drinking water supply, reliability, and household coping strategies. The analysis mobilizes a corpus of scientific articles addressing international cases similar to the Algerian context (India, Middle East, North Africa), The analysis is based on a framework inspired by the work of Majuru et al. (2016), Kumpel & Nelson (2016), and Kudat et al. (1993), Galaitsi et al. (2016), Mokssit (2018), Belmeziti (2025), enabling us to understand intermittency as a drinking water supply approach and to identify the main trends in coping strategies and their articulation with the public drinking water supply service. A general

understanding of the dynamics of intermittency and the adaptive responses of households, informed by lessons learnt from international cases, enables us to apprehend the Algerian case and understand its features.

Keywords: intermittency, water supply, household coping strategies, reliability, public service, water resource management.

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TOWARDS SUSTAINABLE AND INTEGRATED WATER RESOURCES MANAGEMENT IN ALGERIA: CHALLENGES, OPPORTUNITIES AND FUTURE PATHWAYS

Zahra FERHI1, Abdelmalek BEKKOUCHE2

1 Department of Hydraulic, Faculty of Technology, Abou Bekr Belkaid University, Tlemcen, Algeria. Water and Structures in Their Environment (EOLE) Laboratory

2 Department of Civil Engineering, Faculty of Technology, Abou Bekr Belkaid University, Tlemcen, Algeria.

zahra.ferhi@univ-tlemcen.dz1, abdelmalek.bekkouche@univ-tlemcen.dz2.

Abstract

Algeria faces major water management challenges due to its semi-arid climate, uneven distribution of resources and climate change. Water shortages are exacerbated by the overexploitation of groundwater and the increasing scarcity of fresh water. This paper will present an overview of water resources management in Algeria, highlighting key infrastructures such as dams, desalination plants and wastewater treatment plants. Lack of coordination between stakeholders and fragmentation of water governance are major challenges in Algeria. Current policies, including the National Water Plan, need to be reviewed to meet growing demand. Sustainable solutions include the reuse of wastewater for irrigation, but this requires investment and regulatory revisions. It is essential to improve governance, encourage better coordination between stakeholders and promote integrated and innovative practices to meet future challenges.

Keywords: water governance, water resources management, climate change, sustainability

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AXIS 04: DATA ACQUISITION, ARTIFICIAL INTELLIGENCE, REMOTE SENSING, ENVIRONMENTAL MONITORING AND GEOSPATIAL ANALYSIS

ASSESSMENT OF THE NEOTECTONIC ACTIVITY IN THE RHUMEL-MERZOUG BASIN IN NORTHEASTERN ALGERIA USING GEOMORPHIC INDICES.

Dr. Nabil MANCHAR [1], Dr. Mohamed KACIMI[2], Badreddine SAADALI[1]

[1]Département de géologie, Faculté des Sciences de la Terre et de l'architecture, Université Oum El Bouaghi Algérie.

[2]Département des Sciences géologiques, Faculté des Sciences de la Terre de la Géographie et de l'Aménagement du Territoire, Université Frères Mentouri, Constantine 1, Algérie.

manchar.nabil@univ-oeb.dz [1], kacimi.mohamed@umc.edu.dz [2]

Abstract

Northeastern Algeria is characterized by complex tectonics involving strike-slip, normal, and reverse faults. The landscape of the Neogene Rhumel-Merzoug basin was shaped by the continuous activity of faults in the bedrock, as opposed to erosion processes. The neotectonics of this basin have influenced both the geometry of the hydrographic network and the topography of the contemporary landscape. Our methodology assesses neotectonics in this mountainous region by combining the hydrographic network and geomorphic indices, namely the basin shape index (Bs), the stream length gradient (SL), the hypsometric integral (HI), the mountain front sinuosity (Smf), the basin asymmetry factor (AF), and the valley floor ratio (Vf). The six geomorphic indices measured were used to characterize faults and relative tectonic activity in the study area. The results obtained from these indices using GIS-based multi-criteria analysis constitute the relative active tectonic index (Irat). Four hierarchical degrees of Irat were defined, namely very high (VH), high (H), moderate (M), and low (L). Relative active tectonics represents a clear correlation between neotectonics and uplift rates, which allows for the interpretation of tectonic events in the study area. The results obtained prove that this approach makes it possible to highlight the most active regions linked to neotectonic action in the Rhumel-Merzoug watershed. The combination of geomatics and field studies highlights the cliffs, which continue to rise, using drainage models, the relief model, and the shape of the mountain range.

Keywords: Rhumel-Merzoug - Bs - SL - Hi - Smf - AF - Vf – Irat – neotectonic.

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USE OF GEOGRAPHIC INFORMATION SYSTEMS AND SPATIAL ANALYSIS FOR GROUNDWATER QUALITY MAPPING: CASE OF THE KHENCHLA WILAYA, ALGERIA.

Zohra NEMILI 1, Houria BAAZI 2

1Natural Hazards and Territory Planning Laboratory (LRNAT), Faculty of Technology, Departement of Hydraulic, University of Batna 2, Batna, Algeria.
2 Natural Hazards and Territory Planning Laboratory (LRNAT), Earth Sciences and Universe Institute, University of Batna 2, Batna, Algeria.
z.nemili@univ-batna2.dz **,** *h.baazi@univ-batna2.dz*

Abstract

The primary aim of this study is to evaluate the quality of groundwater in the Khenchela region, a vital resource extensively utilized for both domestic consumption and agricultural irrigation. Given its importance to the surrounding communities within the wilaya, ensuring the safety and sustainability of this water source is essential.

To achieve this, a comprehensive physico-chemical analysis was conducted, focusing on key ionic constituents including calcium (Ca^{2+}), magnesium (Mg^{2+}), potassium (K^{+}), sodium (Na^{+}), chloride (Cl^{-}), sulfate (SO_4^{2-}), and nitrate (NO_3^{-}). These parameters were selected due to their relevance in assessing water quality and potential health risks.

The data collected from various sampling points across the region were used to generate spatial distribution maps, highlighting zones with elevated concentrations of these elements. This mapping approach enabled the identification of hotspots where values exceeded normal thresholds, prompting further investigation into the underlying causes.

In cases where abnormal concentrations were detected, the study explored potential sources of contamination. These included anthropogenic factors such as the infiltration of untreated wastewater and the excessive use of chemical fertilizers, as well as natural influences stemming from the region's geological formations. By correlating the concentration levels with land use and geological data, the study aimed to determine the degree of pollution risk associated with each element and to propose targeted mitigation strategies.

Ultimately, this research contributes to a better understanding of groundwater dynamics in Khenchela and supports informed decision-making for water resource management, public health protection, and sustainable agricultural practices.

Keywords: Groundwater, Physico-chemical analyses, Khenchela, GIS, Mapping

L'IA ET L'APPRENTISSAGE AUTOMATIQUE DANS LA SCIENCE CLIMATIQUE

Radia BOUARROUDJ[1], Imen BENDJMILA[2], Kenza BOUARROUDJ[3]

[1 2]University, Salah Boubnider Constantine 3 Faculty of Architecture and Urban Planning of Architecture Department
radia.bouarroudj@univ-constantine3.dz, imen.bendjemila@univ-constantine3.dz
[3] University, Abdel Hamid Mehri Constantine 2
kenza.bouarroudj@univ-constantine2.dz

Résumé

L'intelligence artificielle (IA) et l'apprentissage automatique (ML) transforment profondément la science climatique en améliorant la précision des modèles climatiques, en affinant les prévisions des tendances futures et en anticipant les événements météorologiques extrêmes. Ces technologies excellent dans le traitement de vastes ensembles de données et l'identification de patterns complexes non linéaires, offrant des insights cruciaux pour relever les défis du changement climatique. Dans ce résumé, nous explorons les avancées méthodologiques, les applications pratiques, les défis persistants et les opportunités futures de l'intégration de l'IA en science climatique, en vue d'une soumission à un séminaire. Les modèles climatiques traditionnels, fondés sur des équations physiques, requièrent d'importantes ressources computationnelles. L'IA optimise leur efficacité via des techniques telles que la paramétrisation des processus sous-maille, où des réseaux de neurones remplacent des équations complexes pour réduire le temps de calcul tout en préservant la précision (Rasp et al., 2018). Les méthodes de super-résolution par apprentissage profond affinent les prévisions à l'échelle locale (Vandal et al., 2017), tandis que l'assimilation de données intègre efficacement les observations satellitaires et in situ (Geer, 2021). Des études récentes, comme celles de Chen & Park (2024), démontrent une amélioration significative de la précision des prévisions météorologiques, et Hamdan et al. (2024) soulignent la capacité des modèles IA à reconnaître des relations complexes. Des projets concrets, tels que DeepClimate de Google DeepMind, illustrent des avancées dans la prévision des précipitations à court terme (Ravuri et al., 2021). Parmi les méthodologies clés, l'apprentissage profond se distingue avec des architectures comme les réseaux convolutifs (CNN) et récurrents (RNN), adaptées aux données spatio-temporelles climatiques (Reichstein et al., 2019). L'apprentissage par transfert utilise des modèles pré-entraînés sur des données historiques pour prédire des régimes futurs (Ham et al., 2019), et l'apprentissage par renforcement optimise les stratégies de prévision basées sur les performances passées (Yuval & O'Gorman, 2020). Les approches hybrides, combinant modèles physiques et couches ML, offrent des résultats prometteurs (Kashinath et al., 2021). Maideen et al. (2024) mettent en évidence l'analyse efficace de données complexes comme l'imagerie satellite, et les prévisions

hybrides améliorent la détection d'événements extrêmes (Materia et al., 2024). Pour la prévision des tendances futures, l'IA permet d'explorer rapidement des trajectoires d'émissions via des algorithmes ML (Monteleoni et al., 2021), de détecter des tendances subtiles dans les données historiques (Barnes et al., 2019), et d'affiner les estimations de sensibilité climatique avec des ensembles hybrides (Schneider et al., 2017). Concernant les événements extrêmes, les RNN analysent les précurseurs atmosphériques (McGovern et al., 2017), les algorithmes ML génèrent des cartes de vulnérabilité à haute résolution pour l'adaptation (Reichstein et al., 2019), et les modèles hybrides renforcent les avertissements (Gagne et al., 2019). Kumar et al. (2024) confirment ces bénéfices pour les systèmes d'alerte précoce, avec des exemples comme IBM GRAF et les prévisions du Centre européen (ECMWF) (Dueben & Bauer, 2018). Des applications concrètes démontrent ce potentiel : le Système Européen de Sensibilisation aux Inondations (EFAS) emploie des modèles hybrides pour les alertes (Kratzert et al., 2019), l'apprentissage profond améliore la détection des cyclones tropicaux (Pradhan et al., 2018), et le projet CORDEX-AI utilisé le downscaling IA pour des projections à haute résolution (Baño-Medina et al., 2020). Néanmoins, des défis subsistent, notamment l'interprétabilité des modèles "boîte noire" (McGovern et al., 2019 ; Zeng, 2024), la distinction entre corrélation et causalité (Runge et al., 2019), les données limitées pour les événements rares, les biais historiques, et les besoins computationnels élevés (Hamdan et al., 2024 ; Materia et al., 2023). D'autres enjeux incluent la normalisation des données, les considérations éthiques et la reproductibilité. Les opportunités futures sont prometteuses, avec le développement de modèles hybrides de nouvelle génération intégrant nativement l'IA et la physique (Dueben et al., 2023), des alertes ultra-localisées adaptées aux communautés vulnérables (Singh et al., 2021), et des jumeaux numériques climatiques pour simuler des interventions (Bauer et al., 2021), comme dans le projet Destination Earth de l'Union européenne. Kumar et al. (2024) préconisent des modèles IA universels et explicables. Ces avancées soulèvent des questions éthiques sur l'équité climatique, la transparence et le partage international des données. En conclusion, l'IA et le ML complètent les modèles physiques traditionnels, transformant notre compréhension et prévision du changement climatique. Pour un déploiement responsable, il est essentiel d'adresser les défis liés aux données, à l'interprétabilité et à l'éthique. Cette synergie promet des stratégies holistiques d'adaptation et de mitigation, cruciales pour l'avenir de notre planète.

Mots-clés : intelligence artificielle, apprentissage automatique, science climatique, modèles climatiques, prévision des tendances futures, anticipation des événements extrêmes, approches hybrides, défis d'interprétabilité, opportunités futures, considérations éthiques

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DATA ACQUISITION AND ARTIFICIAL INTELLIGENCE (IA) FOR INTELLIGENT URBAN WASTE MANAGEMENT: THE EXAMPLE OF THE NEW CITY OF ALI MENDJELI (CONSTANTINE)

Omar REDJAL 1, Adel DAIKH 2, Djamel ALKAMA 3

1 Urban Techniques and Environment Department, Urban Techniques Management Institute, University of Constantine 3 Salah BOUBNIDER, LAEEE (Architecture, Urban Environment and Energy Efficiency Laboratory).
2 Urban Techniques and Environment Department, Urban Techniques Management Institute, University of Constantine 3 Salah BOUBNIDER, LAGED (Geoprospecting, Environment and Development Laboratory).
3 Departments of Architecture, Faculty of Science and Technology, 08 Mai 1945 University, Guelma.

omar.redjal@univ-constantine3.dz1, adel.daikh@univ.constantine3.dz2, alkama.djamel@univ-guelma.dz3

Abstract

Urban waste management is a critical issue for modern cities, which are confronted with rapid population growth and escalating environmental challenges. Traditional waste management methods are now showing their limits in terms of efficiency and sustainability. With this in mind, the integration of digital technologies, particularly real-time data acquisition and artificial intelligence (AI), represents a major step forward in optimizing waste collection, sorting, and treatment processes in urban environments. Data acquisition plays a key role in this transformation. It will be possible to simultaneously monitor bin fill levels, waste flows (including weight, frequency of deposit, composition, etc.), and the operational performance of the infrastructure. Similarly, data acquisition will provide a better understanding of citizens' behavior and waste management needs. Artificial intelligence will then be used to analyze this massive amount of data, enabling collection rotas to be optimized, waste production in different urban areas to be reported, sorting and recycling operations to be improved, and faults and illegal dumping to be detected. In this paper, we highlight the impact of data acquisition and artificial intelligence on urban waste management. Using the example of the New City of Ali Mendjeli (Constantine), we will look at the technical, economic, and regulatory challenges involved in implementing these solutions, as well as the prospects for moving towards more intelligent and sustainable cities. Located in the Wilaya of Constantine, the New City of Ali Mendjeli, with its rapid population growth and accelerated urbanization, generates around 87 tonnes of waste per day, and the company in charge of management (EGUVAM) has recorded a total of 4,853.5 tonnes of waste and rubble collected, representing an average of 600 tonnes per month and between 10 and 20 tonnes per day. At present, waste

management in Ali Mendjeli suffers from a number of problems: inefficient collection, with rotations that are often fixed and not adapted to actual waste volumes; overloading of containers in certain areas, leading to anarchic dumping and a deterioration in the living environment; a low recycling rate due to inefficient sorting and limited citizen awareness. To improve waste management in the New City of Ali Mendjeli, an approach based on data acquisition and artificial intelligence could be deployed; the use of AI platforms to analyze the data collected and generate recommendations for more efficient collection, the introduction of mobile applications enabling citizens to report illegal dumping and receive information onwaste management. The transition to intelligent waste management, based on data acquisition and artificial intelligence, represents a major opportunity for Algerian cities. Using Ali Mendjeli as an example, this study highlights the importance of digital technologies in optimizing urban services and reducing environmental impact. However, the success of such an approach depends on close cooperation between local authorities, technology companies, and the active participation of citizens.

