RESEARCH ARTICLE

Efficeiency of local governance in improving Sustainable Solid Waste Managment at the Municipal Level through sustainable urban indicators , case study of the municipality of Eucalyptus, Algiers (Algeria)

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Abstract

In the era of changing paradigms and new approaches to sustainable local development, it is important to establish a sustainable balance at the scale of a territory.

The questioning that arises relates to "how to reconcile between local actors in the ecosystem of the sustainable city? ", a relevant question arises: "how to strengthen local governance in order to ensure the fabric of the sustainable city? ". Knowing that the real involvement of these local actors for the achievement of the objectives in the sustainable local governance process, is a tool determining the efficiency of sustainability. While combining the socio-economic and environmental aspects at the local territorial level.

The waste management is the main component of the local sustainable development. It is released through operations taken by householders in their municipality, all citizens are concerned by actions.

The increase in this population is a determining factor in the efficiency of large cities and metropolitan areas. The territory is a collective construction, based on the development of local resources and the control of various systems and all stakeholders.

The methodological tool is a grid of sustainable urban indicators linked to the solid waste management of the municipality, according to DPSIR as a tool of qualitative and quantitative assessment this at the local level which is a representative case "the commune of Eucalyptus" by defining the degree of involvement of the actors in the management process, ranging following ISO 37120 as an indicator of standardization looking to enhance the environmental policy at the decision-making level. The results will give an answer to our expectations.

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1. INTRODUCTION: GENERAL CONTEXT AND SITUATION OF THE COMMUNE CASE STUDY

Today's urban environment is characterized by global problems and opportunities offered by local solutions that have proven effective (United Nations, 2016). Thinking about sustainable cities at the local level. Indeed, the sustainable development of a city is first and foremost a project to be built collectively(United Nations, 2017), bringing together local stakeholders(Farooq et al., 2021).

The economic and social development of our society inevitably leads to a growing increase in urban waste, which in the short and long term constitutes a major concern for public authorities. It represents a definite danger to public health, particularly in urban areas where there is a high concentration of population(Zakhilwal et al., 2024).

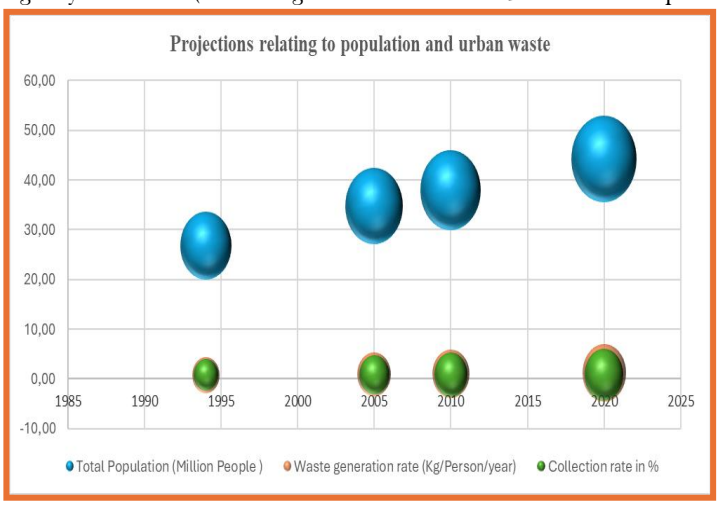
The increase in this population is a determining factor in efficiency in large cities and towns. The territory is a collective construction, based on the development of local resources and the control of the different systems and all the actors(Vargas-Hernández & Zdunek-Wielgołaska, 2019).

Sustainable Development Goal 11, one of 17 Global Goals that make up the 2030 Agenda for Sustainable Development, recognizes the need to make cities and human settlements 'inclusive, safe, resilient and sustainable(United Nations, 2025).

It is a multidimensional process, which takes place over time and in a space that is constructed. The use of the notion of governance (Sheryl Ann Lee, 2022)through forms of collective action, renewal of urban strategic planning, and the development of consultation processes between local actors (Deshmukheet al., 2022).