Keywords: Intelligent Waste Management, data acquisition, Artificial Intelligence, Ali Mendjeli, Constantine.

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ASSESSING THE ROLE OF ANNUAL RAINFALL MAPS IN MULTI-CRITERIA ANALYSIS FOR IDENTIFYING FLOOD-PRONE AREAS

Faicel TOUT[1], Nouh REBOUH[2],Haythem DINAR[3], Yacine BENZID[4]

[1, 2,3 & 4]Centre de Recherche en Aménagement du Territoire (CRAT)

e-mail: faicel.tout@crat.dz[1], e-mail: nouh.rebouh@crat.dz [2], e-mail: haythem.dinar@crat.dz[3], e-mail:yacine.benzid@crat.dz[4],

Abstract

The focus on flood risk mitigation has intensified recently, with multi-criteria analysis often employed to devise prevention strategies. Annual rainfall is commonly included as a key factor in these analyses. This research evaluates the effectiveness of incorporating annual rainfall data in pinpointing flood-prone zones, utilizing Geographic Information Systems (GIS) in a two-phase approach. Initially, flood-vulnerable areas were identified using factors like the Topographic Wetness Index, Height Above Nearest Drainage, proximity to watercourses, and drainage density. In the second phase, these findings were combined with annual rainfall maps, maintaining uniform weights across both stages. Results indicate that while rainfall is vital for flood risk evaluation, its inclusion in multi-criteria analysis may skew outcomes. This is because rainfall patterns are shaped by topography, rendering it the only variable factor among otherwise fixed basin attributes. Consequently, rainfall data may divert attention from lower basin regions, which are generally more susceptible but receive less precipitation, toward higher areas with greater rainfall. The study also suggests that annual rainfall is an unreliable metric for prevention planning, as it does not adequately capture critical rain event traits like intensity, duration, and frequency. The findings underscore the need for criteria better suited to specific regions and advocate for innovative approaches prioritizing rainfall impact over mere distribution.

Keywords: Flood Risk, Rainfall, Multi-criteria Analysis, Prevention, Drainage Basin, Zerdaza, Algeria.

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MONITORING THE AGGLOMERATION OF CONSTANTINE THROUGH REMOTE SENSING AND GEOSPATIAL ANALYSIS

Adel DAIKH [1], Omar REDJAL [2], Samira DEBACHE [3], Larbi MEDDOUR [4]

[1] Institute of Urban Technology Management, Constantine 3 University, LAGED (Geoprospecting, Environment and Development Laboratory E2162200)

[2] Institute of Urban Technology Management, Constantine 3 University, AEEE (Architecture, Urban Environment and Energy Efficiency Laboratory E2191300)

[3]Department of Architecture, Faculty of Architecture and Urban Planning. Constantine 3 University, LAGED (Geoprospecting, Environment and Development Laboratory E2162200)

[4]Department of Architecture, Faculty of Science and Technology. University 8 May 1945 Guelma

adel.daikh@univ.constantine3.dz(1)

Abstract

The Constantine metropolitan area is undergoing a galloping urban expansion that is manifesting itself in notable changes in land occupation and use. The aim of this study is to analyze these changes using a diachronic approach within the current administrative boundaries of the Constantine metropolitan area.To this end, we have processed Landsat satellite images (spatial scenes) over a time series of three punctuated decades (1990, 2000,2010,2020) with the aim of detecting the topology, pace and process of change in land use and land cover. This approach enabled us to draw up eight thematic maps showing unchanged and converted land-use classes. These results were obtained by acquiring and processing multi-spectral raster satellite images on the Geographic Information System © QGIS (V3.10.13) and, more specifically, its semi-automatic supervised classification process © SCP (V7.8.10), leading ultimately to a quantification of land use and land cover change (LULC) in the form of thematic maps incorporating metadata.The change observed is essentially characterized by a net increase in the urban area, i.e. 12,550 hectares in 2020 compared with 8,088 hectares in 1990, an increase of over 57.55%. Over half of this growth was achieved during the decade (2010-2020), giving an average growth rate equivalent to 148.73 hectares per year.However, quantifying the modes and processes of this change is less straightforward without recourse to spatial metrics, which involve factorial analysis of the maps obtained to obtain verifiable indices according to empirical reference frames.Modelling of the maps to assess the landscape metric was carried out using the © FRAGSTATS (V4.2) software package.The correlation and cross-referencing of the indices derived from the modelling enabled us to distinguish three modes of spatial aggregation of change: the first is

contiguous and homogeneous with the summit conurbation (Constantine); the second is a fragmented extension of the main conurbation and its satellite towns; and the last is a peri-urban extension bordering on, but fragmented in relation to, the urban boundaries of the conurbations making up the macro-form of the metropolitan area.The results of this study can be used as a decision-making aid for future urban planning and projection operations, to formulate more sustainable urbanization schemes that are adaptable to the demands of metropolitan status.

Keywords: land use change, urban expansion, remote sensing, landscape metrics, spatial configurations.

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MACHINE LEARNING APPROACH FOR SOIL EROSION MODELING BASED ON RUSLE IN SKIKDA WILAYA, NORTHEAST ALGERIA

Latifa BOULAHIA[1], Ahmed ALLIOUCHE[2], Haithem BERGUELLAH[3]

Affiliation[1]: Geoprospective Laboratory, Environment and Development (LAGED**).** Institute of urban technical management, University, Constantine 3, Salah BOUBNIDER, BP B 72 Ali Mendjeli Nouvelle Ville, 25000 Constantine, Algeria.E-mail : latifa.boulahia@univ-constantine3.dz

Affiliation[2]:The Territory Planning Research Center (CRAT). E-mail:alliouchеahmed1982@gmail.com

Affiliation[3]:Geoprospective Laboratory, Environment and Development (LAGED). Institute of urban technical management, University, Constantine 3, Salah BOUBNIDER, BP B 72 Ali Mendjeli Nouvelle Ville, 25000 Constantine, Algeria.E-mail : berguellahhaithem@gmail.com

Abstract

Soil erosion by water is one of the main environmental challenges, impacting ecosystem sustainability and land productivity. In the context of increasing pressure on natural resources, this study aims to model soil water erosion at Skikda, using a hybrid revised universal soil loss equation (RUSLE) model and advanced machine learning algorithms, in particular the Light Gradient Boosting Machine (LGBM classifier). High-resolution data were obtained from 10-meter Sentinel 1-2 images, y to generate a digital elevation model (DEM). The spatial profile of water erosion in soil was analyzed using geographic information systems (GIS) and Google Earth Engine (GEE) tools. The RUSLE model provided a preliminary prediction of water erosion based on variables such as precipitation, soil erodibility, topography, canopy management and conservation practices. The LGBM model used 13 significant geospatial parameters as input for the machine learning algorithm: LS factor, C factor, K factor, P factor, R factor, LST, NDVI, TWI, slope, river distance, road distance, precipitation, lithology and land cover. The results indicate that, according to the RUSLE model, 49.55% of the land undergoes very low erosion, while 38.81% undergoes severe erosion, mainly in the southern and central parts of Skikda. LGBM classified 51% of the land as having low erosion and 37.19% as having very high erosion. The accuracy of the LGBM model was assessed at 86%. Field surveys were used to validate all models. The results will be useful for identifying areas prone to water erosion and informing land management for soil conservation in Skikda.

Keywords Geographic information system (GIS) · Revised universal soil loss equation (RUSLE) · Erosion susceptibility · Machine learning· LGBM classifier

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ASSESSMENT OF GROUNDWATER QUALITY AND NITRATE HEALTH RISKS IN A SEMI-ARID REGION (AIN BEIDA, NE ALGERIA)

Badreddine SAADALI [1, 2,*], El Fadel DERRADJI[3], Nabil MANCHAR[1], Marwa BENSLAMA [1, 2]

1Department of Geology, Oum El Bouaghi University, Algeria
2Natural Resources and Management of Sensitive Environments Laboratory, Oum El Bouaghi University, Algeria
3Department of Geology, Annaba University, Algeria

E-mail : badreddine.saadali@univ-oeb.dz

Abstract

In the semi-arid province of Oum El Bouaghi (Northeast Algeria), groundwater exploitation serves as an essential resource for drinking and agricultural needs amid water scarcity. This study evaluates the suitability of groundwater for human consumption in Ain Beida, focusing on nitrate contamination risks. Fourteen physicochemical and nutrient parameters were assessed, including pH, electrical conductivity (EC), Total Dissolved Solids (TDS), calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}), potassium (K^{+}), bicarbonates (HCO_3^{-}), chlorides (Cl^{-}), sulfates (SO_4^{2-}), nitrates (NO_3^{-}), nitrites (NO_2^{-}), ammonium (NH_4^{+}), and phosphates (PO_4^{3-}). The study aims to assess groundwater suitability for drinking using the Water Quality Index (WQI) and interpret the nitrate concentrations related to health risks. Analysis of seven boreholes revealed elevated nitrate levels exceeding the WHO limit for B-7 (74.4 mg/L), B-6 (81.5 mg/L), B-3 (100 mg/L) and B-1 (120 mg/L). WQI results classified the boreholes as excellent (B-5), good (B-2, B-4, B-7), poor (B-3, B-1) and bad (B-6) indicated deteriorating quality. High nitrate concentrations correlated with agricultural runoff and sewage infiltration, posing health risks such as methemoglobinemia in infants and potential carcinogenic effects. Other parameters (TDS and Cl^{-}) remained within permissible limits except for B-6. This study highlights significant public health concerns, as some boreholes exceed safe drinking water standards, posing risks of waterborne diseases and long-term health effects. Proper water management and treatment (including optimized fertilizer use, wastewater control, and community awareness) are essential to safeguard public health and ensure sustainable water resources in this vulnerable region.

Keywords: Groundwater, Nitrates, WQI, health risks, Ain Beida, drinking water, hydrochemistry, Northeast Algeria, public health, sustainability

ADVANCING INFILTRATION MODELING IN THE MITIDJA PLAIN: A COMPARATIVE STUDY OF TRANSFORMER-BASED, ANN, AND ELM MODELS

Amina MAZIGHI[1]*, Mohamed MEDDI[1], Hind MEDDI[1].

[1] Higher National School of Hydraulics of Blida, Blida LGEE 09000, Algeria
a.mazighi@ensh.dz[1], m.meddi@ensh.dz[2], h.meddi@ensh.dz[3]

Abstract

Accurate infiltration modeling is crucial for sustainable water resource management, particularly in agricultural regions like the Mitidja Plain. This study evaluates the performance of three AI models—Transformer-Based Model, Artificial Neural Networks (ANN), and Extreme Learning Machine (ELM)—using 70 experimental datasets. The models were assessed based on RSR, KGE, CC, and PBIAS to determine their predictive accuracy. Results indicate that ANN performed best, achieving an RSR close to 0, a CC of 0.95, and a KGE of 0.86, demonstrating high reliability. These findings emphasize the potential of AI-driven approaches to enhance infiltration prediction, optimize water distribution, and support climate adaptation strategies. Improved infiltration modeling can contribute to sustainable agriculture and groundwater recharge in the region. Future work will focus on refining AI models by incorporating additional hydrological and climatic variables to further improve prediction accuracy.

Keywords: ANN, ELM, Infiltration modeling, Mitidja Plain, Transformer-Based Model.

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GIS AS AN ESSENTIAL TOOL FOR INTELLIGENT AND SUSTAINABLE MANAGEMENT OF URBAN WATER

Fatiha NADIR [1], Ali BELMEZITI [1]

Department of Urbanism, Institute of Architecture and Urbanism, University BLIDA 1, OVAMUS
(Laboratory: Observatory of City and Architecture for Urban and Spatial Mutations)
nadir_fatiha@univ-blida.dz, belmeziti_ali@univ-blida.dz

Abstract

Information and data stored in Water Information System are essential for understanding and valuing water resources, as they allow monitoring and controlling water use, determining pollution sources, assessing human activities' impact on these resources and thus helping managers make informed decisions and take effective measures to sustainably manage water. In recent years, Geographic Information Systems (GIS) has positioned itself as an effective decision-making tool, as it allows all water stakeholders to participate in the collection, sharing and use of information. In this presentation, we shed light on hydraulic infrastructures' Geoportal which was implemented in Algeria by the National Agency for Integrated Water Resources Management (NAIWRM/ AGIRE). This system allows access to all geographic information related to water resources. Then, we examine users' organization as well as this system's components and different functionalities. Finally, we propose avenues for improvement to achieve sustainable and intelligent management of urban water.

Keywords: Water Information System; GIS; Geoportal; Sustainable Water Management

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WHEN URBANIZATION THREATENS AGRICULTURAL LAND IN THE MITIDJA PLAIN

Hayet BOUZAR-YAGOUNI1, Rabah ALLEM2, Si Hamoud Samy BELKADI 3

1,2,3 Université des Sciences et Technologie Houari Boumediene (USTHB)

Département de Géographie et Aménagement du Territoire

bouzarhayet@yahoo.fr1, trrmm.15@gmail.com2, belkadisamy861@gmail.com3

Abstract

The Algiers region is facing rapid urbanization and increasing pressure on agricultural land, particularly in peri-urban areas. The Mitidja Plain, known for its fertility and crucial role in national agricultural production, is severely affected by urban sprawl. The creation of the new city of Bouinan, designed to relieve congestion in major urban centers and address the housing shortage, illustrates these challenges. Spanning 2 175 hectares, this project represents a compromise often made at the expense of fertile agricultural land. This study aims to integrate Geographic Information Systems (GIS) and Multi-Criteria Analysis (MCA) to support decision-making processes for more sustainable territorial resource management. By mobilizing these two tools, the system evaluates the impact of such developments on the country's most fertile lands and offers recommendations to reconcile urban development with the preservation of natural resources. The study utilizes integrated land management and multi-criteria evaluation. GIS serves as a powerful tool for spatial modeling and visualization, enabling the assessment of complex interactions between urbanization and agricultural land. MCA adds a decision-support dimension by prioritizing development scenarios based on multiple criteria.

Keywords: Governance, Decision Support, GIS, Multi-Criteria Analysis.

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PREDICTING FUTURE LAND USE AND LAND COVER CHANGES IN THE MITIDJA PLAIN USING MACHINE LEARNING TECHNIQUES AND SENTINEL-2 IMAGERY

Imene SENADI1*, Ayoub ZEROUAL1, Hind MEDDI1

1Water and Environmental Engineering Laboratory, National Higher School for Hydraulics, Blida, Algeria.
i.senadi@ensh.dz1, a.zeroual@ensh.dz 1, h.meddi@ensh.dz1

Abstract

The rapid urban expansion in peri-urban regions such as Algeria's Mitidja Plain presents significant challenges for sustainable land management. (Senadi et al., 2025). Monitoring and predicting Land Use and Land Cover Change (LULCC) is essential for sustainable spatial planning (Gaur & Singh, 2023), ecosystem conservation, and food security. The advent of cloud-based platforms like Google Earth Engine (GEE) (Biswas et al., 2023; Farhan et al., 2024; Patel et al., 2024), coupled with high-resolution satellite data such as Sentinel-2 imagery, offers unprecedented opportunities for scalable, timely land use analysis. This study aims to classify, analyze, and predict LULCC in the Mitidja Plain across three key time periods: 2019, 2023, and 2030. The primary goal is to assess the extent of urban expansion and its implications on agricultural and natural landscapes, using machine learning approaches for accurate prediction. Supervised classification was performed on Sentinel-2 surface reflectance imagery for 2019 and 2023 using a Random Forest (RF) algorithm (Arfa & Minaei, 2024; Pande, 2023). Five LULC categories were identified: Water bodies, Crop lands, Woodland, Barren lands, and Urban/artificial lands, each consistently mapped with a distinct color palette. A transition map was generated between 2019 and 2023 by pixel-wise comparison, capturing land cover transformations. To forecast 2030 LULC patterns, a Random Forest model was trained using past classified maps (Badshah et al.