Cities should have efficient waste management that boosts the economy in order to grow sustainably (Mathew et al., 2025).

The global spread of MSW causes environmental problems, particularly in developing countries(Kerdsuwan et al., 2015).In Algeria, waste management services are provided by local government. Promoting garbage sorting, collecting, transportation, processing, recycling, and removal practices among Algerians in general and municipal authorities in particular is the responsibility of the AND «National Agency of Waste»(Balancing Environmental and Economic Imperatives, 2021)



Graph 1: Urban waste´s quantity and evolution of population in Algeria

1. Eucalyptus municipality as a case study: An effective effort of stackeholders to built a successeful process of sustainable development of waste managment

1.1 Situation of Eucalyptus Municipality:

The municipality of Eucalyptus is located in the South of the Wilaya Algiers, it is 17 km from the center of Algiers (capital of Algeria).
The municipality is divided into 24 sectors, divided into collective and individual housing sectors.
In terms of waste collection management:(Khosravani et al., 2023)managed by the EPIC Extra Net and municipal services.

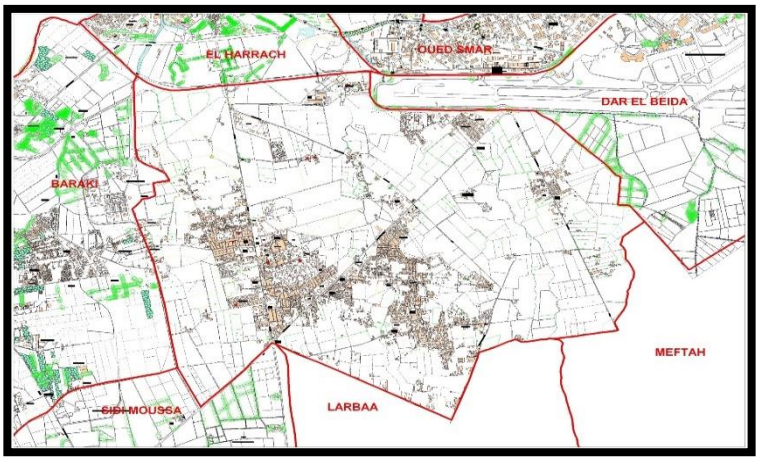
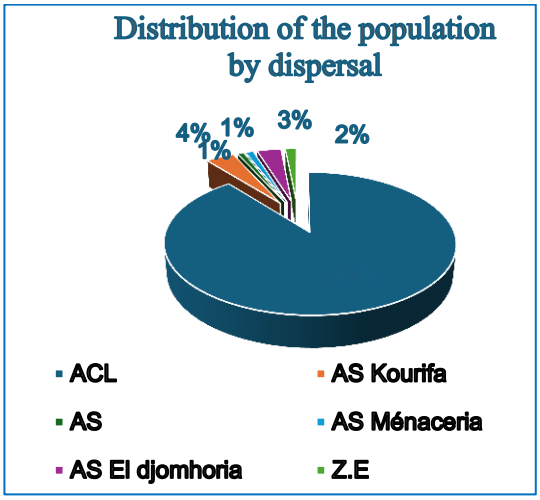


Figure 1: Situation of the Municipality of Eucalyptus / neighboring municipalities (source:Planning service Eucalyptus Municipality)



Note: This spatial distribution of the population is explained by a large concentration in the main town due to a concentration of equipment and housing ; at the same time, 61.76% of the territory of the municipality is rural agricultural (very low density limited to a few dwellings)(Srir et al., 2016).

1.2 Local Governance and the Managment of Solid Waste in Eucalyptus Municipality:

The issue of governance at the local level(Rahardjo, 2021), which represents the municipality as a sustainable territory through its local stakeholders.In a city, the way of living in an urban environment (United Nations Human Settlements Programme (UN-Habitat) "A BETTER QUALITY OF LIFE FOR

ALL IN AN URBANIZING WORLD" THE STRATEGIC PLAN "A BETTER QUALITY OF LIFE FOR ALL IN AN URBANIZING WORLD," 2020)is unfluenced by the degree of urbanization, industrialization, and consumption(Mathew et al., 2025), as well as by the ability of communities to mobilize for a collective cause, Today's urban environment is characterized by global problems and opportunities offered by local solutions that have proven effective in an urban context. How to think about the sustainable city at the local level ? Indeed, the sustainable development (Vargas-Hernández & Zdunek-Wielgołaska, 2019)of a city is first and foremost a project to be built and an approach that must be collective, bringing together local stakeholders around a common goal(Naghel et al., 2022).