The integration of Sentinel-2 imagery, Random Forest classification, and GEE processing proved highly effective in capturing and forecasting land cover dynamics. The results highlight the accelerating pace of urbanization in the Mitidja Plain and the consequent loss of agricultural and forested lands. Immediate policy interventions are required to promote sustainable urban planning and protect vital ecosystems. The methodology developed in this study is scalable and can be applied to other regions facing similar land transformation challenges.

Keywords: Land Use Change, Remote Sensing, Random Forest, Sentinel-2, Google Earth Engine, Urban Expansion.

URBAN EXPANSION AND ITS IMPACT ON URBAN LAND USE THE CASE OF BORDJ BOU ARRÉRIDJ, ALGERIA

Hanane BOUTAGHANE 1 Chourouk BOUTTABA 2

12 Urban Technology Management – University of M'sila

1 hananeboutaghane71@gmail.com
2 *chourouk.bouttaba@univ-msila.dz*

Abstract

This research paper aims to assess the spatial changes in urban land use over the past thirty years (1992–2022), to provide an accurate depiction of the extent of urban expansion in the city of Bordj Bou Arréridj. To achieve this, Remote Sensing (RS) data and Geographic Information System (GIS) technology were utilized. In the first phase, time-series satellite imagery (1992, 2002, 2012, 2022) was obtained from the United States Geological Survey (USGS). The 1992 image was acquired from Landsat 4 and 5, the 2002 and 2012 images from Landsat 7, and the 2022 image from Landsat 9. In the second phase, urban land use patterns were classified based on the Anderson classification system, taking into account the specific characteristics of the study area. Five land use categories were adopted: agricultural land, built-up areas, barren land, road networks, and industrial zones. In the third phase, the satellite imagery was processed and analyzed within the GIS environment using supervised classification techniques along with various image processing operations. This resulted in the generation of digital maps that illustrate the spatial and area-based changes that occurred over time. The results indicated that urban and industrial land uses showed a positive trend, with significant growth, whereas agricultural land experienced a notable decline in area over the thirty years. This shift reflects that urban expansion—especially in residential and industrial uses—occurred at the expense of agricultural land. The study demonstrated that integrating Remote Sensing (RS) and Geographic Information Systems (GIS) is an effective approach for supporting decision-makers in monitoring spatial and area-based changes in urban environments, thereby aiding in the development of strategies to mitigate the challenges of urban sprawl.

Keywords: Urban expansion, Land use, Geographic Information Systems (GIS), Remote Sensing (RS), Bordj Bou Arréridj

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AXIS 05 : DEVELOPPEMENT DES ENERGIES RENOUVELABLES (OU TRANSITION ENERGETIQUE)

DES DECHETS VERS L'ENERGIE

Leila BENSMAIN[1], Noureddine YASSAA [2,], Meryem SABER.[3]

[1] Département de géographie et d'aménagement du territoire, Faculté des sciences de la Terre, de la géographie et de l'aménagement du territoire, Université des sciences et technologies Houari Boumediene, Alger, Algérie.
[2] Faculté de chimie, Université des sciences et technologies Houari Boumediene, Alger, Algérie.
[3] Centre de développement des énergies renouvelables, Alger, Algérie

leila.zemmourbensmain@usthb.edu.dz[1],*noureddine.yassaa@energy.gov.dz[2]*,
meryem.saber@yahoo.fr[3].

Résumé

La mise en décharge est la seule technique d'élimination des déchets utilisée jusqu'à présent en Algérie. Les émissions de méthane (CH_4) représentent près de 87% des émissions totales de gaz à effet de serre (GES) du secteur des déchets. L'objectif de cette étude vise à déterminer la quantité d'énergie susceptible d'être générée à partir des déchets de trois différents centres d'enfouissement technique (CET), à savoir : Hamici (Alger), Meknassa (Chlef) et Safsaf Chetouene (Tlemcen). Cette évaluation s'effectue en deux phases: une phase expérimentale au laboratoire dont le but est de définir le potentiel de production de biogaz (CO_2 et CH_4) à partir d'une tonne de déchets et une phase de théorique qui consiste à calculer la quantité de biogaz issus des déchets des trois CET pré-cités. La formule utilisée pour le calcul est l'équation de décomposition de premier ordre, proposée par le Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) et dédiée aux inventaires de gaz à effet de serre. Les résultats ont révélé que, dans les conditions naturelles des décharges, une tonne de déchets pourrait produire en moyenne 121 m³ de biogaz. Compte tenu du pouvoir calorifique du méthane pur (9,4 kWh/m^3), ce volume est suffisant pour produire 255 kWh d'électricité. Pour le CET de Hamici, qui reçoit la plus grande quantité de déchets annuellement, l'énergie produite serait suffisante pour répondre aux besoins d'une ville de 50 000 habitants. L'exploitation du biogaz des décharges de ces trois CET permettrait non seulement de produire 2 361 GWh d'énergie, mais aussi d'éviter l'émission de plus de 251 millions de m³ de CH_4 dans l'atmosphère au cours des quinze dernières années. La récupération des biogaz des décharges est essentielle pour réduire les impacts environnementaux des déchets sur l'atmosphère, mais offre également des avantages économiques grâce à la production d'énergie renouvelable et à l'optimisation de la gestion des déchets organiques, dans un contexte d'économie circulaire.

Mots clés

Valorisation, biogaz, énergies renouvelables, déchets, enfouissement, gaz à effet de serre.

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VALORISATION DU PATRIMOINE ARCHITECTURAL A TRAVERS LAMODELISATION DES STRATEGIES BIOCLIMATIQUES TRADITIONNELLES DANS LE SUD ALGERIEN

Islam BOUKHELKHAL 1, Rafik BOUDJADJA 2, Imene BENSID 3

1 Département d'architecture, Université Salah Boubnider, Constantine, Algérie.

2 Département d'architecture, Université Larbi Ben Mhidi, Oum El Bouaghi, Algérie.

3 IGTU, Université Salah Boubnider, Constantine, Algérie. islam.boukhelkhal@univ-constantine3.dz1, rafik.boudjadja@univ-oeb.dz2, imene.bensid@univ-constantine3.dz3

Résumé

L'architecture urbaine en Algérie joue un rôle fondamental dans l'amélioration de la qualité de vie des communautés, notamment dans les régions confrontées à des conditions climatiques difficiles. Cette étude se concentre sur l'intégration de stratégies bioclimatiques traditionnelles, particulièrement dans la vallée du M'zab, pour favoriser une meilleure gestion de l'ilot de chaleur urbain et promouvoir un développement durable et respectueux de l'environnement.

En effet, les pratiques architecturales traditionnelles de cette région ont fait preuve d'une grande efficacité face aux conditions climatiques extrêmes, en optimisant l'utilisation des ressources naturelles pour maintenir un confort thermique tout au long de l'année. Pour ce faire, la recherche utilise des simulations numériques, réalisées avec le logiciel ENVI-met, afin d'évaluer l'intensité des îlots de chaleur urbains (ICU) et d'analyser l'efficacité des solutions urbaines passives dans ce contexte particulier.

L'objectif principal est de comparer l'impact thermique des tissus urbains traditionnels et modernes, en mesurant l'influence de l'architecture sur la réduction des températures locales et l'amélioration du confort thermique. Les résultats obtenus révèlent que les tissus urbains traditionnels de la vallée du M'zab permettent de réduire l'intensité d'ilot de chaleur urbain, en diminuant la température de l'air extérieur de 1 à 2 °C, comparativement aux environnements urbains contemporains pendant les périodes de chaleur intense en été, grâce à l'utilisation de matériaux naturels et de techniques passives adaptées au climat. Parmi ces stratégies, on trouve notamment l'utilisation de façades auto-ombragées, l'optimisation des flux d'air, des systèmes de ventilation naturelle, et des matériaux locaux comme le pisé ou la pierre qui permettent d'absorber et de libérer la chaleur de manière optimale. Au-delà des bénéfices thermiques, cette étude souligne également les avantages écologiques et

économiques des solutions bioclimatiques traditionnelles. Elles permettent non seulement de réduire la consommation d'énergie, mais aussi d'encourager la durabilité et la résilience des villes face aux changements climatiques. De plus, l'utilisation de ces techniques favorise la préservation de l'identité culturelle locale, tout en s'inscrivant dans une démarche de réduction de l'empreinte écologique.

La recherche met donc en lumière l'importance cruciale de préserver le patrimoine architectural traditionnel face aux défis contemporains du changement climatique. Elle démontre que ces savoir-faire anciens peuvent offrir des solutions innovantes pour répondre aux besoins des générations actuelles, tout en préservant l'environnement et l'histoire. Cette étude fournit ainsi des recommandations précieuses aux urbanistes, architectes et décideurs politiques qui cherchent à intégrer des pratiques durables dans les zones arides, offrant des pistes concrètes pour intégrer les principes de la durabilité dans l'urbanisme moderne et dans la conception des bâtiments dans ces régions vulnérables.

Mots-clés : vallée des M'zab, Patrimoine architectural, Stratégies extérieures traditionnelles, Climat, Envi met.

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THE ROLE OF THE PRIVATE SECTOR IN THE ENERGY TRANSITION IN ALGERIA: MANAGEMENT OF LANDFILL CENTERS AND BIOGAS RECOVERY FROM WASTE

Aicha BENAZZOZ 1, Narjes BENANI2

1University Salah Boubnider – Constantine 3 Institute of Urban Technology Management

2University Salah Boubnider – Constantine 3 Institute of Urban Technology Management

aicha.benazzouz@univ-constantine3.dz 1, nardjes@benani@univ-constantine3.dz l2

Abstract

Energy transition has become an urgent necessity imposed by environmental, economic, and strategic challenges facing the world today. Climate change and the excessive reliance on fossil fuels have led to a global shift towards renewable energy sources as a clean and sustainable alternative. Most countries, whether developed or developing, are striving to diversify their energy sources, reduce greenhouse gas emissions, and ensure energy security for future generations. Algeria is attempting to align with these global transformations, particularly as it possesses substantial natural resources and a unique geographical location that make it well-positioned to develop renewable energy — a strategic choice for the country's energy future. In this context, Algeria has taken steps to encourage the shift towards renewable energy by launching the National Renewable Energy Development Program in 2021. Additionally, it has strengthened the integration of the private sector in waste management through the sustainable management of landfill centers, as outlined in the National Waste Management Strategy – Horizon 2035. This presentation adopts a theoretical and field-based methodology that combines analytical and quantitative approaches. It includes an analysis of the guidelines of the National Integrated Waste Management Strategy and reports from the National Observatory forRenewable Energy, aiming to link waste to renewable energy production. Furthermore, we estimate the quantities of methane gas that could be generated by landfill centers managed by the private sector and propose potential uses of this energy in surrounding urban areas.

Keywords: Energy transition – Private sector – Landfill centres – Biogas – Household waste.

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SEASONAL VARIATIONS IN THE CORRELATIONS BETWEEN LAND SURFACE TEMPERATURE AND VEGETATION COVER IN CONSTANTINE, ALGERIA

Sara SAHNOUNE *1, Sarah BENHARKAT1, Ahmed Mohamed Salah CHERIET2

1Laboratoire Architecture Bioclimatique et Environnement (ABE), Faculté d'Architecture et d'Urbanisme, Université Constantine 3 — Salah Boubnider, Constantine, Algérie
2 Institut de gestion des techniques urbains, Université Constantine 3 — Salah Boubnider, Constantine, Algérie
sara.sahnoune@univ-constantine3.dz, sarah.benharkat.@univ-constantine3.dz

Abstract

Land Surface Temperature (LST), often referred to as the Earth's "skin temperature," is a key indicator for analyzing urban thermal dynamics. It is influenced by a variety of factors, including topography and land use. In parallel, the Normalized Difference Vegetation Index (NDVI) serves as a valuable tool for assessing variations in LST, primarily driven by the presence and density of vegetation cover. While numerous studies have investigated the relationship between LST and NDVI in urban environments, research focusing on semi-arid regions—particularly those that incorporate seasonal variations—remains scarce. Previous work, mostly concentrated on regions such as India and Nepal, has demonstrated an inverse relationship between these two indicators, with significant implications for urban heat island formation and land-use planning. This study aims to address this research gap by examining the seasonal variability of the LST-NDVI correlation in the semi-arid region of Constantine, Algeria. Using Landsat 5 TM and Landsat 8 OLI/TIRS satellite imagery over a 30-year period (1991–2021), we observed that rapid urban development and an increase in impervious surfaces have contributed to a rise in LST. Concurrently, a reduction in green spaces—reflected in declining NDVI values—was particularly evident during the warmer seasons. A detailed analysis of satellite data further reveals that less urbanized areas of the city, where vegetation cover is denser, generally exhibit lower surface temperatures. This finding confirms the moderating effect of vegetation on LST. Conversely, highly urbanized zones, characterized by heat-retaining construction materials, consistently display higher temperatures throughout the year. Notably, the study finds that the negative correlation between LST and NDVI is more pronounced during the colder seasons, indicating that vegetation is more effective at moderating extreme temperatures in winter. In contrast, the weaker correlations observed during summer months highlight the vulnerability of vegetation to drought conditions in semi-arid climates. These findings are critical for urban planning,

underscoring the importance of integrating green infrastructure as a strategy to combat urban heat islands and enhance the climate resilience of semi-arid cities like Constantine. Implementing policies aimed at increasing vegetated surface areas could significantly contribute to the natural regulation of urban temperatures, fostering a healthier and more sustainable urban environment. In conclusion, this study demonstrates that the management of urban green spaces is not only vital for urban well-being and biodiversity but also plays a pivotal role in climate regulation—particularly in semi-arid contexts where seasonal variations can profoundly affect urban living conditions.

Keywords: Urban Heat Island (UHI), Normalized Difference Vegetation Index (NDVI), Land Surface Temperature (LST), Seasonal Variations, Urban Planning.

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ASSESSMENT OF THE ENERGY POTENTIAL OF AGRICULTURAL BIOMASS IN ALGERIA

Sarah BENHARKAT [1], Rabeh Borhane Eddine BENAISSA[2]

[1] Laboratoire Architecture Bioclimatique et Environnement, Département d'architecture, Université Constantine 3 Salah Boubnider,

[2]Institut de Gestion des Techniques Urbaines, Université Constantine 3 Salah Boubnider

sarah.benharkat@univ-constantine3.dz

Abstract

Biomass from the agricultural sector offers significant opportunities to diversify Algeria's energy mix and reduce its dependence on fossil fuels.

The objective of this study is to assess the amount of biomass from the agricultural sector that can be used in Algeria's energy landscape.

To achieve this objective, we used a quantitative method based on calculations of the energy potential of residues from various agricultural products, using the latest statistics published by the Ministry of Agriculture and Rural Development. We also used Geographic Information Systems (GIS) to present the spatial distribution of this potential across the country.

According to the results obtained, the national energy potential is estimated at 93,357.60 TJ, of which 49% comes from vegetable crop residues, 37% from cereal product residues (straw), and 14% from arboriculture. We have also identified the crops that offer the most energy potential: potatoes, wheat, and barley, with percentages of 43%, 27%, and 10%, respectively. In terms of the distribution of this potential across the country, there is considerable disparity between regions given the diversity of agricultural products harvested, which is closely dependent on local climatic conditions. The three provinces of El Oued, Ain Defla, and Mostaganem have the greatest exploitable potential, with respective shares of 11.27%, 7%, and 6% of the national potential.