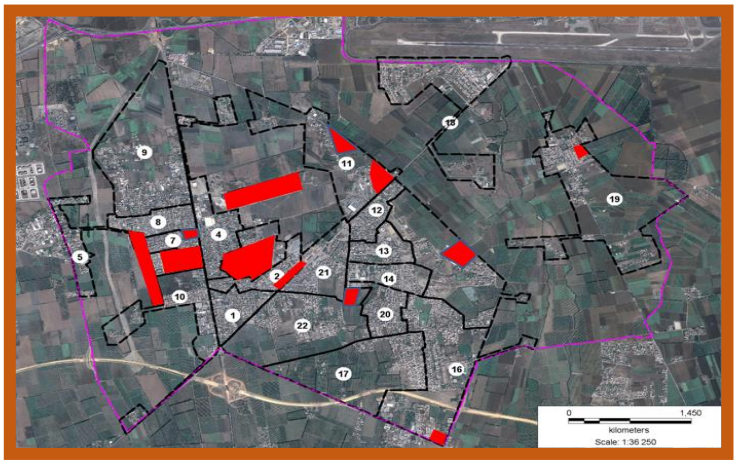


Figure 3: waste sectors of collection in the municipality of Eucalyptus, wilaya of Algiers

According to the master plan for the development of the wilaya of Algiers, Eucalyptus is an area, which has been subject to a hig concentration of population in Eucalyptus, this municipality that could emerge as important urban center(Strategique Developpement D et al., 2019).

The Eucalyptus municipality is located in the Alger wilaya, to the east of the capital. She is accustomed to rapid urbanization brought on by significant demographic and land pressure.
The commune of Eucalyptus, which is part of the Mitidja plain, is ranked eighth in terms of surface area and fourth in terms of population in the wilaya of Algiers(STATISTICAL DIRECTORY WILAYA ALGER, 2020).
Its predominantly agrarian eastern region is experiencing anarchic and disproportionate urban growth.
Comprising both planned and unplanned areas, the area exhibits notable disparities in terms of urbanity, service accessibility, and urban environment quality(Mohamed, 2018).

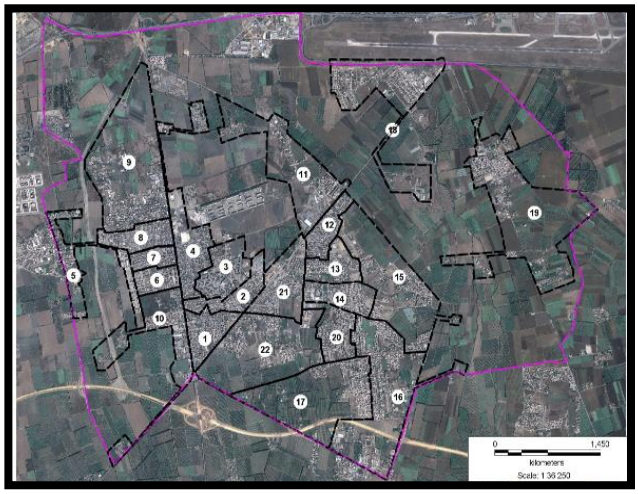


Figure 4: Housing zoning in the municipality of Eucalyptus, wilaya of Algiers (Algeria)

Note: The sectors with high density and small surface area, like S2, S3, S6, S7, and S8, make up the majority of the sectors of the collection that Eucalyptus municipality ensures. These are followed by sectors with medium density and medium surface area, like S1, S4, and S5, and two sectors with low density and large surface area, like S9 and S10.

Fig 5: Semi-buried bins

Indicator Name	Definition	DPSIR Link	Local Source	ISO Indicator
Waste Production Per Capita	kg/capita/year	Pressure	APC / AND	Yes
Formal collection rate	Population served rate	Response	technical Services / plan APC	Yes
Number of illegal dumps mapped	Total geolocated	State	Field Observation / SIG	No
Collection Frequency Per week	Number of rounds/week	Response	Logistics Plan	Yes
users Satisfaction	Average survey Score	Impact	Score citizen survey	No
Waste recovery Rate	% waste recycling/compost	Impact	Private Operators / DND	Yes

Table : Indicators of Solid Waste Managment in Eucalyptus Municipality

Due to the inadequate material resources available to the waste management services in a municipality of this size and concentration (population density and economic activity), we observed an inadequate collection rate in relation to the amount of waste generated. For this reason, high-quality equipment from the EPIC Extranet is crucial.

Figure 6: Material used in the municipality's collection

Figure 7: Waste collection in collective city housing (1600 housing city- state)

3. INVESTIGATION TOOLS AND METHODS:

This study uses a qualitative methodology, focusing on a case study with a set of sustainable urban indicators linked to its management of municipal solid waste, they are of a quantitative and qualitative nature.

➢ Frameworks for Methodological Reference

For the purpose of choosing, organizing, and analyzing sustainable urban indicators related to solid waste management in the municipality of Eucalyptus (Algiers), this study employs two primary academic methodological frameworks:

The structure known as DPSIR (Drivers, Pressures, State, Impacts, and Responses)

• **Indicators for Urban Services and Quality of Life (ISO 37120)**

. **The Framework for DPSIR**

The European Environment Agency (EEA) adopted the DPSIR framework, a conceptual paradigm that enables environmental studies to be organized using a causal logic (Mathew et al., 2025):

Socioeconomic factors that affect the environment, such as urbanization and consumption, are the drivers.

Environmental pressures include the amount of garbage and improper categorization.

-Drivers: socioeconomic factors (urbanization, consumption) that affect the environment Environmental pressures(Mandpe et al., 2023) include the amount of garbage and improper categorization.

- State: the environment's current condition (pollution level, garbage bin saturation)

- Impacts: include repercussions for biodiversity, human health, and the urban environment. Institutional or citizen responses include policies, awareness-raising campaigns, and other measure.

✓ The problems with waste management in the municipality being studied will be methodically examined using this framework.

3. **The ISO 37120**

The International Organization for Standardization (ISO) created (WCCD, 2018)ISO 37120:2018, an international standard that offers a set of uniform metrics for evaluating the sustainable development performance of cities.

This standard(Sustainable Cities and Communities-Indicators for City Services and Quality of Life COPYRIGHT PROTECTED DOCUMENT, 2018) suggests indicators for waste management, including:

The amount of solid garbage produced by municipalities per person

The pace at which municipal solid waste is collected; the proportion of treated or recovered municipal solid waste.

3.1. Description of the study area

The Selected Sector of Eucalyptus Municipality make up the study area. It consists of the sectors waste collection chosen by its stackholders(Ministry of Environment and Natural Resources, 2018).

3.2 Types of waste Collection in Eucalyptus municipality:

Materials	Contents	Collection Door-to-door in columns or separate	Processing and Uses
Cardboard	Cardboard, newspapers, paper packaging	Trash can and brown bag	Transfer to paper mill
Glass	All types of glass	Trash can and blue bag	All reuse of colored glass

Plastic	Lightweight packaging, boxes, capsules, plastic bags	Trash can and yellow bag	Energy recovery, material recovery, chemical recovery
Biodegradable waste	Peelings, garden waste, shells, leftovers, ashes, etc.	Take directly to the recycling center	Compost recovery
Bulky waste	Furniture	Take directly to the recycling center	Dismantling and decontamination facility for recovery
Hazardous substances (WEEE)	Paints, batteries, household appliances, batteries, etc.	Trash can and black bag	Dismantling and decontamination facility for recovery
Medicines	All types of medication	Trash can and purple bag	Repurposing of products, Energy recovery
Oils, acids, solvents, aerosol sprays, phytosanitary products, glues,	Oil and other waste	In leak-proof containers to prevent any leakage of toxic products	Regenerated (new oils) or burned (incineration)

Table: Types of waste Collection in the municipality

Note: The secret to a clean recyclable product and a more successful recovery is separate garbage collecting. To compact them into bales and deliver them to recovery plants, each sorting column needs to be gathered separately(Allaoua & Kahil, n.d.).