Keywords: Biomass, agricultural residues, energy potential, energy recovery, Algeria.

HUBBERT'S PEAK AND PLANETARY LIMITS: CHALLENGES FORA SUSTAINABLE DEVELOPMENT MODEL

Karima YOUNICI [1], Anissa KHELLADI [2], Nacera MAHFOUD [3]

[12] [3]Faculté des Sciences Economiques, Commerciales et des Sciences de Gestion, Université Abderrahmane Mira de Bejaia. 06000 Bejaia, Algérie

karima.younici@univ-bejaia.dz[1], anissa.khelladi@univ-bejaia.dz[2], nacera.mahfoud@univ-bejaia.dz[3]

Summary

This paper explores theme of Hubbert' speak and questions the limits of the current development model in the face of geological and environmental constraints. In Hubbert's model, oil exploitation is confronted with a production peak for these resources, a peak that will later be applied to other non-renewable natural resources. We will begin by presenting the theoretical foundations of the Hubbert curve governing the exploitation of non-renewable natural resources, before extending the analysis to other natural resources, in order to gain a better understanding of this sues associated with the notion of Hubbert's peak.This reflection is part of the context of planetary limits**,** implying the urgent need to rethink our economic and energy models for a more sustainable management of resources. The aim is to highlight the implications of this dynamic or public policy, with a view to developing adaptation strategies, particularly through the circular economy and the transition to renewable alternatives.

Keywords: Hubbert's Peak, planetary limits, natural resources, energy transition.

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MODELING URBAN ENERGY TRANSITION: A SPATIAL AND SCENARIO-BASED APPROACH FOR HYDRA, ALGIERS

[1] Younes SAHLI [2], Leila BOUCHAMA, Ouahiba BOUCHAMA [3].

[1]ZIANE ACHOUR University of Djelfa
[2] Université USTHB- Alger
[3] ENS Bouzareah .Alger

Email [1] sahliyounes08@gmail.com , Email[2]lbouchama@usthb.dz, Email[3]bouchamahaima@gmail.com

Abstract

Renewable energy refers to energy sources that regenerate naturally and continuously within human timescales. These energies primarily originate from the sun, wind, water, biomass, and geothermal sources. Unlike fossil fuels (oil, natural gas, coal), renewable energies are sustainable, non-polluting, and contribute to reducing greenhouse gas emissions, thereby playing a vital role in combating climate change.

Among renewable energies, solar energy stands out due to its immense potential and nearly universal availability. It is primarily harnessed through photovoltaic panels, which directly convert sunlight into electricity, or through thermal collectors that produce heat. Solar energy offers the advantage of being exceptionally clean, generating no direct emissions during its use. However, its effectiveness remains dependent on weather conditions and day-night cycles. Wind energy is derived from converting the kinetic energy of wind into mechanical and then electrical energy via wind turbines. These turbines can be installed on land (onshore) or at sea (offshore), where more consistent and stronger wind regimes can be exploited. Wind energy is also clean but varies in output depending on wind speed and consistency, necessitating appropriate energy management strategies to address its intermittency. Hydropower harnesses the energy of moving water through hydroelectric dams, run-of-river stations, or tidal installations. Its relative stability and predictability, compared to other renewable sources, make it one of the most extensively used renewable energies on a large scale today. However, its development can significantly impact local environments, particularly aquatic ecosystems.

Biomass encompasses all organic materials derived from wood, agricultural residues, forestry, or urban waste. These materials can generate heat, electricity, or biofuels through various thermal, chemical, or biological processes. When sustainably managed, biomass represents a renewable resource capable of substantially reducing dependency on fossil fuels. Geothermal energy utilizes the Earth's natural subsurface heat to produce heat or electricity. Its potential

varies regionally, with volcanic zones having particularly high potential. Geothermal energy offers stable, continuous output largely independent of external climate fluctuations, making it an appealing option for steady energy provision. In the current context of energy transition, urban areas represent priority territories due to their high concentration of energy consumption and significant contributions to greenhouse gas emissions. Energy transition today represents a major strategic challenge, especially in urban contexts where energy use is concentrated and climate issues are pressing. This research develops a modeling approach for energy transition processes applied to the municipality of Hydra (Algiers), quantitatively assessing the integration potential of renewable energy systems, notably photovoltaic, and analyzing multidimensional impacts under different development trajectories.

The methodological framework employs an interdisciplinary approach combining geospatial analysis through Geographic Information Systems (GIS), techno-economic modeling of energy production systems, and prospective scenario planning. Three scenarios were modeled for the horizon of 2035: a business-as-usual scenario, a gradual transition scenario, and an ambitious transition scenario.

Results indicate that Hydra possesses significant rooftop photovoltaic production potential, capable of covering up to 65% of residential electricity consumption under optimal conditions. Multi-criteria analysis also highlights substantial reductions in CO_2 emissions, economic viability with satisfactory returns on investment, and positive effects on local employment.

However, the widespread adoption of renewable energies faces several significant challenges, including high initial investment costs, energy storage complexities, potential environmental impacts, and technical constraints related to integration with existing power grids. Nevertheless, technological advancements, continuous reductions in installation costs, and supportive public policies are fostering sustained global growth in renewable energy deployment.

In conclusion, renewable energy is a critical and essential solution for global energy transition. Its sustainable and integrated development not only mitigates environmental and climate impacts but also enhances energy security and improves local economic and social prospects. This research thus provides a replicable methodological framework for other Algerian municipalities and strategic recommendations to guide local policies toward a sustainable, efficient, and inclusive urban energy transition.

Keywords: Urban energy transition; GIS; Renewable energy; Scenario modeling; Sustainable

AXIS 6. URBAN HEAT ISLANDS: PROSPECTS, CHALLENGES AND POTENTIAL

RAPPORT ENTRE L'ILOT DE CHALEUR URBAIN ET LA GEOMETRIE URBAINE CONSTAT, INVESTIGATIONS ET RESULTATS

Dr. Fouzia BOUCHERIBA

Laboratoire « ABE », Université de constantine3, Salah Boubnider- Algérie,

Email : fouzia.boucheriba@univ-constantine3.dz

Résumé

On définit l'ICU comme étant ce phénomène micro climatique relatif aux zones urbanisées et caractérisé par des températures estivales plus élevées que l'environnement immédiat, avec des différences qui varient selon les auteurs de 5 à 10°C. L'ICU, est la résultante des phénomènes climatologiques particuliers causés par les facteurs spécifiques aux milieux bâtis plus denses. Il s'agit très certainement de la manifestation climatologique la plus évidente provoquée par l'urbanisation, dont le résultat est l'augmentation de la température de l'air et de surfaces.

D'autres part, l'urbanisme des temps modernes se trouve confronté à une nouvelle façon de percevoir, concevoir et de planifier l'espace public en fonction des principes divers de durabilité, parmi lesquels, figure le recours aux « fortes densités urbaines » notamment pour les climats chauds et arides. La problématique de la densité urbaine et son rapport avec l'îlot de chaleur urbain en tant que phénomène micro climatique sera penché sur deux paramètres essentiels : 1) l'importance d'un détail précis par rapport à la géométrie urbaine qui est le prospect (H/L) qui est également exploité pour la définition de la densité urbaine, 2) la température de l'air qui est un paramètre micro climatique essentiel dans l'évaluation de l'ICU.

A travers cette contribution, on abordera cette problématique à travers la présentation de la synthèse de deux recherches scientifiques élaborées au niveau de deux sites urbain différents situés à la ville de Constantine. L'objectif, est de démontrer la relation directe et signifiante entre le prospect et la température de l'air, et par conséquent entre la densité urbaine et l'ICU. A travers ces deux recherches, plusieurs outils de recherche ont été utilisés à savoir : la prise de mesure de la température de l'air sur terrain, le logiciel de simulation Envi-Met et le modèle Rayman.

Mots clés : Ilot de chaleur urbain, Densité urbaine, Géométrie urbaine, Microclimat Urbain, urbanisation.

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ASSESSMENT OF THE INFLUENCE OF VARIOUS GREEN SPACE CONFIGURATIONS ON THE URBAN HEAT ISLAND AND URBAN CLIMATE IN A SEMI-ARID REGION: THE CASE OF AIN SMARA (ALGERIA)

Samira LOUAFI[1], Anouar Khallil BELMILI[2]

[1]Laboratory (ABE) Bioclimatic Architecture & Environment, Faculty of Architecture and Urban Planning, University of Constantine 3 Salah Boubnider. Constantine, Algeria.

[2]Department of Urban Technology and Environment, University of Constantine3 Salah Boubnider, Constantine, Algérie.

*Email[1]: **samira.louafi@univ-constantine3.dz**,*

Abstract

Urban green spaces positively influence both microclimate and urban climate by providing cooling through shading and evapotranspiration. They contribute to reducing the Urban Heat Island (UHI) effect, while improving air quality, increasing humidity, and enhancing residents' well-being. This study assesses the impact of spatial and temporal variations in vegetation cover on urban climate in the semi-arid city of Aïn Smara, Algeria, between 1992 and 2021. Using remote sensing data (Landsat 5 TM, 7 ETM+, and 8 OLI/TIRS), vegetation and climate indices such as NDVI, LST, and NDMI were extracted via ArcGIS 10.4. In situ measurements (air and surface temperatures, relative humidity, and wind speed) were conducted using an LM-8000 microclimate meter to validate satellite observations. Findings reveal a strong correlation between increased vegetation cover and lower surface temperatures, as well as higher humidity levels. Vegetation density, spatial arrangement, typology, and proximity to urban areas emerged as key factors influencing the magnitude of cooling. These results highlight the importance of integrating well-planned green spaces to mitigate UHI and enhance urban climate resilience.

Keywords: Green spaces, urban climate, spatial configurations, urban heat island, vegetation mass, land surface temperature.

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L'INDICE DE CIRCULARITÉ SPATIALE : UN OUTIL D'AIDE À LA DÉCISION POUR LA VALORISATION DES ESPACES URBAINS SOUS-UTILISÉS DANS UNE PERSPECTIVE D'ÉCONOMIE CIRCULAIRE

Amira SOUALAH[1], Louiza SOUALAH[2] et Mouatez Billah BOUSSOUF[3]

[1,3] Faculté d'architecture et d'urbanisme, Laboratoire AVMF. Université de Constantine 3,
[2] Institut de gestion et technique urbaine, université de Constantine3.

Louiza.soualah@univ-constantine 3.dz
Amira.soualah@univ-constantine 3.dz
Mouatez.boussouf@univ-constantine 3.dz

Résumé

Dans un contexte marqué par la pression foncière, la saturation des ressources et les exigences du développement durable, la revalorisation des espaces urbains sous-utilisés s'impose comme une priorité. L'économie circulaire, en tant que modèle alternatif au schéma linéaire classique, offre un cadre pertinent pour aborder cette problématique à travers la régénération, la mutualisation et l'optimisation des ressources spatiales.

Cette communication introduit l'indice de circularité spatiale (ICS), un outil d'aide à la décision conçu pour diagnostiquer le niveau d'usage d'un espace urbain et orienter les stratégies de requalification.

L'ICS repose sur une grille d'indicateurs multicritères mesurant l'occupation, la fonctionnalité, l'adaptabilité, la connectivité et le potentiel de revalorisation. Il s'appuie sur l'analyse de données spatiales (SIG, imagerie satellitaire), d'enquêtes et de critères réglementaires pour produire un score synthétique permettant de classer les espaces selon leur circularité.

À travers une étude de cas, l'outil a démontré son efficacité pour identifier les dysfonctionnements spatiaux et proposer des scénarios adaptés : réaffectation d'usage, insertion dans des boucles économiques locales, ou encore aménagements temporaires. En orientant les décideurs vers des actions fondées sur la circularité, l'ICS participe à une gestion plus durable, inclusive et efficiente du territoire.

Ce travail met ainsi en lumière le potentiel des métriques spatiales comme leviers d'innovation urbaine et propose une contribution concrète à l'intégration des principes de l'économie circulaire dans les politiques de planification et de gestion urbaine.

Mots-clés: économie circulaire, espaces sous-utilisés, indice de circularité, requalification urbaine, aide à la décision.

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ÎLOTS DE CHALEUR URBAINS EN CLIMAT SEMI-ARIDE : CADRE THEORIQUE ET STRATEGIES D'ATTENUATION – CAS D'ETUDE CONCEPTUEL DE CONSTANTINE

Lamia MANSOURI[1], Radia BOUARROUDJ[2], Kenza BOUARROUDJ[3]

[1] University, Alger 1, Department of Architecture
l.mansouri@univ-alger.dz
[2] University, Salah Boubnider Constantine 3 Faculty of Architecture and Urban Planning of Architecture Department
radia.bouarroudj@univ-constantine3.dz
[3] University, Abdel Hamid Mehri Constantine 2
kenza.bouarroudj@univ-constantine2.dz

Résumé

Le phénomène des îlots de chaleur urbains (ICU) représente une manifestation clé du changement climatique en milieu urbain, avec des températures plus élevées dans les zones bâties par rapport aux espaces ruraux, amplifié par le réchauffement global et impactant la consommation énergétique, la santé publique et la qualité de vie, particulièrement dans les régions méditerranéennes où les vagues de chaleur s'intensifient (Oke et al., 2017 ; IPCC, 2021 ; Zittis et al., 2021 ; Santamouris, 2020). Bien que largement étudié dans les climats tempérés et tropicaux (Li et al., 2020 ; Manoli et al., 2019), il reste sous-exploré en climats semi-arides, couvrant 40 % des terres émergées et abritant plus de 2 milliards d'individus (Reynolds et al., 2007 ; Beniston et al., 2018). Constantine, ville algérienne de 450 000 habitants sur les Hautes Plaines, constitue un cas paradigmatique avec sa topographie unique (gorges du Rhumel, plateaux calcaires) et son climat semi-aride (étés >35 °C, pluviométrie hivernale de 450 mm), influençant les flux thermiques locaux (Hadji et al., 2016 ; Bouchareb et al., 2019 ; Benzarti et al., 2018).

Cette recherche propose un cadre théorique novateur adaptant les modèles classiques de climatologie urbaine (Stewart & Oke, 2012) aux spécificités semi-arides : amplitude thermique diurne, aridité et vents dominants, intégrant la topographie accidentée (Erell et al., 2011 ; Gober et al., 2010). L'objectif est d'élaborer un framework intégré pour l'analyse et la gestion des ICU, via une critique des modèles existants (Arnfield, 2003 ; Voogt & Oke, 2003), un développement systémique (Oke et al., 2017 ; Huang et al., 2019), et une application conceptuelle à Constantine pour tester sa pertinence et proposer des stratégies d'atténuation adaptées (Santamouris, 2014).

Méthodologiquement, l'approche multidisciplinaire (géographie urbaine, climatologie, aménagement) inclut : une revue systématique PRISMA (Moher et al., 2009) analysant les

ICU et leur transférabilité (Coutts et al., 2016) ; une analyse conceptuelle de Constantine basée sur données historiques (Kehila et al., 2020), modélisation thermique (Oke, 1987) et identification des vulnérabilités ; un développement du cadre avec modèle adapté, indicateurs et typologie de stratégies durables (Newman, 2006).

Les livrables comprennent un état de l'art critique (Huang et al., 2019), un modèle adaptatif (Erell et al., 2011), une grille d'évaluation, un catalogue de stratégies (Santamouris & Kolokotsa, 2016), et des recommandations pour recherches empiriques géomatiques. Les contributions théoriques enrichissent les processus thermiques semi-arides (Li et al., 2020) et un framework transférable méditerranéen (Lionello et al., 2006), favorisant l'intégration climatique en planification (C40 Cities, 2020) ; pratiquement, un outil d'aide à la décision et guide pour urbanisme climatique (Erell et al., 2011).

S'inscrivant dans les axes d'un séminaire (événements extrêmes, impacts environnementaux, perspectives ICU), cette étude promeut l'adaptation durable en Méditerranée (Zittis et al., 2021). Perspectives : application à d'autres villes (Batna, Sétif, Djelfa), télédétection (Voogt & Oke, 2003), modélisation (Masson et al., 2020), et collaborations interdisciplinaires (santé, ingénierie).

Mots-clés : Îlots de chaleur urbains, climat semi-aride, Constantine, adaptation climatique, planification urbaine durable, Méditerranée, cadre théorique

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PARKLETS AS URBAN COOL SPOTS: A TACTICAL URBANISM INTERVENTION TO MITIGATE URBAN HEAT ISLANDS

Darda BENCHEIKH[1], Lina CHAOUI[2].

[1]Department of Architecture, Faculty of Civil Engineering and Architecture, University of Amar Telidji Laghouat, Algeria. ORCID: 0000-0002-5336-4495.
[2]AETAP laboratory, Architecture and urbanism institute, University of Saad Dahleb, Blida, Algeria.
d.bencheikh@lagh-univ.dz[1], chaoui_lina@univ-blida.dz[2].

Abstract

This study investigates the effectiveness of parklets, as a tactical urbanism intervention, in mitigating the Urban Heat Island (UHI) effect in London, UK. Through in-situ measurements using FLiR C3-X compact thermal camera, the research assesses the impact of parklets on microclimate temperature variations within urban environments. Three parklets located in different areas of London were selected: Hammersmith Grove, Paper & Cup, and Wilton Way. The study focuses on evaluating temperature differentials between parklets and adjacent urban elements, including sidewalks, streets, and buildings. The findings show that parklets contribute to local microclimate cooling through several mechanisms, including shading and evapotranspiration. Surface temperature measurements reveal a notable decrease within parklets, exhibiting temperatures lower by up to 20°C compared to surrounding urban elements, highlighting the cooling effect of vegetation. This research underscores the potential of parklets as sustainable tactical urbanism interventions for mitigating the UHI effect and enhancing climate resilience in urban environments.

Keywords: Tactical urbanism; Parklet; Vegetation; Microclimate; Temperature; Urban Heat Island Effect.

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VALORIZATION OF SARDINE DIGESTIVE PROTEASES FOR SUSTAINABLE AQUACULTURE IN LGEARIA

Taous Kaddour [1, *], Nassima Chaher-Bazizi [1], Samir Zeggane [2], Achour Chergui[3, 4]

[1] *Université de Bejaia, Faculté des Sciences de la Nature et de la Vie, Laboratoire de Biochimie Appliquée, 06000 Bejaia, Algeria*

[2] *Université de Bejaia, Faculty of Engineering and Technology, Department of Electrical Engineering, Laboratoire LTII. Bejaia 06000, Algeria*

[3] *Department of Biology, Faculty of Natural and Life Sciences and Earth Sciences, University of Bouira, 10000 Bouira, Algeria.*

[4] *Laboratory of Analytical Biochemistry and Biotechnology, Mouloud Mammeri University, 15000 Tizi-Ouzou.*

Email: taous.kad4@gmail.com

Abstract

The increasing demand for seafood in Algeria has led to a rise in fishery by-products, posing significant environmental challenges. This study explores the extraction and characterization of proteases from sardine (*Sardina pilchardus*) digestive systems to assess their potential applications in organic waste management and aquaculture. The valorization of these fishery by-products aligns with circular economy principles, aiming to reduce marine pollution while enhancing the sustainability of the aquaculture sector.

A specific quantity of sardine digestive tubes was isolated, extracted, and preserved using an optimized protocol. The extracted proteases were subjected to biochemical and enzymatic characterization, including pH stability, optimal activity temperature, proteolytic specificity, and resistance to various environmental conditions. The results revealed that these proteases exhibit significant proteolytic activity, even at lower temperatures, making them promising candidates for aquaculture applications, such as improving fish digestion and hydrolyzing fishery waste into valuable protein sources. Their low-temperature stability enhances their potential for environmentally friendly industrial processes, particularly in food processing and bioconversion of organic waste into fish feed supplements.

The integration of such biotechnological innovations in Algerian aquaculture could contribute to a more sustainable seafood production system, reduce reliance on synthetic enzymes, and support the development of eco-friendly aquafeeds. This research paves the way for novel applications of marine-derived enzymes in sustainable aquaculture and waste management strategies

Keywords: Aquaculture, enzymatic valorization, fishery by-products, proteases, circular economy.

POSTER SESSION

ANALYZING THE ASYMMETRIC EFFECT OF RENEWABLE ENERGY CONSUMPTION ON ENVIRONMENTAL QUALITY IN TUNISIA: A NARDL APPROACH

Jihène KHALIFA

Faculty of Economics and Management of Sousse, University of Sousse, Tunisia.

jihene.khalifa@yahoo.fr

ABSTRACT

Environmental degradation remains a pressing global challenge, compelling nations to accelerate the transition toward renewable energy. Urbanization, when strategically managed, presents an opportunity to optimize renewable energy adoption and mitigate environmental harm. This study examines the asymmetric impact of Tunisia's renewable energy consumption on environmental quality from 1990 to 2021 using the Nonlinear Autoregressive Distributed Lag (NARDL) model. The analysis captures both short- and long-run dynamics to uncover the nuanced relationship between renewable energy, urbanization, and CO_2 emissions. The findings confirm the existence of asymmetries in the impact of renewable energy on environmental quality in both the short and long run. In the long run, both positive and negative shocks to renewable energy consumption contribute to environmental deterioration, suggesting inefficiencies in the transition process or reliance on fossil-fuel-dependent energy infrastructure. Notably, a 1% decline in renewable energy consumption leads to a 0.15% increase in CO_2 emissions in the short run, while a 1% positive shock in renewable energy reduces emissions by 0.5%. Furthermore, urbanization significantly influences environmental quality only in the long run, with its effects suggesting potential efficiency gains in emissions reduction. These results underscore the need for more effective renewable energy policies that enhance efficiency and sustainability while leveraging urbanization as a tool for environmental improvement. In Tunisia, few studies have explicitly examined the asymmetric effects of renewable energy consumption on environmental quality.

Keywords – Renewable energy use, Urbanization, Environmental quality, NARDL

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MAPPING AND ANALYSIS OF SOIL SALINITY IN NORTHERN ALGERIA USING REMOTE SENSING: AN INNOVATIVE APPROACH WITH SENTINEL-2 IMAGERY

Zohra EL FARES

Department of Rural Hydraulics, National Higher School of Agronomy, EL HARRACH, Algiers
zahraelfares94@gmail.com

Abstract

The study of soil salinity in northern Algeria is essential to understand its impact on agriculture and the environment. For this purpose, Google Earth Engine offers an advanced platform that enables remote sensing and the analysis of various salinity profiles using satellite and ground data. Rather than examining each salinity profile individually, an unsupervised classification approach is favored, based on Sentinel-2 satellite imagery. This method groups soils into different categories according to their salinity levels, thereby facilitating interpretation and decision-making. By integrating these classifications with spatial data, it becomes possible to accurately map (using ArcGIS software) the affected areas, identify trends, and propose appropriate management strategies. This approach enhances the precision of the analysis and supports better land management, especially for agriculture and the preservation of sensitive ecosystems.

Keywords: Salinity; Northern Algeria; Remote Sensing; Sentinel-2; Classification; ArcGIS

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ASSESSING THE IMPACT OF CLIMATE CHANGE ON DESERTIFICATION IN THE NAÂMA REGION (2010–2023): A GIS AND REMOTE SENSING APPROACH

Abderrahmane1MEBARKI *, Tayeb SITAYEB 2, Yahia DJELLOULI 3

[1, 2, 3] Laboratory of Biotoxicology, Pharmacognosy and Biological Valorization of Plants. Department of Biology, Faculty of Natural Science and Life, University of Saida Dr. Moulay Tahar, BP 138 City ENNASR 20000, Saida, Algeria.

email of corresponding author fadi0161@gmail.com

Abstract

This study investigates the relationship between climate change—specifically precipitation trends—and desertification in the Naâma region of Algeria between 2010 and 2023. Utilizing remoten sensing and geographic information systems (GIS), the research analyzes raster-based desertification maps for the years 2013 and 2023 and annual precipitation data from 2010 to 2023. A regression analysis was conducted to derive the spatial slope of precipitation trends, which was then classified into four drought intensity levels. These drought classes were used to extract zonal statistics from the desertification difference raster, allowing for a spatial correlation analysis. Results reveal a general decline in precipitation across the region, with slope values ranging from –3.31 to –1.16 mm/year. Areas experiencing the most severe drought also showed significant desertification, confirming a strong climate–land degradation linkage. However, notable desertification was also observed in areas with only slight precipitation decline, suggesting that anthropogenic factors such as land misuse and overgrazing may also play a critical role. The integration of climatic and land degradation data demonstrates a robust framework for assessing desertification risk in arid and semi-arid regions and highlights the urgency of implementing targeted environmental management strategies.

Key words: Desertification; Climate Change; Rehabilitation Projects; Overgrazing; Vegetation Degradation.

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UTILISATION DES SCRIPTS DE GOOGLE EARTH ENGINE POUR LA CREATION D'UNE CARTE DE SENSIBILITE A L'EROSION DE LA CHENAIE VERTE D'EL HASASSNA, DANS LE CADRE D'UN PROGRAMME DE PLANIFICATION DE LA RESTAURATION

Yahia DJELLOULI [1ere], 2nd Abdelkrimr KEFIFA [2], 3ème Abderrahmane MEBARKI [3]

1 3 Laboratoire de bio toxicologie, pharmacognosie et valorisation biologiques des plantes (LBPVBP) faculté des sciences Université de Saïda - Dr Moulay Tahar Saïda, Algérie

2 Laboratoire des ressources hydriques et environnement (RHE), faculté des sciences Université de Saïda - Dr Moulay Tahar Saïda, Algérie

Djellouliyahia00@gmail.com, kkefifa@yahoo.fr ,fadi0161@gmail.com

Abstract

L'érosion hydrique constitue une menace sérieuse pour les sols forestiers de la chênaie verte située dans la commune d'El Hassasna, relevant de la wilaya de Saïda. Ce phénomène, accentué par les conditions climatiques et les pressions anthropiques, compromet la stabilité des écosystèmes forestiers, la fertilité des sols, et la durabilité des services environnementaux qu'ils fournissent.

Afin d'évaluer l'intensité et la répartition spatiale de cette érosion, une méthodologie innovante a été mise en œuvre, reposant sur l'utilisation de la plateforme Google Earth Engine (GEE). Cette approche permet de traiter efficacement de grandes quantités de données satellitaires, notamment les images multispectrales de Landsat 8 et les modèles numériques de terrain (MNT), tout en intégrant des outils d'analyse géospatiale avancés.

L'évaluation de l'érosion hydrique s'appuie sur l'application du modèle RUSLE (Revised Universal Soil Loss Equation), qui estime la perte de sol annuelle en fonction de cinq facteurs principaux (R : l'agressivité des précipitations, K : érodibilité du sol, LS : topographie, C: couverture végétale et P : les pratiques de conservation des sols).

L'intégration de ces facteurs dans GEE permet de générer des cartes thématiques illustrant la sensibilité des sols à l'érosion hydrique. Ces cartes facilitent l'identification des zones les plus vulnérables, où les risques de dégradation sont élevés.

Les résultats obtenus offrent une base scientifique solide pour orienter les politiques de gestion durable des forêts, en ciblant les zones prioritaires pour la mise en œuvre de mesures de conservation. Cette démarche contribue à la préservation des sols forestiers, à la lutte contre la désertification, et à la résilience des paysages face aux changements climatiques.

Keywords: erosion. GEE. RUSLE. El Hassasna.

IMPACT OF THE MANUFACTURING OF BUILDING MATERIALS ON CLIMATE CHANGE AND GLOBAL WARMING ACCORDING TO ISO 14040-44 STANDARDS.

Sabrina BENDOUMA *, **Mahmoud ZAIDI** 2

1* Badji Mokhtar University, earth sciences faculty, mining engineering department.

2 Applied Hydraulics and Environment Research Laboratory, University of Bejaia, Algeria.

*sabrinaben.mining@gmail.com

Abstract

The intersection between climate change and mining activities is a crucial issue, particularly in countries like Algeria, where mining is a major economic driver. As climate change intensifies, its impacts on mining operations and surrounding communities are becoming more pronounced. Our study aims to assess the contribution of quarrying to climate change and the environment. The analysis was conducted according to the LCA standards ISO 14040-44. The results show that the impact category of the studied case on the environement cover global warming : 1,93E-06 DALY, terrestrial acidification 9.01E-10 species.yr, Freshwater ecotoxicity : 3.38E-12 species.yr etc. global warming potential (GWP) varies is about 4,689 kg CO 2 -eq./ton and it is remarkably dominated by CO 2 and N 2 O emissions related to quarrying and processing operations.

Keywords: Climate change; ISO Standards; Global Warming; Environment.

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SALINITY AND ITS EFFECTS ON WHEAT UNDER CLIMATE CHANGE: ENVIRONMENTAL AND GENETIC PERSPECTIVES

Asmaa BEMMOUSSAT1, Amina BELLATRECHE2, Adel BEREZZOUG3, Yacine MAHDAD4.

[1,3] Agronomy department, Faculty of Nature and Life Sciences (SNV), Tlemcen University, Laboratory of Functional Agrosystems and Technology of Agronomic Sectors (AFTAGRO), Algeria.

[2]Agronomy department, Faculty of Nature and Life Sciences (SNV), Tlemcen University, Laboratory of Aplied Genetic In Agriculture, Ecology And Public Health, Algeria.

[4] University center of Naâma, Laboratory for Sustainable Management of Natural Resources in Arid and Semi-Arid Areas Naâma, Algeria, Laboratory of Applied Genetic In Agriculture, Ecology And Public Health, University of Tlemcen, Algeria.

Abstract

This study evaluated the effects of varying salinity levels, defined by both electrical conductivity (EC) and Sodium Adsorption Ratio (SAR), on the germination and growth of two Turkish wheat cultivars (Harmankaya 99 and Dumlupinar) in Algeria and Türkiye, aiming to assess their differential responses and emphasize the importance of comprehensive irrigation water quality analysis. Germination experiments were conducted in a laboratory using a randomized complete block-factorial design with 3 replications. Seeds were subjected to six salinity levels (0-20 dS/m) prepared using NaCl, MgSO4, and CaCl2 with four SAR values (3, 6, 9, 12). Germination rate was assessed after 8 days. Concurrently, greenhouse experiments in Tlemcen, Algeria, and Çanakkale, Türkiye, utilized a similar design to evaluate growth parameters under irrigation water at EC 8, 16, and 20 dS/m (SAR 9). Significant differential responses were observed between the two locations; wheat in the warmer Algerian environment demonstrated heightened sensitivity to salinity stress across most parameters compared to the cooler Turkish environment, highlighting the crucial interaction between temperature and salinity. The study concludes that considering comprehensive irrigation water quality parameters, including both EC and SAR, is essential for sustainable agriculture in saline areas and emphasizes the critical need for developing salt-tolerant genotypes adapted to specific regional climates to ensure future food security.