4. METHODS AND RESULTS

✓ Sustainable durability in municipal waste management indicators:

To attempt to answer this question, we used indicators, following this logic of DPSIR method(Sinan Kufeoglu, 2022)

We indicate these values indicated by these following symbols:

D – Drivers

- **D1**: Urban population
- **D2**: Urbanization rate
- **D3**: Consumption level

P – Pressures

- **P1**: Volume of waste produced per capita/day
- **P2**: Percentage of unsorted waste
- **P3**: Number of illegal accumulation areas

S – State

- **S1**: Urban cleanliness

- **S2**: Area occupied by illegal dumpsites
- **S3**: Effective collection level (%)

I – Impacts

- **I1**: Number of waste-related complaints
- **I2**: Incidence of pollution-related illnesses
- **I3**: Reported environmental nuisances

R – Responses

- **R1**: Municipal budget for waste management
- **R2**: Number of awareness campaigns/year
- **R3**: Recycling rate

Category	Code	Indicator	Value
D – Drivers	**D1**	Urban population	75
D – Drivers	**D2**	Urbanization rate	80
D – Drivers	**D3**	Consumption level	60
P – Pressures	**P1**	Volume of waste produced per capita/day	50
P – Pressures	**P2**	Percentage of unsorted waste	30
P – Pressures	**P3**	Number of illegal accumulation areas	40
S – State	**S1**	Urban cleanliness	50
S – State	**S2**	Area occupied by illegal dumpsites	20
S – State	**S3**	Effective collection level (%)	85
I – Impacts	**I1**	Number of waste-related complaints	35
I – Impacts	**I2**	Incidence of pollution-related illnesses	25
I – Impacts	**I3**	Reported environmental nuisances	45
R – Responses	**R1**	Municipal budget for waste management	20
R – Responses	**R2**	Number of awareness campaigns/year	10
R – Responses	**R3**	Recycling rate	30