Keywords: Wheat, Salinity stress, Environment, Climate change, Germination.

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EFFECTS OF CLIMATE CHANGE ON ECOSYSTEMS AND NATURAL HAZARDS IN THE SAÏDA REGION

Chaimaa KHADIR 1*, Yasmine HALFAOUI 2. Mohamed Mahmoud El GHADY AMAR2

1. Department of Biology, Faculty of Sciences, University of Saïda - Algeria. Laboratory of Water Resources and Environment (RHE), Ain El Hadjer Campus.

2. Department of Biology, Faculty of Sciences, University of Saïda - Algeria. Laboratory of Biotoxicology, Pharmacognosy and Biological Valorization of Plants (LBTPVBP), Ain El Hadjer Campus.

chaimaakhadir1998@gmail.com1
, yasminehalfaoui1996@gmail.com2
, medmahmoud1906@gmail.com3

Abstract

Climate change is placing increasing pressure on the environment of semi-arid regions, particularly in the wilaya of Saïda, Algeria. This study examines the impact of climate variability on soils, vegetation, and water resources, with a focus on phenomena such as erosion, desertification, wildfires, and drought. Rising temperatures and irregular precipitation are profoundly altering local ecosystems, reducing soil fertility and weakening biodiversity.

Based on the analysis of available climatic data and numerous previous studies published in various scientific articles, this research identifies major trends and their consequences on the Saïda ecosystem. Water erosion and the depletion of vegetation cover accelerate desertification, while prolonged droughts reduce the availability of water resources. The intensification of wildfires worsens soil degradation, contributing to biodiversity loss and amplifying natural risks. To mitigate these impacts, appropriate solutions must be implemented, such as sustainable forest and soil management, strengthening water infrastructure, and restoring degraded ecosystems. This study highlights the urgent need for effective adaptation strategies to protect the environment and ensure the resilience of ecosystems in the face of climate change.

Keywords: Climate change, ecosystems, desertification, wildfires, environmental resilience, semi-arid soils.

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LES CHANGEMENTS CLIMATIQUES OBSERVES EN ALGERIE : ETUDE DES VARIATIONS DE TEMPERATURES

Moussa DJERAFA 1, Yasser AZIZI 1

1 Laboratory of Materials Interaction and Environment (LIME), Faculty of Exact Sciences and Computer Science ,University of Jijel

Djerafamoussa23@gmail.com

Abstract

The objective of this study is to quantify and analyze temperature and precipitation regimes in Algeria in the context of climate change. We analyzed a large number of climate data recorded at 20 weather stations spread across the national territory and extending up to 52 years (1969-2020). The analysis of the homogeneity and the trend of the observation series were carried out using the Pettitt and Mann-Kendall tests respectively.

The results obtained show that the period (2001-2020) symbolizes the hot years for almost all stations where the average temperature anomaly was always positive with an increase of +0.7°C, and the years 2003, 2010, 2014, 2016 and 2018 are the hottest years ever recorded. Precipitation variability indicates an unclear rainfall trend and the succession of wet and dry years is disordered. The chronological evolution of the standardized precipitation index (SPI) shows an overall downward trend and therefore a drought trend.

Keywords: Temperatures - Samples - Climate change - The Standardized Samples Index (SPI)- precipitation variability-Mann kendall tests.

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RELATIONSHIPS BETWEEN REGIONAL ATMOSPHERIC CIRCULATION AND EXTREME RAINFALL IN NORTHERN ALGERIA

Ahmed KHELOUFI ATTOU 1, Kamila BABA-HAMED 1, Abderrazak BOUANANI 1,

1 Laboratory n°25, Promotion of Water, Mineral and Soil Resources. Environmental Legislation and Technological Choices, University of Tlemcen, Algeria
ahmedgeooran2014@gmail.com , attou.kheloufi@univ-tlemcen.dz

Abstract

This research analyzes the variability of extreme rainfall and examines the influence of the North

Atlantic pressure pattern on extreme rainfall in northern Algeria, based on homogeneous daily data. A series of key steps formed the basis of the methodology applied in this study. First, daily rainfall data were collected from meteorological stations across northern Algeria. Second, homogeneity tests were applied to the data using two methods: (a) an absolute method by applying parametric and non-parametric tests, and (b) a relative method based on comparing stations to each other to assess homogeneity. Third, Regionalization was carried out to identify regions exhibiting similar rainfall patterns. Fourth, extreme rainfall events and their trends were analyzed using the Mann-Kandell regional method. Finally, the relationship between extreme rainfall and the North Atlantic Oscillation (NAO) index was explored using the Spearman's correlation coefficient.

The results of the homogenization by absolute method showed that the data is inhomogeneous in three stations: Arzew, Miliana, and Jijel, while the relative method revealed inhomogeneous data at Miliana and Jijel. Cluster analysis identified four distinct clusters of rainfall stations. An analysis of long-term trends of extreme rainfall events revealed a steady reduction in consecutive dry days alongside a slight increase in consecutive wet days, reflecting evolving rainfall patterns and heightened climate variability over the study period.

Keywords: North-Algerian, Extreme Rainfall, Mann-Kandell, Spearman's correlation, NOA.

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SUSTAINABLE STRATEGIES FOR PROTECTING CHERRY ORCHARDS FROM SPRING WEATHER EXTREMES

Rayene DJABOURABI 1, 2,a , Hana BOUZAHOUANE 1,3,b , Moundji TOUARFIA 1,c , Abdelkader DJOUAMAA 1,d and Azzedine CHEFROUR 1,4,e

1 Faculty of Natural and Life Sciences, Mohamed Cherif Messaadia University – Souk Ahras, Algeria, 2 Organic and Interdisciplinary Chemistry Laboratory E0841400, Souk Ahras, Algeria
3 Laboratory of Environmental Biosurveillance, Department of Biology, Faculty of Sciences, Badji Mokhtar University, BP 12, El Hadjar, Annaba 23000, Algeria
4 Development and control of hospital pharmaceutical preparations, Faculty of Medicine, Badji Mokhtar University-Annaba
ra.djabourabi@univ-soukahras.dz a , h.bouzahouane@univ-soukahras.dz b , m.touarfia@univ-soukahras.dz c a.djouamaa@univ-soukahras.dz d, a.chefrour@univ-soukahras.dz

Abstract

Cherry orchards in Souk Ahras are integral to the local economy and cultural heritage, providing substantial income and preserving agricultural traditions. However, these orchards face significant threats from spring weather extremes, particularly cold waves and late spring rains. These adverse conditions increase fungal disease incidence, cause fruit loss and decrease overall crop quality, posing a substantial risk to sustainable production. This study aims to evaluate the potential effectiveness of various innovative and practical techniques to protect cherry trees from the adverse effects of spring weather extremes. Data collected from interviews with local farmers and agricultural experts support the anticipated benefits of these methods, by proposing the implementation of protective nets, biological treatments and improved cultural practices, the study seeks to provide accessible and sustainable solutions for local farmers. The proposed study focuses on traditional cherry orchards in Souk Ahras, Algeria, based on previous research, theoretical models and the interventions suggested include the use of fine mesh nets over trees to prevent rain damage, reduce excess moisture and minimize mechanical damage to blossoms and fruits. Additionally, the application of natural fungicides and organic composts is proposed to enhance tree resistance and reduce fungal infections. Improved soil drainage through specific land management techniques and regular pruning are also suggested to increase airflow and reduce residual moisture. These techniques are expected to provide sustainable and environmentally friendly solutions; local farmers can ensure sustainable production, increase yields and maintain high-quality fruit, thereby safeguarding their livelihoods and cultural heritage.

Keywords: cherry tree, climate changes, innovative agricultural techniques, heritage preservation

CARACTERISATION MORPHOLOGIQUE ET AGRONOMIQUE DE QUELQUES ACCESSIONS SPONTANEES DE LA VESCE COMMUNE COLLECTEES A PARTIR DE LA PROVINCE DE SETIF ET SES REGIONS LIMITROPHES

Hocine BOUGRINE 1, Salah HADJOUT 1, Mohamed ZOUIDI 1, Abdeldjalil BELKENDIL 1, Amar MEBARKIA 2

1 Centre de Recherche en Aménagement du Territoire (CRAT), Constantine, Algérie.
2 Laboratoire d'Amélioration et de Développement de la Production Végétale et Animale (LADPVA), Université Ferhat Abbas, Sétif, Algérie
bougrinehoucine77@gmail.com 1, hadjout.salah@gmail.com 1,
zouidibiologie20@gmail.com 1,
algeria7002@gmail.com 1, mebarkia.mok@gmail.com 2 .

Abstract

The objective of this work is to evaluate the performance and potential of several wild accessions of common vetch in terms of both aerial biomass and seed yield, while also assessing the extent of their genetic polymorphism based on phenotypic and agronomic traits. This aims to address the growing interest in the collection, characterization, and conservation of local ecotypes in order to facilitate the use of this germplasm in breeding programs and contribute to the adaptation of agriculture to climate change. To this end, the collected accessions were subjected to a pot experiment conducted from 24/12/2020 to 08/06/2021 under greenhouse conditions in a completely randomized design with three replications per accession at the experimental farm of Ferhat Abbas University, El Bez, Sétif.

Quantitative agro-morphological traits such as hundred-seed weight, pod length and width, number of leaflet pairs per leaf, and peduncle length revealed high polymorphism among the studied vetch populations. These observed variations within this germplasm provide breeders with a valuable reservoir of raw material, enabling them to judiciously select the appropriate accession according to the region and the type of livestock system, taking into account its eco-geographical traits. Similarly to quantitative traits, several qualitative attributes such as leaf texture, stem shape and color, leaflet hairiness, stipule shape, and tendril color showed great diversity among the populations studied. In addition to their effective use as identification keys, these traits could also be highly useful in studies of genetic diversity estimated through morphological markers.

Keywords: Spontaneous Accessions, Vicia, Climate Change, Abiotic Stress, Polymorphism, Genetic Diversity.

IMPACT DES ÉVÉNEMENTS EXTRÊMES ET DU CHANGEMENT CLIMATIQUE SUR LE RISQUE D'INONDATION À CONSTANTINE

Manel YAKHLEFOUNE 1 , Chaouki BENABBAS 1 , Florina GRECU 2 , Abdeljalil BELKENDIL 1

1 Centre de Recherche en Aménagement du Territoire (CRAT), Université de Constantine1, Campus Zouaghi Slimane Constantine, Algérie.
2 Département de Géographie, université de Bucarest, Roumanie.

manel.yakhlefoune@crat.dz 1 , chaouki.benabbas@crat.dz 1 , abdeldjalil.belkendil@crat.dz 1 , grecu@geo.unibuc.ro 2

Résumé

Cette étude vise à analyser l'impact des événements climatiques extrêmes sur le risque d'inondation dans le bassin versant semi-urbain d'Oued Mgharouel à Constantine. Elle met en lumière les facteurs aggravants et propose des mesures d'adaptation pour atténuer leurs effets. L'analyse porte sur l'impact des précipitations extrêmes sur l'environnement et les infrastructures, l'identification des principaux facteurs qui exacerbent le risque d'inondation et la cartographie des zones vulnérables.

L'approche méthodologique adoptée repose sur une analyse de terrain couplée à l'exploitation d'outils technologiques avancés (SIG/HecRas). Ces outils permettent une meilleure planification des mesures préventives et contribuent à la réduction des impacts des inondations sur la population et l'environnement. L'observation directe des zones touchées par l'inondation permet d'identifier les secteurs les plus vulnérables aux inondations, d'évaluer les dégâts subis et de valider notre cartographie du risque.

Les résultats de l'analyse de terrain ont montré que, malgré le calibrage d'Oued Mgharouel, des débordements persistent en aval, aggravant les risques pour la population et les infrastructures. Cela du essentiellement aux effets de changement climatique qui rend les événements extrêmes plus fréquents et plus violents, accentuant ainsi les risques d'inondation et rendant plus difficile la gestion des ressources en eau dans les zones vulnérables.

Mots clés : changements climatiques, risque d'inondation, HecRas, système d'information géographique (SIG), Constantine.

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BIOTECHNOLOGY'S ROLE IN CLIMATE CRISIS COMBAT

Dr. Nabil CHARCHAR

Biotechnology research center CRBt

n.charchar@crbt.dz

Abstract

Climate change, due to rising emissions of greenhouse gases, particularly carbon dioxide (CO_2), has become a major global challenge. Biotechnology has great potential to make a substantial contribution to a low-carbon society. Several environmentally-friendly processes are already well established, using the unique capacity of living cells or their instruments.

What's more, new biotechnological procedures are being developed which have the potential to contribute to the change underway in our economy. This study highlights the main innovations, applications, challenges and future directions in this field. We have selected several promising game-changing biotechnology tools: (i) the Wood-Ljungdahl pathway, (ii) carbonic anhydrase, (iii) cutinase, (iv) methanogens, (v) electro-microbiology, (vi) hydrogenase, (vii) cellulosome and (viii) nitrogenase. Some of these are relatively new and are being explored mainly in scientific laboratories. Others have been around for decades, but new scientific bases are enabling their role to be rigorously expanded.

Key words: Climate change, biotechnology, carbon dioxide (CO_2), innovations, Environmentally-friendly.

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IMPACT OF CLIMATE CHANGE AND DROUGHT ON LAND PRODUCTIVITY IN WESTERN ALGERIA: CURRENT STATUS AND SUSTAINABLE MANAGEMENT PERSPECTIVES

Mohamed ZOUIDI, Salah HADJOUT, Hocine BOUGRINE, Abdeldjalil BELKENDIL, Dounia KEDDARI, Chaima TOUABA

Centre de Recherche en Aménagement du Territoire (CRAT), Campus Zouaghi Slimane, Route de Ain el Bey, 25000 Constantine, Algérie.

Abstract

In Western Algeria, irregular rainfall and prolonged droughts over recent decades have had a profound impact on land degradation and declining soil productivity. This region, already characterized by a semi-arid to arid climate, is experiencing rising temperatures and decreasing precipitation, exacerbating desertification and weakening ecosystems. In this study, the dynamics of land productivity in Western Algeria were analyzed using a non-linear phenological algorithm (Ivits & Cherlet, 2013). This method, integrated into the World Atlas of Desertification, combines NDVI trend analysis with biomass variation to detect early signs of soil degradation.

The results reveal an accelerated degradation between 2016 and 2023, with a significant increase in declining areas. The surface area of improving lands drastically decreased (from 1,767,827.81 km² in 2016 to 179,498.84 km² in 2023), indicating that current restoration efforts are insufficient. However, some still-stable but stressed zones offer opportunities for targeted interventions.

In response to this situation, urgent action is required: the adoption of sustainable agricultural practices, improved water management, and reforestation programs. Integrating these measures could help reverse the trend and enhance ecosystem resilience in the face of climate change.

Key words: Degradation, ecosystem, climate, drought, soil management, Algeria.

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IMPACT DU CHANGEMENT CLIMATIQUE SUR LA DIVERSITE DES ESPACES VERTS URBAINS – CAS DE LA VILLE DE CONSTANTINE

Touaba Chaima 1, Zouidi Mohamed 2, Farah Mohamed Ikbal[3]

[1, 2, 3] Centre de Recherche en Aménagement du Territoire (CRAT), Campus Zouaghi Slimane, Route de Ain el Bey, 25000 Constantine, Algérie.

chaima.touaba@crat.dz 1, mohamed.zouidi@crat.dz 2, mohamed-ikbal.farah@crat.dz[3]

Abstract

The impact of climate change on the diversity of urban green spaces in Constantine can be demonstrated in in phenomena include reduced water availability, more frequent heat waves, and changes in precipitation patterns. These phenomena have an impact on the growth and survival of animal species, affect local ecosystems and make the management of these areas more complex.

The scope of our work is to examine the diversity of plant species in three main green spaces of Constantine city (The garden of Bennaceur, Bel Air "Cilock" and Bardou), as well as to analyse the climate change impact on the biodiversity of these areas. The methodology followed during this study is based on the following steps: locating and mapping the three major green spaces in the city of Constantine (the green spaces: Bennaceur, Bel Air "Cilock" and Bardou), undertake field trips (site selection for study) to carry out an inventory of these species (the variety of plant species), and integrate data in the geographic information system (SIG). Results show significant variations in species richness within the different studied gardens. The comparison of thedata makes it possible to conclude that, taken as a whole, these three gardens contain 40 species from 25 botanical families. This plant diversity could be influenced by climate change, which affects local environmental conditions, such as temperature, precipitation and extreme phenomena, therefore, modifying the distribution and growth of plant species.

Key words: Espaces verts, Changement climatique, Diversité végétales, Constantine, SIG

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MODELLING APPROACH TO ASSESS THE STATE AND DYNAMICS OF NORTH ALGERIAN BIODIVERSITY UNDER ENVIRONMENTAL FORCING: A CASE STUDY OF QUERCUS ILEX

Arar Abdelkrim[1] , 2, 3 , Megherbi Dhikra Amel[1], Bendjoudja Dounia[1], Khloufi Amani[1], Benbrahim Aya[1]

[1] Faculty of natural and life sciences, Department of Ecology and Environment, University Mostefa Benboulaid Batna 2, Batna, Algeria.
2 Laboratory "Biodiversity, Biotechnology and Sustainable Development'', Faculty of Nature and Life Sciences, University Mostefa Benboulaid Batna 2, Batna, Algeria
3 Laboratory of Functional Ecology and Environment, University of Oum El Bouaghi. Oum El Bouaghi
Algeria.
E-mail :a.arar@univ-batna2.dz

Abstract

This study employs ecological niche modeling to investigate the current and future distribution dynamics of Holm oak (Quercus ilex) within Belezma National Park, Algeria, using the MaxEnt approach. The main goal is to gain insights into the species ecological preferences and spatial distribution patterns over time, while identifying the key environmental drivers influencing its establishment.

A total of 15 environmental variables were integrated into the model, including two climate variables (current data from 1950–2000 and future projections for 2050 and 2070), ten soil-related factors, and three topographic variables. Field surveys provided 156 georeferenced occurrence records of Quercus ilex, which served as input for the model.

MaxEnt demonstrated robust predictive performance, with an AUC value of 0.824, indicating high model reliability. Results revealed significant shifts in the species potential distribution: a range contraction projected for 2050 followed by a notable expansion by 2070, with soil variables contributing most substantially to habitat suitability. These findings provide valuable guidance for conservation planning and resource management, offering a science-based tool to support biodiversity preservation in the face of environmental change.

Key words: Key words: Modeling, SDMs, National Park of Belezma, distribution dynamics, Quercus Ilex.

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EVALUATION OF THE FLOCCULATING EFFICIENCY OF MORINGA OLEIFERA AS A BIOFLOCCULANT FOR REDUCING WASTEWATER TURBIDITY

Abdelkader DILMI 1, Abdelfateh BENMAKHLOUF 1

Laboratoire d'électrochimie et de l'environnement. Université Mohamed El Bachir El Ibrahimi Bordj Bou Arréridj, Algérie.
Email: abdelkader.dilmi@univ-bba.dz

Abstract

Water is a vital resource for all living organisms on Earth. However, pollution and the deterioration of water quality have become major global concerns. Industrial and municipal wastewater often ontains suspended particles, resulting in increased water turbidity. Turbidity is not only aesthetically undesirable but can also pose risks to human health and aquatic ecosystems. Therefore, finding effective solutions to reduce wastewater turbidity is of paramount importance. Among the commonly used treatment methods, the use of chemical coagulants and flocculants has been favored due to their efficiency. Coagulation and flocculation are two processes often applied together, with the primary objective of reducing turbidity caused by suspended solids, colloids, microorganisms, and viruses. The process involves using coagulants to neutralize the electrostatic charges on the surface of colloidal particles and suspended matter in water and aggregating them into larger flocs that can settle quickly by gravity. Today, the use of mineral salts and synthetic polymers as coagulants in wastewater treatment is associated with certain risks. These substances can increase the organic load and generate large volumes of sludge that are non-biodegradable and difficult to dispose of. As a result, these drawbacks necessitate extensive research into the development of alternative, cost-effective, and environmentally friendly coagulants and flocculants. These alternatives come in the form of natural coagulants and flocculants, which are known to be eco-friendly and inexpensive.

The aim of this study is to examine the effect of different coagulants, namely aluminum sulfate and the bioflocculant Moringa oleifera, on the treatment of synthetic turbid water through coagulation, flocculation, and sedimentation using a jar test apparatus.

The performance of the Moringa oleifera bioflocculant was quantified and compared to that of alum in terms of its ability to neutralize and destabilize suspended charges, reduce turbidity, and its impact on pH, electrical conductivity, residual organic matter, as well as cytotoxicity in the treated water.

Key words: Wastewater, coagulation-flocculation, coagulants, aluminum sulfate, Moringa oleifera bioflocculant,

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ADVANCED ENSEMBLE LEARNING FOR HIGH-PRECISION WATER QUALITY MONITORING IN WADI SAF-SAF RIVER BASIN: A VOTING-BASED FRAMEWORK FOR INTELLIGENT PREDICTION

Dounia KEDDARI, Farah BOUTOUATOU, Nadjet CHETTIH, Ahlam LABDAOUI, Abdelhak SEBBIH, Amer ZEGHMAR, Abdeldjalil BELKENDIL, Bachir SAKAA, Saifi MERDAS

[1]Centre de Recherche en Aménagement du Territoire (CRAT), Constantine, Algérie.
[2]Laboratory of Applied Mathematics and Modeling, Brothers Mentouri University of Constantine 1.
[3]Laboratory of Applied Animal Biology, Faculty of Sciences, Badji Mokhtar University, Annaba, Algeria.
[4]Laboratory of Water Resources and Sustainable Development, Faculty of Earth Sciences, Badji Mokhtar University, Annaba, Algeria.
[5]Scientific and Technical Research Center on Arid Regions (CRSTRA), Biskra, Algeria.

dounia.keddari@crat.dz

Abstract

Water pollution remains a critical global challenge, threatening both environmental sustainability and public health. Accurate and reliable predictive models are essential for proactive water resource management, yet traditional monitoring methods fall short in addressing the complexities of water quality dynamics. In this study, we present an advanced ensemble learning approach to predict water quality in the Wadi Saf-Saf river basin, Algeria, leveraging the Water Quality Index (WQI) as a key assessment metric. The model incorporates a comprehensive set of input variables known to influence WQI. A diverse set of powerful machine learning algorithms including Extreme Gradient Boosting (XGBoost), Decision Tree (DT), Gradient Boosting Machine (GBM), Extra Trees (ET), and Support Vector Machine (SVM) were integrated within a Voting Regressor framework to enhance predictive performance. The ensemble model significantly outperformed individual regressors, achieving a high R^2 of 0.92, Mean Squared Error (MSE) of 11.63, Root Mean Squared Error (RMSE) of 3.41, Mean Absolute Error (MAE) of 2.79, and Scatter Index (SI) of 0.07. These findings underscore the necessity of machine learning-driven solutions in modern water quality assessment, demonstrating that ensemble techniques can more effectively capture nonlinear relationships and improve prediction reliability. The proposed framework serves as a powerful tool for monitoring and managing river pollution, offering data-driven insights to support sustainable water resource planning and pollution mitigation strategies.

Key words: Water quality prediction; Pollution; Artificial intelligence; Machine learning; Ensemble learning.

THE DECLINE OF FOGGARAS IN THE SAHARA: CASE STUDY OF THE ADRAR REGION (SOUTHWESTERN ALGERIA)

Salah Eddine MALLEM 1, Saliha ABBAS 2, Aissam GAAGAI 3

1, 2, 3 Centre de Recherche Scientifique et Technique sur les Régions Arides (C.R.S.T.R.A.) - Biskra, Algérie

salaheddine.ma.7@gmail.com1, abbassaliha05@gmail.com2, gaagaiaissam37@gmail.com3

Abstract

The objective of our study is to highlight the causes of foggaras drying up and the direct impact of their depletion on the oases in the Adrar region, and to propose a number of recommendations. The study area is part of the Adrar province, located between latitudes 26°30'N and 28°00'N and longitudes 0°30'W and 0°30'E, stretching from the city of Adrar to the city of Reggane over a distance of nearly 170 km. Regarding the methodology used, it is based on an analysis of foggaras flow rates during the years 1960, 1998, and 2011, as well as a cartographic comparison of the piezometric level of the Continental Intercalaire aquifer between 1971 and 2007. It outcrops along the axis connecting Timimoun to In Salah and represents the unconfined portion of the Northern Sahara Aquifer System in its southwestern part. The analysis of piezometric maps over a 40-year observation period shows a decline in the water table level in the study region, estimated at over 8 meters. According to the results of the last three foggaras flow measurement campaigns conducted in 1960, 1998, and 2011, the overall foggaras flow rate experienced a significant reduction: it dropped from 1.909 m3/s in 1960 to 1.423 m3/s in 1998, and then to 0.918 m3/s in 2011—a total loss of 52% in flow rate. This situation has led to the drying up of many foggaras. The number of dried-up foggaras increased from 59 in 1960 to 168 in 1998, and reached 286 in 2011—an increase in the drying-up rate of 40% compared to 1960. It is urgent to preserve the foggaras, true elements of hydraulic heritage, by ensuring their protection and rehabilitation.

Keywords: Adrar; foggaras; drying; flow rate; Continental Intercalaire

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ENVIRONMENTAL VULNERABILITY ASSOCIATED WITH THE ESTABLISHMENT OF INDUSTRIAL FACILITIES ON AGRICULTURAL LAND

Nahla BENSALHIA[1], Abd ElAli BENCHENNA[2]

[1] LAGED laboratory, IGTU, UC 3 University, Algeria
[2] Muhammad Al-Siddiq Binyahya University, Jijel
nahla.bensalhia@univ-constantine3.dz, abdelali.benchenna@univ-jijel.dz

Abstract

The study presented analyzes the environmental impacts associated with the establishment of industrial facilities on agricultural land, using the case of liquid discharges from the NAFTAL site in El Khroub (Constantine) as an illustration. Two analysis reports from the ONEDD laboratory indicate that while certain parameters are under control—such as temperature, pH, COD, suspended solids, and initially, oils and greases—others remain concerning, particularly hydrocarbons and heavy metals. The second sampling reveals significant exceedances in BOD5, suspended solids, oils/greases, and hydrocarbons, highlighting deterioration in water quality and underscoring the need to improve the management of industrial effluents.

The study concludes by recommending enhanced monitoring, improved treatment technologies, and

continuous surveillance in order to mitigate environmental impacts and ensure sustainable industrial

growth while safeguarding agricultural land.

Keywords: Adrar; foggaras; drying; flow rate; Continental Intercalaire.

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ENVIRONMENTAL IMPACT OF LANDSLIDE VULNERABILITY AT THE URBAN SCALE: CASE OF CONSTANTINE, ALGERIA

Mohamed BOUAOUD 1, Sami MEZHOUD 2

(1) University Constantine 3, Salah BOUBNIDER,
(2) University Constantine 1 Frères Mentouri,

mohamed.bouaoud@univ-constantine3.dz, samimezhoud@gmail.com

Abstract

This study focuses on assessing landslide vulnerability and its environmental implications within the urban context of Constantine, Algeria. The methodology is based on a vulnerability index approach, integrating multiple physical and anthropogenic factors such as slope gradient, lithology, rainfall, land use, and proximity to faults or watercourses. This multi-criteria method allows for the evaluation of the relative influence of each factor on the occurrence and spatial distribution of landslides. The analysis highlights that zones already affected by slope instability correspond to areas of high vulnerability, emphasizing the strong relationship between environmental conditions and human-induced pressure. The results provide valuable insights for developing targeted urban planning and prevention strategies that consider both natural and socio-environmental dimensions of landslide risk.

Keywords: vulnerability; urbanization; environmental; risks and monitoring.

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THE PHYSICOCHEMICAL PROPERTIES OF WATER RESOURCES IN THE OUED DJENDJEN WATERSHED (W. JIJEL)

Riad KOUADRA

Department of Earth Sciences, University Center of Mila, Algeria

kouadra.r@centre-univ-mila.dz

Abstract

The objective of the present research is to provide information on the physicochemical characteristics of water resources in the Oued Djendjen watershed (W. Jijel) by analyzing key parameters, including temperature, pH, and conductivity and major ions. These factors were evaluated to determine the overall condition and suitability of the water for use. The data analysis reveals that the water on the right bank of the wadi and in the downstream section of the plain exhibits high mineralization levels, ranging from 1500 to 2000 µS/cm. This water primarily consists of two chemical facies: chloride and calcium bicarbonate. Additionally, the water in the plain is classified as hard to very hard (with a total hardness greater than 32°F). It is generally considered good to acceptable quality for irrigation purposes, but it is important to monitor trends and changesin water salinity.

Keywords: Water resources, Oued Djendjen, Watershed, mineralization, Salinity

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PHYSICO-CHEMICAL QUALITY ASSESSMENT AND POLLUTION OF GROUNDWATER IN SEBKHA EL MAHMEL, KHENCHELA (NORTHEAST ALGERIA)

Nour EL Houda TOUBI 1, Nour el Houda MEZERREG 2, 1 Selwa3 12 FSTGAT BOUBGUIRA,

Department of Geological Sciences, University of Constantine 1 3 ISTU, Department of Geology, University of Batna 2 Nourelhouda.toubi@umc.edu.dz nour-el-houda.mezerreg@umc.edu.dz selwa.boubguira@univ-batna2.dz

Abstract

This study evaluates the physico-chemical quality of groundwater in Sebkha El Mahmell (Khenchela) and identifies potential sources of pollution. The parameters considered for evaluating water quality include: electrical conductivity, pH, cations (Ca, Mg, Na, and K), anions (Cl, SO_4 , and HCO_3), as well as NO_3 , NO_2 , and NH_4^+ as indicators of mineralization and pollution. Physicochemical studies generally indicate that the waters are highly mineralized. The chemical quality criteria are far from the WHO drinking water standards, except at a few points. This is due to the geological composition of the soil, as well as the direct discharge of domestic liquid and solid waste into the sebkha. The authors recommend sound management of water resources and regular quality monitoring, in order to limit the degradation of groundwater in this vulnerable area.

Keywords: Sebkha; Mahmel; groundwater; pollution; physico-chemical.

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SOIL WATER BALANCE MONITORING USING A MODIFIED VERSION OF THE BBH-MODEL

Lydia BENAOUDIA 1, Zoubeida BARGAOUI 2, Amel BEJAOUI 2, Abdelhadi AMMARI 1, Mohamed MEDDI 1

1Environnement and water engineering laboratory (GEE) , National Higher School for Hydraulics , 29 Route de Soumaa , Blida , Algeria

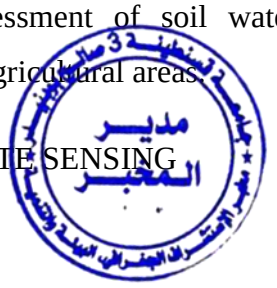
2Hydrological and environmental modeling laboratory, National School of Engineers, Univ. Tunis El Manar, BP 37, Tunis 1002, Tunisia.