Table: DPSIR Indicators

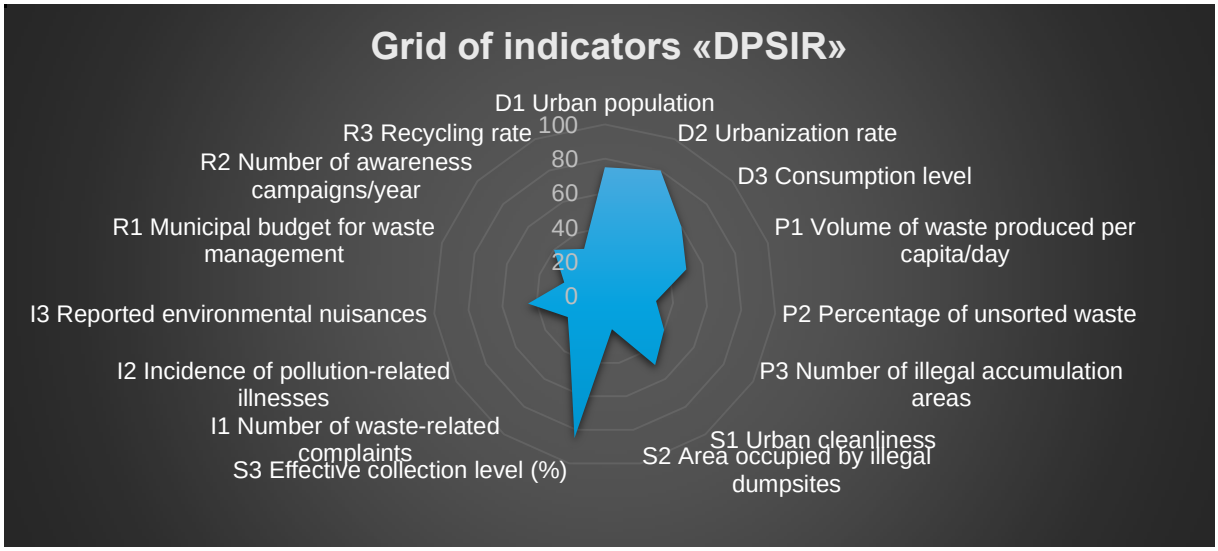


Figure 8: Grid of Indicators for Sustainable Waste Managment at Local level

CONCLUSION :

In order to achieve four complementary goals preserving natural resources for future generations, improving the environment, generating economic activity and jobs(Serge Kubanza & Simatele, 2020), and involving our fellow citizens in organizing collective action—sustainable municipal waste management must be viewed first and foremost as a source of raw and secondary materials that local authorities and municipalities have an obligation to utilize(Ramandei, 2022). In order to accomplish this, we must give accurate information on recycling and treatment methods as well as the organizational structures that should be established to maximize collections, with the goal of keeping expenses within the reach of our fellow residents. More support should be given to new technology for recycling and treatment(Girma et al., 2022).

Figure 9: Swipe Card of Eucalyptus Municipality

References

1. Allaoua, S., & Kahil, S. (n.d.). *The Management of Special and Hazardous Waste in Algeria: The Case of the Company Greensky*. http://eelet.org.uk
2. Balancing Environnemental and Economic Imperatives. (2021). *3 Editorial 4 Tribune*.
3. Deshmukhe, A. S., Chorage, P. R., Sanvake, O. B., Mali, A. H., Kambale, A. D., & Shinde, C. S. (2022). Smart Garbage Monitoring System. In *International Journal of Research Publication and Reviews Journal homepage: www.ijrpr.com* (Vol. 3, Issue 7). www.ijrpr.com
4. Farooq, A., Haputta, P., Silalertruksa, T., & Gheewala, S. H. (2021). A Framework for the Selection of Suitable Waste to Energy Technologies for a Sustainable Municipal Solid Waste Management System. In *Frontiers in Sustainability* (Vol. 2). Frontiers Media S.A. https://doi.org/10.3389/frsus.2021.681690
5. Girma, H., Geremew, A., Alemayehu, M., Mulatu, G., Gebrehiwot, M., & Defloor, B. (2022). Urban Households' Willingness to Pay to Improve Municipal Solid Waste Collection Services and Associated Factors: A Double-Bounded Contingent Valuation Study in Harar City, Ethiopia. *Environmental Health Insights*, *16*. https://doi.org/10.1177/11786302221134937
6. Kerdsuwan, S., Laohalidanond, K., & Jangsawang, W. (2015). Sustainable Development and Eco-friendly Waste Disposal Technology for the Local Community. *Energy Procedia*, *79*, 119–124. https://doi.org/10.1016/j.egypro.2015.11.493
7. Khosravani, F., Abbasi, E., Choobchian, S., & Jalili Ghazizade, M. (2023). A comprehensive study on criteria of sustainable urban waste management system: using content analysis. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-49187-x
8. Mandpe, A., Paliya, S., Gedam, V. V., Patel, S., Tyagi, L., & Kumar, S. (2023). Circular economy approach for sustainable solid waste management: A developing economy perspective. In *Waste Management and Research* (Vol. 41, Issue 3, pp. 499–511). SAGE Publications Ltd. https://doi.org/10.1177/0734242X221126718
9. Mathew, A., Pavithran P, S. A., Singh, K., Joshi, S. S., & Professor, A. (2025). Integrated Waste Management Strategies For Sustainable Urban Development. In *International Journal of Environmental Sciences* (Vol. 11, Issue 4). https://doi.org/https://www.theaspd.com/ijes.php
10. Ministry of Environment and Natural Resources. (2018). *THE NATIONAL SUSTAINABLE WASTE MANAGEMENT BILL, 2018 ARRANGEMENT OF CLAUSES PART II-POLICY COORDINATION AND OVERSIGHT OF WASTE MANAGEMENT 6-Ministry of Environment and Natural Resources. 7-National Environment Management Authority. 8-County Governments*.
11. Mohamed, G. (2018). *JCSE Special Issue on Control Applications for Chaotic and Hyperchaotic Systems View project CEO Emotional View project*. https://www.researchgate.net/publication/326294921
12. Naghel, M., Farhi, A., & Redjem, A. (2022). Household Waste Management Challenges The Case of M'sila, Algeria. In *Technology & Applied Science Research* (Vol. 12, Issue 3). www.etasr.com
13. Rahardjo, M. (2021). Community Behavior Relationship With The Quality Of Household Waste Management (Case Study In Jabungan Village). *International Journal of Health, Education and Social (IJHES)*, *4*(10), 1–8. www.ijhes.com
14. Ramandei, L. (2022). Community Participation in Waste Management in Hamadi South. In *South Jayapura District*. https://www.researchgate.net/publication/365126419
15. Serge Kubanza, N., & Simatele, M. D. (2020). Sustainable solid waste management in developing countries: a study of institutional strengthening for solid waste management in Johannesburg, South Africa. *Journal of Environmental Planning and Management*, *63*(2), 175–188. https://doi.org/10.1080/09640568.2019.1576510
16. Sheryl Ann Lee. (2022). SLeePhDThesis151159272022`E glish Local Authorities. *Manchester Metropolitan University*, 283.
17. Sinan Kufeoglu. (2022). *Connecting the Goals SinannKüfeoğlu Emerging Technologies Value Creation forrSustainable Development*. https://doi.org/doi.org101.007