*email of corresponding author: l.benaoudia@ensh.dz

Abstract

This study presents an improved approach of the BBH model for monitoring soil water balance in a context of increased climate variability. The new version of the BBH model uses satellite-derived Soil Water Index (SWI) from Copernicus or other SWI datasets in addition to the satellite-derived Leaf Area Index (LAI) and some weather data like daily precipitation and reference evapotranspiration to estimate deep percolation, real evapotranspiration and surface runoff. The model's performance was satisfying following some criteria like the Pearson's correlation coefficient (r = 0.82). However, using a higher SWI and LAI spatial resolutions compared to the ones used in this study can lead to better results of the new BBH-model version. The results demonstrate a better accuracy of the modified model, allowing more reliable assessment of soil water availability and optimization of water management in sensitive agricultural areas.

Keys words: BBH, SWI, LAI, MODEL, REMOTE SENSING



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SPATIAL VARIABILITY OF WATER QUALITY AND HYDROCHEMICAL CHARACTERISTICS UNDER CLIMATE CHANGE: A NORTH–SOUTH TRANSECT OF KHENCHELA PROVINCE (NORTHEASTERN ALGERIA)

Dr. Hichem CHENAKER, Maroua CHENAKER, Abdenour SEDRATI

1 Laboratory of Algerian Forest and Climate Change, Higher National School of Forests
2 Laboratory de Biology, Environment and health, University El Oued.
3 Laboratory of Water, environment and renewable energies, University of Khenchela.

Email auteur communicant : chenaker.hichem@ensf.dz

Abstract

This study analyzes the spatial variability of water quality and hydrochemical composition in relation to climate change across a north–south transect of Khenchela Province, northeaster Algeria. In situ measurements of temperature, pH, and electrical conductivity were conducted, while laboratory analyses determined the concentrations of major cations (Ca^{2+}, Mg^{2+}, Na^{+}, and K^{+}) and anions (NO_3^{-}, SO_4^{2-}, Cl^{-}, HCO_3^{-}). Hydrochemical interpretation was performed using Piper and Wilcox diagrams, complemented by spatial distribution mapping to evaluate both drinking and irrigation suitability.

Results reveal marked spatial heterogeneity. Northern sites generally meet to Algerian and World Health Organization (WHO) standards for potable and agricultural use, whereas southern sites exhibit elevated salinity and nitrate levels, limiting their suitability.

Hydrochemical facies analysis identified three distinct water types, while Wilcox Classification confirmed that a significant portion of groundwater is of excellent quality for irrigation, particularly in the northern sector. The findings highlight the dual influence of climate change: higher temperatures accelerate geochemical and biological processes, while altered rainfall regimes intensify runoff, erosion, and nutrient leaching. These combined effects contribute to the degradation of water quality, especially in southern Khenchela.

Keywords: Climate change, Hydrochemistry, Spatial variability, Groundwater quality, Khenchela Province, Algeria.

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MULTI-TEMPORAL LANDSAT IMAGERY AND SPECTRAL INDICES FOR MONITORING A SPATE IRRIGATION PERIMETER – CASE STUDY OF THE EL FEIDH REGION (NORTHEASTERN ALGERIA)

Salah Eddine MALLEM 1, Saliha ABBAS 2, Aissam GAAGAI 3

1, 2, 3 Centre de Recherche Scientifique et Technique sur les Régions Arides (C.R.S.T.R.A.) - Biskra, Algérie

salaheddine.ma.7@gmail.com1, abbassaliha05@gmail.com2, aagaiaissam37@gmail.com3

Abstract

This study aims to analyse a model of traditional agriculture irrigated by flood spreading. It is one of the most recognized rainwater harvesting systems in arid pre-Saharan regions. The method adopted to assess land use dynamics is the diachronic approach. The principle of this method is based on the comparison of eight multi-date satellite images (LANDSAT) covering the period from 1985 to 2020.

During the 1985–2020 study period, there was a very strong positive correlation between vegetation greenness (NDVI) and vegetation water content (NDWI) (R = 0.961). Conversely, there was a moderate negative correlation between vegetation cover and soil salinity (R = -0.839). The main factor contributing to the degradation of the El Feidh area is the Babar Dam, which was built in 1995 on the Oued Abiod.

Keywords: spate irrigation; remote sensing; El Feidh; LANDSAT; climate change.

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GREEN ROOFS: A SUSTAINABLE SOLUTION FOR STORMWATER MANAGEMENT AND URBAN ADAPTATION TO CLIMATE CHANGE (EL MERRIDJ – CONSTANTINE – ALGERIA)

Imane SOUICI 1, Adjiel ABDERRAZAK 2

1 Department of GTU, Institute of Urban and Environmental Techniques, University of Constantine 3, Algeria. LAGED (Laboratory of Perspective, Environment and Development)
2 Department of GTU, Institute of Urban and Environmental Techniques, University of Constantine 3, Algeria.

*imene.souici@univ-constantine3.dz

Abstract

In a context marked by climate change and the increasing frequency of extreme weather events, green roofs are emerging as an innovative solution for stormwater management and urban adaptation to environmental challenges. This study explores their role through two main axes: the social acceptance of green roofs in the El Merridj district of Constantine, and the hydrological efficiency of extensive green roofs, assessed through an experiment conducted on a prototype installed on the terrace of a single-family dwelling.

The results indicate good social acceptance, although their widespread adoption still requires greater awareness, training, and financial support. From a hydrological perspective, the extensive green roof retains between 50% and 90% of rainfall, with a discharge delay of 5 to 10 minutes, thereby reducing flood risks. These systems also help mitigate urban heat islands, improve air quality, and promote biodiversity. When integrated into public policies, green roofs represent a sustainable strategy to strengthen urban resilience, manage stormwater, and mitigate the impacts of climate change, while providing environmental, social, and economic benefits.

Keywords: Green roofs; Alternative storm water management; urban resilience; Climate change; Social acceptance; El Merridj district (Constantine).

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SUIVI DE LA DEGRADATION ENVIRONNEMENTALE DES ECOSYSTEMES STEPPIQUES : ÉTUDE DE CAS DE LA WILAYA DE DJELFA A PARTIR DES DONNEES LANDSAT 8

Fouzia BOUDJEMLINE

Département de langue arabe, histoire et géographie, École normale supérieure de Sétif, Algérie.

f.boudjemline@ens-setif.dz

Résumé

Face aux crises environnementales mondiales, les écosystèmes steppiques sont parmi les plus vulnérables aux impacts des activités humaines et aux aléas naturels, notamment la dégradation de la végétation. Pour analyser ces dynamiques, la télédétection et les Systèmes d'Information Géographique (SIG) offrent des outils performants permettant de suivre, comprendre et prévoir l'évolution de l'environnement.

Dans cette étude, la plateforme Google Earth Engine a été utilisée pour traiter les images Landsat 8 Level-2 sur la région de Djelfa (Algérie) sur la période 2019–2023. Après filtrage spatial et temporel, ainsi qu'une correction à l'aide des bandes de qualité, plusieurs indices spectraux ont été calculés : NDVI, SAVI et NDWI, en complément de la température de surface terrestre (LST). Des séries temporelles et des analyses de corrélation ont été établies afin d'évaluer l'état et l'évolution de la couverture végétale.

Les résultats révèlent des valeurs de NDVI faibles (0,05–0,25), traduisant une végétation globalement dégradée, particulièrement en 2020 et 2021. Le SAVI montre une tendance similaire mais plus stable, tandis que le NDWI, avec des valeurs comprises entre -0,2 et -0,4, confirme l'aridité persistante de la zone. Les corrélations indiquent une faible relation positive entre la LST et les indices NDVI (r=0,064) et SAVI (r=0,14), mais des corrélations négatives marquées entre NDVI et NDWI (r=-0,64), ainsi qu'entre SAVI et NDWI (r=-0,70). Ces résultats traduisent l'impact de la sécheresse et du déficit hydrique sur la végétation steppique. En conclusion, l'approche adoptée permet de caractériser la dynamique de la dégradation dans la steppe de Djelfa et souligne la nécessité de stratégies de gestion durable afin de préserver ces écosystèmes fragiles.

Mots-clés : Télédétection ; Google Earth Engine (GEE) ; NDVI ; NDWI ; LST.

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PASSIVE STRATEGIES TO COUNTER THE URBAN HEAT ISLAND

Ouarda MANSOURI 1, Habiba TEBBANI 2

1 Department of Civil Engineering. Faculty of Technology. August 20, 1955 university. Skikda. Algeria. ABE (Bioclimatic Architecture and Environment laboratory, Constantine3 University. Algeria)

2 Department of Architecture. Faculty of Earth Sciences. Badji Mokhtar University. Annaba. Algeria. ABE (Bioclimatic Architecture and Environment laboratory, Constantine3 University. Algeria)

ouarda.mansouri@univ-skikda.dz, archibioclim@yahoo.com

Abstract

Environmental concerns, particularly those linked to climate change, marked the end of the 20th century. Global warming is the increase in the average temperature of the earth surface. This is because warmer temperatures over time change weather patterns and disrupt the usual balance of nature. This poses many risks to humans and all other life forms on Earth. Moreover, the city, which is a dense environment, does not escape the influence of this warming and the best-known manifestation of the microclimate generated by cities following this rise in temperature is the urban heat island “UHI”. Several passive strategies have been implemented to mitigate the effects of global warming and reduce energy consumption in urban areas. What about blue and green infrastructures (BGI)? What are their environmental benefits? and what is their impact on mitigating urban heat islands?

Keywords: Climate Change, Urban heat island, passive strategies, Green and blue infrastructures (BGI).

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INFLUENCE OF THE URBAN MORPHOLOGY ON THE URBAN HEAT ISLANDS: MICROCLIMATIC ANALYSIS OF THE PUBLIC SQUARES OF CONSTANTINE

Afef OUIS1, Sara SAHNOUNE2, Nassira BENHASSINE3

1,2,3 Laboratoire Architecture Bioclimatique et Environnement (ABE), Faculté d'Architecture et d'Urbanisme, Université Constantine 3 — Salah Boubnider–Constantine, Algérie

afef.ouis@univ-constantine3.dz1, *sara.sahnoune@univ-constantine3.dz 2*, *nassira.benhassine@univconsatntine3.dz 3*

Abstract

This study focused on the microclimatic analysis of three places public located in the protected sector of the city of Constantine, in Algeria. Each exhibiting distinct physical characteristics and configurations that influence their microclimate and their use. These sites include *Si El Haoues* square known by the Palace Square, the Revolution Esplanade, known as *La Bréche*, and *Hadj Ahmed Square Bey*, also called *'Dounia Ettraif'* Square. *Si El Haoues* Square has a quasi-rectangular configuration with a sky view factor (SVF) of 0.89, providing a relative protection against microclimatic factors and mitigating the effect of heat islands in urban areas due to its partially enclosed urban setting. The Esplanade of *la Brèche* located in the centre of the city, presents a high SVF of 0.94, indicating greater exposure to the sun and winds, which corresponds to the morphology of open space framed by buildings Haussmannian buildings, thus promoting the formation of an urban heat island. Finally, Place Hadj Ahmed Bey, renovated during the event "Constantine Capital of Arab Culture" in 2015, has an SVF of 0.95, the highest of the three sites studied, providing minimal thermal protection despite its historical and cultural importance, which accentuates its character as a heat island.

These observations highlight the importance of urban planning and management, revealing that thoughtful interventions in the development of public places, such as the addition of shaded areas or modification of surface materials, are likely to improve significantly the well-being of users, particularly in the face of the challenges posed by the islands of urban heat. An in-depth analysis of the interactions between urban morphology and climatic variables thus make it possible to formulate appropriate strategies aimed at improving the thermal comfort and the attractiveness of public spaces while mitigating the effects of heat islands urban heat.

Keywords: Public squares; Urban Microclimate; Urban Morphology; Sky View Factor (SVF)

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L'AUDIT ENERGETIQUE AU SERVICE DE LA TRANSITION ENERGETIQUE : CAS DE L'UNIVERSITE SALAH BOUBNIDER CONSTANTINE 3

Fatima Zohra Filali 1, Louiza Soualah 2, Fatima Zohra Chafi 3
1, 2,3 Institut gestions des techniques urbaines, université Constantine 3, Algérie
E-mail : fatima.filali@univ-constantine3.dz

Résumé

Face aux enjeux croissants liés au changement climatique et à la raréfaction des ressources énergétiques, la transition énergétique devient une priorité pour les institutions publiques, notamment dans le secteur du bâtiment tertiaire. Ce travail s'inscrit dans cette dynamique et propose une étude approfondie de la performance énergétique de l'Université Salah Boubnider Constantine 3 à travers la réalisation d'un audit énergétique. L'objectif principal est d'évaluer les consommations en énergie, d'identifier les dysfonctionnements et les surconsommations, et de proposer des pistes d'amélioration concrètes pour optimiser la gestion énergétique des bâtiments. L'audit a permis de relever des défaillances au niveau de l'enveloppe du bâtiment, des systèmes de chauffage, de ventilation et de climatisation (CVC), ainsi que de l'éclairage. Des recommandations adaptées ont été formulées, visant à réduire la consommation énergétique, les émissions de CO_2, et à améliorer le confort des usagers. Cette démarche s'inscrit pleinement dans les objectifs de durabilité et d'efficacité énergétique, et constitue un levier stratégique pour accompagner la transition énergétique dans le secteur universitaire.

Mots-clés : Audit énergétique, bâtiment tertiaire, efficacité énergétique, université Constantine 3, transition Énergétique, emissions de CO_2

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THE DYNAMICS OF THE URBAN HEAT ISLAND IN MILA CITY IN RESPONSE TO LAND USE CHANGES DURING THE PERIOD 2004–2024

Dr. Zineddine OMAROUAYACHE, Aissa BOULKAIBET

IGTU, Oum El Bouaghi University, Algeria
Zineddineomar97@gmail.com 1, boulkaibeta@gmail.com 2

Abstract

This study aims to analyze the relationship between land use changes and land surface temperature (LST) in Mila city over a period of twenty years. To achieve this, remote sensing and geographic information systems (GIS) techniques were employed to investigate land use and surface temperature changes for the years 2004, 2014, and 2024.

The results revealed a positive correlation between urban expansion and surface temperature increase, with barren lands recording the highest temperatures during the study periods, followed by built-up areas. Conversely, vegetated areas consistently exhibited lower surface temperatures compared to urban zones. These findings highlight the importance of increasing green spaces within urban areas as an effective measure to mitigate the urban heat island effect, thereby contributing to improved urban environmental quality and more efficient energy consumption.

Keywords: Urban expansion, urban heat island, land surface temperature, GIS, RS.

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ALGERIA'S BLUE ECONOMY: CHALLENGES AND PROSPECTS

Dr. Imane KECHACHA[1], Koudoua FERHATI[2]

[1, 2] Faculty of Architecture and Urban Planning, University of Constantine 3 — Salah Boubnider, Constantine, Algeria

Abstract

This study explores the challenges and prospects of the blue economy in Algeria, a strategic sector linking economic growth to environmental sustainability.

The authors examine the country's maritime potential, particularly in the fields of fisheries, marine energy, coastal tourism and maritime transport, while highlighting the institutional and technological obstacles that hinder its development.

They insist on the need for integrated governance and investment in research, innovation and training, in order to position Algeria as a major player in the sustainable blue economy in the Mediterranean.

Keywords: The blue economy, the Algerian waters, the national economy and the sustainability.

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