18. Srir, Mohamed., Benaïssa, Amine., & Berezowska-Azzag, Ewa. (2016). *Dynamiques urbaines à Alger : la (re)fabrication de la ville en question*. L'Harmattan.
19. STATISTICAL DIRECTORY WILAYA ALGER. (2020). *.1 APERCU HISTORIQUE*.
20. Strategique Developpement D, P. DE, Renouvellement De La Demarche D, P. U., La Ville Algerienne, A. DE, Abdelouahab, B., LA VILLE ALGERIENNE Kehal Sihem BOUCHERIT, A. DE, & Bouchareb, A. (2019). Résumé. In *Sciences & Technologie D-N°49*. https://www.researchgate.net/publication/338456563
21. *Sustainable cities and communities-Indicators for city services and quality of life COPYRIGHT PROTECTED DOCUMENT*. (2018).
22. United Nations. (2016). *H A B I TAT I I I-2 0 1 6*. https://doi.org/www.habitat3.org
23. United Nations. (2017). *New Urban Agenda, United Nations, 2017, ISBN 978 92 1 132731 1-English*. 66.
24. United Nations. (2025). *The Sustainable Development Goals Report*.
25. *United Nations Human Settlements Programme (UN-Habitat) "A BETTER QUALITY OF LIFE FOR ALL IN AN URBANIZING WORLD" THE STRATEGIC PLAN "A BETTER QUALITY OF LIFE FOR ALL IN AN URBANIZING WORLD."* (2020). www.unhabitat.org
26. Vargas-Hernández, J. G., & Zdunek-Wielgołaska, J. A. (2019). Recent trends in Sustainable Urban Planning. *International Journal of Sustainable Economies Management*, *8*(3), 29–47. https://doi.org/10.4018/ijsem.2019070103
27. WCCD. (2018). *The New ISO Standard for Resilient Cities Indicators: Opportunities for City and Expert Input Session Overview*.
28. Zakhilwal, S. A., Shirzad, W., & Behsoodi, M. M. (2024). A Comprehensive Review of Engineering Strategies for Environmental Sustainability in Sustainable Waste Management. *International Journal of Current Science Research and Review*, *07*(10). https://doi.org/10.47191/ijcsrr/V7-i10-02